

FINAL
**ENVIRONMENTAL ASSESSMENT
OF
INSTALLATION DEVELOPMENT
AT
MACDILL AIR FORCE BASE, FLORIDA**



MARCH 2013

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14. ABSTRACT

MacDill AFB uses numerous 6 AMW-approved development plans to project installation development requirements. These plans propose demolition, construction, infrastructure improvement natural infrastructure management, and strategic sustainability performance projects intended to ensure that the installation can sustain its current and future national security operations and mission-readiness status. These projects include installation development projects contained in the MacDill AFB Installation Development Plan, Base Comprehensive Asset Management Plan, and the community of all other existing Wing-approved development and resource plans. MacDill AFB seeks to improve its understanding of the potential environmental consequences associated with the continuing installation development process by evaluating in a single environmental assessment (EA) selected projects from those projects proposed in the 6 AMW-approved community of plans for installation development, called the Installation Development EA (IDEA). The Proposed Action is to implement a range of selected projects, such as demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, community living upgrades, infrastructure improvement, recreational upgrades, natural infrastructure management, and other environmental projects that would be among those proposed to be completed or implemented during the next 5 years (from Fiscal Year [FY] 2012 to FY 2017). The IDEA uses a fenceline-to-fenceline approach, capturing and addressing in some form identified projects within the installation boundary that have been proposed by host and tenant agencies in accordance with Interservice Support Agreements. The intent of the IDEA is to address the Proposed Action of implementing installation development actions for continuing development on MacDill AFB to ensure that future mission and facility requirements are met. The scope of the IDEA includes a detailed analysis of the selected projects, an evaluation of alternatives to selected projects in various categories and an analysis of the cumulative effects on the natural and man-made environment of all other identified projects from the installation development and resource management plans. Through the IDEA, MacDill AFB provides a constraints-based environmental impact analysis of installation development actions for projects selected from those projected over the next 5 FYs and thus help to identify environmental concerns that could exist throughout the installation and those unique to specific areas of the installation. The analysis draws from the knowledge gained from extensive recent evaluations for similar types of projects to determine the direct, indirect, and

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FINDING OF NO SIGNIFICANT IMPACT (FONSI)
AND
FINDING OF NO PRACTICABLE ALTERNATIVE (FONPA)
Environmental Assessment of Installation Development
at MacDill Air Force Base (AFB), Florida

Federal actions that potentially involve significant impacts on the environment must be reviewed in accordance with the National Environmental Policy Act (NEPA) and all other applicable laws. The United States Air Force (USAF) has completed an Environmental Assessment (EA) to address the potential environmental consequences associated with implementing selected installation development projects at MacDill AFB, Florida, as drawn from the MacDill AFB Wing-approved community of plans for installation development and resource management. The selected installation development projects were grouped into five categories: demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects because of common elements of their activity and the nature of their expected potential environmental impacts. The selected installation development projects include the following:

Demolition Projects

- D1. Demolish Buildings 65, 82, 83, and 85
- D2. Demolish Building 1107
- D3. Demolish Building 40

Construction Projects

- C1. Upgrade Fitness Center Soccer Field, add to and alter Physical Fitness Center, Construct Joint Combat Aquatic Training Center
- C2. Construct Logistics Readiness Complex
- C3. Construct Explosive Ordnance Disposal Bunker Barricades
- C4. Construct Joint Special Operations University
- C5. Construct Outdoor Recreation Maintenance Facility
- C6. Alert Facility, Fuels Mobility Support Equipment Facility

Infrastructure Improvement Projects

- I1. Construct CENTCOM Parking Garage
- I2. Straighten Marina Bay Drive
- I3. Construct Dining Facility Parking Lot
- I4. Construct Medical Clinic Sidewalks

- I5. Replace Sludge Digester Tanks
- I6. Construct Defense Information Systems Agency (DISA) Parking Lot, Building 805

Natural Infrastructure Management Projects

- NI1. Storm Water Drainage Improvements

Strategic Sustainability Performance Project

- S1. Install Jogging Path Lighting

The Proposed Action, implementing these 17 selected projects, and potential alternatives have been reviewed in accordance with NEPA as implemented by the regulations of the Council on Environmental Quality (CEQ) and USAF regulation in 32 Code of Federal Regulation (CFR) 989, *Environmental Impact Analysis Process*. The analyses focuses on the following environmental resources: noise, land use, air quality, geological resources, water resources, biological resources, cultural resources, socioeconomic resources and environmental justice, infrastructure, hazardous materials and waste, and safety. Details of the potential environmental consequences identified from these analyses can be found in the attached Installation Development Environmental Assessment (IDEA).

Florida Coastal Zone Management. In accordance with the Federal Coastal Zone Management Act (CZMA) and the Florida CZMA, this Federal action must be consistent “to the maximum extent practicable” with the Florida Coastal Management Program (CMP). Appendix E of the IDEA contains the USAF’s Consistency Statement and finds that the conceptual Proposed Action and alternatives plans presented in the attached IDEA are consistent with Florida’s CMP. In accordance with Florida statutes, the USAF submitted a copy of the attached IDEA to the State of Florida so that a coastal zone consistency evaluation could be performed. The State of Florida determined that, at this stage, the Proposed Action is consistent with the Florida CMP. The state’s final concurrence of the Proposed Action’s consistency with the CMP will be determined during the environmental permitting stage of the projects.

Finding of No Practicable Alternative. Executive Order (EO) 11990, *Protection of Wetlands*, (24 May 1977) directs agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands, wherever there is a practicable alternative. Federal agencies are to avoid new construction in wetlands, unless the agency finds there is no practicable alternative to construction in the wetland and the proposed construction incorporates all possible measures to limit harm associated with development in a wetland. Agencies should use economic and environmental data, agency mission statements, and any other pertinent information when deciding whether or not to build in wetlands. EO 11990 directs each agency to provide for early public review of plans for construction in wetlands. In accordance with EO 11990 and 32 CFR Part 989, a FONPA must accompany the FONSI stating why there are no practicable alternatives to development within or affecting wetland areas.

Wetland impacts are reduced to the maximum extent possible through project design and implementation of environmental protection measures. However, as noted in the attached IDEA, Project NI1 has the potential for minor, adverse and beneficial impacts on wetlands. Adverse

effects on wetlands will not be significant, and will be minimized with proper implementation of best management practices (including flagging the wetland boundary, the use of erosion-control devices, and installing silt fencing). Beneficial effects on wetlands will occur because localized flooding and standing waters in ditches would be reduced. This action will also comply with the installation's Storm Water Management Plan and Spill Prevention, Control, and Countermeasures Plan. Any necessary agency coordination and required permits will be acquired prior to commencing any activities associated with drainage improvements. As noted in the attached IDEA, there are no practicable alternatives to this project because the objectives sought by this project preclude the selection of any practicable alternatives.

EO 11988, *Floodplain Management* (24 May 1977), requires Federal agencies to avoid to the maximum extent possible the long- and short-term, adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. If it is found that there is no practicable alternative, the agency must minimize potential harm to the floodplain, and circulate a notice explaining why the action is to be located in the floodplain prior to taking action. Finally, new construction in a floodplain must apply accepted flood proofing and flood protection to include elevating structures above the base flood level rather than filling in land.

The Proposed Action will place all selected projects, with the exception of Project I4, within the 100-year floodplain. As noted in Section 2.1 of the attached IDEA, practicable alternatives are not available for these projects because approximately 80 percent of the installation occurs in the 100-year floodplain. The runway and airfield occupy approximately 80 percent of the land mass outside of the floodplain on MacDill AFB and are constrained from further development for safety reasons. Therefore, any alternatives to these selected projects would also occur within the 100-year floodplain. All six construction projects, the natural infrastructure project and strategic sustainability performance project, and all infrastructure projects except Project I4 will have long-term, minor, adverse effects on the 100-year floodplain because they will result in a net gain in impervious surfaces within the 100-year floodplain. Buildings designated to be occupied structures will be constructed on a minimum 11.5-foot elevated pad to raise facilities above the 100-year floodplain elevation. Any necessary agency coordination and required permits will be acquired prior to commencing any activities associated with increasing impervious surfaces within the 100-year floodplain. Demolition projects that return areas to open space within the 100-year floodplain will represent long-term, minor, beneficial effects on the 100-year floodplain. These activities, while occurring in the 100-year floodplain, will not result in a significant increase to impervious surfaces within the 100-year floodplain. Therefore, no significant impacts on the 100-year floodplain are anticipated.

Pursuant to EOs 11988 and 11990, the authority delegated in Headquarters Air Force Mission Directive 1-18, and in AMC/CV Redelegation of Environmental Authorities letter dated 14 January 2005, and in consideration of the findings of the IDEA, which is incorporated herein by reference, I find that there is no practicable alternative to this action and that these projects include all practicable measures to minimize harm to the environment.

Finding of No Significant Impact. Based upon my review of the facts and analyses contained in the attached IDEA, incorporated by reference, I conclude that implementation of the Proposed Action would not have a significant environmental impact, either by itself or cumulatively with

other projects at MacDill AFB. Accordingly, the requirements of NEPA and the regulations promulgated by the CEQ and the USAF are fulfilled and an EIS is not required. The *Tampa Tribune* published a Notice of Availability on 21 August, 2012 for public review of the Draft IDEA. Copies of agency coordination letters, project correspondence, and comments received from the agencies are included in Appendix B of the IDEA.



TIMOTHY S. GREEN
Brigadier General, USAF
Director of Installations and Mission Support

18 Apr 13

DATE

Attachment: *Environmental Assessment of Installation Development at MacDill AFB, Florida*

ACRONYMS AND ABBREVIATIONS

µg/m ³	micrograms per cubic meter	EISA	Energy Independence and Security Act
6 AMW	6th Air Mobility Wing	EIS	Environmental Impact Statement
6 CES	6th Civil Engineering Squadron	EO	Executive Order
ACHP	Advisory Council on Historic Preservation	EOD	Explosive Ordnance Disposal
ACM	asbestos-containing material	EPAct	Energy Policy Act
AFB	Air Force Base	EPF	Environmental Planning Function
AFOSH	Air Force Occupational and Environmental Safety, Fire Protection, and Health	ERP	Environmental Restoration Program
AFI	Air Force Instruction	ESA	Endangered Species Act
AFPD	Air Force Policy Directive	ESCP	erosion-and-sediment-control plan
AICUZ	Air Installation Compatible Use Zone	F&I	furnish and install
AMC	Air Mobility Command	FAA	Federal Aviation Administration
AOC	area of concern	F.A.C.	Florida Administrative Code
APE	area of potential effect	FAMCAMP	family campground
APZ	accident potential zone	FDEP	Florida Department of Environmental Protection
AST	aboveground storage tank	FEMA	Federal Emergency Management Agency
AT/FP	Anti-Terrorism/Force Protection	FGUA	Florida Governmental Utility Authority
AQCR	air quality control region	FIRM	Flood Insurance Rate Map
BASH	bird/wildlife aircraft strike hazard	FMSE	Fuels Mobility Support Equipment
BCE	Base Civil Engineering	FOD	foreign object damage
BMP	best management practice	FONPA	Finding of No Practicable Alternative
BOWST	boom operator weapon system trainer	FONSI	Finding of No Significant Impact
BRAC	Base Realignment and Closure	FORCE	Fuels Operation Readiness Capability Equipment
C&D	construction and demolition	FPPA	Farmland Protection Policy Act
CAA	Clean Air Act	FR	Federal Register
CAIS	Chemical Agent Identification Sets	ft ²	square feet
CCCL	coastal construction control line	FUB	Facilities Utilization Board
CENTCOM	U.S. Central Command	FWC	Florida Wildlife Commission
CEQ	Council on Environmental Quality	FY	fiscal year
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	GHG	greenhouse gas
CEV	Environmental Flight	GIS	Geographic Information System
CEVR	Environmental Restoration Element	HABS	Historic American Building Survey
CIP	Capital Improvement Project	HAP	Hazardous Pollutant
CFR	Code of Federal Regulations	HAZMAT	Hazardous Materials
CO	carbon monoxide	HAZMART	Hazardous Materials Pharmacy
CO ₂	carbon dioxide	HAZWOPER	Hazardous Waste Operations and Emergency Response
CWA	Clean Water Act	HMMP	hazardous materials management process
CZ	clear zone	HUD	U.S. Housing and Urban Development
dBA	A-weighted decibel	HQ	headquarters
DISA	Defense Information Systems Agency	HVAC	heating, ventilation, and air conditioning
DNL	day-night average sound level	ICRMP	Integrated Cultural Resource Management Plan
DOD	Department of Defense	IDEA	Installation Development Environmental Assessment
DODI	Department of Defense Instruction	IDP	Installation Development Plan
DRMO	Defense Reutilization and Marketing Office	IHMP	Installation Hazardous Materials Management Program
EA	Environmental Assessment	IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
EESOH-MIS	Enterprise Environmental Safety and Occupational Health – Management Information System	INRMP	Integrated Natural Resource Management Plan
EFH	essential fish habitat		
EIAP	Environmental Impact Analysis Process		

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LBP lead-based paint
 JCAT Joint Combat Aquatic Training
 JCSE Joint Communications Support Element
 kV kilovolt
 LEED Leadership in Energy and Environmental Design
 LID low-impact development
 JLUS joint land use study
 JSOU Joint Special Operations University
 LPA large project area
 LRS Logistics Readiness Squadron
 LTM long-term management
 LUC land use control
 LUCIP Land Use Control Implementation Plan
 MBTA Migratory Bird Treaty Act
 MILCON military construction
 MFH military family housing
 mgd million gallons per day
 mg/m³ milligrams per cubic meter
 MNA monitored natural attenuation
 MOA Memorandum of Agreement
 mph miles per hour
 MSA munitions storage area
 MSDS Material Safety Data Sheet
 MSGP Multi Sector Generic Permit
 MS4 Municipal Separate Storm Sewer System
 msl mean sea level
 MSW municipal solid waste
 MW megawatt
 NAAQS National Ambient Air Quality Standards
 NAF Nonappropriated Funds
 NAGPRA Native American Graves Protection and Repatriation Act
 NEPA National Environmental Policy Act
 NESHAP National Emissions Standards for Hazardous Air Pollutants
 NFA No Further Action
 NHPA National Historic Preservation Act
 NMFS National Marine Fisheries Service
 NO₂ nitrogen dioxide
 NO_x oxides of nitrogen
 NOA Notice of Availability
 NOAA National Oceanic and Atmospheric Administration
 NPDES National Pollutant Discharge Elimination System
 NPS National Park Service
 NRCS Natural Resources Conservation Service
 NRHP National Register of Historic Places
 NSR new source review
 O₃ ozone
 OSHA Occupational Health and Safety Administration

OWS oil water separator
 PAH polycyclic aromatic hydrocarbon
 Pb lead
 pCi/L picocuries per liter
 percent g percentage of the force of gravity
 PCB polychlorinated biphenyl
 P.L. public law
 PM_{2.5} particulate matter equal to or less than 2.5 microns in diameter
 PM₁₀ particulate matter equal to or less than 10 microns in diameter
 POV personally operated vehicle
 ppb parts per billion
 PPE personal protective equipment
 ppm parts per million
 PSD Prevention of Significant Deterioration
 QD quantity-distance
 RCRA Resource Conservation and Recovery Act
 ROI region of influence
 SARA Superfund Reauthorization Act of 1986
 SDWA Safe Drinking Water Act
 SHPO State Historic Preservation Office
 SIP State Implementation Plan
 SME subject matter expert
 SO₂ sulfur dioxide
 SOCCENT Special Operations Command Central
 SOCOM U.S. Special Operations Command
 SPCC Spill Prevention Control and Countermeasures
 SRM Sustainment, Restoration, and Modernization
 SSPP Strategic Sustainability Performance Plan
 SWFWMD Southwest Florida Water Management District
 SWMU Solid Waste Management Unit
 SWPPP Storm Water Pollution Prevention Plan
 tpy tons per year
 TSCA Toxic Substances Control Act
 UFC Unified Facilities Criteria
 U.S.C. United States Code
 USAF U.S. Air Force
 USEPA U.S. Environmental Protection Agency
 USFWS U.S. Fish and Wildlife Service
 USGS U.S. Geological Survey
 UST underground storage tank
 UXO unexploded ordnance
 VOC volatile organic compound
 WCFI West Central Florida Intrastate
 WSA weapons storage area
 WWTP wastewater treatment plant

COVER SHEET

FINAL

ENVIRONMENTAL ASSESSMENT OF INSTALLATION DEVELOPMENT

AT

MACDILL AIR FORCE BASE, FLORIDA

Responsible Agencies: U.S. Air Force (USAF), Headquarters Air Mobility Command (AMC), Scott Air Force Base (AFB), Illinois; and the 6 Air Mobility Wing (6 AMW) at MacDill AFB, Florida.

Affected Location: MacDill AFB.

Proposed Action: Implementation of Selected Installation Development Projects.

Report Designation: Final Environmental Assessment (EA).

Abstract: MacDill AFB uses numerous 6 AMW-approved development plans to project installation development requirements. These plans propose demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects intended to ensure that the installation can sustain its current and future national security operations and mission-readiness status. These projects include installation development projects contained in the MacDill AFB Installation Development Plan, Base Comprehensive Asset Management Plan, and the community of all other existing Wing-approved development and resource plans. MacDill AFB seeks to improve its understanding of the potential environmental consequences associated with the continuing installation development process by evaluating in a single environmental assessment (EA) selected projects from those projects proposed in the 6 AMW-approved community of plans for installation development, called the Installation Development EA (IDEA). The Proposed Action is to implement a range of selected projects, such as demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, community living upgrades, infrastructure improvement, recreational upgrades, natural infrastructure management, and other environmental projects that would be among those proposed to be completed or implemented during the next 5 years (from Fiscal Year [FY] 2012 to FY 2017). The IDEA uses a fenceline-to-fenceline approach, capturing and addressing in some form identified projects within the installation boundary that have been proposed by host and tenant agencies in accordance with Interservice Support Agreements. The intent of the IDEA is to address the Proposed Action of implementing installation development actions for continuing development on MacDill AFB to ensure that future mission and facility requirements are met. The scope of the IDEA includes a detailed analysis of the selected projects, an evaluation of alternatives to selected projects in various categories, and an analysis of the cumulative effects on the natural and man-made environment of all other identified projects from the installation development and resource management plans.

Through the IDEA, MacDill AFB provides a constraints-based environmental impact analysis of installation development actions for projects selected from those projected over the next 5 FYs and thus help to identify environmental concerns that could exist throughout the installation and those unique to specific areas of the installation. The analysis draws from the knowledge gained from extensive recent evaluations for similar types of projects to determine the direct, indirect, and cumulative effects of projects that would be completed as part of the installation's development.

The IDEA has been prepared to evaluate the Proposed Action and alternatives, including the No Action Alternative. Resources that were considered in the impacts analysis are noise, land use, air quality, geological resources, water resources, biological resources, cultural resources, socioeconomic resources and environmental justice, infrastructure, hazardous materials and waste management, and safety.

FINAL

**ENVIRONMENTAL ASSESSMENT
OF
INSTALLATION DEVELOPMENT
AT
MACDILL AIR FORCE BASE, FLORIDA**

**HEADQUARTERS AIR MOBILITY COMMAND
INTEGRATED PLANNING BRANCH
507 SYMINGTON DRIVE
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MARCH 2013

**FINAL
ENVIRONMENTAL ASSESSMENT OF INSTALLATION DEVELOPMENT
AT
MACDILL AIR FORCE BASE, FLORIDA**

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1. Purpose, Need, and Scope

MacDill Air Force Base (AFB), Florida, seeks to improve its understanding of the potential environmental consequences associated with the continuing installation development process by evaluating in a single Environmental Assessment (EA) selected projects from those proposed in the MacDill AFB Wing-approved community of plans for installation development and resource management. The 6 Air Mobility Wing (6 AMW) at MacDill AFB, Florida, and Headquarters (HQ) Air Mobility Command (AMC) believe a comprehensive U.S. Air Force (USAF) Environmental Impact Analysis Process (EIAP) document would improve the continuing activity of installation development and facilitate compliance with the National Environmental Policy Act (NEPA) documentation process and requirements. As a result, the 6 AMW and HQ AMC have initiated an evaluation in this EA of selected projects from the programmed and reasonably foreseeable projects identified for the next 5 fiscal years (FYs), FY 2012 to FY 2017.

This document constitutes an Installation Development EA (IDEA). The intent of the IDEA is to address the Proposed Action of implementing selected installation development actions as found in the community of all current 6 AMW-approved plans on MacDill AFB. These projects identified in the various sections of this IDEA are a compilation of installation development activities as described in the MacDill AFB Installation Development Plan (IDP), Base Comprehensive Asset Management Plan, and all other existing 6 AMW-approved development and resource management plans. These plans provide for future development of the installation to accommodate future mission and facility requirements, include projects for transportation improvements and airfield and utility infrastructure enhancements, address natural and cultural resources management, and consider development constraints and opportunities and land use relationships. Since the establishment of MacDill AFB, as with all other USAF installations, continuous development has occurred.

The community of installation development plans is linked to individual funding programs, such as Base Realignment and Closure (BRAC); Military Construction (MILCON); Operations, and Maintenance; Military Family Housing (MFH); Sustainment, Restoration and Modernization (SRM); Anti-Terrorism/Force Protection (AT/FP); Nonappropriated Funds (NAF); and others. The MacDill AFB community of plans was examined to provide a consolidated list of projects that are planned and programmed over the next 5 FYs for the continued physical development of the installation to support air mobility missions and other readiness training and operational assignments. In addition to evaluating the selected projects in detail, the IDEA serves as a baseline for future environmental analysis of mission and training requirements and future projects. Alternatives applicable to the various categories of projects, and to individual selected projects, are provided. An analysis of the potential cumulative effects associated with all the other projects from the installation development plans is also included in this IDEA in the cumulative impacts section.

This section of the IDEA includes background information on the location and mission of MacDill AFB, a statement of the purpose of and the need for the Proposed Action, an overview of the scope of the analysis, and a summary of key environmental compliance requirements.

1.1 Location and Mission

MacDill AFB is at the southern tip of the Interbay Peninsula, in Hillsborough County, Florida. The installation is under the command and control of AMC. MacDill AFB is a 5,866-acre USAF installation approximately 8 miles south of downtown Tampa, Florida (see **Figure 1-1**). MacDill AFB is the 6 AMW headquarters. The 6 AMW's overall mission is to generate and execute air refueling,

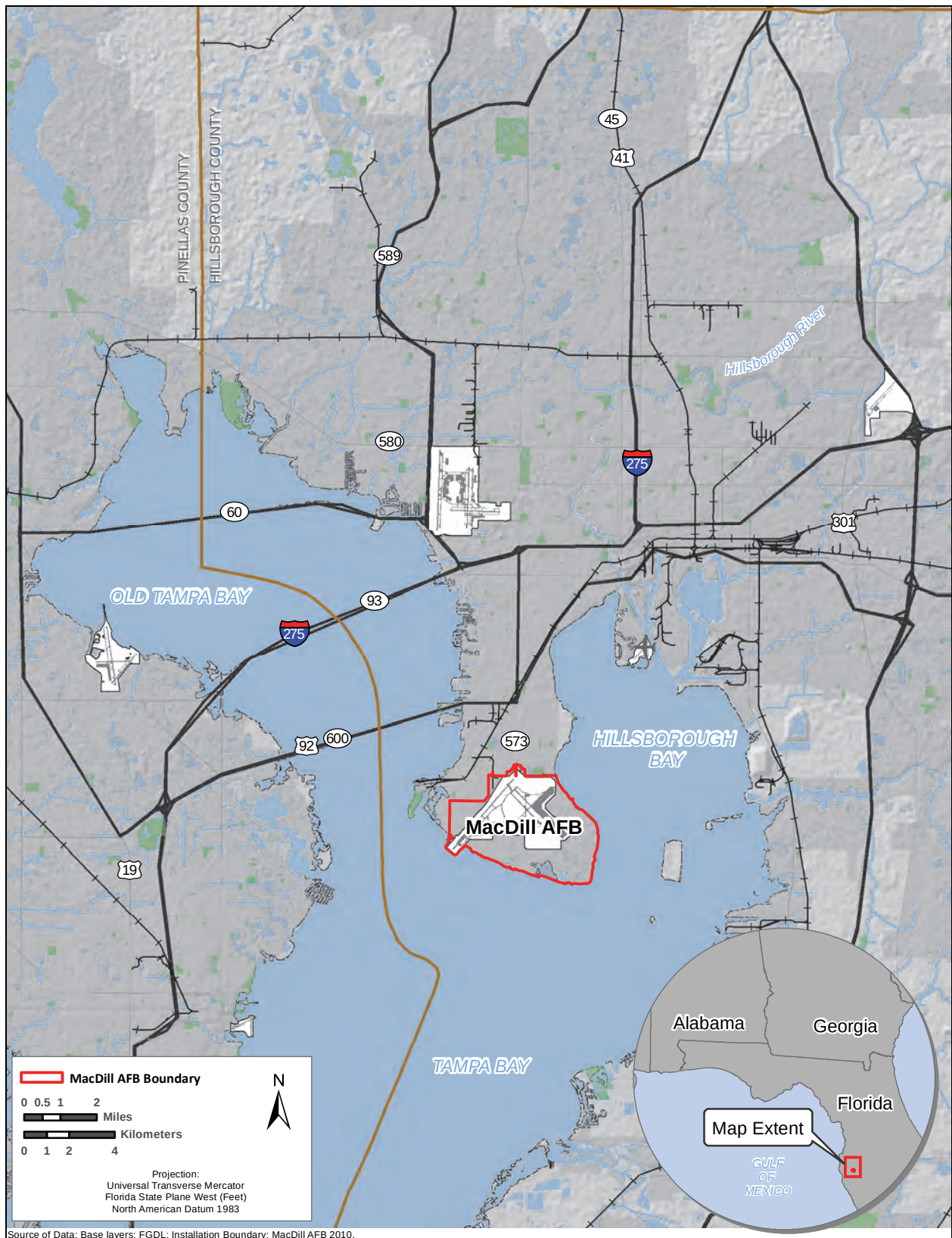


Figure 1-1. MacDill AFB and Surrounding Area

airlift, and contingency response capabilities while providing installation support for joint, coalition, and interagency partners. MacDill AFB is also home to approximately 38 mission partners, including the U.S. Central Command (CENTCOM) and the U.S. Special Operations Command (SOCOM). The presence of these two unified commands and other tenant units create a unique multiservice community at MacDill AFB, with all branches of service represented.

1.2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to complete selected demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance improvements from among those identified as necessary to ensure that future mission and facility requirements are met. The analysis of applicable installation development projects in a single EA will facilitate an understanding of the potential environmental consequences associated with the continuing installation development process; facilitate the NEPA review and compliance process; eliminate project fractionation and segmentation; improve the coordination of land use planning; expedite project execution by using early planning; reduce installation, reviewing agency, and major command workloads; provide cost savings; help better evaluate potential cumulative environmental impacts; assist in maintaining a baseline for future analysis; support strategic basing decisionmaking; and encourage agency coordination.

The need for the Proposed Action is to meet current and future mission requirements and national security objectives associated with MacDill AFB. This involves meeting ongoing mission requirements that necessitate repairing and upgrading installation utilities, pavements, and facilities; improving the efficiency and effectiveness of forces with the capability to expand; replacing older, substandard facilities with new buildings that are on a par with workplaces outside the gate; and providing reliable utilities, quality housing, and an efficient transportation system to support MacDill AFB. In addition, morale and welfare projects that are a critical part of supporting the MacDill AFB mission are addressed. Continued development of infrastructure at MacDill AFB must take into account future facility construction, demolition, renovation, transportation needs, airfield alterations and enhancements, utilities improvements, land use planning, energy requirements, and development constraints and opportunities.

Another need for the Proposed Action is to allow and guide development on MacDill AFB within the 100-year floodplain. Installation maps indicate that 80 percent of the land at MacDill AFB is within the 100-year floodplain, including residential, industrial, and institutional land uses and most of the commercial and aviation support areas. Furthermore, the runway and airfield occupy approximately 80 percent of land mass outside the floodplain on MacDill AFB and are constrained from further development for safety reasons (e.g., clear zones, noise constraints). Developable areas are further reduced by other constraints such as Environmental Restoration Program (ERP) sites, sensitive habitats, and historic district areas. Approximately 164 acres fall outside the 100-year floodplain and are not within other areas of constraint. However, this area includes existing drainage ditches, culverts, roads, sidewalks and buildings. Therefore, areas outside the 100-year floodplain that are suitable for development are extremely limited. Development within the floodplain would be guided by environmental protection measures and the Integrated Natural Resources Management Plan (INRMP).

Contributions by MacDill AFB to national security dictate that the installation implement planning for the next 5 FYs. To ensure complete readiness at the installation for any assigned tasks, infrastructure improvement projects must take into account—and be capable of supporting—all functions inherent to a USAF installation. These include aircraft operations and maintenance activities, security, administration, communications, billeting, supply and storage, training, transportation, and community quality of life.

1.2.1 Purpose of and Need for Proposed Demolition Actions

The Department of Defense (DOD) has called for significant transformation in all services to strengthen U.S. warfighting capabilities and to operate more efficiently. A key element of USAF transformation is embodied in the goal “20/20 by 2020.” The 20/20 by 2020 term describes a major goal of USAF Civil Engineering to achieve offsetting efficiencies to ensure that installations remain capable of enabling USAF missions. The purpose of the proposed demolition actions is to remove excess, obsolete, deteriorating, and underused facilities and pavements throughout the installation to improve mission capability, meet security objectives, and comply with the USAF’s “20/20 by 2020” goal. The need for the proposed demolition actions is for USAF Civil Engineering to reduce the amount of the physical plant that it spends money on by 20 percent by the year 2020. USAF Civil Engineering currently manages more infrastructure than is necessary and must focus limited time and funding on only the infrastructure needed to perform the USAF mission. In order to achieve this goal, the USAF must divert its resources away from excess, obsolete, and under-used infrastructure, and implement processes to increase consolidation and demolition, optimize space allocation and utilization, and promote other emerging initiatives. Therefore, HQ AMC has worked together for the past year to align AMC’s consolidation/demolition plan with the 2009 through 2013 USAF Civil Engineer Strategic Plan to develop sustainable AMC installations by implementing asset management principles for built and natural assets. As a result of this alignment, AMC’s target is to reduce the building footprint at all AMC installations (HQ AMC 2010).

1.2.2 Purpose of and Need for Proposed Construction Actions

The purpose of the proposed construction actions is to provide state-of-the-art facilities to accommodate current and future mission and facility spacing requirements while meeting national security objectives. The need for the proposed construction actions is because fundamental support of mission requirements is not being met by existing facilities. In addition, proposed construction projects are needed to improve mission efficiency by consolidating mission functions currently housed in multiple, older, and undersized facilities into more modern facilities with sufficient space; to incorporate life safety and handicapped accessibility requirements; and to meet modern AT/FP measures. The proposed construction projects are also needed to enhance morale and wellness for active and retired military members and their dependents. Individual purpose and need statements for each of the selected construction projects are provided in **Section 2.1.4**.

1.2.3 Purpose of and Need for Proposed Infrastructure Improvement Actions

The purpose of the proposed infrastructure improvement actions is to remove and replace excess, obsolete, and deteriorating utilities; improve the installation’s parking and transportation systems; improve and maintain airfield pavements and supporting infrastructure; and enhance existing communications systems. The need for the infrastructure improvements is to improve mission efficiency and effectiveness, improve ground and airspace safety, incorporate life safety and handicapped accessibility requirements, address parking limitations, and provide the installation with state-of-the-art utilities and communications systems to enhance and improve the installation’s mission and meet security objectives. Individual purpose and need statements for each of the selected infrastructure improvement projects are provided in **Section 2.1.5**.

1.2.4 Purpose of and Need for Proposed Natural Infrastructure Management Actions

The purpose of the natural infrastructure management actions is to enhance airspace management, improve water quality, improve species habitat, enhance outdoor recreation opportunities, and implement projects for the protection and enhancement of the installation’s natural and historic resources as

identified in the INRMP and Integrated Cultural Resources Management Plan (ICRMP). The need is to develop a sustainable installation by implementing asset management principles for built and natural resources assets. Other needs for the proposed natural infrastructure actions are to comply with Federal, state, and local regulations to limit downstream water quality degradation by reducing erosion, which causes sedimentation to accumulate and disperse in the installation's waterways; to improve or maintain safe aircraft takeoff and landing conditions; to protect and enhance cultural resources; and to comply with the Migratory Bird Treaty Act (MBTA) of 1918 and other laws designated to protect migratory birds, threatened and endangered species, wetlands, and other natural resources while balancing the requirements of its military mission. In addition, the need for the proposed natural infrastructure actions is to comply with the Federal Noxious Weed Act (7 United States Code [U.S.C.] 2801 et seq.) and Executive Order (EO) 13112, *Invasive Species*, which require Federal agencies to control noxious weeds on Federal properties by removing noxious and invasive species throughout their installations. Individual purpose and need statements for each of the selected natural infrastructure management projects are provided in **Section 2.1.6**.

1.2.5 Purpose of and Need for Proposed Strategic Sustainability Performance Improvement Actions

The purpose of the proposed strategic sustainability performance improvement actions is to comply with EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (5 October 2009), by accomplishing the following:

- Ensure efficient water use
- Implement high-performance sustainable Federal building design, construction, operation, and management
- Advance regional and local integrated planning by identifying and analyzing impacts from energy usage and alternative energy sources.

The need for the proposed strategic sustainability improvement performance actions is to comply with Federal mandates for Federal facilities to conduct their environmental, transportation, and energy-related activities in support of their respective missions in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.

Another need for these actions is to reduce the installation's overall carbon footprint, reduce dependency on foreign coal and oil, and improve local and regional air quality. In addition, these actions are required to comply with Energy Policy Act (EPA) mandates, which require that all Federal agencies' renewable electricity consumption meet or exceed 3 percent from FY 2007 through FY 2009, with increases to at least 5 percent in FY 2010 through FY 2012 and 7.5 percent in FY 2013 and thereafter. The individual purpose and need statements for the selected natural infrastructure management project is provided in **Section 2.1.7**.

1.3 Scope of the Analysis

MacDill AFB seeks to improve its understanding of the potential environmental consequences associated with the continuing installation development process by evaluating in a single EA selected projects proposed in the MacDill AFB Wing-approved community of plans. The complete list of identified proposed installation development and resource management projects from these plans, presented in **Appendix A**, was developed from the projects identified in the MacDill AFB IDP and other

Wing-approved plans using a fenceline-to-fenceline approach to capture projects within the installation boundary as proposed by host and tenant agencies in accordance with Interservice Support Agreements.

The IDEA evaluates the potential environmental impact of selected projects involved in modernizing and upgrading MacDill AFB to meet future requirements in each of the following categories: demolition, construction, infrastructure improvement, natural infrastructure management, and the strategic sustainability improvement program. These five categories were identified for use in the IDEA because they allow the grouping of development initiatives by generally common elements of their activity and the nature of their expected potential environmental impacts. These categories and the selected projects are described in detail in **Sections 2.1.3** through **2.1.7** of the IDEA. The individual projects analyzed in this IDEA should be considered independent of each other, and the USAF could eventually choose to implement all, none, or any combination of these selected projects. This would be the case even if a Finding of No Significant Impact (FONSI) is reached based on the analyses in the IDEA.

From the list of proposed projects identified in **Appendix A**, projects were selected for detailed analysis in the IDEA based on two independent criteria. First, projects were selected that are expected to have the greatest potential to impact the natural and man-made environment. These are typical of the types of projects that are proposed at MacDill AFB. They were selected based on geographic setting, project size, acreage disturbed, amount of air emissions, increases in impervious surfaces, vegetation disturbed, and other relevant factors associated with environmental and socioeconomic resources. Second, projects were selected for detailed analysis if they have the potential to result in impacts on sensitive resources, such as 100-year floodplains, wetlands, protected cultural resources, or species protected under the Endangered Species Act (ESA). Such projects were selected because they are believed, as a group, to frame the range of potential impacts that reasonably could be expected from other projects within the category and consequently are subject to detailed analysis in this IDEA. The projects selected for analysis in this IDEA are described in **Sections 2.1.3** through **2.1.7**.

The remaining other projects from the installation development and resource management plans (see the “Other Projects” portions of the tables presented in **Appendix A**) are considered in the cumulative impacts analysis of the IDEA. This IDEA does not represent NEPA documentation for projects other than the selected projects. Projects listed in the “Other Projects” inventory will be reviewed individually to determine the necessary environmental analysis needed to make a decision on whether or not to approve each of these projects, which are outside the scope of this IDEA.

The Proposed Action includes numerous projects selected from those listed in **Appendix A**, such as demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, quality of life upgrades, infrastructure improvement, recreational upgrades, natural infrastructure management and other environmental projects, and sustainable improvement projects that would be completed or implemented during the next 5 FYs (2012 to 2017). The assessment compiles information on constraints that might inhibit development or dictate courses of actions affecting development, improve the facility planning process, and capture the Wing Commander’s vision of the facility and infrastructure improvements necessary to support the installation’s ongoing mission.

The scope of the IDEA includes an evaluation of actions that have the potential to impact the 100-year floodplain or wetlands. Because it has been determined through the analysis contained in this IDEA that several selected projects would involve construction in a wetland or an action within a floodplain, a Finding of No Practicable Alternative (FONPA) and approval from HQ AMC would be required. In accordance with 32 CFR 989, if it is determined that the alternative selected would involve construction within wetlands or action in floodplains, a FONPA must accompany the FONSI to discuss why no other practicable alternative exists to avoid impacts. Floodplain and wetland impacts would be reduced to the maximum extent practicable through project design and implementation of environmental protection

measures. In addition, appropriate permits would be obtained from applicable regulatory agencies to address impacts on wetland areas and to determine potential mitigation, if required.

In accordance with EO 11988, *Floodplain Management*, and EO 11990, *Protection of Wetlands*, MacDill AFB would consider alternatives to proposed actions in the floodplain or wetlands and would develop within the floodplain and wetlands if there is no practicable alternative. New construction within the floodplain would apply acceptable floodproofing and flood protection, including planning and constructing the elevation of structures above the base flood level. Because 80 percent of MacDill AFB is within the 100-year floodplain, new development to include construction within the floodplain will be necessary. Direct impacts on wetland areas would be avoided through design. If impacts cannot be avoided, environmental protection measures, such as flagging the boundary of the wetland area and ensuring construction vehicles and workers remain outside the boundary would be implemented. If direct impacts cannot be avoided, adverse effects would be minimized through techniques such as phasing construction activities to minimize the potential for erosion, installing sedimentation basins and detention or retention ponds, and limiting construction activities to drier periods of the year. The Proposed Action would result in action within a floodplain and construction in wetland areas; therefore, a FONSI/FONPA is anticipated and approval from HQ AMC would be required.

The IDEA could include projects that might have direct or indirect impacts on historic properties. All projects that could impact properties listed in or adjacent to historic districts or that could be eligible for listing on the National Register of Historic Places (NRHP) are subject to the consultation requirements of Section 106 of the National Historic Preservation Act (NHPA) of 1966. Projects have been included in the selected projects for the IDEA if the Section 106 consultation process has been recently completed for properties potentially eligible for listing on the NRHP; however, if new or additional consultation would be required and would not be completed by the finalization of the signed FONSI/FONPA, such projects may have been excluded from the IDEA analysis. **Appendix C** includes the status of State Historic Preservation Office (SHPO) concurrence for facilities that will be 50 years in age or older by 2017.

The precise design, footprint, and location on the installation of all projects are in the early planning stages. Therefore, exact locations and layouts are generally not finalized at this time. Should locations and final layouts of the projects differ substantially from those anticipated in terms of the land use category involved or the compatibility with the land use category at the final designated location, then separate environmental documentation for those projects might be required.

It is intended that the projects contained in the IDEA generally will be reviewed on a 5-year rotational basis and that an additional NEPA document might need to be prepared to accommodate changes in development plans, mission objectives, laws and regulations, or land use plans. During the course of the next 5 FYs (FY 2012 to FY 2017), if significant new circumstances or information relevant to environmental concerns are discovered or the scope or proposed siting of any of the selected projects associated with the Proposed Action change enough to be outside the coverage of the analysis provided in the IDEA, the specified projects would no longer be covered by the NEPA analysis represented by this IDEA, but this would not affect other projects originally included in the IDEA.

The IDEA examines potential effects of the Proposed Action and alternatives on 11 resource areas: noise, land use, air quality, geological resources, water resources, biological resources, cultural resources, socioeconomic resources and environmental justice, infrastructure, hazardous materials and wastes, and safety. These resources were identified as being potentially affected by the Proposed Action and include applicable elements of the human environment that are prompted for review by EO, regulation, or policy.

After a FONSI/FONPA is signed, and as funding becomes available, each project would be reviewed by the Environmental Planning Function (EPF) prior to implementation to ensure that it has been analyzed

sufficiently in this IDEA and that there has not been a substantial change in the installation mission or project scope, or there are no significant new circumstances or information relevant to environmental conditions; and that there have not been new or modified environmental regulations promulgated warranting reevaluation of potential environmental consequences. If the project has not been sufficiently analyzed or there has been a change in scope, conditions, or regulations, MacDill AFB would complete additional environmental documentation for the project, as applicable.

1.4 Summary of Key Environmental Compliance Requirements

1.4.1 National Environmental Policy Act

NEPA of 1969 (42 U.S.C. Section 4321–4347) is a Federal statute requiring the identification and analysis of potential environmental impacts associated with proposed Federal actions before those actions are taken. The intent of NEPA is to help decisionmakers make well-informed decisions based on an understanding of the potential environmental consequences and take actions to protect, restore, or enhance the environment. NEPA established the Council on Environmental Quality (CEQ) that was charged with the development of implementing regulations and ensuring Federal agency compliance with NEPA. The CEQ regulations mandate that all Federal agencies use a prescribed structured approach to environmental impact analysis. This approach also requires Federal agencies to use an interdisciplinary and systematic approach in their decisionmaking process. This process evaluates potential environmental consequences associated with a proposed action and considers alternative courses of action.

The CEQ-established process for implementing NEPA is codified in Title 40 of the Code of Federal Regulations (CFR), Parts 1500–1508, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. The USAF's implementing regulation for NEPA is *Environmental Impact Analysis Process*, 32 CFR Part 989, as amended, which provides a framework for how to implement the CEQ regulations and achieve the goals of NEPA. Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*, states that the USAF will comply with applicable Federal, state, and local environmental laws and regulations, including NEPA.

1.4.2 Integration of Other Environmental Statutes and Regulations

To comply with NEPA, the planning and decisionmaking process for actions proposed by Federal agencies involves a study of other relevant environmental statutes and regulations. The NEPA process, however, does not replace procedural or substantive requirements of other environmental statutes and regulations. It addresses them collectively in the form of an EA or EIS, which enables the decisionmaker to have a comprehensive view of major environmental issues and requirements associated with the Proposed Action. According to CEQ regulations, the requirements of NEPA must be integrated “with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively.”

As noted in **Section 1.3**, the IDEA examines potential effects of the Proposed Action and alternatives on 11 resource areas. These resources were identified as being potentially affected by the Proposed Action and include applicable elements of the human and natural environments required by specific laws, regulations, EOs, and policies

1.4.3 Interagency and Intergovernmental Coordination for Environmental Planning (IICEP), Native American Tribal Consultation, and Public Involvement

IICEP. NEPA requirements help ensure that environmental information is made available to the public during the decisionmaking process and prior to actions being taken. The premise of NEPA is that the

quality of Federal decisions will be enhanced if proponents provide information to the public and involve the public in the planning process. The Intergovernmental Coordination Act and EO 12372, *Intergovernmental Review of Federal Programs*, require Federal agencies to cooperate with and consider state and local views in implementing a Federal proposal. Air Force Instruction (AFI) 32-7060, *Interagency and Intergovernmental Coordination for Environmental Planning*, requires the USAF to implement the IICEP process, which is used for the purpose of agency coordination and implements scoping requirements.

Through the IICEP process, MacDill AFB notifies relevant Federal, state, and local agencies of the Proposed Action and alternatives and provides them sufficient time to make known their environmental concerns specific to the action. The IICEP process also provides MacDill AFB the opportunity to cooperate with and consider state and local views in implementing the Federal proposal. IICEP materials related to this action are included in **Appendix B** and will be expanded throughout the EIAP process.

Native American Tribal Consultation. EO 13175, *Consultation and Coordination with Indian Tribal Governments* (6 November 2000), directs Federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly and substantially affected by activities on federally administered lands. To comply with legal mandates, federally recognized tribes that are affiliated historically with the MacDill AFB geographic region are invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. Because many tribes were displaced from their original homelands during the nineteenth and early twentieth centuries, tribes with cultural roots in an area might not currently reside in the region where the undertaking is to occur. Effective consultation requires identification of tribes based on ethnographic and historical data and not simply a tribe's current proximity to a project area. The tribal coordination process is distinct from NEPA consultation or the IICEP processes and requires separate notification of all relevant tribes by MacDill AFB. The timelines for tribal consultation are also distinct from those of intergovernmental consultations. The MacDill AFB Cultural Resources Manager serves as the point-of-contact for day-to-day issues with Native American tribes, the Florida SHPO, and the Advisory Council on Historic Preservation (ACHP).

The goal of the tribal consultation process is not simply to consult on a particular undertaking but rather to build constructive relationships with appropriate Native American tribes. Consultation should lead to constructive dialogs in which the Native American tribes are active participants in the planning process. MacDill AFB is in the process of developing government-to-government relationships with affiliated federally recognized tribes. The list of Native American tribal governments with whom coordination for the IDEA occurred is included in **Appendix B**.

Public Involvement. A Notice of Availability (NOA) was published in the *Tampa Tribune* on August 21, 2012 with a 45-day review period. The NOA was issued to solicit comments on the Proposed Action and involve the local community in the decisionmaking process. Public and agency comments on the Draft IDEA were considered prior to a decision being made as to whether or not to sign a FONSI/FONPA. Several comments were received (see **Appendix B**) including those from the U.S. Fish and Wildlife Service (USFWS), Florida SHPO, and National Marine Fisheries Service (NMFS).

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2. Description of the Proposed Action and Alternatives

This section presents information on the Proposed Action of implementing selected installation development projects, as drawn from the relevant MacDill AFB Wing-approved installation development and resource management plans. **Section 2.1** describes the Proposed Action at MacDill AFB. **Section 2.2** identifies alternatives to the Proposed Action. **Section 2.3** discusses the No Action Alternative. **Section 2.4** identifies the decision to be made and the Preferred Alternative.

2.1 Proposed Action

As noted in **Section 1.3**, the Proposed Action is to implement a range of selected installation development projects drawn from projects contained in the community of all current 6 AMW-approved plans on MacDill AFB.

The projects selected for analysis in this IDEA are described in **Sections 2.1.3** through **2.1.7** and would meet the selection criteria presented in **Section 2.2**. Each of the projects has been assigned a project identification number corresponding to the category to which they belong. **Figures 2-1** through **2-4** show the proposed potential locations of all mapable projects associated with the Proposed Action relative to known constraints at MacDill AFB. The remaining other projects that have been drawn from the applicable Wing-approved development plans, which are listed in **Appendix A** under the “Other Projects” portions of the tables, are addressed in the cumulative impacts analysis in this IDEA.

2.1.1 Project Considerations

Each selected project ultimately would be sited in a manner compatible with MacDill AFB’s surrounding land uses (see **Figure 2-5**). The analyses provided in this IDEA addressing the selected projects evaluate their siting anywhere within the improved or semi-improved areas of the installation that are within compatible land use areas of the installation, as analyzed in **Section 4** of this IDEA. They are not assessed for a site-specific location within that area of compatible land use because the environmental impacts would be essentially the same no matter where the project is specifically located in that land use area. The MacDill AFB IDP identifies 12 land use categories: housing (accompanied), administrative, aircraft operations and maintenance, airfield pavements, community (commercial), community (service), industrial, medical, open space, outdoor recreation, housing (unaccompanied), and water.

Projects would avoid sensitive or constrained areas (see **Figures 2-1** through **2-4** and **Figure 2-6**) to the maximum extent practicable. Sensitive areas include floodplains, wetlands, ERP sites, nesting and foraging areas for species of special concern, migration and breeding habitat areas, and known archaeological sites. Constrained areas include airfield and airspace clear zones (CZs) and accident potential zones (APZs), areas within safety quantity-distance (QD) arcs, areas inside the 65+ A-weighted decibels (dBA) noise contours, and areas restricted per AT/FP and other mission requirements.

The exterior and interior design of new facilities would follow the design guidelines outlined in the *Air Mobility Command Civil Engineering Squadron Design Guide* (AMC 1999). This guidance would ensure a consistent and coherent architectural character throughout MacDill AFB. This document is available for review at the web address provided in **Section 7**.

Landscaping would be used to provide an attractive and professional-looking installation by using plants, shrubs, and trees to blend with the surrounding environment. Landscape design would use regionally appropriate plants for improved and semi-improved grounds, which would minimize adverse effects on natural habitats while reducing maintenance inputs in terms of energy, water, manpower, and equipment. In addition, the landscape designs would choose plant species adapted to local environmental conditions

that have the potential to reduce the need for irrigation and fertilization or pesticide use. Landscaping would conform to the MacDill AFB INRMP requirements regarding suggested and prohibited plants, and landscape modifications within the installation's historic districts would be subject to Section 106 of the NHPA consultation requirements (MAFB 2010a).

Force protection measures would be incorporated in accordance with the Unified Facilities Criteria (UFC) 4-010-01, *DOD Minimum Antiterrorism Standards for Buildings*, 9 February 2012 (DOD 2012). This document is available for review at the web address provided in **Section 7** of the IDEA. All construction would comply with applicable building, fire, and safety codes. The proposed construction projects would be implemented using sustainable design concepts. Sustainable design concepts emphasize state-of-the-art strategies for site development, efficient water and energy use, and improved indoor environmental quality.

2.1.2 Major Installation Constraints

To incorporate selection parameters for the siting of projects, this IDEA has been prepared using a constraints-based analysis. This approach enables a comprehensive evaluation of environmental concerns throughout the installation and also those concerns unique to specific areas of MacDill AFB. This analysis uses the information layers from the installation's Geographic Information System (GIS) database (also called the GeoBase system) and the information obtained from extensive recent EIAP evaluations for similar types of projects to help determine the direct, indirect, and cumulative effects of projects that would be completed as part of the installation's development plan.

There are a number of land use, regulatory, and mission-related constraints within the boundaries of MacDill AFB that influence and limit future development at the installation. The major constraints on MacDill AFB are depicted in **Figures 2-1 through 2-4 and 2-6**. The electronic mapping data from MacDill AFB's GIS database were used to quantify the major installation constraints to development, unless another source of information is identified. Some constraint areas overlap, and therefore, the acreages listed in the following bulleted items do not equal the total acreage of MacDill AFB. The acreage calculations do not include any portions of the constraint areas that extend off the installation. The major constraints are discussed in the following bulleted paragraphs:

- **Noise Zones (2,071 acres).** Aircraft operations are a dominant component of the noise environment at MacDill AFB. USAF, Federal Aviation Administration (FAA), and the U.S. Department of Housing and Urban Development (HUD) criteria specify that noise levels in noise-sensitive land use areas are normally considered unacceptable where they exceed a day-night average sound level (DNL) of 65 dBA. The USAF recommends restricting development to compatible uses when noise levels exceed 65 dBA DNL. A total of 2,071 acres of MacDill AFB property are inside the 65 dBA DNL noise contour generated by the MacDill AFB runway.
- **Airfield Infrastructure, Clear Zones, and Imaginary Surfaces (1,971 acres).** The airfield at MacDill AFB includes pavement, runways, overrun, apron and ramp, and arm/disarm pads, and totals approximately 1,971 acres. CZs, APZs, and imaginary surfaces associated with the aircraft approach patterns are areas where nonairfield development is constrained or discouraged for airfield safety. These areas would allow only airfield improvements and projects directly associated with airfield operations. All projects within this area must be approved by the Facilities Utilization Board (FUB) and airfield management prior to commencing any construction-related activities.

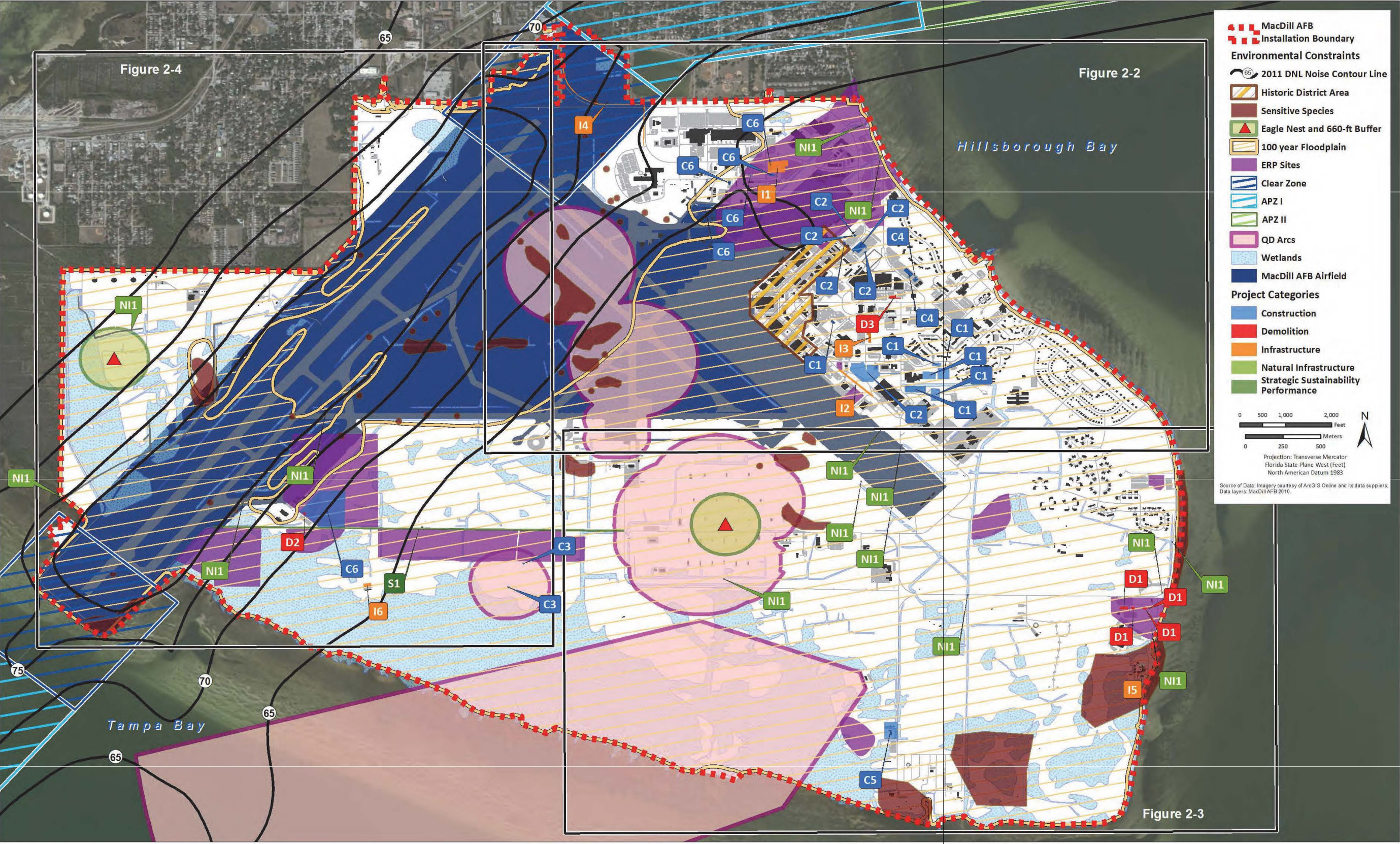
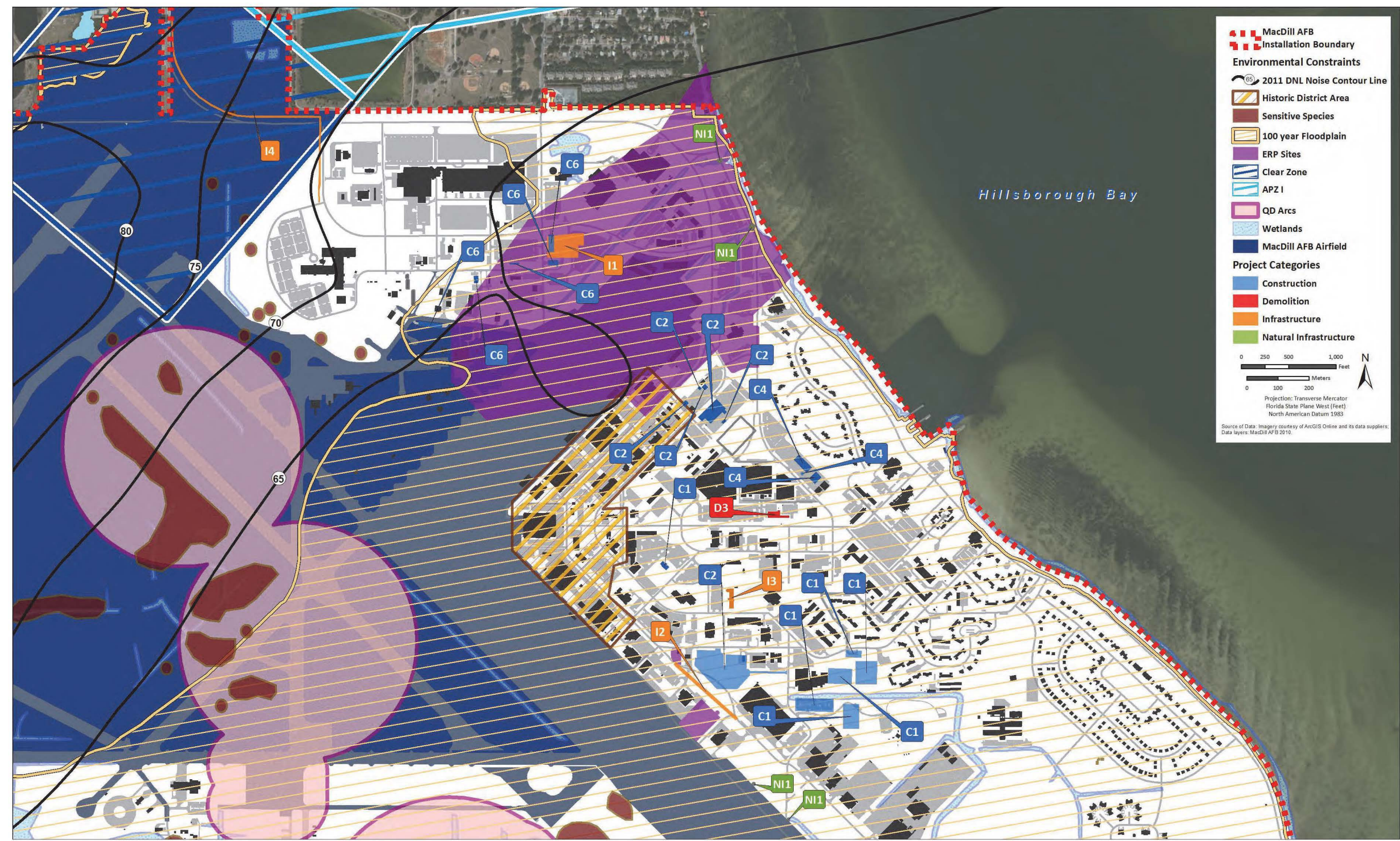
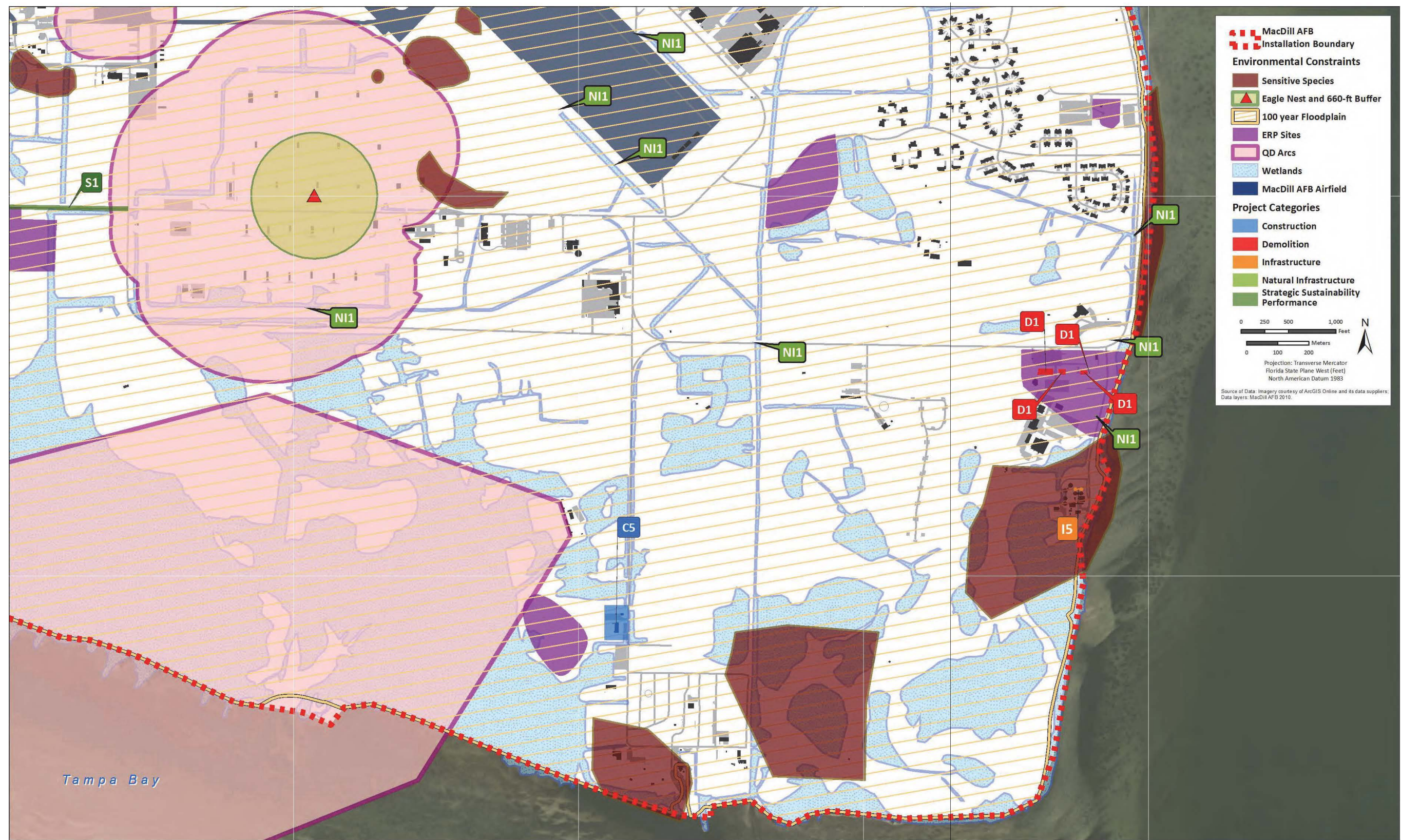


Figure 2-1. Possible Locations and Environmental Constraints Associated with Selected Projects (Overview)



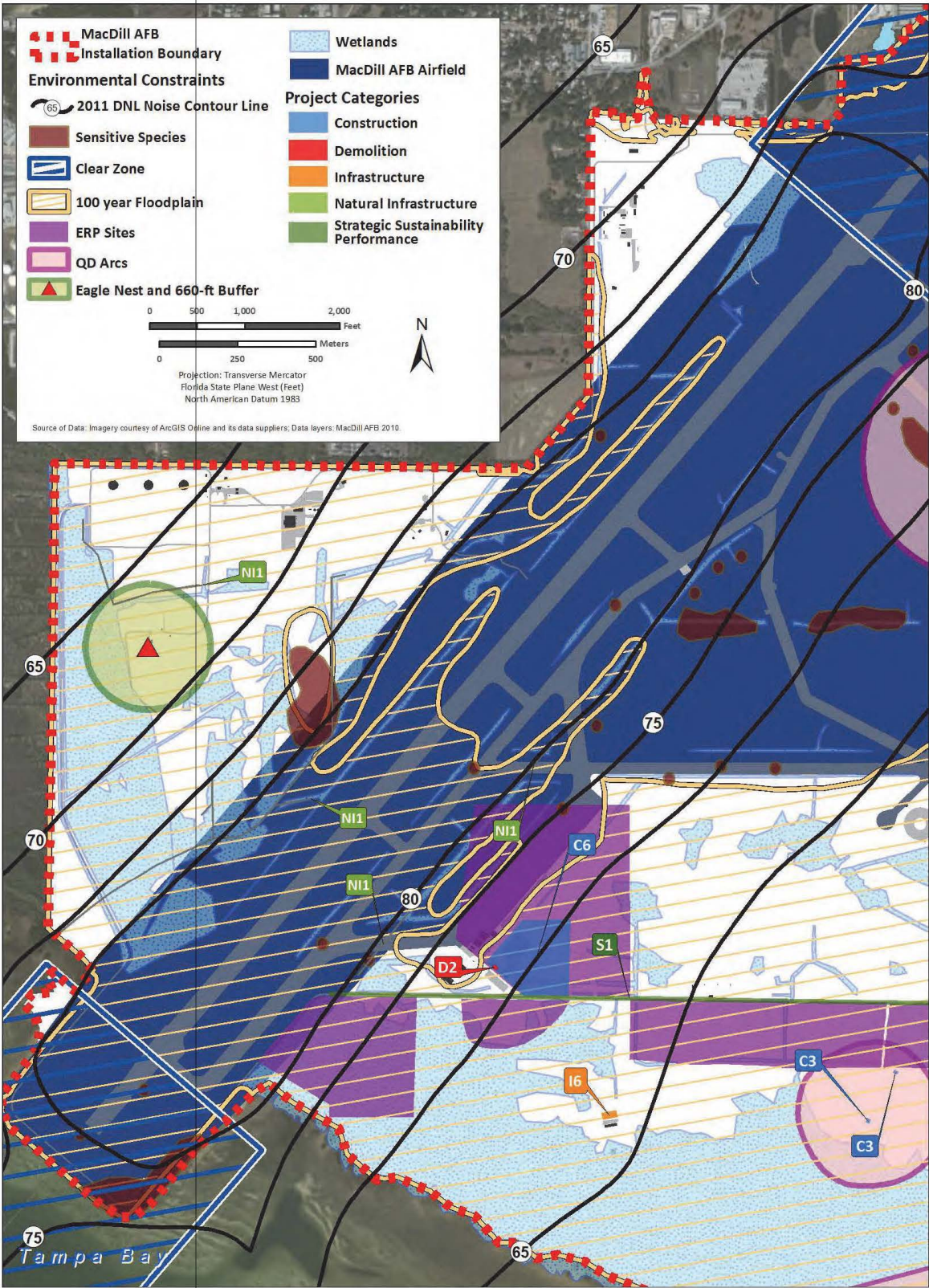
Note: Project numbers and associated descriptions are given in **Tables 2-1 through 2-5**.

Figure 2-2. Possible Locations and Environmental Constraints Associated with Selected Projects (Northeast)



Note: Project numbers and associated descriptions are given in **Tables 2-1** through **2-5**.

Figure 2-3. Possible Locations and Environmental Constraints Associated with Selected Projects (Southeast)



Note: Project numbers and associated descriptions are given in **Tables 2-1** through **2-5**.

Figure 2-4. Possible Locations and Environmental Constraints Associated with Selected Projects (West)

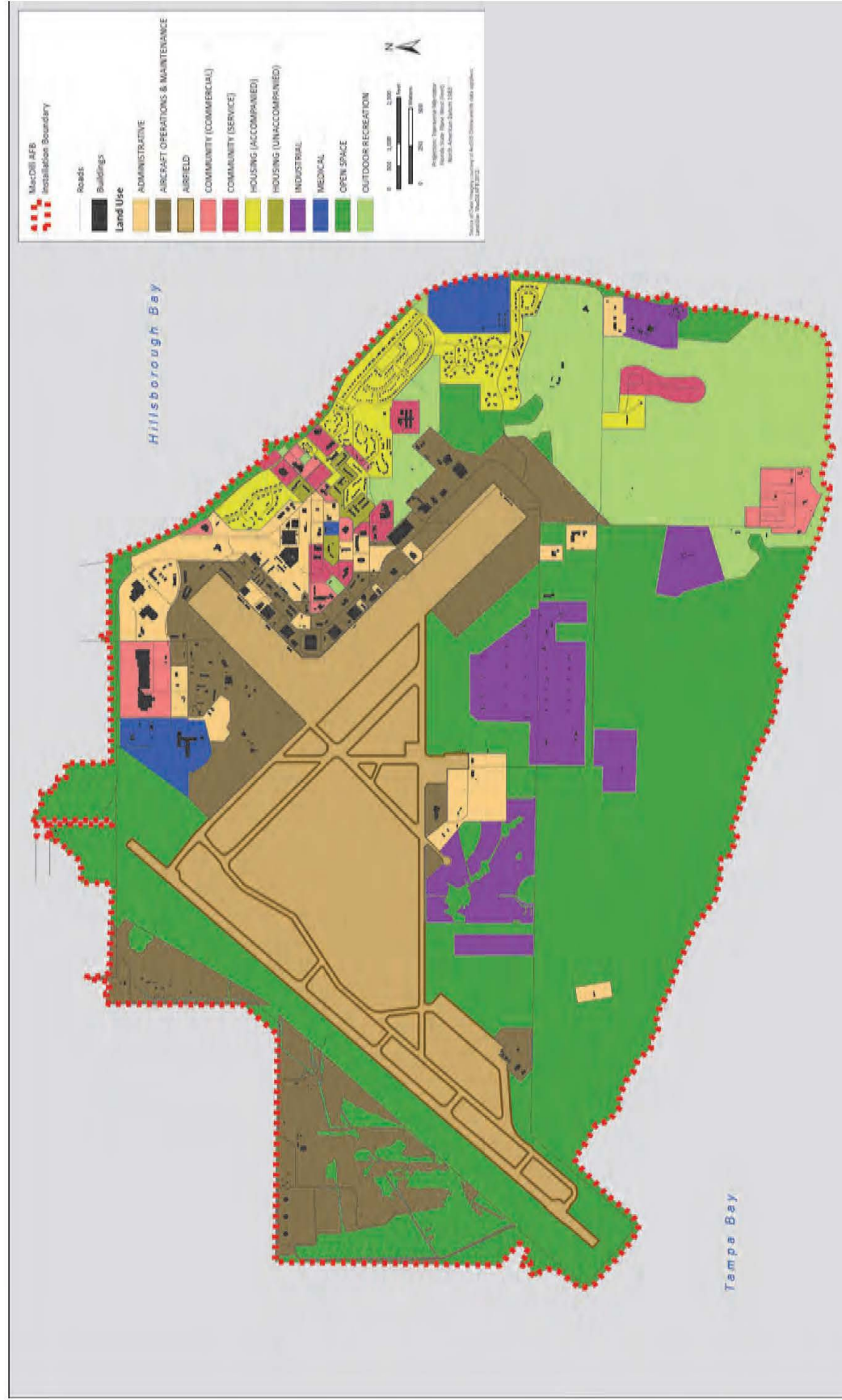
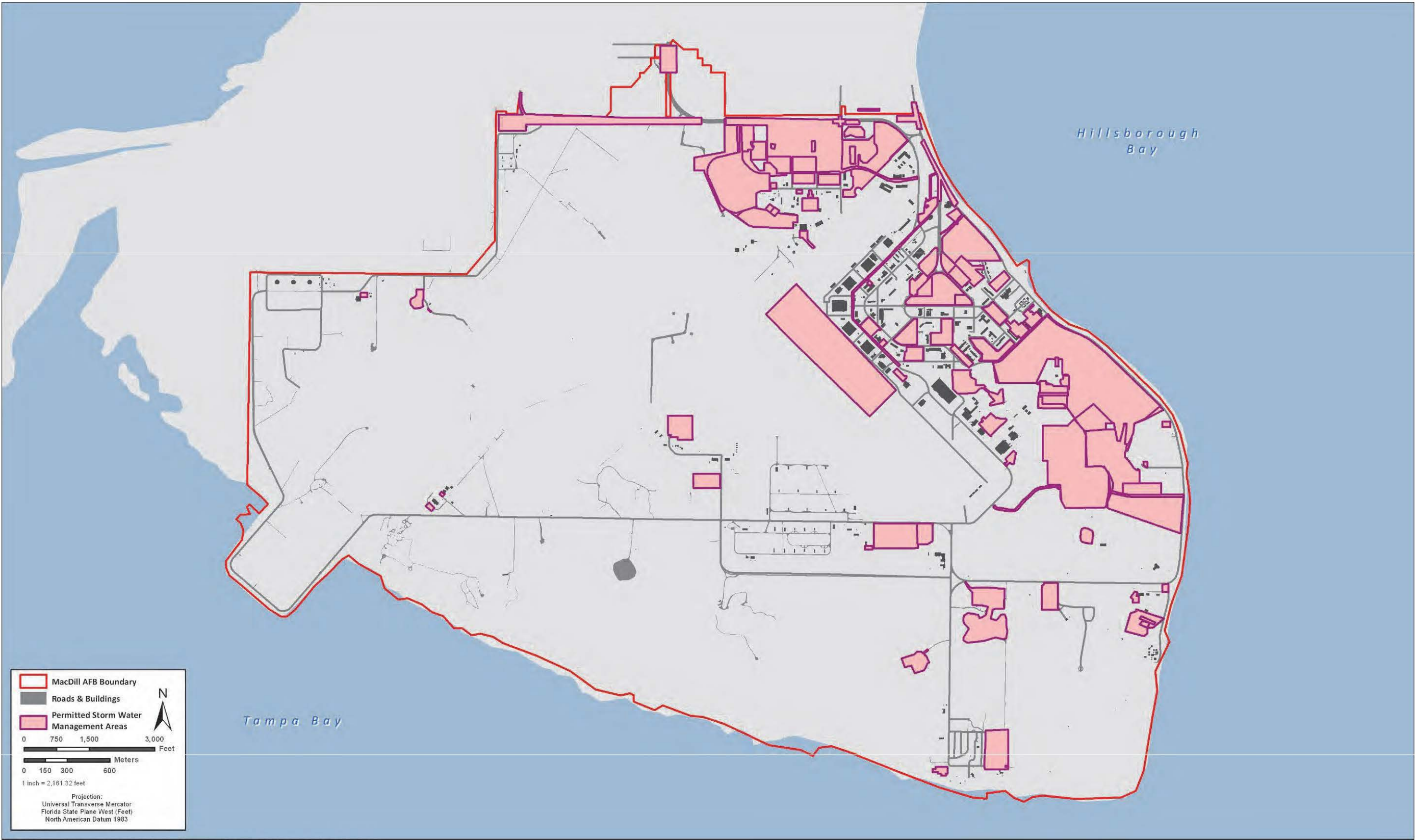


Figure 2-5. MacDill AFB Existing Land Use Categories

- **Munitions and Other Safety Criteria (539 acres).** There are several areas that are constrained for safety reasons at MacDill AFB. The QD arcs are the minimum prescribed distance between munitions site handling and storage areas and inhabited areas. The safety zone associated with the weapons storage area (WSA) creates the largest area of the installation constrained by a QD arc. The WSA has a 1,250-foot QD arc that limits development in this area. The aviation Fuel Farm has a QD arc of 1,250 feet. A less-restrictive QD arc of 500 feet is associated with the Explosive Ordnance Disposal (EOD) pit on the southern side of the installation. In addition, the skeet range and small arms range have restrictions limiting development in these areas.
- **Environmental Restoration Program Sites (782 acres).** MacDill AFB contains 25 Solid Waste Management Units (SWMUs) and ERP sites. These ERP sites include landfills, storage tanks, drainage areas, fuel spills, spill areas, and fire-training areas. Primary contaminants in soil and water include fuels, waste solvents, dissolved phase fuels, and metals (MAFB 2010b). New facilities may be constructed within certain ERP sites depending upon the level of contamination, clean-up efforts, and land use controls (LUCs). Approval of new construction within ERP sites must be obtained from the FUB and coordinated with the 6th Civil Engineering Squadron (6 CES)/Environmental Restoration Element (CEVR). In addition, an *ERP Waiver to Construct* must be reviewed and approved by HQ AMC in order to construct on an ERP site.
- **Wetlands (1,195 acres).** In accordance with EO 11990, construction of new facilities within areas containing wetlands is avoided, where practicable. In general, more than 20 percent of MacDill AFB is considered to be wetlands, including more than 500 contiguous acres of prime mangrove community along the southern installation coastline (MAFB 2010a). Wetland impacts would be reduced to the maximum extent practicable through project design and the implementation of environmental protection measures. However, some projects would have minimal direct impacts on wetland areas. In accordance with 32 CFR 989, if it is determined that no practicable alternative to construction within a wetland exists, a FONPA must be prepared and approved by HQ AMC for all projects requiring construction in wetland areas. In addition, appropriate permits must be obtained from applicable regulatory agencies to address impacts on wetland areas and to determine potential mitigation, if required.
- **100-Year Floodplain (4,533 acres).** In accordance with EO 11988, conducting actions or constructing new facilities within the 100-year floodplain is avoided to protect the functions of floodplains, minimize the potential damage to facilities, and ensure the safety of working personnel. However, approximately 80 percent of MacDill AFB is within the 100-year floodplain (MAFB 2010a). Residential, industrial, and institutional land uses on the installation are within the 100-year floodplain, along with most of the commercial and aviation support areas. The runway and airfield occupy approximately 80 percent of the land mass outside of the floodplain on MacDill AFB and are constrained from further development for safety reasons. Overall, less than 3 percent of MacDill AFB's land mass is outside the 100-year floodplain and suitable for development. It is USAF policy to avoid constructing new facilities within the 100-year floodplain; however, due to space constraints and mission requirements, such construction within the floodplain could become necessary if no other practicable alternative exists. All proposed construction and other activities within the 100-year floodplain must adhere to the requirements of EO 11988, *Floodplain Management*. MacDill AFB's rationale for development includes protecting and enhancing the natural environment through a systematic and holistic approach to installation development. If the Proposed Action is implemented, actions within the 100-year floodplain would occur, therefore a FONSI/FONPA must be obtained and the project must be approved by HQ AMC. The construction of Federal structures and facilities must be in accordance with the standards and criteria of those standards promulgated under the National Flood Insurance Program. If new construction of structures or facilities is to be located in a floodplain, accepted floodproofing and other flood protection measures would be applied to new



Source of Data: Imagery courtesy of ArcGIS Online and its data suppliers; Installation Boundary and Land Use: MacDill AFB 2010.

Figure 2-6. Permitted Storm Water Management Areas at MacDill AFB

construction or renovation. If approved, most new structures on MacDill AFB must be elevated at least 11.5 feet above the 100-year floodplain/storm surge level and must be able to withstand sustained winds of up to 100 miles per hour (mph) and wind gusts of 120 mph.

- **Coastal Zone Management Act.** MacDill AFB contains 7.2 miles of coastline along its installation boundary. Coastal zones are regulated under the Florida Coastal Zone Protection Act (1985) by the Florida Department of Environmental Protection (FDEP). Under this Act (Florida Statute, Chapter 161, Beach and Shore Preservation), permits are required for any erosion-control devices, excavations, or erection of structures within established coastal construction control lines (CCCLs). All new construction within the coastline areas must be approved by the FUB and 6 CES/Civil Engineering – Environmental Flight (CEV).
 - **Storm Water Management Areas.** Storm water management areas on MacDill AFB manage storm water flow and protect receiving water bodies from increased velocity and volume of storm water runoff after a storm event. In addition, increased sedimentation of receiving water bodies is reduced after storm events, as sediment is captured by retention ponds. At a minimum, the Southwest Florida Water Management District (SWFWMD) requires that MacDill AFB treat 0.5 inches of storm water runoff from new construction or redevelopment projects on the installation. MacDill AFB discharges to impaired water bodies and must therefore demonstrate that post-project pollutant loads are equal to or less than pre-project loads. Also, the Energy Independence and Security Act (EISA) Section 438 requires MacDill AFB to demonstrate that post-project hydrology matches pre-project conditions in terms of volume, flow rate, temperature, and other parameters. These two additional requirements can increase the minimum capacity of the permitted storm water management system(s).
- Storm water retention ponds, and other storm water management techniques, such as dry retention ponds, aid in complying with this requirement. An environmental resource permit is required before beginning any construction activity that would affect wetlands, alter surface water flows, or contribute to water pollution. MacDill AFB has numerous permitted storm water management areas, with Lewis Lake being the largest pond collecting runoff from the runway (see **Figure 2-6**). Storm water management areas could be a constraint to installation development if development would require the removal or relocation of a retention pond, or construction within a management area that would result in modification to the system. Any permitted storm water management areas that are removed would require replacement; new or modified (i.e., relocated) storm water management areas would require an environmental resource permit in accordance with Rule 40D-40.302 and 62-25.040 Florida Administrative Code (F.A.C.).

- **Threatened and Endangered Species and Associated Habitats (191 acres).** There are a number of known threatened and endangered species on MacDill AFB (see **Section 3.6.2**). Some of the projects analyzed in this IDEA would be developed in or near existing threatened and endangered species habitat. MacDill AFB has a depredation permit with the USFWS to take, temporarily possess, and transport migratory birds (excluding bald eagles, golden eagles, and threatened or endangered species) along airport property in situations where nesting species pose a serious threat to human health and safety. Nonlethal management techniques would be emphasized in accordance with the installation’s INRMP. The installation would consider threatened and endangered species and their habitat during project planning; however, construction of a project near threatened and endangered species or habitat could occasionally be required. If threatened and endangered species or habitat is anticipated to be affected by proposed development activities, consultation with the USFWS and 6 CES/CEV would occur to determine feasible conservation measures, including alternative project siting locations. However, if it is determined that a federally protected species were to be affected, the formal ESA Section 7 process would commence, and a Biological Assessment would be prepared

and submitted to the USFWS. The USFWS would then prepare a Biological Opinion addressing the potential effects of the proposed projects on federally protected species. Concurrence on the project must be obtained prior to commencing construction activities that could affect a threatened or endangered species. If a state-protected species could be affected, MacDill AFB would consult with the Florida Fish and Wildlife Conservation Commission (FWC) for all protected flora and fauna. It is not anticipated that a Biological Assessment would be required for the Proposed Action.

- **Cultural Resources, Historic Buildings, and Archaeological Sites.** There are a number of known prehistoric archaeological sites and historic buildings on MacDill AFB, and there are two historic districts. Some of the projects evaluated in this IDEA would be developed within the MacDill Field Historic District on MacDill AFB. Advance coordination with 6 CES/CEVN and the FUB would be accomplished for any projects involving construction or demolition activities within either of the historic districts or that would involve the alteration of historic buildings. In accordance with Section 106 of the NHPA, consultation with the Florida SHPO would be completed prior to initiating projects within either of the historic districts or for projects that directly involve the demolition or renovation of historic buildings.
- **AT/FP Setback Requirements.** Minimum AT/FP design standards for new construction have been specified by the DOD and would increase the land area required for individual facilities. Design standards for new construction are contained in UFC 4-010-01, *DOD Minimum Antiterrorism Standards for Buildings*, 9 February 2012 (DOD 2012), and augmented by USAF instructions. The USAF Force Protection Design Guide, published by the Air Force Center for Engineering and the Environment, supplements the DOD standards and must also be consulted during the planning and design processes.

Installation constraints are an important parameter in the siting of projects and the development of reasonable alternatives for all projects proposed at MacDill AFB. As a general practice, MacDill AFB seeks to avoid, wherever possible, any disturbance to sensitive or constrained areas. However, as future mission activities dictate, and due to the expanse of existing constrained areas on MacDill AFB (i.e., approximately 95 percent of the installation's acreage), avoiding or restricting future development within this acreage would not be practical and would severely limit the installation's ability to accomplish its missions successfully. When these resources cannot be avoided and if selected projects would result in significant environmental impacts, separate and additional NEPA documentation would occur and consultation with the appropriate regulatory agencies would be completed prior to initiating the action. All construction or other activities that would occur within areas of concern, such as the floodplain, would comply with the requirements of various Federal, state, and local policies and regulations that govern such resources, and the appropriate environmental protection measures would be followed and instituted.

2.1.3 Demolition Projects

Of the demolition projects proposed for the next 5 FYs (as identified in **Appendix A**), three projects were selected for detailed analysis as selected projects under the Proposed Action. The other remaining proposed demolition projects are addressed in the cumulative impacts analysis of the IDEA. The selected demolition projects would remove an estimated 30,237 square feet (ft²) of facilities of an estimated 254,597 ft² of demolition projects proposed over the next 5 FYs. These demolition projects would contribute to the goal of reducing the physical plant footprint on the installation according to the "20/20 by 2020" initiative for making space available for future development. In accordance with AFI 32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*, it is USAF policy to replace a facility when the estimated repair cost exceeds 70 percent of the replacement cost. Most of the facilities proposed for demolition have either been deemed to be unusable or too costly to repair or renovate to meet the future mission requirements of MacDill AFB by the 6 CES and other

installation personnel. **Section 2.2.1** provides an overview of the demolition justification determination process, and **Section 2.2.2** further discusses issues considered for the evaluation of individual demolition projects.

Some selected construction projects also include demolition of facilities. Demolition of all facilities associated with the Proposed Action (i.e., all selected projects), including those from demolition and construction categories, would remove an estimated 24 facilities (159,340 ft²) and their associated pavements. Of those facilities, six are associated with three demolition projects for the next 5 FYs (FYs 2012 to 2017) and are proposed to support future mission requirements. Eighteen facilities associated with construction projects and one associated with infrastructure projects are proposed for demolition (see **Table 2-1**, **Section 2.1.4**, and **Appendix A**).

Projects within this category primarily include the demolition of structures, but could also include demolition of parking lots and other pavements. The demolition of old or outdated facilities would minimize the area of undisturbed land required for new facilities and reduce labor costs associated with maintenance and repair of these excess facilities. **Table 2-1** identifies the selected demolition projects to be evaluated in detail in this IDEA. **Figures 2-1** through **2-4** show the locations of the selected demolition projects relative to known constraints at MacDill AFB. Demolition of facilities and pavements associated with construction or infrastructure category projects are discussed in **Sections 2.1.4** and **2.1.5**. The total project area associated with each project includes additional space required for demolition activities, including project equipment and staging areas. For buildings that are several stories tall, the total project area could be larger than the footprint associated with the building square footage.

The three selected demolition projects are believed to encompass the upper range of potential impacts on the natural and man-made environments from such projects in the demolition category and thus frame the upper limits for potential impacts that reasonably could be expected from the demolition projects proposed at the installation. For example, Project D2 (Demolish Building 1107) and Project D3 (Demolish Building 40) would result in a large surface disturbance in this category; in addition, these projects could impact sensitive resources such as hazardous materials (i.e., asbestos-containing material [ACM] and lead-based paint [LBP]), ERP sites, the 100-year floodplain, and historic resources. The other nine demolition projects not selected under the Proposed Action are considered in the cumulative impacts analysis for this IDEA.

All demolition projects that could impact properties listed in or adjacent to historic districts or that could be eligible for listing as a NRHP site are subject to consultation with the Florida SHPO as per 36 CFR 800. **Appendix C** includes a list of facilities on MacDill AFB that have reached or are reaching 50 years in age by 2017 and contains documentation on NRHP eligibility evaluations. All consultations with the Florida SHPO for facilities that meet applicable parameters and any mitigation requirements developed during consultation would be completed prior to signature of a FONSI/FONPA to garner a no adverse effect on historic properties determination. In addition, all fill used for post-demolition activities would be obtained from an approved offsite borrow pit. All trees and vegetation associated with facilities scheduled for demolition that could not be avoided would be replaced or relocated as applicable and the area sodded with native species. Greater detail on each of the selected demolition projects is given in the following paragraphs.

D1. Demolish Buildings 65, 82, 83, and 85. The proposed demolition of Buildings 65 (Morale, Welfare, and Recreation Offices, 9,522 ft²), 82 (USAF Plant Administration Office, 3,898 ft²), 83 (Warehouse, 2,579 ft²), and 85 (Base Civil Engineering Storage Shed, 70 ft²), and associated pavements would result in a reduction of impervious surfaces totaling 20,136 ft². All of these buildings have been determined to be ineligible for NRHP listing (MAFB 2006b). Demolition of these facilities would include the termination of utilities and the restoration of the site to match the surrounding areas.

Table 2-1. Selected Facilities Demolition Projects Analyzed in this IDEA

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Facilities Demolition (ft ²)	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
D1. Demolish Buildings 65, 82, 83, and 85	NVZR090025 NVZR120102 No Number Assigned	2013 and 2014	Industrial	Demolish Buildings 65 (Morale, Welfare, and Recreation Offices, 9,522 ft ²), 82 (USAF Plant Administration Office, 3,898 ft ²), 83 (Warehouse, 2,579 ft ²), and 85 (Base Civil Engineering Storage Shed, 70 ft ²). Terminate utilities and restore site to match surrounding areas.	ERP, Floodplain, ACM, LBP, PCB	16,069	54,923	-20,136
D2. Demolish Building 1107	NVZR100154	2013	Open Space	Demolish Building 1107 (Warehouse, 2,431 ft ²). Terminate utilities and restore site to match adjacent areas.	ERP, Floodplain, ACM, LBP, PCB, Historic resources	2,431	11,320	-5,395
D3. Demolish Building 40	NVZR100179	2014	Administrative	Demolish Building 40 (Communications Facility, 11,737 ft ²).	Floodplain, ACM, LBP, PCB	11,737	45,614	-11,737
Total Square Feet						30,237	111,857	-37,268

Note: Total Project Area includes additional laydown area required for demolition activities.

Key:

ACM = asbestos-containing material

LBP = lead-based paint

ERP = Environmental Restoration Program

PCB = polychlorinated biphenyl

ft² = square feet

D2. Demolish Building 1107. The proposed demolition of Building 1107 (Warehouse) would result in a reduction of impervious surfaces of 2,431 ft². Building 1107, constructed in 1974, is a steel-framed storage facility that would be vacated and become obsolete when Special Operations Command Central (SOCCENT) relocates. The long-term goal for this area is to return it to the original purpose of alert operations. Utilities at the building would be terminated and the site would be restored to match adjacent areas.

D3. Demolish Building 40. The proposed demolition of Building 40 (Communications Facility) would result in a reduction of impervious surface totaling 11,737 ft². Building 40 would become obsolete upon completion of the Consolidated Communications Facility (which is under construction and will not be analyzed in this IDEA). Building 40 was constructed in 1953 and was determined to be ineligible for NRHP listing (MAFB 2006b). Site conditions would be restored to match surrounding areas.

2.1.4 Construction Projects

Of the 41 construction projects proposed at MacDill AFB over the next 5 FYs (identified in **Appendix A**), 6 were selected for detailed analysis under the Proposed Action. The remaining 35 are addressed in the cumulative impacts analysis for this IDEA. The selected construction projects would add an estimated 1,196,975 ft² of facilities, new pavements, and site improvements of an overall estimated 1,322,411 ft² of construction projects proposed over the next 5 FYs. Total impervious surfaces added for selected construction projects would be 687,970 ft². Projects within this category primarily include new facility construction and additions to existing facilities, but could also include renovations, repairs, alterations, parking, and other pavements when these elements are a large relevant component of a facility construction project. The construction of new facilities would be sited in accordance with appropriate land use areas in order to continue or enhance compatibility with currently designated land use areas. **Table 2-2** identifies the selected construction projects to be evaluated in detail in this IDEA, and **Figures 2-1** through **2-4** show the possible locations of the selected construction projects relative to known constraints at MacDill AFB. Construction projects could also include demolition of facilities, as indicated in **Table 2-2** by an asterisk following the project name. The total area associated with each project includes additional space required for demolition activities, including project equipment and staging areas. For buildings that are several stories tall, the total area could be larger than the building square footage.

These selected construction projects are believed to encompass the upper range of potential impacts on the natural and man-made environments from such projects in the construction category and thus frame the upper limits for potential impacts that might reasonably be expected from the construction projects proposed at the installation. For example, Project C1 (Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Joint Combat Aquatic Training [JCAT] Center), Project C2 (Construct Logistics Readiness Complex), and Project C6 (Alert Facility, Fuels Mobility Support Equipment Facility) would have the potential to create the greatest surface disturbance compared to other construction projects. The other construction projects listed in **Appendix A** are considered in the cumulative impacts section of this IDEA.

All fill used for construction activities would be obtained from an approved offsite borrow pit. All trees and vegetation impacted from construction activities would be replaced or relocated, as practicable. All ground disturbed during construction activities that does not include site improvements would be covered with sod, where appropriate. All MILCON projects would be constructed to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver standard. A more detailed description of each of the selected construction projects is given in the following paragraphs.

Table 2-2. Selected Facilities Construction Projects Analyzed in this IDEA

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Representative Construction Projects							
C1. Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, JCAT Center *	NVZR103707, NVZR063705, NVZR103706	2013 and 2014	Outdoor Recreation	Construct a new 36,000-ft ² indoor JCAT Center in the area of the Base Fitness Center. Project includes demolition of Facilities 46 (Pool, 7,011 ft ²) and 47 (Bathroom, 3,795 ft ²). Total project area needed for demolition is 54,961 ft ² because the site is elevated. Renovate south and southwest sections of existing facility (12,422 ft ²) and pave and stripe the parking area south of the existing facility (includes a new pedestrian bridge and retention pond). Two parking areas totaling 104,603 ft ² would be constructed.	Floodplain, ACM, LBP, PCB	Facilities: 48,422 Pavements: 104,603 Demolition: 54,961 Total Project Area: 278,961	+142,219
C2. Construct Logistics Readiness Complex*	NVZR043704	2013	Administrative, Open Space	Construct a 32,132-ft ² Logistics Readiness Complex to replace inadequate facilities. Project relocates the transportation function and consolidates functions adjacent to the Supply Warehouse (Building 49). Demolishes 5 substandard facilities (Buildings 119, 175, 178, 500, and 510) totaling 41,059 ft ² and removes a leased modular facility. Total project area, including building footprints, paved areas, roadway work, storm water retention pond(s), and green spaces, is 344,974 ft ² , with 293,878 ft ² of impervious surfaces. Straightening Marina Bay Drive entails a new 35,700 ft ² -roadway to replace the existing 26,600 ft ² -roadway (see Project I4). Parking areas would be constructed for vehicle maintenance, vehicle operations, and privately owned vehicles.	Floodplain, ERP, ACM, LBP, PCB	Facilities: 32,132 Pavements: 261,746 Demolition: 41,059 Site Improvements: 51,096 Total Project Area: 344,974	+293,878

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Representative Construction Projects (continued)							
C3. Construct EOD Bunker Barricades	NVZR110193	2013	Outdoor Recreation	Construct new EOD range with 780-ft ² detonation point barricades and a 300-ft ² , three-sided, reinforced-concrete personnel bunker.	ERP, QD, Floodplain	Facilities: 1,080 Pavements: 0 Site Improvements: 0 Total Project Area: 1,080	+1,080
C4. Construct Joint Special Operations University (JSOU)*	NVZR083702	2013	Administrative	Remove two temporary structures (Buildings 506A and 506E, totaling 39,027 ft ²) with a total project area of 94,234 ft ² ; construct a three-story, 85,000-ft ² education building elevated above the floodplain to collocate the JSOU with SOCOM. Utilities would be upgraded.	Floodplain	143,234	-22,546
C5. Construct Outdoor Recreation Maintenance Facility*	NVZR103710	2014 and 2015	Outdoor Recreation	Construct a 20,500-ft ² building behind Building 60. Facility would serve as the storage and maintenance building for outdoor recreation equipment. The 50,000 ft ² -parking area would be reconfigured. The project also includes the demolition of Buildings 13, 60, and 694 (5,695 ft ²).	ERP, ACM, LBP, PCB, Floodplain	Facilities: 20,500 Pavements: 50,000 Site Improvements: 98,839 Demolition: 37,000 Total Project Area: 169,339	+64,805

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Representative Construction Projects (continued)							
C6. Alert Facility, Fuels Mobility Support Equipment Facility*	NVZR103712 NVZR063716 NVZR110053	2014 and 2015	Open Space	Construct a two-story, 30,000-ft ² facility to house crew readiness operational, recreational, and administrative functions adjacent to the Alert Aircraft Parking Ramp. Construct an 18,000-ft ² facility to house Fuels Mobility Support Equipment (FMSE) and Fuels Operation Readiness Capability Equipment (FORCE), and a 3,050-ft ² facility for administrative functions. A 10,000-ft ² fuels containment area with three support fuel tanks would be included. Includes demolition of obsolete facilities (1051, 1052, 1053, 1069, 1079, and 1081), totaling 32,516 ft ² with a total demolition project area of 144,273 ft ² , and relocation of operational testing equipment. An 180,000 ft ² parking area would be constructed.	ERP, Floodplain, ACM, LBP, PCB, AST	Facilities: 61,050 Pavements: 180,000 Site Improvements: 144,273 Total Project Area: 385,323	+208,534
Total Square Feet						1,322,411	+687,970

Note: * = Denotes projects that include demolition of facilities.

Key:

ACM = asbestos-containing material

AST = aboveground storage tank

ERP = Environmental Restoration Program

FMSE = Fuels Mobility Support Equipment

FORCE = Fuels Operation Readiness Capability Equipment

ft² = square feet

FY = Fiscal Year

JCAT = Joint Combat Aquatic Center

JSOU = Joint Special Operations University

LBP = lead-based paint

PCB = polychlorinated biphenyl

SF = Security Forces

QD = quantity distance

C1. Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, JCAT Center.

The Fitness Center is not large enough to meet current requirements for the number of personnel using the facility. The proposed project would add to and alter the existing physical fitness center (Building 303). The purpose of Project C1 is to construct an adequately sized and configured fitness and aquatic center for daily training and exercise for the installation population. Implementing Project C1 is needed to meet the requirements of the USAF's Fitness Facilities Design Guide.

Although a major addition to the Fitness Center has recently been completed, budget constraints prevented all of the necessary maintenance, repair, and construction work from being accomplished. The new addition would allow for year-round aquatic activities with the construction of a 25-meter pool with a diving board and bleachers for spectators. In addition, there would be multi-purpose gymnasiums and renovations to the layout of the current Fitness Center. The addition would result in the relocation of the running track and softball field to the southeast of its current location. These additions are necessary to achieve an adequate fitness center. The addition to and alteration of the Fitness Center would be approximately 43,099 ft². A new 36,000-ft² indoor JCAT Center would be constructed in the area of the Base Fitness Center. This project includes demolition of Facilities 46 (Pool, 7,011 ft²) and 47 (Bathhouse, 3,795 ft²). Three parking areas totaling 122,874 ft² would be constructed. The addition to and alteration of the Fitness Center would not be required to be elevated above the installation floodplain as it would not qualify under Federal Emergency Management Agency (FEMA) regulations as a substantial improvement because it would not exceed 50 percent of the market value of the facility (FEMA 2010). The JCAT Center, however, would be elevated above the 100-year floodplain with minimum pad elevations of 11.5 feet. In total, this project would result in an increase of 171,296 ft² of impervious surfaces. **Figure 2-7** is a conceptual diagram of the proposed additions and alterations, relocation of the softball field, and other associated construction activities.

C2. Construct Logistics Readiness Complex. This project consists of constructing a 32,132-ft² facility, properly designed and centrally located, to consolidate vehicle maintenance, transportation, administrative, and operational functions adjacent to the Supply Warehouse (Building 49). The purpose of Project C2 is to construct a new Logistics Readiness Complex and demolish existing inadequate logistics readiness facilities. Project C2 needs to be implemented to meet current AMC and USAF standards, and because current facilities are inadequate to perform the required maintenance and administrative functions required of a Logistics Readiness Squadron (LRS).

The facility would be elevated above the 100-year floodplain with minimum pad elevations of 11.5 feet. A drainage ditch exists around Building 49 and out towards the flightline, where it splits into two ditches. Marina Bay Drive would cross these two ditches. The existing 26,600-ft² roadway would be straightened and new culverts constructed to cross the two ditches, and would increase impervious surfaces by 9,100 ft². This proposed building would replace the inadequate vehicle maintenance shop, which is approaching 40 years old, is in poor shape, does not meet AMC or USAF standards, has insufficient electrical capacity, and is too small to allow for efficient performance of vehicle maintenance. In addition, peeling LBP on the ceiling and floors must be captured daily and treated as hazardous waste, and the lack of space in the existing supply warehouse forces individual units to store mobility equipment outside or in condemned buildings. ACM could be present in Building 500. Prior to demolition, each facility would be surveyed for LBP and ACM. MacDill AFB maintains a *Lead-Based Paint Management Plan* (MAFB 2007a) and an *Asbestos Management and Operations Plan* (MAFB 2007b) that document policies and procedures for managing LBP and ACM at MacDill AFB and specify responsibilities and requirements for identifying, assessing, and maintaining LBP and ACM. Removal activities would comply with these plans. In addition, there are five ERP sites (i.e., Sites 39, 54, 57, SS035/305, and F45) within or immediately adjacent to the proposed project area.



Figure 2-7. Proposed Upgrade to Fitness Facilities (Project C1)

The new facility would collocate logistic readiness functions, and would result in an estimated energy savings of \$60,000 per year by implementing more energy-efficient functionality (MAFB 2010c). The project would result in the demolition of Buildings 119, 175, 178, 500, and 510. New parking areas would be constructed, and storm water retention pond(s) and green space are proposed. A box culvert would be constructed within the drainage ditch. **Figure 2-8** is a conceptual diagram of the proposed Logistics Readiness Complex.

C3. Construct EOD Bunker Barricade. A 780-ft² barricade would be constructed with two entrances that surround the destruction point, which is the equivalent of at least two side-by-side sandbags, 6 feet in height, and is within 10 feet of the destruction point. The barricade entrances would be separated by 180 degrees. A 300-ft² personnel bunker would be constructed of reinforced concrete to provide full frontal and overhead cover to personnel inside. The purpose of Project C3 is to construct an EOD bunker barricade to control the ejection of debris. This project is needed because the current EOD range does not meet requirements listed in Air Force Manual 91-201, *Explosives Safety Standards*.



Figure 2-8. Proposed Logistics Readiness Complex (Project C2)

A firing wire control box would be moved from its current underground location and mounted on the inside of the observation wall associated with the personnel bunker. **Figure 2-9** shows the location of the proposed barricade and bunker.

C4. Construct Joint Special Operations University (JSOU). The purpose of Project C4 is to construct a new JSOU facility to collocate the JSOU with SOCOM on the installation. The current JSOU facility is at Hurlburt Field, Florida, in an inadequately sized facility. This project is needed to comply with a 30 June 2009 memorandum from the SOCOM Commander directing that the JSOU relocate from Hurlburt Field, Florida, to HQ SOCOM on MacDill AFB.

Two temporary structures (Buildings 506A and 506E, totaling 39,027 ft²) would be removed with a total project area of 94,234 ft². The new JSOU would be a three-story, 85,000-ft² education building elevated above the floodplain. Utilities would be upgraded. The project would include a loading dock and receiving area, landscaping, site improvements, installation of communications infrastructure connecting to the Building 501/501A complex and AT/FP measures. **Figure 2-10** shows the location of the proposed JSOU facility and buildings to be demolished.

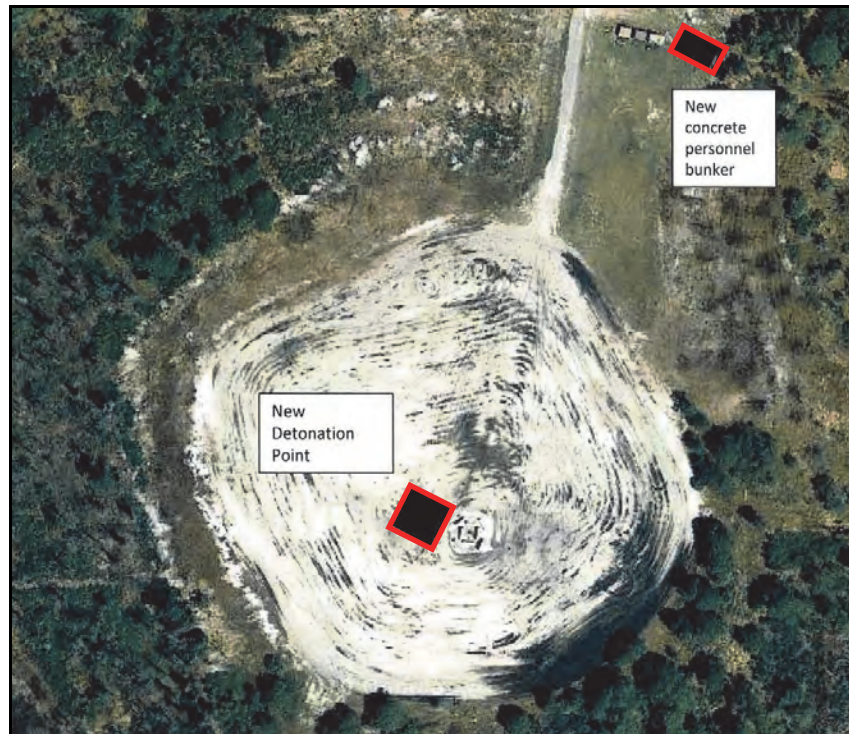


Figure 2-9. Proposed EOD Barricade and Bunker (Project C3)



Figure 2-10. Proposed JSOU Project Site and Buildings to be Removed (Project C4)

C5. Construct Outdoor Recreation Maintenance Facility. The purpose of Project C5 is to provide adequate facilities to support recreational activities. The project is needed to comply with Air Force Handbook (AFH) 32-1084, *Civil Engineering Facilities Requirements*. In addition, existing outdoor recreation Facilities 13, 60, and 694 are 1960s radio communication facilities that do not meet current safety codes and Americans with Disabilities Act criteria. The buildings are susceptible to flooding because they are below the required 11.5-foot elevation above ground level, intended to raise facilities above the 100-year floodplain. It is proposed that these three facilities be demolished (with demolition totaling 5,695 ft²) and a 20,500-ft² building be constructed. The new facility would be elevated above the 100-year floodplain with minimum pad elevations of 11.5 feet. Parking areas would compose approximately 50,000 ft². **Figure 2-11** is a conceptual diagram of the proposed Outdoor Recreation Maintenance Facility. This project would be sited to avoid wetland impacts. If it is determined that wetlands could not be practicably avoided and would be impacted, the necessary permits would be obtained prior to construction activities commencing. Mitigation for impacts on wetlands, if required, would be determined during the permit application process.



Figure 2-11. Proposed Outdoor Recreation Maintenance Facility (Project C5)

C6. Construct Alert Facility, Fuels Mobility Support Equipment Facilities. The purpose of Project C6 is to construct an adequate Alert Facility at MacDill AFB because alert crews are presently using billeting and dining facilities 5 miles from the Alert Aircraft Parking Ramp, which results in response times that do not meet USAF requirements. This project is needed to decrease the crew response time and meet USAF requirements, and to support homeland defense initiatives. This project consists of constructing a two-story, 30,000-ft² facility to house crew readiness operational, recreational, and administrative functions adjacent to the Alert Aircraft Parking Ramp. This facility would also require an estimated 1,000-kilowatt emergency generator.

In addition to the Alert Facility, Project C6 includes construction of an 18,000-ft² facility to house Fuels Mobility Support Equipment (FMSE) and Fuels Operation Readiness Capability Equipment (FORCE). The purpose of the FMSE Facility is to consolidate fuels mobility support functions and store FMSE and FORCE. This project is needed to provide adequate storage facilities for FMSE and FORCE, because current facilities leave some assets exposed to the elements. In addition, one facility is more than 0.5 miles from the operational testing location and another facility has deteriorated to the point that it is considered a safety hazard to personnel and equipment.

A 3,050-ft² facility would be constructed for administrative functions. The storage facility would have a loading dock and office space for 21 personnel. A 10,000-ft² fuels containment area with three support fuel tanks (two at 10,000 gallons and one at 5,000 gallons) would be installed to support operational testing and operator's maintenance and troubleshooting. This project includes demolition of obsolete facilities (i.e., Buildings 1051, 1053, 1069, 1079, and 1081) and relocation of operational testing equipment. **Figure 2-12** is a conceptual diagram of the proposed Fuels Management Facility and proposed FMSE Facility.



Figure 2-12. Proposed Alert Facility, FMSE Facility (Project C6)

The new facilities would be elevated above the 100-year floodplain with minimum pad elevations of 11.5 feet. Areas solely used for storage would not need to be elevated above the floodplain. This project would be designed to avoid impacts on wetlands.

2.1.5 Infrastructure Improvement Projects

Of the infrastructure improvement projects proposed at MacDill AFB over the next 5 FYs (as identified in **Appendix A**), six were identified for detailed analysis as selected projects under the Proposed Action. The other remaining proposed infrastructure improvement projects are addressed in the cumulative impacts analysis for this IDEA. The selected infrastructure improvement projects could disturb as much as 400,882 ft² of land, of which approximately 239,975 ft² of impervious surfaces would be added. Projects within this category include the removal, installation of, or upgrades to, paved roadways,

sidewalks, parking areas, utilities, storm water systems, fences, and outdoor recreational facilities. **Table 2-3** identifies the selected infrastructure improvement projects to be evaluated in detail in this IDEA, and **Figures 2-1** through **2-4** show the possible locations of the selected infrastructure improvement projects relative to known constraints at MacDill AFB. These projects also include demolition of facilities and pavements, as indicated in **Table 2-3** by an asterisk following the project name.

Figures 2-1 through **2-4** show the possible locations of the selected infrastructure improvement projects relative to known constraints at MacDill AFB.

These selected infrastructure improvement projects are believed to encompass the upper range of potential impacts on the natural and man-made environment from such projects in the infrastructure improvement category and thus frame the upper limits for potential impacts that reasonably could be expected from the projects proposed at the installation. For example, the construction of the CENTCOM Parking Garage (Project I1) would have the potential to create the greatest amount of land disturbance and new impervious surfaces of any of the infrastructure improvement projects proposed at MacDill AFB. This project would also have the potential to impact an ERP site and the floodplain. Replacement of the sludge digester tanks (Project I5) would have the potential to impact sensitive species and the floodplain. Other road and parking lot repair projects resulting in substantial land disturbance would be the straightening of Marina Bay Drive (Project I2) and construction of the dining facility parking lot (Project I3). The other infrastructure improvement projects identified in **Appendix A** not selected under the Proposed Action are considered in the cumulative impacts analysis of this IDEA.

All fill dirt used for infrastructure activities would be obtained from an approved offsite borrow pit. All trees and vegetation impacted from infrastructure improvement activities would be replaced or relocated, as practicable. All ground disturbed during construction activities that does not include site improvements would be revegetated with sod or by hydroseeding. Greater detail on each of the selected infrastructure improvement projects is given in the following paragraphs.

I1. Construct CENTCOM Parking Garage. A new multi-story, 595-981-ft² CENTCOM Parking Garage would be constructed to accommodate approximately 1,500 vehicles and 112 motorcycles. The proposed CENTCOM Parking Garage would be at the southeastern corner of Zemke Avenue and MacDill Avenue, and northwest of an existing tidal drainage channel. The purpose of Project I1 is to provide a multi-story parking garage and an elevated walkway connecting the garage to the replacement HQ building currently under construction. Project I1 is needed because the construction of new command and control facilities has nearly eliminated surface parking areas. As a result, dedicated parking is inadequate and does not meet the needs of the more than 4,400 personnel at CENTCOM. An elevated 5,580-ft² walkway above Zemke Avenue would be constructed to connect the parking garage to the replacement headquarters building currently under construction. This site is presently occupied by Buildings 1051 and 1053 that support the 49th Materiel Maintenance Support Squadron mission, and a 328-space surface parking lot serving the CENTCOM campus. Construction of the proposed parking garage would require demolition of Buildings 1051, 1052, and 1053 (also discussed under Project C6) and the existing CENTCOM parking lot, including the western entrance.

The site proposed for the CENTCOM Parking Garage is within the designated limits of SWMU 61. SWMU 61 encompasses an area where groundwater has been contaminated with chlorinated solvents. Therefore, any collected groundwater removed from below the groundwater table resulting from demolition operations are subject to segregation, sampling, analysis, and characterization for hazardous constituents prior to being disposed of off site at an approved landfill. Storm water runoff from the proposed parking garage would be directed toward existing, onsite, perimeter storm water conveyance and treatment systems, with eventual discharge to Tampa Bay. **Figure 2-13** shows a conceptual diagram of the CENTCOM Parking Garage.

Table 2-3. Selected Infrastructure Improvement Projects

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
I1. Construct Central Command (CENTCOM) Parking Garage	NVZR083712A, NVZR083712	2012 and 2013	Industrial	Site preparation (including soil compaction) and construction of a four-story, 595,981-ft ² parking garage (footprint of approximately 149,000 ft ²) to accommodate approximately 1,500 vehicles and 112 motorcycles. An elevated 5,580-ft ² walkway above Zenke Avenue would connect the garage to the replacement headquarters building currently under construction. Access roadways and sidewalks would be approximately 11,000 ft ² . Project includes demolition of Facilities 1051, 1052, and 1053 to clear the site and all necessary roadway modifications, landscaping, utilities, communications, site improvements, and construction of replacement facilities (covered under Project C6). Possible photovoltaic system.	Floodplain, AST, ACM	280,432	+ 160,000
I2. Straighten Marina Bay Drive	NVZR100044	2013	Open Space	Fix problems of Marina Bay Drive near Building 49, Base Supply by straightening the road and adding sidewalks and landscaping.	ERP, Floodplain	36,000	+9,100
I3. Construct Dining Facility Parking Lot	NVZR110153	2013	Community Service	Construct parking lot where Building 258 (Education Center) currently stands. Demolition of Building 258 is not part of the IDEA.	Floodplain	60,000	+48,000
I4. Construct Medical Clinic Sidewalks	NVZR100054	2013	Medical	Construct 3,150 linear feet of a 6-foot-wide concrete sidewalk.	Airfield, CZ, Sensitive species	3,150	+ 1,575
I5. Replace Sludge Digester Tanks	NVZR100051	2013	Industrial	Replace two 170,000-gallon sludge digestion tanks. Tanks are original equipment installed in the 1950s and have developed several leaks. The tanks would be within the wastewater treatment plant compound north of the existing digesters (Facility 64).	Sensitive species, Floodplain, EFH	3,300	+3,300
I6. Construct DISA Parking Lot, Building 805	NVZR110059	2014	Open Space	Expand Building 805 parking lot to support increased personnel from 18 to 70 spaces.	Floodplain	18,000	+18,000
Total Square Feet						400,882	+239,975

Note: * = Denotes projects that include demolition of facilities.

Key:

ACM = asbestos-containing material

AST = aboveground storage tank

CENTCOM = U.S. Central Command

CZ = clear zone

DISA = Defense Information Systems Agency

EFH = essential fish habitat

ERP = environmental restoration program

ft² = square feet

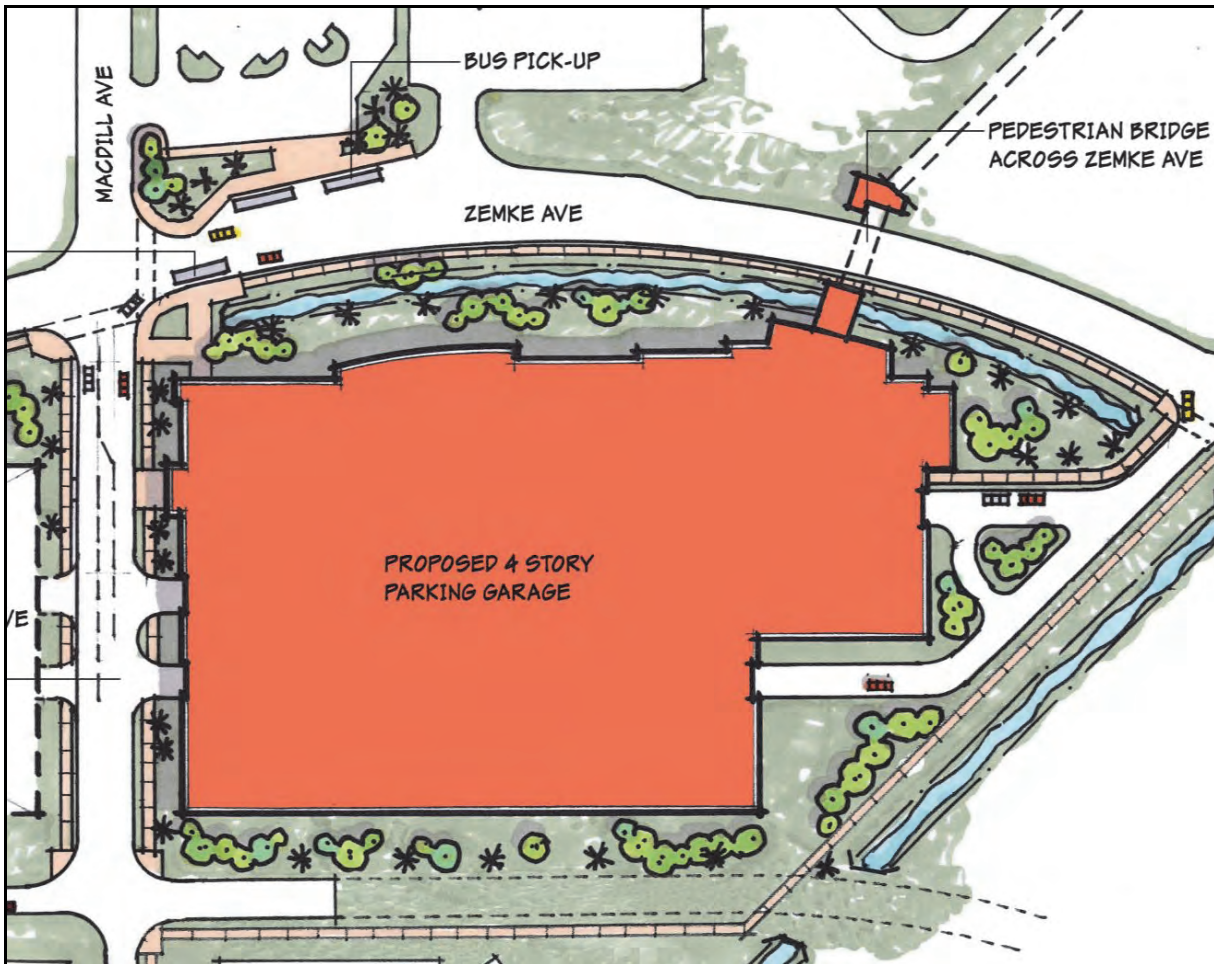


Figure 2-13. Proposed CENTCOM Parking Garage (Project I1)

I2. Straighten Marina Bay Drive. The straightening of Marina Bay Drive would include the construction of a relocated roadway (Marina Bay Drive) from Hangar Loop Drive to Nighthawk Place and the subsequent demolition of a large portion of the existing roadway. A temporary access road would be constructed to Building 90 from the area beyond the construction area (see **Figure 2-14**). The purpose of Project I2 is to provide safer and more direct traffic flow. This project is needed because the existing roadway is not designed efficiently and does not meet the safety mission of the installation. This project would also reconfigure the intersection at Hangar Loop Drive and Marina Bay Drive, and the intersection at Nighthawk Place and Marina Bay Drive. This action would install culverts to cross two drainage ditches, abandoning two monitoring wells, and drilling two new wells. An entrance to Buildings 49, 52, and 90, and Facility 45 (gas station) would be constructed, along with a sidewalk. The old roadway would be demolished. The proposed roadway and improvements would result in approximately 35,000 ft² of impervious surfaces, but approximately 26,000 ft² would be demolished for a net increase of 9,100 ft² of impervious surfaces.

I3. Construct Dining Facility Parking Lot. A 48,000-ft² parking lot is proposed for construction at the site of former Building 258 (Airman Leadership School), which was demolished in 2012, and within the empty lot west of Building 263 (Dining Facility) (see **Figure 2-15**). The purpose of Project I3 is to provide sufficient parking for the Dining Facility. The project is needed because current parking capacity does not meet the needs of increased personnel.

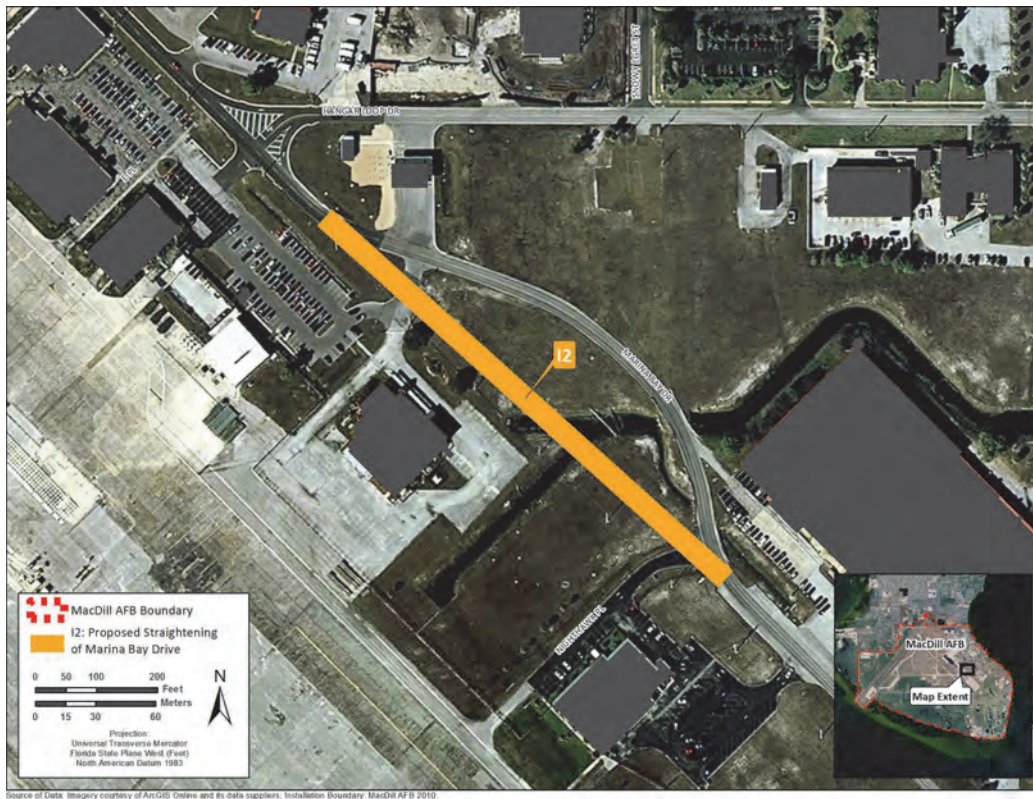


Figure 2-14. Proposed Straightening of Marina Bay Drive (Project I2)

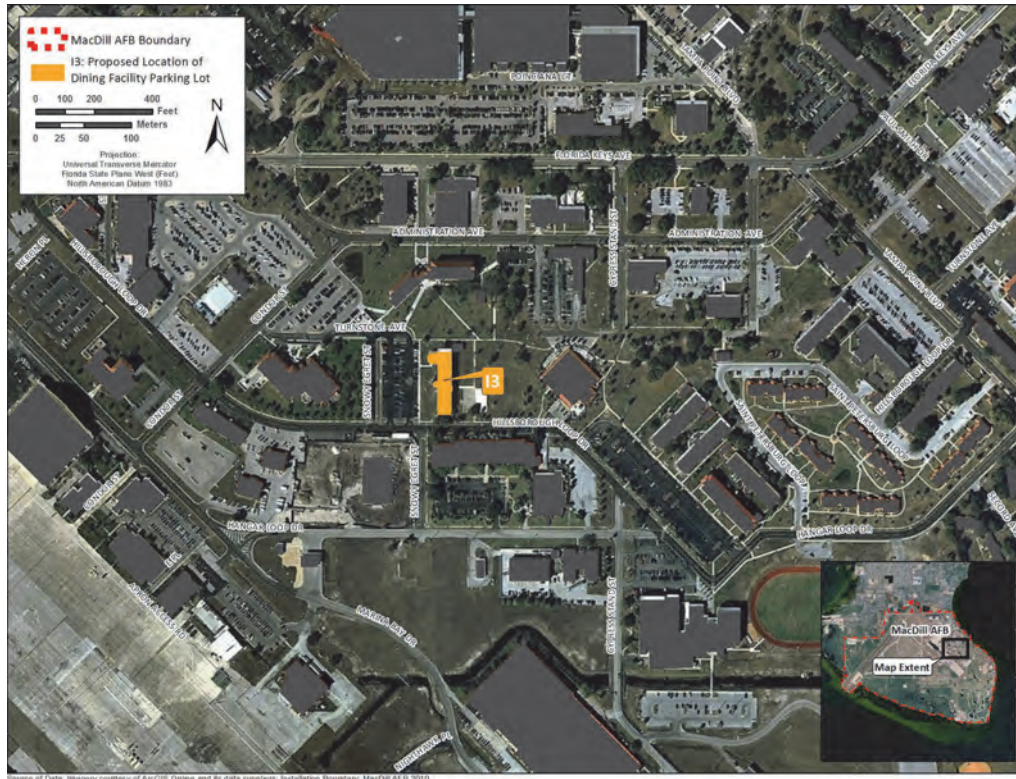


Figure 2-15. Proposed Dining Facility Parking Lot (Project I3)

I4. Construct Medical Clinic Sidewalks. A 6-foot-wide concrete sidewalk would be constructed from the Main Gate on Dale Mabry Avenue, south along the eastern side of Dale Mabry Avenue, continuing east along the northern side of North Boundary Boulevard, and south along the western side of Zemke Avenue, ending at the new Medical Clinic (see **Figure 2-16**). The purpose of Project I4 is to provide an egress sidewalk for the Medical Clinic that meets clinic safety requirements. This project is needed because current safe egress capability during emergency evacuations is inadequate and does not meet the requirements listed in the National Fire Protection Association's *Life Safety Code Handbook*. Sidewalks leading to 10 medical center building egress doors would be constructed. The entire length of the proposed sidewalks would be approximately 3,150 linear feet.



Figure 2-16. Proposed Medical Clinic Sidewalks (Project I4)

I5. Replace Sludge Digester Tanks. Two existing 170,000-gallon sludge digestion tanks at the wastewater treatment plant (WWTP) would be replaced. The purpose of Project I5 is to provide efficient sludge digester tanks that meet the demands of the WWTP. This project is needed because the tanks proposed for replacement are outdated, inefficient, and have developed several leaks. The tanks would be within the WWTP compound north of the existing digesters (Facility 64) (see **Figure 2-17**).

I6. Construct DISA Parking Lot. The Defense Information Systems Agency (DISA) parking lot is proposed to be expanded by 18,000 ft² adjacent to Building 805 to add 52 parking spaces for employees and guests (see **Figure 2-18**). The purpose of Project I6 is to provide adequate parking space at the DISA parking lot. The project is needed because current dedicated parking does not meet the needs of the increased personnel at Building 805. The site would need to be excavated and graded, and vegetation would need to be removed. This project would be designed to avoid wetlands impacts; a storm water permit would be required.

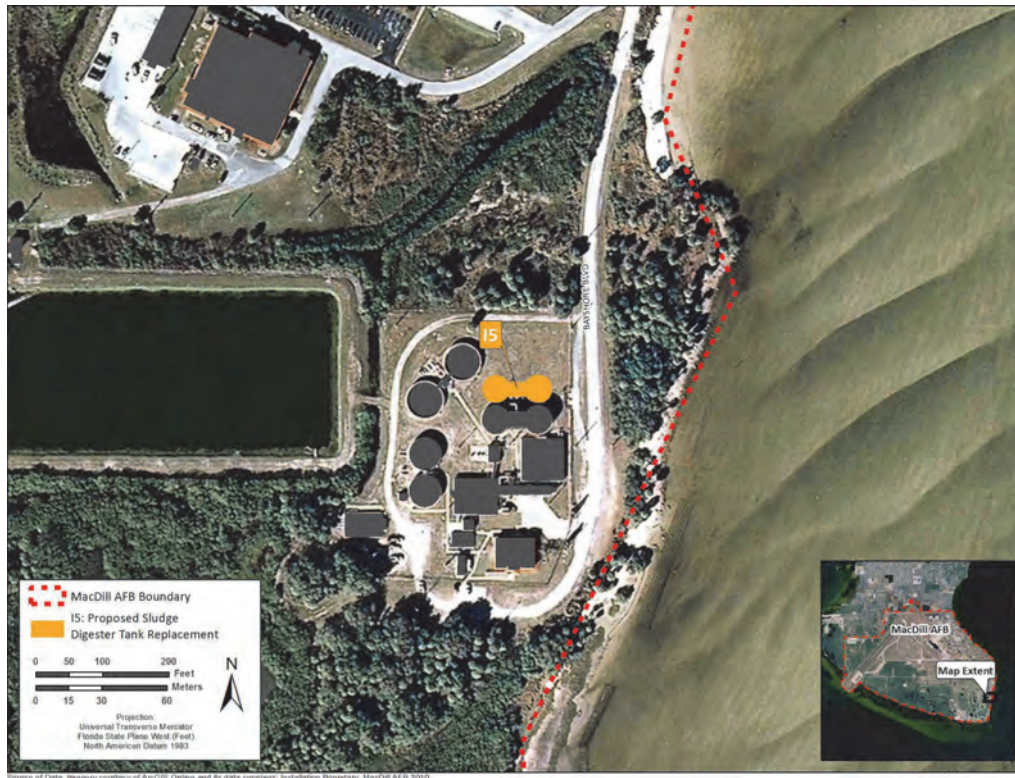


Figure 2-17. Proposed Sludge Digester Tank Replacement (Project I5)



Figure 2-18. Proposed Expanded DISA Parking Lot Location (Project I6)

2.1.6 Natural Infrastructure Management Projects

The IDEA addresses one natural infrastructure management project over the next 5 FYs (FYs 2012 to 2017) to support future mission requirements. The natural infrastructure management project from the listing in **Appendix A** is large enough in scope to warrant analysis as a selected project under the Proposed Action. This natural infrastructure management project could disturb as much as 184,156 ft² of land, though there is no anticipated change in impervious surfaces. The project within this category includes improvements to water quality. **Table 2-4** lists the natural infrastructure management project associated with the Proposed Action, and **Figures 2-1** through **2-4** show the possible locations of the natural infrastructure management project relative to known constraints at MacDill AFB. This natural infrastructure management project is described in detail as it is the only project programmed for this category within the timeframe of the IDEA.

This project involves work within or adjacent to streams and wetland areas. If it is determined that this project could affect federally listed threatened and endangered species, consultation with the USFWS under Section 7 of the ESA would be required prior to initiating the project. Trees and vegetation impacted from natural infrastructure management activities would be replaced or relocated, as practicable. All ground disturbed during construction activities would be replaced with sod, as appropriate. Greater detail on the natural infrastructure management project is given in the following paragraphs.

NI1. Storm Water Drainage Improvements. Installation-wide culvert repair is considered necessary as many culverts on the installation have broken headwalls and drainage pipes (see **Figure 2-19**). The purpose of Project NI1 is to provide sufficient storm water drainage throughout the installation. The project is needed because many culverts on the installation have broken headwalls and drainage pipes and drainages have an inadequate flow capacity during storm events, which results in overflows of storm water. In one location within the golf course, oyster colonization is impairing the integrity of the culvert by eroding the headwall. Joints in box culverts (such as K9 along the eastern end of Taxiway K) would be repaired. The Taxiway G headwall was damaged by heavy equipment and concrete debris now clogs drainage. Taxiway G headwall work could be conducted within an ERP site. Some storm drainage headwall repairs could be within the SWMU 61 site. In addition, many of MacDill AFB's culverts and open drainage ditches are overgrown with brush, which restricts drainage and causes localized flooding.

Therefore, storm water drainage throughout the installation is inadequate for proper drainage after storm events. In addition, ditches with standing water can attract birds, which can cause bird/wildlife aircraft strike hazard (BASH) issues near the flightline. Ditches with standing water also attract mosquitoes and other noxious insect species. This project also calls for the addition and grading of dirt to drainage ditches near the control tower to make the ditches more accessible to slope mowers to maintain vegetation. Maintenance of storm water drainage facilities by removal of vegetation is necessary for storm water runoff to flow efficiently off the installation and into receiving water bodies, and to aid in preventing flooding of the installation. Improvements of storm water drainage facilities are necessary to comply with MacDill AFB's Storm Water Management Plan. **Figure 2-20** shows an example drainage ditch requiring vegetation removal to retain functionality.

2.1.7 Strategic Sustainability Performance Projects

Of the sustainability performance projects proposed at MacDill AFB over the next 5 FYs (as identified in **Appendix A**), one was selected for detailed analysis under the Proposed Action. The selected strategic sustainability performance project could disturb as much as 7,920 ft² of land. Projects within this category include alternative energy projects and projects that support energy and water conservation measures. **Table 2-5** identifies the selected strategic sustainability performance project to be evaluated in detail in this IDEA. **Figure 2-4** shows the possible location of the selected strategic sustainability performance project relative to known constraints at MacDill AFB.

Table 2-4. Proposed Natural Infrastructure Management Project Analyzed in this IDEA

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
N11. Storm Water Drainage Improvements	NVZR080772, NVZR050269, NVZR100178, NVZR090053, NVZR040097, NVZR110027, NVZR090123, NVZR040198, NVZR090105, NVZR090097	2012 through 2016	Airfield pavements, Housing, Industrial, Open Space	Remove excess sediment and vegetation and restore grades to storm water drainage ditches. Four ditches have sediment contaminated with VOCs, polycyclic aromatic hydrocarbons (PAHs), and metals. Three of these ditches are adjacent or in near proximity to the airfield. Replace two storm water drainage pipes under Bayshore Boulevard near the pedestrian bridge across from the old military housing area (south of Youth Center). Dredge installation drainage ditches within the tank farm area. The north ditch is approximately 1,600 feet long; the south drainage is approximately 700 feet long. Repair/replace existing storm water drainage culverts at various locations (e.g., Marina Bay Drive, Southshore Avenue, North Golf Course Street, and Golf Course Avenue). Clean out the concrete culvert just north of the WWTP near Building 717. Clean, evaluate, and repair the joints of box culvert K-9 on the eastern end of Taxiway K to facilitate proper storm water drainage. Repair damaged reinforced concrete pipe and headwall (2,000 ft ²) near Bayshore Boulevard and CENTCOM Avenue. Repair headwall in the southern side of Taxiway G, west of the entry to Taxiway X (2,000 ft ²).	Airfield, ERP, Wetlands, Floodplain, Bald eagle nests, EFH, QD	184,156	No change
Total Square Feet						184,156	No change

Key:

CENTCOM = U.S. Central Command

EFH = essential fish habitat

ERP = Environmental Restoration Program

ft² = square feet

PAH = polycyclic aromatic hydrocarbons

QD = quantity-distance

VOC = volatile organic compound



Figure 2-19. Location of Storm Water Drainage Improvements (Project NI1)



Figure 2-20. Culvert Proposed to be Cleared and Relocated Away from Road (Project NI1)

Table 2-5. Proposed Strategic Sustainability Performance Project Analyzed in this IDEA

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
S1. Install Jogging Path Lighting	NVZR100079	2013	Open Space	Install solar-powered lights along Southshore Road to illuminate the jogging path from the intersection with North Golf Course Street (west) for a distance of 1.5 miles.	QD, Floodplain	7,920	No change
Total Square Feet						7,920	No change

Key:

ft² = square feet

QD = quantity-distance

All trees and vegetation impacted from strategic sustainability performance construction activities would be replaced or relocated, as practicable. All construction activities requiring ground disturbance that do not include site improvements would be sodded, as appropriate. Greater detail on the selected strategic sustainability performance project is given in the following paragraph.

S1. Install Jogging Path Lighting. Install solar-powered lights along Southshore Road from the intersection with North Golf Course Street (west) for a distance of 1.5 miles to illuminate the jogging path (see **Figure 2-21**). The purpose of Project S1 is to improve pedestrian and driver safety by providing a well-lit, safe jogging path on the installation. The project is needed because lighting is non-existent and many near misses with runners and vehicles occur. Southshore Avenue has no street lighting. It can be difficult for drivers and others to see people using the path, and safety has become an issue.



Figure 2-21. Location of Proposed Jogging Path Lighting (Project S1)

2.1.8 Summary of Selected Projects Associated with the Proposed Action

As a result of implementing the projects described in the preceding subsections (all projects identified in **Tables 2-1** through **2-5**), there would be approximately 24 facilities demolished at MacDill AFB, resulting in a decrease of impervious surfaces of approximately 159,340 ft². However, over the course of the next 5 FYs (FYs 2012 to 2017), selected projects would add approximately 1,138,741 ft² of new facilities, site improvements, and new pavements, resulting in an anticipated addition of 687,970 ft² of impervious surfaces. Additionally, there would be infrastructure and natural infrastructure upgrades and improvements. The selected infrastructure improvement projects under the Proposed Action could disturb as much as 400,882 ft² of area and would increase impervious surfaces by approximately 239,975 ft². The natural infrastructure management and strategic sustainability performance projects

would disturb 184,156 ft² and 7,920 ft² of ground surface, respectively, but no change in impervious surfaces would be anticipated. **Table 2-6** summarizes the anticipated project areas and changes in impervious surfaces from the selected projects under the Proposed Action.

Table 2-6. Project Area and Change in Impervious Surfaces

Project Type	Total Project Area (ft²)	Change in Impervious Surfaces (ft²)
Demolition	111,857	-37,268
Construction	1,322,911	+687,970
Infrastructure Improvement	400,882	+239,975
Natural Infrastructure Management	184,156	No change
Strategic Sustainability Performance	7,920	No change
Total	2,027,726	+890,677

Notes: Change in impervious surfaces is not necessarily equivalent to the project area square footage because some projects would disturb area but not add impervious surfaces or would include removal of pavements. Furthermore, many facilities proposed for demolition are multiple stories, and many new facilities would be multiple stories. Lastly, some infrastructure improvement, natural infrastructure management, and strategic sustainability projects would disturb area but not add impervious surfaces.

2.2 Alternatives

All proposed projects and their associated possible locations at MacDill AFB have undergone an intensive review by Civil Engineering Planning and Asset Management Flights and supporting installation staff. During revisions to MacDill AFB installation development plans and individual project planning and programming, alternatives for all projects are considered and evaluated. Reasonable alternatives for the selected projects are identified based on the following selection criteria:

- Fulfillment of current mission requirements
- Facility sustainability as mission evolves or changes
- Economic feasibility
- Consistency with future land use and the IDP
- Consistency with state, regional, and local plans
- Consistency with DOD and USAF policies, guidance, and directives
- Adherence to USAF Strategic Sustainable Performance goals and objectives
- Functional compatibility with adjacent facilities
- Collocation of like services
- Availability of sites and adequacy of space
- Environmental constraints (see **Section 2.1.2**).

All proposed projects are reviewed and approved by the FUB, which is chaired by the Wing Commander. Some projects, such as those that require demolition, renovation, or addition to specific buildings, might not have any alternatives by their very nature. Based on the listed criteria, the scope and possible locations for each project identified in **Section 2.1** were determined by installation personnel to be mission supportive, sustainable, and an economical solution. **Section 2.2.1** provides an overview of the alternative analysis determination process.

The individual projects identified in this IDEA would be prioritized and implemented as funding becomes available. The Proposed Action encompasses all the currently identified priority projects and the analyses describe the specific and cumulative consequences of implementing installation development. Since project phasing is expected to occur based on the availability of funding, no phasing alternatives were carried forward for independent analysis. The following subsections discuss alternatives for each of the project categories.

2.2.1 Alternatives Analysis

The process for selecting projects to be analyzed in the IDEA is initiated with a review of all projects included in the community of the installation-approved 5-year development plans. The inclusion of a project in an installation-approved plan begins with the identification of a DOD mission-essential requirement by a proponent. The proponent submits the requirement to the Base Civil Engineer (BCE) for project consideration. Working with the proponent, the Engineering staff, and other subject matter experts (SMEs), including planners and environmental professionals, the BCE conducts an internal review to determine if the requirement can be met with operational or engineering solutions, while minimizing potential environmental impacts on natural and man-made environments. Additional reviews are conducted to determine if the proposed solution is consistent with the IDP, AT/FP Plan, INRMP, ICRMP, and other approved installation plans. If the requirement includes facility construction, the internal review will include an evaluation of alternatives for potential development sites, which, in turn, must meet mission and national security requirements and minimize potential environmental concerns. The siting analysis for the proposed facility considers the adequacy of the site to fulfill current requirements with space for future expansion, functionality, command and control, compatibility with existing and future land use, compatibility with adjacent facilities, infrastructure availability, and site development costs. Once the requirement is determined to need an engineering solution and is consistent with installation plans, a project is created and additional screening is conducted to determine placement of the project into the appropriate construction program (i.e., MILCON, SRM, NAF). Finally, the project is presented to the FUB for approval. If it is approved, it is assigned a priority and recommended for a specific FY for completion.

2.2.2 Alternatives for Demolition Projects

The demolition projects selected under the Proposed Action are facilities proposed for demolition because they no longer meet the selection criteria described in **Section 2.2**, including the Capital Improvement Program (CIP) to replace aged, undersized, and poorly sited facilities with new, properly sized, and correctly sited facilities. As presented in **Table 2-7**, the three selected demolition projects have been proposed for demolition because they have been deemed by the proponent and 6 CES to not meet current mission requirements or are economically infeasible to repair or renovate. In accordance with AFI 32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*, it is USAF policy to replace a facility when the estimated repair or renovation costs exceed 70 percent of the replacement cost.

In addition, the facilities included as selected demolition projects under the Proposed Action are proposed for demolition because they aid MacDill AFB in achieving the DOD and USAF energy conservation goals, as required by EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, the EISA, and EPAct. The goals include reducing energy consumption/gross square footage by 2 percent each year through FY 2015, with a total reduction of 30 percent from a baseline of FY 2003.

Table 2-7. Justification for Proposed Selected Building Demolition Projects

Project Number/Description	Project Area (ft²)	Justification for Demolition
D1. Demolish Buildings 65, 82, 83, and 85	54,923	Buildings are no longer needed for the current mission. Demolition would remove facilities from the floodplain. This project is consistent with the MacDill AFB IDP.
D2. Demolish Building 1107	11,320	Building no longer meets mission requirements and is not economically feasible to upgrade for an alternative use. Demolition of Building 1107 would remove facility from the floodplain. This project is consistent with the MacDill AFB IDP.
D3. Demolish Building 40	45,614	Building has exceeded its lifespan and no longer meets mission requirements. Demolition of Building 40 would remove facility from the floodplain. This project is consistent with the MacDill AFB IDP.

Sources: MAFB 2010e, Boyd 2012, UFC 3-701-01, and DOD 2011

All facilities associated with the selected demolition projects (Buildings 65, 82, 83, 85, 1107, and 40) are within the floodplain and subject to flooding because they are not elevated. By demolishing buildings within the floodplain, the installation's footprint of impervious surfaces and structures within the floodplain would decrease. Any new occupied structures within the floodplain would be elevated above the 100-year floodplain with minimum pad elevations of 11.5 feet, thereby reducing the potential for impacts on the facilities during flood events. Therefore, the selected demolition projects would decrease the structures within the floodplain.

Although not alternatives to demolition, different demolition methods, and the timing of demolition activity to minimize fugitive dust generation, would be employed. Alternative demolition methods would vary depending on the area where demolition is planned, the building or structural materials to be demolished, the purpose of the demolition and the way the resultant debris would be disposed of, and are discussed within the analysis, where appropriate. These alternative demolition methods are not alternatives in the sense that the USAF would consider them during project planning, but rather, the USAF would choose the appropriate demolition method as dictated by local site conditions.

2.2.3 Alternatives for Construction Projects

MacDill AFB is a densely developed installation supporting a variety of host and tenant activities. Consequently, the need for adjacency in operational activity and the overall lack of and demand for available space results in most construction alternatives being limited to sites made available through demolition for a specific intended purpose. As noted in **Section 2.1.2** and shown in **Figures 2-1** through **2-4**, much of the installation is constrained by the location of the airfield; extensive floodplain and wetland areas; the existence of cultural resources sites, including two historic districts; numerous ERP sites; land use constraints such as permitted storm water management areas; QD arcs; AT/FP standoffs; parking shortages; and designated land use categories. Due to the constraints described here and in **Section 2.1.2**, the analyses provided in this IDEA addressing the selected projects evaluate their siting anywhere within the improved or semi-improved areas of the installation that are within compatible land use areas of the installation.

Specific alternatives to the six selected construction projects were considered by the 6 CES and other installation personnel during the planning process for these projects. **Figure 2-22** shows the locations of the site alternatives in relation to the Proposed Action site locations. The following sections provide a summary of the alternatives considered for further evaluation in this IDEA; and the alternatives that were initially considered but were eliminated from further detailed analysis. No alternatives have been deemed reasonable for the Upgrade Fitness Center Soccer Field project associated with Project C1 (Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Construct JCAT) or Project C2 (Construct Logistics Readiness Complex).

2.2.3.1 Alternatives Considered for Further Detailed Analysis for Construction Projects

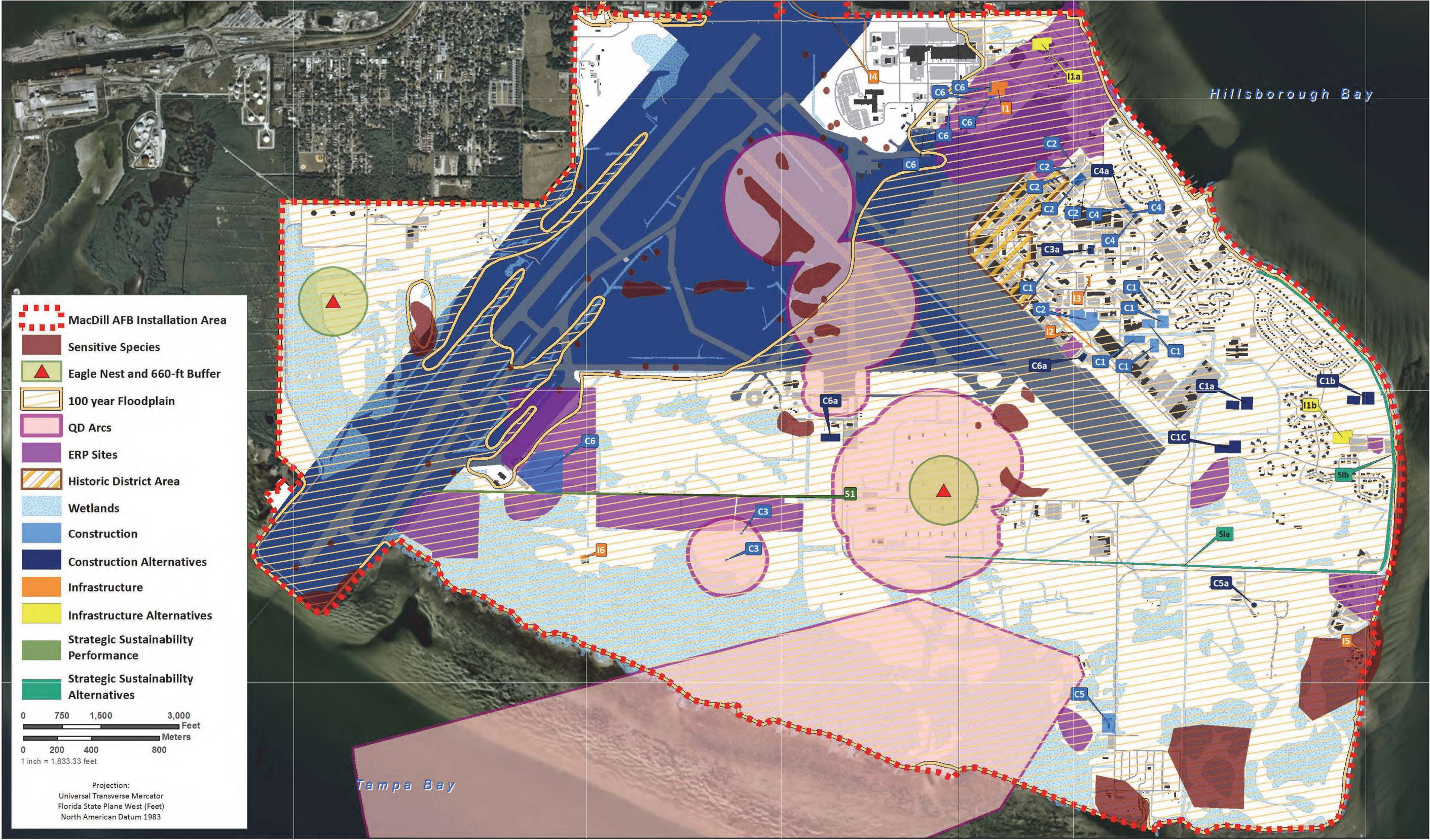
Alternative for Project C1 (Project C1a). Revised Location for Proposed Fitness Center and JCAT Center. An alternative to Add to and Alter Physical Fitness Center and JCAT Center associated with Project C1 (Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Construct JCAT Center) would be to construct a fitness center and aquatic center east of Buildings 861 and 862 and south of the Tinker Elementary School (Building 1203). The Fitness Center would include the additions proposed in Project C1, including multi-purpose gymnasiums and a 25-meter pool with a diving board and bleachers for spectators. Renovations to the layout of the current Fitness Center would not occur. Potential environmental constraints at this alternative location (shown in **Figure 2-22**) would be its location within the 100-year floodplain.

This revised location alternative was chosen for analysis because Project C1 is within community service and outdoor recreation land use, whereas Project C1a would be in open space land use. Additionally, Project C1 would result in modifications to an upland-cut drainage ditch (i.e., jurisdictional waters of the United States) and Project C1a would not. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project C1 (Project C1b). Revised Location for Proposed Fitness Center and JCAT Center. Another alternative is Project C1b (Add to and Alter Physical Fitness Center and JCAT Center) associated with Project C1 and would be to construct the Fitness Center and JCAT Center at the former site of the hospital, to the northeast of Facility 713, Water Tank Storage, and east of Building 82 (USAF Plant Administration Office). The Fitness Center would include the additions proposed in Project C1, including multi-purpose gymnasiums and a 25-meter pool with a diving board and bleachers for spectators. Renovations to the layout of the current physical fitness center would not occur. This location is adjacent to MFH. Potential environmental constraints for this alternative location would be its location within the 100-year floodplain.

This revised location alternative was chosen for analysis because Project C1 is within the community (service) and outdoor recreation land uses, whereas Project C1b would be in open space land use. Additionally, Project C1 would involve modifications to an upland-cut drainage ditch (i.e., jurisdictional waters of the United States) and Project C1b would not. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project C1 (Project C1c). Revised Location for Proposed Fitness Center and JCAT Center. A third alternative is Project C1c (Add to and Alter Physical Fitness Center and JCAT Center) would be to construct the Fitness Center and JCAT Center to the east of Joint Communications Support Element (JCSE) and west and southwest of MFH (see **Figure 2-22**). The Fitness Center would include the additions proposed in Project C1, including multi-purpose gymnasiums and a 25-meter pool with a diving board and bleachers for spectators. Renovations to the layout of the current physical fitness center would not occur. The 100-year floodplain is a potential environmental constraint for this alternative location.



Source of Data: Imagery courtesy of ArcGIS Online and its data suppliers; Data layers: MacDillAFB 2010.

Figure 2-22. Location of Selected Projects and Alternatives Analyzed in this IDEA

This revised location alternative was chosen for analysis because Project C1 is within community (service) and outdoor recreation land uses, whereas Project C1c would be in open space land use. Additionally, Project C1 is not within or adjacent to any ERP sites; ERP Site LF002 is south of the proposed location for Project C1c. Project C1 would result in modification of an upland-cut drainage ditch (i.e., jurisdictional waters of the United States) and Project C1c would not. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project C3 (Project C3a). Use of Pre-Constructed Barricades and Personnel Bunker. An alternative to constructing permanent barricades and a personnel bunker within the EOD range would be to install pre-constructed facilities that would comply with AFMAN 91-201 requirements. These facilities would be installed at the same location proposed for the permanent facilities. This alternative is considered reasonable and will be carried forward for further detailed analysis in this IDEA.

Alternative for Project C4 (Project C4a). Revised Location for JSOU. An alternative to constructing the JSOU facility at the locations of Buildings 506A and 506E would be to construct the facility at a site to the northeast of Building 506A (see **Figure 2-22**). This alternative site is currently used as a parking lot and is classified as an administrative land use. This location is consistent with the plans to consolidate SOCOM assets as described in the 2011 IDP.

This revised location alternative was chosen for analysis because the two temporary facilities would not need to be removed as they would under Project C4. This alternative is considered reasonable and will be carried forward for further detailed analysis in this IDEA.

Alternative for Project C5 (Project C5a). Revised Location of the Proposed Outdoor Recreation Maintenance Facility. An alternative location for Project C5 (Construct Outdoor Recreation Maintenance Facility) would be north of Building 700 (former EOD Facility) and southeast of Building 1044 (Aeromedical Training Warehouse) (see **Figure 2-22**).

This revised location alternative was chosen for analysis because Project C5 is within outdoor recreation land use, whereas Project C5a is within administrative land use. Project C5a is also within 165 feet from and ERP site. Although this site location is not preferred logistically due to its distance from the marina, this location is reasonable and will be carried forward for further detailed analysis in this IDEA.

Alternative for Project C6 (Project C6a). Revised Location for Alert Facility, FMSE Facility. An alternative location for the Alert Facility would be to renovate Building 52. Building 52 would require interior renovations including a new heating, ventilation, and air conditioning (HVAC) system and a 1,000-kilowatt emergency generator. A new standing seam metal roof would be added. Building 52 currently houses the Traffic Management Office and Mission Support Group Commander functions; these functions would need to be relocated. An alternative location for constructing a new Fuels Management Facility and FMSE Facility would be to the north of Building 106 (EOD Facility) and south of Building 71 (Squadron Operations) (see **Figure 2-22**). These facilities are required to be near the flightline; therefore, only the proposed location and alternative near the current facilities would be feasible.

This alternative location was chosen for analysis because Project C6 is adjacent to a wetland area and within an ERP site; Project C6a is not within or adjacent to wetland areas or ERP sites. This alternative is considered reasonable and practicable and will be carried forward for further detailed analysis in this IDEA.

2.2.3.2 Alternatives Considered for Construction Projects but Eliminated from Further Analysis

Alternative for All Construction Projects – Site Facilities on DOD-Owned Land Surrounding MacDill AFB. There are no suitable DOD-owned lands surrounding MacDill AFB to use for siting facilities. There are limited tracts of land available to the east and south of MacDill AFB due to the presence of Tampa and Hillsborough bays. In addition, there is no land available for purchase to the west and north of the installation due to private development/encroachment and the presence of mangrove wetlands that cannot be developed. Therefore, this alternative is not considered reasonable and is eliminated from further detailed analysis in this IDEA.

Alternative for All Construction Projects – Lease Additional Facilities in the Surrounding Community. Under this alternative, MacDill AFB would lease office and warehouse space in the surrounding private-sector community to house personnel and provide space for mission operations. This alternative would result in an insufficient span of control for the command-and-control function. The leased facilities would have great limitations in their ability to meet the DOD force-protection requirements. These limitations include: high costs to provide required separation distances, increased mission response times, prohibitive costs to meet necessary construction requirements, and inability to meet force-protection requirements. This alternative is not considered reasonable and is eliminated from further detailed analysis in this IDEA.

Alternative for Project C2 (Project C2a). Revised Location for Proposed Logistics Readiness Complex. The Logistics Readiness Complex has been proposed to replace the outdated and inadequate vehicle maintenance shop and collocate the new building with other logistics readiness functions. An alternative location for this has been proposed on the site currently occupied by LRS vehicle maintenance and operations, which is on the northeastern portion of the installation between North Boundary Boulevard and Bayshore Boulevard at the current location of Buildings 119, 175, 178, 500, 510, 3175, and 3500. Demolition of Building 178 would be necessary. This alternative would require a phased approach to the construction and demolition (C&D) component. The demolition of Buildings 119, 175, 178, and 3175 would have to occur first and then the new vehicle maintenance and operations facilities would be constructed in this area.

Once the new vehicle maintenance area has been constructed, Buildings 500, 510, and 3500 would be demolished and the new warehouse would be constructed. This location is situated within the 100-year floodplain, and is adjacent to an historic district and an ERP site (see **Figure 2-22**). This alternative would meet the current space requirements but would not permit consolidation of LRS functions, since warehouse space would be split between the new warehouse and Building 49. Furthermore, the Building 500, 510, and 3500 sites are currently being evaluated for use by SOCOM. Therefore, this alternative does not meet the selection criteria described in **Section 2.2** with respect to collocation of like services (i.e., Base Support Goals in the IDP) and environmental constraints (i.e., location within an ERP site with LUCs and adjacency to the MacDill Field Historic District and Building 501).

Alternative for Project C5 (Project C5b). Revised Location for Outdoor Recreation Maintenance Facility. The existing outdoor recreation facilities do not meet current life safety codes and Americans with Disabilities Act criteria and are also susceptible to flooding because they are below the 100-year floodplain. Renovation of these facilities to comply with current safety codes and laws could be plausible, but raising the finished floor elevation to a height of 11.5 feet above ground level would be costly and is considered infeasible. Because this alternative does not meet the selection criteria described in **Section 2.2** with respect to consistency with Federal, DOD, and USAF policies, guidances, and directives for safety (including the Americans with Disabilities Act; Uniform Federal Accessibility Standards; DODI 4715.03, *Natural Resources Conservation Program*; and AFH 32-1084, *Facility Requirements*) and because of the economic infeasibility to renovate or repair (in accordance with AFI

32-1032, *Planning and Programming Appropriated Funded Maintenance, Repair, and Construction Projects*), this alternative has been eliminated from further detailed analysis in the IDEA.

2.2.4 Alternatives for Infrastructure Improvement Projects

Infrastructure improvement projects include the removal, installation of, or upgrades to paved roadways, sidewalks, parking areas, and utilities. Alternatives are limited to existing and proposed locations of real property facilities (i.e., buildings, structures) and non-real property assets (i.e., aircraft, equipment, vehicles) that the infrastructure serves. MacDill AFB is a densely developed installation supporting a variety of host and tenant activities. Consequently, the need for adjacency in operational activity and the overall lack of and competition for available space results in most infrastructure alternatives being limited to areas that such infrastructure would serve. Additionally, as noted in **Sections 2.1.2** and **Figures 2-1** through **2-5**, much of the installation is constrained by the existing land use; therefore, the number of reasonable alternatives to the infrastructure improvement projects analyzed in the IDEA is limited.

No alternatives exist for Project I2 (Straighten Marina Bay Drive), Project I3 (Construct Dining Facility Parking Lot), Project I4 (Construct Medical Clinic Sidewalks), Project I5 (Replace Sludge Digester Tanks), or Project I6 (Construct DISA Parking Lot, Building 805). Project I2 does not have any alternatives because no other alternative would meet the purpose of and need for the project. Projects I3 and I6 have no alternatives because the parking lots need to be constructed adjacent to their associated facilities, which is consistent with the selection criteria to collocate like services. In addition, Projects I3 and I6 are constrained by available sites and adequacy of space. No alternative for Project I4 exists that would meet the specifications from the National Fire Protection Association's *Life Safety Code Handbook* to provide safe egress from the medical clinic; other route options for the sidewalk would be environmentally constrained. For Project I5, no other alternative would meet the purpose of and need for the project, or adhere to the selection criteria regarding collocation of like services and functional compatibility with adjacent facilities.

2.2.4.1 Alternatives Considered for Further Detailed Analysis for Infrastructure Improvement Projects

Alternative for Project I1 (Project I1a). Revised Location for the Proposed CENTCOM Parking Garage. Alternative I1a would consist of construction of the CENTCOM Parking Garage at the location of the Building 540 demolition. This alternative location is within an ERP site and the 100-year floodplain (see **Figure 2-22**).

This revised location alternative was chosen for analysis because Project I1 is within aircraft operations and maintenance land use, whereas Project I1a is within administrative land use. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project I1 (Project I1b). Revised Location and Design for the Proposed CENTCOM Parking Garage with Shuttle Buses. Currently, parking available for CENTCOM personnel is inadequate and overflows into the parking area for the Base Exchange. A space surface lot is proposed for construction at the site of Building 540, which is proposed for demolition. Because the 330-space surface parking area at Building 540 would not accommodate the estimated 1,940 vehicles requiring parking associated with the CENTCOM campus, a 1,600-space remote parking area with shuttle buses would be used to transfer employees and visitors from the former site of the hospital, to the CENTCOM Campus (see **Figure 2-22**). This location is adjacent to MFH and is within the 100-year floodplain.

This alternative would require CENTCOM to establish 24-hour bus service with bus bays in the CENTCOM campus. Four bus bays would be constructed within the remote parking lot. This alternative

would use diesel- or gas-powered buses. Storm water retention ponds would be constructed to manage storm water from the parking lots. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

This revised location alternative was chosen for analysis because Project I1 is within aircraft operations and maintenance land use, whereas Project I1b is within medical land use. In addition, Project I1b is not within any ERP sites. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

2.2.4.2 Alternatives Considered for Infrastructure Improvement Projects but Eliminated from Further Analysis

Alternative for Project I1 (Project I1c). Revised Location and Design for the CENTCOM Parking Garage. This alternative is similar to Alternative I1b, but would require construction of a larger parking area than proposed to accommodate the additional parking necessary for CENTCOM personnel in lieu of a parking garage. This alternative would require a larger footprint when compared to the CENTCOM Parking Garage project, as a larger surface area would be required to house the same number of spots for a parking lot than a parking garage. This alternative would not require the site preparation proposed for Project I1. However, there is not enough open land available at this site to construct a parking lot, so this alternative is considered to be unreasonable. Therefore, this alternative does not meet the selection criteria discussed in **Section 2.2** regarding availability of sites and adequacy of space, and, therefore, will not be carried forward for further detailed analysis in the IDEA.

2.2.5 Alternatives for Natural Infrastructure Management Projects

Alternatives for natural infrastructure management projects have been considered and are either carried forward for detailed analysis in the IDEA or have been eliminated as they have been deemed infeasible.

2.2.5.1 Alternatives Considered for Further Detailed Analysis for Natural Infrastructure Management Projects

Alternative for Project NI1 (Project NI1a). Line Storm Water Drainage Ditches with Geotextile or Geoweb. As an alternative to Project NI1 (Storm Water Drainage Improvements), drainage ditches could be lined with geotextile or geoweb material where appropriate to limit the growth of vegetation, thereby reducing the overall maintenance of storm water drainages. Although this alternative would reduce vegetation, sediment could still be deposited in the drainage ditches. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project NI1 (Project NI1b). Treat Storm Water Drainage Ditches with Chemical Herbicide. Project NI1b could be an alternative to Project NI1. Instead of mechanically or manually removing vegetation, a chemical herbicide could be applied. However, application of chemical herbicides along drainage ditches could be harmful to aquatic species, and only herbicides approved for aquatic environments should be used. As stated with Project NI1a, herbicide treatment could decrease maintenance in drainage ditches associated with vegetation, but sediment could still be deposited and would still need to be managed. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project NI1 (Project NI1c). Integrated Control of Vegetation in Storm Water Drainage Ditches. This alternative presents an integrated method to control vegetation growth in storm water drainage ditches by using mechanical means of removing vegetation, installation of geotextile or geoweb materials, and chemical herbicide treatment where appropriate. By combining all three proposed

methods, vegetation and sediment would be managed so that storm water could drain efficiently after storm events. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

2.2.5.2 Alternatives Considered for Natural Infrastructure Management Projects but Eliminated from Further Analysis

Alternative for Project NI1 (Project NI1d). Pipe Storm Water Drainage Ditches. An alternative to the proposed Storm Water Drainage Improvements would be to pipe drainage ditches. By piping ditches, regular maintenance, including removal of vegetation and sediment, would not need to be conducted. However, this alternative would not be practical as the area requiring piping would be quite large and would require substantial funding. In addition, habitat and aquatic ecosystems would be lost and ecological value would decrease. Therefore, this alternative does not meet the selection criteria discussed in **Section 2.2** regarding economic feasibility (AFI 32-1032); consistency with DOD and USAF policies, guidance, and directives (including DODI 4715.03); and environmental constraints, and, therefore, will not be carried forward for further detailed analysis in the IDEA.

2.2.6 Alternatives for the Strategic Sustainability Performance Project

Two alternatives to Project S1 have been determined to be reasonable alternatives and are carried forward for detailed analysis in the IDEA. Implementation of these projects would be in compliance with EO 13514, *Federal Leadership In Environmental, Energy, And Economic Performance*, and EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, by incorporating sustainable design through implementing green technologies.

Alternative for Project S1 (Project S1a). Install Jogging Path Lighting along Golf Course Avenue. As an alternative to install jogging path lighting along 1.5 miles of Southshore Road, the lighting could be installed along Golf Course Avenue for a distance of 1.5 miles in between Bayshore Boulevard and North Golf Course Street (see **Figure 2-22**). Potential environmental constraints for this alternative location include floodplains, QD arcs, and ERP sites.

This revised location alternative was chosen for analysis because Project S1 traverses open space and industrial land uses, whereas Project S1a traverses outdoor recreation, administrative, housing (accompanied), aircraft operations and maintenance, and open space land uses. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

Alternative for Project S1 (Project S1b). Install Jogging Path Lighting along Bayshore Boulevard. As an alternative to install jogging path lighting along 1.5 miles of Southshore Road, the lighting could be installed along Bayshore Boulevard for a distance of 1.5 miles from Tampa Point Boulevard to Golf Course Avenue (see **Figure 2-22**). Potential environmental constraints include floodplains and cultural resources.

This revised location alternative was chosen for analysis because Project S1 traverses open space and industrial land uses, whereas Project S1b traverses outdoor recreation, housing (accompanied), and medical land uses. Project S1b does not have any ERP sites or QD arcs adjacent to it. This alternative is considered reasonable and will be carried forward for further detailed analysis in the IDEA.

2.2.7 No Action Alternative

CEQ regulations require consideration of the No Action Alternative for all proposed actions. The No Action Alternative serves as a baseline against which the impacts of the Proposed Action and other potential action alternatives can be compared and consequently it is carried forward for further evaluation

in this IDEA. The No Action Alternative would mean “no change” from current practices or continuing with the present course of action until that action is changed.

Through implementation of the No Action Alternative, future installation development projects would continue to be evaluated on an individual project basis. It is anticipated that future development would occur under the No Action Alternative, but those development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate. This alternative is carried forward for analysis as a baseline against which the impacts of the Proposed Action and potential action alternatives can be evaluated.

2.2.8 No Action Alternative for Selected Demolition Projects

Under the No Action Alternative, the selected demolition projects would not be implemented. In some situations relevant to the projects addressed in the IDEA, mission functions would continue to occur, and personnel would continue to work in obsolete, deteriorating, and underused facilities or would be consolidated into other less appropriate facilities within the installation, if space is available. In addition, limited funding would have to be used to continue maintenance and upkeep of these facilities diverting necessary funding away from other mission-essential functions. The No Action Alternative for demolition projects is considered unreasonable because it would prevent MacDill AFB from meeting its prescribed goals and reducing the physical plant footprint on the installation pursuant to the “20/20 by 2020” initiative or allowing the installation to make space available for future development.

2.2.9 No Action Alternative for Selected Construction Projects

Under the No Action Alternative, the selected construction projects under the Proposed Action would not be built. In some situations relevant to the projects addressed in this IDEA, MacDill AFB would not have new state-of-the-art facilities to accommodate current and future missions and address facility workspace requirements. For instance, projects to upgrade and enhance AT/FP and communications capabilities would not be constructed, causing the installation to decrease mission efficiency and experience difficulty meeting national security requirements. Projects planned to enhance morale and wellness for active and retired military members and their dependents would not be constructed, causing fitness and other recreational programs to be held in facilities that are inadequate in size and considered to be in substandard conditions; ultimately causing MacDill AFB to experience difficulty meeting USAF physical fitness and welfare requirements.

2.2.10 No Action Alternative for Selected Infrastructure Improvement Projects

Under the No Action Alternative, the selected infrastructure improvement projects would not be implemented. In some situations relevant to the projects addressed in this IDEA, MacDill AFB would continue to use obsolete and deteriorating utilities, vehicle and storage parking space would continue to be inadequate to support mission functions and meet national security objectives, and the installation’s roadways and airfield pavements and parking space would continue to deteriorate and could cause unsafe conditions. MacDill AFB would still be required to repair breaks and interruptions in utilities and would continue to repair cracks and deteriorating pavement areas by patching until their useful life has ended. In addition, not upgrading and replacing outdated and unsafe infrastructure would hinder MacDill AFB’s mission and security objectives and could increase potential foreign object damage (FOD) hazards to aircraft.

2.2.11 No Action Alternative for Selected Natural Infrastructure Improvement Projects

Under the No Action Alternative, the selected natural infrastructure improvement projects would not be implemented. In some situations relevant to the projects addressed in this IDEA, MacDill AFB would not

be able to enhance airspace management and safety, the potential for erosion and degradation of water quality would increase, habitat for sensitive species would not be enhanced, and historic resources could be at risk. MacDill AFB would not be in full compliance with INRMP and ICRMP management objectives to protect its natural and historic resources. In addition, MacDill AFB would not be in full compliance with Federal, state, and local regulations requiring protection of water quality, sensitive species and their associated habitat, and protection of historic resources.

2.2.12 No Action Alternative for Strategic Sustainability Performance Projects

Under the No Action Alternative, the selected strategic sustainability performance project would not be implemented. Lighting would not be provided along the jogging path at this location and safety would continue to be a concern.

2.3 Decision to be Made and Identification of the Preferred Alternative

In this IDEA, MacDill AFB provides an evaluation of the selected projects to determine whether the Proposed Action would result in any significant impacts. If such impacts are predicted, MacDill AFB would provide mitigation to reduce impacts to below the level of significance, undertake the preparation of an EIS addressing the Proposed Action, or abandon the Proposed Action. The IDEA is also intended to be used to guide MacDill AFB in implementing the Proposed Action, should it be approved, in a manner consistent with USAF standards for environmental stewardship. The Preferred Alternative for the Proposed Action is set forth in **Section 2.1**.

3. Affected Environment

Section 3 describes the environmental resources and conditions most likely to be affected by the Proposed Action and provides information to serve as a baseline from which to identify and evaluate potential environmental and socioeconomic impacts that could result from the Proposed Action. Baseline conditions represent current conditions. The potential environmental impacts of the Proposed Action and the No Action Alternative on the baseline conditions are described in **Section 4**.

3.1 Noise

3.1.1 Definition of the Resource

Sound is defined as a particular auditory effect produced by a given source, for example the sound of rain on a rooftop. Noise and sound share the same physical aspects, but noise is considered a disturbance while sound is defined as an auditory effect. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Noise can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. It can be readily identifiable or generally nondescript. Human response to increased sound levels varies according to the source type, characteristics of the sound source, distance between source and receptor, receptor sensitivity, and time of day. How an individual responds to the sound source will determine if the sound is viewed as music to one's ears or as annoying noise. Affected receptors are specific (e.g., schools, churches, or hospitals) or broad areas (e.g., nature preserves or designated districts) in which occasional or persistent sensitivity to noise above ambient levels exists.

Noise Metrics and Regulations. Although human response to noise varies, measurements can be calculated with instruments that record instantaneous sound levels in decibels. The metric used to characterize sound levels that can be sensed by the human ear is dBA. "A-weighted" denotes the adjustment of the frequency range to what the average human ear can sense when experiencing an audible event. The threshold of audibility is generally within the range of 10 to 25 dBA for normal hearing. The threshold of pain occurs at the upper boundary of audibility, which is normally in the region of 135 dBA (USEPA 1981b). **Table 3-1** compares common sounds and shows how they rank in terms of the effects of hearing. As shown, a whisper is normally 30 dBA and considered to be very quiet while an air conditioning unit 20 feet away is considered an intrusive noise at 60 dBA. Noise levels can become annoying at 80 dBA and very annoying at 90 dBA. To the human ear, an increase by 10 dBA seems twice as loud (USEPA 1981a).

Federal Regulations. Under the Noise Control Act of 1972, the Occupational Safety and Health Administration (OSHA) established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

Sound levels, resulting from multiple single events, are used to characterize noise effects from aircraft or vehicle activity and are measured in DNL. The DNL noise metric incorporates a "penalty" for nighttime noise events to account for increased annoyance. DNL is the energy-averaged sound level measured over a 24-hour period, with a 10-dBA penalty assigned to noise events occurring between 10:00 p.m. and 7:00 a.m. DNL values are obtained by averaging sound exposure levels over a given 24-hour period. DNL is the designated noise metric of the FAA, HUD, U.S. Environmental Protection Agency (USEPA), and DOD for modeling airport environments.

Table 3-1. Sound Levels and Human Response

Noise Level (dBA)	Common Sounds	Effect
10	Just audible	Negligible*
30	Soft whisper (15 feet)	Very quiet
50	Light auto traffic (100 feet)	Quiet
60	Air conditioning unit (20 feet)	Intrusive
70	Noisy restaurant or freeway traffic	Telephone use difficult
80	Alarm clock (2 feet)	Annoying
90	Heavy truck (50 feet) or city traffic	Very annoying Hearing damage (8 hours)
100	Garbage truck	Very annoying*
110	Pile driver	Strained vocal effort*
120	Jet takeoff (200 feet) or auto horn (3 feet)	Maximum vocal effort
140	Carrier deck jet operation	Painfully loud

Source: USEPA 1981a and *HDR extrapolation

According to the USAF, the FAA, and the HUD criteria, residential units and other noise-sensitive land uses are “clearly unacceptable” in areas where the noise exposure exceeds 75 dBA DNL, “normally unacceptable” in regions exposed to noise between 65 and 75 dBA DNL, and “normally acceptable” in areas exposed to noise of 65 dBA DNL or under. The Federal Interagency Committee on Noise developed land use compatibility guidelines for noise in terms of a DNL sound level (FICON 1992). For outdoor activities, the USEPA recommends 55 dBA DNL as the sound level below which there is no reason to suspect that the general population would be at risk from any of the effects of noise (USEPA 1974).

State Regulations. Noise regulations for the State of Florida are provided in Titles 23 and 24 of the Florida statutes; however, these regulations pertain to noise associated with motor vehicles and vessels respectively. There are no state statutes for noise associated with construction activities.

Local Regulations. MacDill AFB is located in the City of Tampa. Section 14-51 of the City of Tampa Code limits noise levels to 60 dBA between the hours of 7:00 a.m. and 10:00 p.m. and 55 dBA between the hours of 10:00 p.m. and 7:00 a.m. Any noise that causes these levels to be exceeded is prohibited. Section 5-301.2 of the Code contains the regulations for construction noise. The generation of any noise by construction activity on private property (other than between the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday; 8:00 a.m. and 6:00 p.m. on Saturday; or 10:00 a.m. and 6:00 p.m. on Sunday) is prohibited if such construction activity is within 1,500 feet of any occupied residence. Additionally, pile drivers and jackhammers are not to be used on Saturdays and Sundays except for between the hours of 10:00 a.m. and 6:00 p.m.

Ambient Sound Levels. Noise levels in residential areas vary depending on the housing density and location; a normal suburban residential area is about 55 dBA, which increases to 60 dBA for an urban residential area, and 80 dBA in the downtown section of a city.

Construction Sound Levels. Building C&D work can cause an increase in sound that is well above the ambient level. A variety of sounds are emitted from loaders, trucks, pavers, and other work equipment.

Table 3-2 lists noise levels associated with common types of C&D equipment. C&D equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

Table 3-2. Predicted Noise Levels for Construction and Demolition Equipment

Equipment	Predicted Noise Level at 50 feet (dBA)
Backhoe	72–93
Concrete mixer	74–88
Crane	75–87
Front loader	72–83
Grader	80–93
Jackhammer	81–98
Paver	86–88
Pile driver	95–105
Roller	73–75
Truck	83–94

Source: USEPA 1971

3.1.2 Existing Conditions

MacDill AFB is at the southern end of Interbay Peninsula, approximately 8 miles south of downtown Tampa. Given the close proximity to downtown Tampa and the installation's location in Tampa Bay, there are numerous noise-generating activities, facilities, and resources in the area. The ambient noise environment around MacDill AFB is dominated by military aircraft operations and automobile traffic. Military operations that impact the noise environment can also include aircraft maintenance activities on the ground and weapons training.

MacDill AFB is home to the 91st Air Refueling Squadron, which operates the KC-135R Stratotanker and the 310th Airlift Squadron, which operates the C-37A. As shown in **Figures 2-1** through **2-4**, the 65 to 80+ dBA DNL noise contours from the 2008 Air Installation Compatible Use Zone (AICUZ) Study extend from the runway centerlines and parallel the runways (MAFB 2008a). The noise contours extend outside the installation boundary, most notably north of the runway where a residential development exists. Most of the selected projects are not within the noise contours and, therefore, are within a noise environment that is below 65 dBA DNL from aircraft operations. Projects C6 (Alert Facility, FMSE Facility), I4 (Construct Medical Clinic Sidewalks), NI1 (Storm Water Drainage Improvements), and S1 (Install Jogging Path Lighting) are partially or totally within the noise contours.

Vehicle use associated with military operations at MacDill AFB primarily consists of passenger and military vehicles and delivery trucks. Passenger vehicles compose most of the vehicles present at MacDill AFB and the surrounding community roadways.

Considering the military aircraft operations and vehicle traffic at and adjacent to MacDill AFB, the ambient sound environment present at the developed eastern portion of MacDill AFB, where sensitive receptors are located, most resembles an urban residential area.

3.2 Land Use

3.2.1 Definition of the Resource

The term “land use” refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws. However, there is no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, “labels,” and definitions vary among jurisdictions. Natural conditions of property can be described or categorized as unimproved, undeveloped, conservation or preservation area, and natural or scenic area. There is a wide variety of land use categories resulting from human activity. Descriptive terms often used include residential, commercial, industrial, agricultural, institutional, and recreational. USAF installation land use planning commonly uses 12 general land use classifications: airfield pavements, aircraft operations and maintenance, industrial, administrative, community (commercial), community (service), medical, housing (accompanied), housing (unaccompanied), outdoor recreation, open space, and water (USAF 1998).

Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. According to Air Force Pamphlet 32-1010, *Land Use Planning*, land use planning is the arrangement of compatible activities in the most functionally effective and efficient manner (USAF 1998). The highest and best uses of real property are obtained when compatibility among land uses fosters societal interest. Tools supporting land use planning within the civilian sector include written master plans/management plans, policies, and zoning regulations. The USAF comprehensive planning process also uses functional analysis, which determines the degree of connectivity among installation land uses and between installation and off-installation land uses, to determine future installation development and facilities planning.

In appropriate cases, the location and extent of a proposed action needs to be evaluated for its potential effects on a project site and adjacent land uses. The foremost factor affecting a proposed action in terms of land use is its compliance with any applicable land use or zoning regulations. Other relevant factors include matters such as existing land use at the project site, the types of land uses on adjacent properties and their proximity to a proposed action, the duration of a proposed activity, and its “permanence.”

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. 1451 et seq.) declares a national policy to preserve, protect, develop and, where possible, restore or enhance the resources of the nation’s coastal zone. The Florida Coastal Management Program (FCMP) is a federally approved program that ensures the wise and compatible use of Florida’s coastal resources. Federal proposals are reviewed by the FDEP for consistency with the FCMP under the CZMA.

3.2.2 Existing Conditions

MacDill AFB encompasses approximately 5,866 acres of land and easements. Water surrounds the installation on three sides: Hillsborough Bay to the east, Old Tampa Bay to the west, and Tampa Bay to the south. In accordance with the CZMA, MacDill AFB maintains consistency with the FCMP. The City of Tampa has planning and zoning jurisdiction over land directly adjacent to MacDill AFB’s northern boundary; however, it does not have zoning jurisdiction over government lands. Land use in the area north of the installation is mixed, although a large portion is residential. Areas directly north of the installation are primarily composed of industrial land use, which is intended to prohibit noise-sensitive uses, such as residential, within the airfield flight path (MAFB 2007b). A joint land use study was completed in 2006 by the City of Tampa and MacDill AFB. The joint land use study aims to review and recommend compatible land uses adjacent to MacDill AFB to protect the health, safety, and welfare of the surrounding community (Tampa 2006).

The 2011 MacDill AFB IDP illustrated the “district overlays” which were created to serve as a guide for future development by identifying desired functional relationships and analyzing these relationships among the units and activities assigned to the installation. Land is allocated within each district for future activities necessary to support ongoing and anticipated operations and missions (MAFB 2011b). These districts help facilitate land use/functional relationship patterns, building types, and infrastructure systems. These district overlays are as follows:

- **Airfield:** Focuses on airfield-related activities, emphasizing associated uses that support aircraft maintenance, operations, and administrative activities.
- **“A” Industrial:** Provides industrial support to the airfield activities.
- **“B” Industrial:** Incorporates land area for storage, warehouse, and logistical mission support.
- **Core:** Creates synergy through the application of land uses to enhance the present environment.
- **North Area:** Provides community (commercial) amenities and other community service-oriented administrative activities.
- **Outdoor Activity:** Includes facilities that support outdoor recreational activities.

Facilities and operations at MacDill AFB are grouped by functional areas and land use categories within the district overlays. Air Force Pamphlet 32-1010, *Land Use Planning*, states that land use planning must effectively integrate the physical elements of an installation, the built and natural environments, and the human activities that take place within and around the physical elements of the installation (AFP 1998). Land use at MacDill AFB includes administrative, airfield pavements, community (commercial), community (service), housing (accompanied), housing (unaccompanied), industrial, medical, open space, and outdoor recreation. **Figure 2-5** shows existing land use on MacDill AFB. Compatible land uses have been built within district overlays and in close proximity to achieve functional areas (i.e., aircraft facilities are adjacent to the airfield). Most of the military housing and administrative buildings, commercial buildings, and community services are on the northeastern side of the installation and a large recreational area is present on the southern tip of the peninsula (MAFB 2007b).

The AICUZ program has been developed by DOD for military airfields. This program promotes compatible land use development around air bases. Operational constraints such as CZs and APZs are included in the AICUZ program. APZs and CZs are created to discourage development in areas where the greatest chance of aircraft accidents exists.

With respect to the selected projects, **Table 3-3** identifies the land use categories associated with each selected project. Some selected projects occur in multiple land use categories.

Project C3 (Construct EOD Bunker Barricades) and a portion of Project NI1 (Storm Water Drainage Improvements) are within explosive QD arcs. QD arcs are restricted-use areas associated with munitions storage areas, hot cargo pads, and other explosive hazard areas (MAFB 2011b). See **Section 3.11.2** for more information on safety at MacDill AFB.

Projects D1 (Demolish Buildings 65, 82, 83, and 85), D2 (Demolish Building 1107), C3 (Construct EOD Bunker Barricades), C5 (Construct Outdoor Recreation Maintenance Facility), C6 (Alert Facility, FMSE Facility), I1 (Construct CENTCOM Parking Garage), I2 (Straighten Marina Bay Drive), I4 (Construct Medical Clinic Sidewalks), NI1 (Storm Water Drainage Improvements), and S1 (Install Jogging Path Lighting) are within or adjacent to known ERP sites.

Table 3-3. Land Use Categories Associated with the Selected Projects

Land Use Category	Selected Project
Airfield Operations and Maintenance	• Project D2 (Demolish Building 1107) • Project C2 (Construct a Logistics Readiness Complex) • Project C6 (Alert Facility, FMSE Facility) • Project I1 (Construct CENTCOM Parking Garage) • Project I2 (Straighten Marina Bay Drive) • Project NI1 (Storm Water Drainage Improvements) • Project S1 (Install Jogging Path Lighting)
Airfield Pavements	• Project NI1 (Storm Water Drainage Improvements)
Industrial	• Project I5 (Replace Sludge Digester Tanks) • Project NI1 (Storm Water Drainage Improvements) • Project S1 (Install Jogging Path Lighting)
Administrative	• Project D1 (Demolish Buildings 65, 82, 83, and 85) • Project D3 (Demolish Building 40) • Project C2 (Construct a Logistics Readiness Complex) • Project C4 (Construct JSOU) • Project I2 (Straighten Marina Bay Drive) • Project I3 (Construct Dining Facility Parking Lot) • Project I6 (Construct DISA Parking Lot, Building 805) • Project NI1 (Storm Water Drainage Improvements)
Open Space	• Project C3 (Construct EOD Bunker Barricades) • Project C6 (Alert Facility, FMSE Facility) • Project I4 (Construct Medical Clinic Sidewalks) • Project NI1 (Storm Water Drainage Improvements) • Project S1 (Install Jogging Path Lighting)
Community (Service)	• Project C1 (Construct indoor JCAT Center, includes demolition of facilities 46 and 47) • Project C2 (Construct a Logistics Readiness Complex)
Outdoor Recreation	• Project C1 (Construct indoor JCAT Center, includes demolition of facilities 46 and 47) • Project C5 (Construct Outdoor Recreation Maintenance Facility) • Project NI1 (Storm Water Drainage Improvements)
Medical	• Project I4 (Construct Medical Clinic Sidewalks)

Table 3-4 shows the projects that are within or adjacent to ERP sites that are undergoing Land Use Control Implementation Plans (LUCIP). LUCs for these areas are site-specific and include the prohibited use of ground/surface water and soil from these areas, based on the contaminants of concern for the particular site. For more information on these ERP sites see **Section 3.10.2**. MacDill AFB currently uses LUCIPs, which dictate how the land can be used and are important to long-range land use planning.

Table 3-4. Projects Within or Adjacent to ERP Sites with LUCs

Project	ERP Site
D1	SWMU 25
D2	SWMU 18
C1c	SWMU 2
C2, I1	SWMU 61
C3	SWMU 6 and SWMU 7
C6	SWMU 18 and SWMU 10
I2	Site 57 and TU/US-C500
NI1	SWMU 25 and SMWU 61
S1	SWMU 5, SWMU 6, SWMU 7, SWMU 8, SWMU 11, SWMU 18, and SWMU 10

3.3 Air Quality

3.3.1 Definition of the Resource

In accordance with Federal Clean Air Act (CAA) requirements, the air quality in a given region or area is measured by the concentration of criteria pollutants in the atmosphere. The air quality in a region is a result of not only the types and quantities of atmospheric pollutants and pollutant sources in an area, but also surface topography, the size of the topological “air basin,” and the prevailing meteorological conditions.

Ambient Air Quality Standards. Under the CAA, the USEPA developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for pollutants that have been determined to affect human health and the environment. The NAAQS represent the maximum allowable concentrations for ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), respirable particulate matter (including particulate matter equal to or less than 10 microns in diameter [PM₁₀] and particulate matter equal to or less than 2.5 microns in diameter [PM_{2.5}]), and lead (Pb) (40 CFR Part 50). The CAA also gives the authority to states to establish air quality rules and regulations. The State of Florida has adopted the NAAQS, which are presented in **Table 3-5**.

Attainment Versus Nonattainment and General Conformity. The USEPA classifies the air quality in an air quality control region (AQCR), or in subareas of an AQCR, according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. Areas within each AQCR are therefore designated as either “attainment,” “nonattainment,” “maintenance,” or “unclassified” for each of the six criteria pollutants. Attainment means that the air quality within an AQCR is better than the NAAQS; nonattainment indicates that criteria pollutant levels exceed NAAQS; maintenance indicates that an area was previously designated nonattainment but is now attainment; and an unclassified air quality designation by USEPA means that there is not enough information to appropriately classify an AQCR, so the area is considered attainment. USEPA has delegated the authority for ensuring compliance with the NAAQS in Florida to the FDEP, Division of Air Resources Management. In accordance with the CAA, each state must develop a State Implementation Plan (SIP), which is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS.

Table 3-5. National and State Ambient Air Quality Standards, Effective October 2011

Pollutant	Averaging Time	Primary Standard		Secondary Standard
		Federal	State	
CO	8-hour ⁽¹⁾	9 ppm (10 mg/m ³)	Same as Federal	None
	1-hour ⁽¹⁾	35 ppm (40 mg/m ³)	Same as Federal	None
Pb	Rolling 3-Month Average ⁽²⁾	0.15 µg/m ³ ⁽³⁾	Same as Federal	Same as Primary
NO ₂	Annual ⁽⁴⁾	53 ppb ⁽⁵⁾	Same as Federal	Same as Primary
	1-hour ⁽⁶⁾	100 ppb	--	None
PM ₁₀	24-hour ⁽⁷⁾	150 µg/m ³	Same as Federal	Same as Primary
PM _{2.5}	Annual ⁽⁸⁾	15 µg/m ³	Same as Federal	Same as Primary
	24-hour ⁽⁶⁾	35 µg/m ³	Same as Federal	Same as Primary
O ₃	8-hour ⁽⁹⁾	0.075 ppm ⁽¹⁰⁾	Same as Federal	Same as Primary
SO ₂	1-hour ⁽¹¹⁾	75 ppb ⁽¹²⁾	--	None
	3-hour ⁽¹⁾	--	Same as Federal	0.5 ppm

Sources: USEPA 2011, FDEP 2012

Notes:

1. Parenthetical values are approximate equivalent concentrations.
2. Not to be exceeded more than once per year.
3. Not to be exceeded.
4. Final rule signed 15 October 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
5. Annual mean.
6. The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of cleaner comparison to the 1-hour standard.
7. 98th percentile, averaged over 3 years.
8. Not to be exceeded more than once per year on average over 3 years.
9. Annual mean, averaged over 3 years.
10. Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
11. Final rule signed 12 March 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, USEPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
12. 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
13. Final rule signed 2 June 2010. The 1971 annual (0.3 ppm) and 24-hour (0.14 ppm) SO₂ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Key: ppm = parts per million; ppb = parts per billion; mg/m³ = milligrams per cubic meter; µg/m³ = micrograms per cubic meter

The General Conformity Rule applies only to significant actions in nonattainment or maintenance areas. This rule requires that any Federal action meet the requirements of a SIP or Federal Implementation Plan. More specifically, CAA conformity is ensured when a Federal action does not cause a new violation of the NAAQS; contribute to an increase in the frequency or severity of violations of NAAQS; or delay the timely attainment of any NAAQS, interim progress milestones, or other milestones toward achieving compliance with the NAAQS.

Federal Prevention of Significant Deterioration. Federal Prevention of Significant Deterioration (PSD) regulations apply in attainment areas to a major stationary source (i.e., a source with the potential to emit 250 tons per year [tpy] of any criteria pollutant) and a significant modification to a major stationary source (i.e., a change that adds 15 to 40 tpy to the facility's potential to emit depending on the pollutant). PSD regulations also define ambient air increments, limiting the allowable increases to any area's baseline air contaminant concentrations, based on the area's class designation (40 CFR 52.21[c]). Additional PSD major source and significant modification thresholds apply for greenhouse gases (GHGs), as discussed in the Greenhouse Gas Emissions subsection.

PSD permitting can also apply to a proposed project if all three of the following conditions exist: (1) the proposed project is a modification with a net emissions increase to an existing PSD major source, (2) the proposed project is within 10 kilometers of national parks or wilderness areas (i.e., Class I Areas), and (3) regulated stationary source pollutant emissions would cause an increase in the 24-hour average concentration of any regulated pollutant in the Class I area of 1 milligram per cubic meter (mg/m^3) or more (40 CFR 52.21[b][23][iii]). Class I areas include national parks larger than 6,000 acres, national wilderness areas and national memorial parks larger than 5,000 acres, and international parks. MacDill AFB is not within 10 kilometers of a Class I area; therefore, this separate PSD permitting threshold does not apply to the selected projects.

Title V Requirements. Title V of the CAA Amendments of 1990 requires states and local agencies to permit major stationary sources. A Title V major stationary source has the potential to emit criteria air pollutants and hazardous air pollutants (HAPs) at levels equal to or greater than Major Source Thresholds. Major Source Thresholds vary depending on the attainment status of an AQCR. The purpose of the permitting rule is to establish regulatory control over large, industrial-type activities and monitor their impact on air quality. Section 112 of the CAA lists HAPs and identifies source categories.

Greenhouse Gas Emissions. GHGs are gaseous emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane, and nitrous oxide. GHGs are primarily produced by the burning of fossil fuels and through industrial and biological processes. On 22 September 2009, the USEPA issued a final rule for mandatory GHG reporting from large GHG emissions sources in the United States. The purpose of the rule is to collect comprehensive and accurate data on CO_2 and other GHG emissions that can be used to inform future policy decisions. In general, the threshold for reporting under this rule is 25,000 metric tons or more of CO_2 equivalent emissions per year but excludes mobile source emissions. The first emissions report was due in 2011 for 2010 emissions. GHG emissions will also be factors in PSD and Title V permitting, according to a separate USEPA rulemaking issued on 3 June 2010 (75 Federal Register [FR] 31514). GHG emissions thresholds of significance for permitting of modified or new stationary sources are 75,000 tons CO_2 equivalent potential emissions per year and 100,000 tons CO_2 equivalent potential emissions per year under these permit programs. The 100,000 tpy threshold has no significance under Title V permitting if a facility is already a Title V permitted source, regardless of its GHG potential emissions before a change occurs.

EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, was signed in October 2009 and requires agencies to set goals for reducing GHG emissions. One requirement within EO 13514 is the development and implementation of an agency Strategic Sustainability Performance Plan (SSPP) that prioritizes agency actions based on lifecycle return on investment. Each SSPP is required to identify, among other things, "agency activities, policies, plans, procedures, and practices" and "specific agency goals, a schedule, milestones, and approaches for achieving results, and quantifiable metrics" relevant to the implementation of EO 13514. On 26 August 2010, DOD released its SSPP to the public. This implementation plan describes specific actions the DOD will take to achieve its individual GHG reduction targets, reduce long-term costs, and meet the full range of goals of the EO. All SSPPs segregate GHG emissions into three categories: Scope 1, Scope 2, and Scope 3 emissions. Scope 1 GHG emissions

are those directly occurring from sources that are owned or controlled by the agency. Scope 2 emissions are indirect emissions generated in the production of electricity, heat, or steam purchased by the agency. Scope 3 emissions are other indirect GHG emissions that result from agency activities but from sources that are not owned or directly controlled by the agency. The GHG goals in the DOD SSPP include reducing Scope 1 and Scope 2 GHG emissions by 34 percent by 2020, relative to FY 2008 emissions, and reducing Scope 3 GHG emissions by 13.5 percent by 2020, relative to FY 2008 emissions.

3.3.2 Existing Conditions

MacDill AFB is in Hillsborough County, Florida, which is within the West Central Florida Intrastate (WCFI) AQCR. The WCFI includes Citrus County, Hardee County, Hernando County, Hillsborough County, Levy County, Manatee County, Pasco County, Pinellas County, Polk County, and Sumter County in Florida (USEPA 2012c). Hillsborough County has been designated as unclassified/attainment for all criteria pollutants except for a portion of Hillsborough County that is designated as nonattainment for lead (USEPA 2012d). However, MacDill AFB does not fall within the radius of the nonattainment area for lead in Hillsborough County. According to 40 CFR Part 81, no Class I areas are within 10 kilometers of MacDill AFB (USEPA 2012e).

The most recent emissions for Hillsborough County and the WCFI AQCR are shown in **Table 3-6**. Hillsborough County is considered the local area of influence, and the WCFI AQCR is considered the regional area of influence for this air quality analysis. Ozone is not a direct emission; it is generated from reactions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x), which are precursors to O₃. Therefore, for the purposes of this air quality analysis, VOCs and NO_x emissions are used to represent O₃ generation.

**Table 3-6. Local and Regional Air Emissions Inventory
Associated with the Selected Projects (2008)**

Area	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
Hillsborough County	56,348	35,779	200,158	19,078	17,543	4,313
WCFI AQCR	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA 2012f

MacDill AFB is not in a nonattainment area for any pollutant; therefore, Nonattainment New Source Review (NSR) permitting does not apply. MacDill AFB currently has a Title V operating permit because the potential emissions for the installation are more than 100 tpy for NO_x and CO. In addition, the installation is a PSD major source for NO_x as the potential NO_x emissions are more than 350 tpy, which is greater than the PSD major source threshold of 250 tpy (MAFB 2009a).

3.4 Geological Resources

3.4.1 Definition of the Resource

Geological resources consist of the Earth's surface and subsurface materials. Within a given physiographic province, these resources typically are described in terms of topography and physiography, geology, soils, and, where applicable, geologic hazards and paleontology.

Topography and physiography pertain to the general shape and arrangement of a land surface, including its height and the position of its natural and human-made features.

Geology is the study of the Earth's composition and provides information on the structure and configuration of surface and subsurface features. Such information derives from field analysis based on observations of the surface and borings to identify subsurface composition.

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types, in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential, affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981 and is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The soil qualities, growing season, and moisture supply are needed for a well-managed soil to produce a sustained high yield of crops in an economic manner. The land could be cropland, pasture, rangeland, or other land, but not urban built-up land or water. The intent of the FPPA is to minimize the extent that Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses. The Act also ensures that Federal programs are administered in a manner that, to the extent practicable, will be compatible with private, state, and local government farmland protection programs and policies.

The implementing procedures of the FPPA and Natural Resources Conservation Service (NRCS) require Federal agencies to evaluate the adverse effects (direct and indirect) of their activities on prime and unique farmland and farmland of statewide and local importance, and to consider alternative actions that could avoid adverse effects. Determination of whether an area is considered prime or unique farmland, and potential impacts associated with a proposed action, is based on preparation of the farmland conversion impact rating form AD-1006 for areas where prime farmland soils occur and by applying criteria established at Section 658.5 of the FPPA (7 CFR 658). The NRCS is responsible for overseeing compliance with the FPPA and has developed the rules and regulations for implementation of the Act (see 7 CFR Part 658, 5 July 1984).

Geologic hazards are defined as a natural geologic event that can endanger human lives and threaten property. Examples of geologic hazards include erosion, earthquakes, landslides, ground subsidence, and sinkholes.

3.4.2 Existing Conditions

Regional Geology. The geologic features of MacDill AFB are consistent with the surrounding area of southwest Florida, with generally flat, sandy terrain. There are three principal lithologic sequences in the area. The surficial unit is unconsolidated sand, clay, and marl. This unit might include remnants of the Hawthorn Formation composed of sand, clay, and thin lenses of limestone. Sands in this unit range from 5 to 20 feet thick, with clay layers up to 40 feet thick. This surficial layer is very thin or even absent on the eastern side of the installation, and underlying limestone formations sometimes outcrop in this area. Underlying the surficial layer are the Tampa and Suwannee limestones, which range from 250 to 500 feet thick. Below this layer is the Ocala Group, consisting of Avon Park, Lake City, and Oldsmar limestones; and the Cedar Keys Limestone, which are about 2,300 feet deep (MAFB 2010a).

Topography. MacDill AFB is on the Pamlico Terrace, which rises gently from the coast to about 25 feet above mean sea level (MSL), and is situated in the Gulf Coastal Lowlands physiographic region. Elevations on the installation range from sea level at the southern edge to about 15 feet above MSL in the northern portions. Much of the installation is less than 5 feet above MSL (MAFB 2010a).

Soils. Thirteen soil series are mapped within areas associated with the selected projects. Three soils, the Myakka fine sand, Myakka fine sand (frequently flooded), and the Malabar fine sand are hydric and, thus, have jurisdictional wetland implications. The Myakka fine sand (frequently flooded) is within tidal areas and occurs mainly within the mangrove portions of the installation. These soils are subject to tidal flooding, are very level, and are poorly drained. Malabar fine sand is generally adjacent to the Myakka fine sand. This includes flatwood areas, portions of the golf course, and some developed areas. They are nearly level and poorly drained, often occurring in low-lying sloughs and shallow flatwood depressions. There are no prime or unique farmland soils on MacDill AFB (MAFB 2010a, NRCS 2012). **Table 3-7** shows the soil properties associated with the selected projects. Soils mapped on MacDill AFB are shown in **Figure 3-1**.

Table 3-7. Soil Properties of Soils Mapped at the Site of the Selected Projects

Project	Map Unit Name and Texture	Slope (percent)	Hydric?	Drainage	Engineering Limitations
D1, C1, C4, I5, NI1	St. Augustine-Urban Land Complex	0 to 2	No	Somewhat poorly drained	Somewhat limited due to depth to saturated zone.
D2, D3, C1, C2, C6, I1, I2, I3, I4, NI1	Urban Land	0	No	Not rated	Not rated.
D2, C3, C6, I6, NI1, S1	Myakka fine sand	0 to 2	Yes	Poorly drained	Very limited due to depth to saturated zone and ponding.
C5, I4, NI1, S1	Malabar fine sand	0 to 2	Yes	Poorly drained	Very limited due to depth to saturated zone and ponding.
C5	Myakka fine sand (frequently flooded)	0 to 1	Yes	Very poorly drained	Very limited due to depth to flooding, depth to saturated zone, subsidence, organic matter content, and ponding.
C6, S1	Pomello fine sand	0 to 5	No	Moderately well-drained	Not limited.
C6, I1	Tavares-Urban Land Complex	0 to 5	No	Moderately well-drained	Not limited.
I4, NI1	Pomello urban land complex	0 to 5	No	Moderately well-drained	Not limited.
NI1	Arents	0	No	Somewhat poorly drained	Somewhat limited due to depth to saturated zone.
NI1	Wabasso fine sand	0 to 2	No	Poorly drained	Very limited due to depth to saturated zone.
NI1	Wabasso urban land complex	0 to 2	No	Poorly drained	Very limited due to depth to saturated zone.
S1	Myakka urban land complex	0 to 2	No	Very poorly drained	Very limited due to depth to saturated zone and ponding.

Sources: MAFB 2010a, NRCS 2012



Figure 3-1. Soils Mapped on MacDill AFB

The Malabar fine sand, Myakka fine sand, Myakka-Urban land complex, Wabasso fine sand, and Wabasso-Urban land complex are rated very limited for construction. The Arents, St. Augustine fine sand, and St. Augustine-Urban land complex map units are rated somewhat limited for construction. The Pomello fine sand, Pomello-Urban land complex, and the Tavares-Urban land complex are not limited for construction, and all other soils types on installation are not rated (NRCS 2012).

Geologic Hazards. Sinkholes are common in the Hillsborough County area, but are uncommon on MacDill AFB because of overlying impervious layers of clay, limited groundwater recharge, and the presence of a slow discharge zone for the Floridian aquifer. Sinkhole activity at MacDill AFB is minimal with only one sinkhole identified during a 1985 study (MAFB 2010a). There has also been a considerable amount of fill material placed on MacDill AFB to provide adequate land for development. Most of this material originated from dredging activities in the surrounding bays.

In addition, erosion is an ongoing problem along Gadsden Point at the southeastern corner of the Bay Palms Golf Complex. Sand also often washes into the boat channel leading to the installation's marina.

Hillsborough County is in the USEPA's Zone 2 for radon, meaning the area has a predicted average indoor radon screening level between 2 and 4 picocuries per liter (pCi/L), which is a moderate potential for elevated levels of indoor radon (USEPA 2012a).

MacDill AFB is at minimal risk from geologic hazards such as earthquakes, as Florida lies on a passive continental margin with a stable transition between continental and oceanic crust. The U.S. Geological Survey (USGS) produces seismic hazard maps based on current information about the frequency and intensity of earthquakes. The maps show the levels of horizontal shaking that have a 2 in 100 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of the force of gravity (percent g) and is proportional to the hazard faced by a particular type of building. In general, little or no damage is expected at values less than 10 percent g, moderate damage could occur at 10 to 20 percent g, and major damage could occur at values greater than 20 percent g. The 2008 National Seismic Hazard map produced by the USGS shows that MacDill AFB has a seismic hazard rating of approximately 4 to 8 percent g (USGS 2012), making the risk of damage from seismic activity minimal.

3.5 Water Resources

3.5.1 Definition of the Resource

Water resources are natural and man-made sources of water that are available for use by and for the benefit of humans and the environment. Water resources relevant to MacDill AFB in Florida include groundwater, surface water, wetlands, and floodplains. Hydrology concerns the distribution of water through the processes of evapotranspiration, atmospheric transport, precipitation, surface runoff and flow, and subsurface flow. Hydrology is affected by climatic factors such as temperature, wind direction and speed, topography, soil, and geologic properties.

Groundwater is water that exists in the saturated zone beneath the earth's surface and includes underground streams and aquifers. It is an essential resource that functions to recharge surface water and is used for drinking, irrigation, and industrial processes. Groundwater features include depth from the surface, aquifer or well capacity, quality, recharge rate, and surrounding geologic formations. Groundwater quality and quantity are regulated under several different programs. The Federal Underground Injection Control regulations, authorized under the Safe Drinking Water Act (SDWA), require a permit for the discharge or disposal of fluids into a well. The Federal Sole Source Aquifer regulations, also authorized under the SDWA, protect aquifers that are critical to water supply.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale.

Waters of the United States are defined within the Clean Water Act (CWA), as amended, and jurisdiction is addressed by the USEPA and the U.S. Army Corps of Engineers. These agencies assert jurisdiction over (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-around or have continuous flow at least seasonally (e.g., typically 3 months), and (4) wetlands that directly abut such tributaries. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredge or fill into waters of the United States including wetlands. Encroachment into waters of the United States and wetlands requires permits from the state and the Federal governments.

A water body can be deemed impaired if water quality analyses conclude that exceedances of CWA water quality standards occur. The CWA also mandated the National Pollutant Discharge Elimination System (NPDES) program, which requires a permit for any discharge of pollutants into waters of the United States.

The USEPA issued a Final Rule for the CWA concerning technology-based Effluent Limitations Guidelines and New Source Performance Standards for the Construction and Development point source category. All NPDES storm water permits issued by the USEPA or states must incorporate requirements established in the Final Rule. This Rule is effective 1 February 2010 and will be phased in over 4 years. All new construction sites are required to meet the non-numeric effluent limitations and to design, install, and maintain effective erosion and sedimentation controls, including the following:

- Control storm water volume and velocity to minimize erosion
- Minimize the amount of soil exposed during construction activities
- Minimize the disturbance of steep slopes
- Minimize sediment discharges from the site
- Provide and maintain natural buffers around surface waters
- Minimize soil compaction and preserve topsoil where feasible.

In addition, construction site owners and operators that disturb 1 or more acres of land are required to obtain an NPDES general permit for construction activities. The permit mandates use of best management practices (BMPs) to ensure that soil disturbed during construction activities does not pollute nearby water bodies. Effective 1 August 2011, construction activities disturbing 20 or more acres must comply with the numeric effluent limitation for turbidity in addition to the non-numeric effluent limitations. On 2 February 2014, construction site owners and operators that disturb 10 or more acres of land are required to monitor discharges to ensure compliance with effluent limitations as specified by the permitting authority. The USEPA's limitations are based on its assessment of what specific technologies can reliably achieve. Permittees can select management practices or technologies that are best suited for site-specific conditions.

Construction activities such as clearing, grading, trenching, and excavating displace soils and sediment. If not managed properly, disturbed soils and sediments can easily be washed into nearby water bodies during storm events and reduce water quality. Section 438 of the EISA (42 U.S.C. Section 17094) establishes into law new storm water design requirements for Federal construction projects that disturb a footprint greater than 5,000 ft² of land. The project footprint consists of all horizontal hard surfaces and disturbed areas associated with the project development, including both building area and pavements such as roads, parking lots, and sidewalks. Note that these requirements do not apply to resurfacing of existing

pavements. Under these requirements, predevelopment site hydrology must be maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. Predevelopment hydrology will be modeled or calculated using recognized tools and must include site-specific factors such as soil type, ground cover, and ground slope. Site design will incorporate storm water retention and reuse technologies such as bioretention areas, permeable pavements, cisterns/recycling, and green roofs to the maximum extent technically feasible. Post-construction analyses will be conducted to evaluate the effectiveness of the as-built storm water reduction features. As stated in a 19 January 2010 DOD memorandum, these regulations will be incorporated into applicable DOD UFC within 6 months (DOD 2010). Additional guidance is provided in the USEPA's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act*.

Floodplains are areas of low-level ground present along rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic systems in which each component helps to maintain the characteristics of the environment that supports it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and diversification of plants and animals. Floodplain storage reduces flood peaks and velocities, and the potential for erosion. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body.

Floodplains are subject to periodic or infrequent inundation due to rain or melting snow. Risk of flooding typically depends on local topography, the frequency of precipitation events, and the size of the watershed above the floodplain. Flood potential is evaluated by FEMA, which defines the 100-year floodplain. The 100-year floodplain is an area that has a 1 percent chance of inundation by a flood event in a given year. Certain facilities inherently pose too great a risk to be in either the 100- or 500-year floodplain, such as hospitals, schools, or storage buildings for irreplaceable records. Federal, state, and local regulations often limit floodplain development to passive uses such as recreational and preservation activities to reduce the risks to human health and safety.

EO 11988, *Floodplain Management*, requires Federal agencies to determine whether a proposed action would occur within a floodplain. This determination typically involves consultation of FEMA Flood Insurance Rate Maps (FIRMs), which contain enough general information to determine the relationship of the project area to nearby floodplains. EO 11988 directs Federal agencies to avoid floodplains unless the agency determines that there is no practicable alternative. Where the only practicable alternative is to site in a floodplain, the agency should develop measures to reduce impacts and mitigate unavoidable impacts.

EO 11990, *Protection of Wetlands* (24 May 1977), directs agencies to consider alternatives to avoid adverse effects and incompatible development in wetlands. Federal agencies are to avoid new construction in wetlands, unless the agency finds there is no practicable alternative to construction in the wetland and the proposed construction incorporates all possible measures to limit harm to the wetland. Agencies should use economic and environmental data, agency mission statements, and any other pertinent information when deciding whether or not to build in wetlands. EO 11990 directs each agency to provide for early public review of plans for construction in wetlands.

It is USAF policy to avoid construction of new facilities within areas containing wetlands or within the 100-year floodplain, where practicable. If a construction project does occur within a wetland or the 100-year floodplain, direct, adverse effects would be expected. Wetland and floodplain impacts would be reduced to the maximum extent practicable through project design and implementation of environmental protection measures. However, some projects might have direct impacts on wetlands and floodplains, and there is potential for indirect impacts from activities adjacent to these areas. In accordance with EOs

11988 and 11990, a FONPA must be prepared and approved by HQ AMC for all projects involving construction in a wetland or action within floodplain areas. For those actions determined to impact jurisdictional wetlands, MacDill AFB would be required to obtain a permit under Section 404 of the CWA and Chapter 373 Florida Statute, and could be required to mitigate or compensate in order to comply with the USAF's "no net loss" policy regarding wetlands.

3.5.2 Existing Conditions

Groundwater. MacDill AFB has two aquifer systems: a shallow, surficial aquifer, and the underlying regional Floridan aquifer. The surficial aquifer system (composed of sand, clayey sand, and shell) is about 20 feet thick and is used to supply small irrigation systems beyond installation boundaries and is not used by MacDill AFB. This shallow aquifer ranges from the surface to about 5 feet beneath the surface at inland locations. The surficial aquifer is highly susceptible to groundwater contamination, primarily due to shallow water table depth and permeable sediments. Underground storage tanks (USTs), landfills, and golf courses (fertilizer applications) are the primary sources of known contamination. Recharge of the surficial aquifer primarily occurs through percolation of precipitation. The Floridan aquifer is not significantly recharged from the surface of MacDill AFB (MAFB 2010a).

The surficial aquifer is generally underlain by heterogeneous calcareous clays and limestone with varying permeability. The Floridan aquifer underlies the clay and limestone barrier. The Floridan aquifer is not significantly recharged from the surface of MacDill AFB or the surficial aquifer. The installation is primarily a discharge zone for the Floridan aquifer due to an upward flow of water (MAFB 2010a).

The groundwater quality of the Floridan aquifer has not been fully defined due to a lack of monitoring wells. This aquifer is rated as moderately susceptible to contamination. There is slight contamination of this aquifer but is not contaminated to the extent that remediation criteria have been met. This aquifer is not used for drinking water at MacDill AFB. MacDill obtains potable water from the City of Tampa and no drinking water wells are on the installation (MAFB 2010a). MacDill AFB operates a potable water storage and distribution system that provides water for various uses at all installation facilities (see **Section 3.9** for a discussion on infrastructure).

Surface Water. MacDill AFB is an independent drainage area with no surface waters entering or leaving the installation other than discharge to Tampa and Hillsborough bays. The northern boundary road along the installation is the watershed divide between MacDill AFB and the adjoining civilian residential community; the remainder of the installation is surrounded by Hillsborough Bay (to the east) and Tampa Bay (to the southwest), and Old Tampa Bay (to the northwest).

The State of Florida in 62-302.40 F.A.C. classifies all surface waters according to their designated use. Tampa Bay is a Class III water body with portions of the bay south and west of MacDill AFB classified as Class II waters. Class III is designated for Fish Consumption, Recreation, Propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Class II is designated for the same uses as Class III and includes shellfish propagation or harvesting.

According to USEPA, the most frequently observed water quality impairments in Tampa Bay and Hillsborough Bay were the presence of fecal coliform, elevated chlorophyll a, and low dissolved oxygen (USEPA 2010). Excessive nutrients are the leading cause of high levels of chlorophyll a and low dissolved oxygen. The most common nutrients are nitrogen and phosphorus. Excess nutrients enter water bodies most often from storm water runoff, often carrying chemicals like lawn fertilizers or detergents from residential areas.

Raccoon Hammock and Broad Creek are the main natural drainage features and occur on the southern portion of MacDill AFB. Surface water flows on the installation are primarily storm water runoff. The

drainage system is composed of approximately 25 miles of culverts and 56 miles of open ditches and canals. All upland cut drainage ditches on MacDill AFB are classified as waters of the United States (MAFB 2010a). In addition, there are multiple artificial impoundments on MacDill AFB. The two largest impoundments, Lake McClelland and Lewis Lake, total approximately 20 acres and are on the eastern side of the installation. There are another 35 acres of small, unnamed impoundments throughout the installation. The coastal plain at MacDill AFB is crisscrossed with drainage canals, which are primarily mangrove swamps. Most of these canals are interconnected and tidally influenced (MAFB 2010a).

MacDill AFB receives 48 inches of rainfall per year on average. The storm water generated infiltrates into the soil, flows over land into receiving waters, or flows into the storm water drainage system. The drainage systems ultimately discharge into either Tampa Bay or Hillsborough Bay. Areas of the installation with large impervious surfaces, such as the flightline area, experience sheet flows of storm water during large rain events, which is then collected and conveyed to storm water treatment areas (MAFB 2011a).

MacDill AFB has two NPDES Permits: a Multi-Sector Generic Permit (MSGP) for storm water discharge associated with industrial activity (Permit No. FLR05E128), and a Phase II Municipal Separate Storm Sewer System (MS4) generic storm water permit (Permit No. FLR04E059). The MSGP covers primarily flightline areas at MacDill AFB, including activities such as aircraft refueling, vehicle maintenance, and materials handling. As a component of the MSGP, MacDill AFB maintains a Storm Water Pollution Prevention Plan (SWPPP) that documents existing storm water management practices and guides personnel responsible for ensuring that potential storm water pollution is minimized. The MS4 permit requires the development of a storm water management program with detailed BMPs that implement, among other things, construction site runoff and control and pollution prevention measures (MAFB 2011a).

MacDill AFB also maintains an Installation Emergency Management Plan, a Spill Prevention Control and Countermeasures (SPCC) Plan, and a Facility Response Plan that provide guidance for handling materials appropriately and detailed procedures to follow in the event of a spill.

Floodplains. As discussed in **Section 2.1.2**, most of MacDill AFB is within the 100-year floodplain (**Figure 2-1**). The installation is in Tampa's Coastal High Hazard Area, which is an area threatened by tropical storms and hurricanes. Any hurricane, particularly those of higher intensity, could cause major damage to installation facilities. MacDill AFB is within the Special Flood Hazard Area, also called the 100-year floodplain, which means that this area must comply with the National Flood Insurance Program's floodplain management regulations, which must be enforced, and floodplain insurance is mandatory. According to FEMA FIRM Map Numbers 12057C0457H, 12057C0459H, and 12057C0476H, effective 28 August 2008, most of MacDill AFB is within floodplain Zone AE. Flood Zone AE designates that an area is inundated by 100-year flooding, for which base flood elevations have been established.

Wetland hydrology. Wetlands are valuable for biological habitat, hydrologic cycling, and aesthetics. More than 20 percent of MacDill AFB is wetlands, including more than 500 contiguous acres of prime mangrove community along the southern installation coastline. Wetland hydrology is an important component of wetland health. Water saturation and flow regimes (hydrology) largely determine how the soil develops and the types of plant and animal communities living in and on the soil.

The 1998 Wetland Delineation Study identified, delineated, and classified approximately 1,195 acres of wetlands on MacDill AFB (MAFB 2010a). This includes 880 acres of estuarine wetlands and 315 acres of palustrine wetlands. **Figure 2-1** shows the wetland areas on the installation. The principal estuarine wetland community is mangrove wetlands, which are dominated by black mangrove (*Avicennia*

germinans) and white mangrove (*Languncularia racemosa*). Red mangrove (*Rhizophora mangle*) is also present at the waterward fringes of the community. These wetland areas on MacDill AFB are generally considered high quality (MAFB 2010a). Mangrove wetland hydrology is tidally influenced and performs the following functions: trap and cycle nutrients, provide food chain resources for marine species, provide habitat and nursery grounds for species, and protect the shoreline by buffering wind and wave action (MAFB 2011f).

Palustrine wetlands at MacDill AFB are classified into the following four categories:

- Emergent wetlands (characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens)
- Scrub/shrub wetlands (dominated by woody vegetation less than 20 feet tall, including true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions)
- Forested wetlands (characterized by woody vegetation that is 20 feet tall or taller)
- Open water wetlands (including small bodies of surface water free of emergent vegetation but that might have floating leaved vegetation).

The typical hydrology for palustrine emergent wetlands on MacDill AFB is temporarily flooded, defined as surface water present for brief periods during the growing season but the water table usually lies below the soil surface. The typical hydrology for palustrine scrub/shrub and palustrine forested wetland on the base is seasonally flooded, defined as surface water present for extended periods, especially early in the growing season, but absent by the end of the growing season in most years with the water table varying from saturated to the surface to well below the ground surface. The typical hydrology for palustrine open water wetlands is permanently flooded, defined as water covering the land surface throughout the year (MAFB 2010a, USFWS 1979).

Wetland habitat and biota are discussed in **Section 3.6.2**.

3.6 Biological Resources

3.6.1 Definition of the Resource

Biological resources include native or naturalized plants and animals and the habitats (e.g., grasslands, forests, and wetlands) in which they exist. Protected and sensitive biological resources include ESA-listed species (threatened or endangered) and those proposed for ESA-listing as designated by the USFWS (terrestrial and freshwater organisms) and NMFS (marine organisms), and migratory birds. Migratory birds are also protected species under the MBTA. Sensitive habitats include those areas designated by the USFWS (or NMFS) as critical habitat protected by the ESA and as sensitive ecological areas designated by state or other Federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or limited in distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, crucial summer and winter habitats).

The ESA (16 U.S.C. §1531 et seq.) establishes a Federal program to protect and recover imperiled species and the ecosystems upon which they depend. The ESA requires Federal agencies, in consultation with the USFWS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. Under the ESA, “jeopardy” occurs when an action is reasonably expected, directly or indirectly, to diminish numbers, reproduction, or distribution of a species so that the likelihood

of survival and recovery in the wild is appreciably reduced. An “endangered species” is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. A “threatened species” is defined by the ESA as any species likely to become an endangered species in the foreseeable future. The ESA also prohibits any action that causes a “take” of any listed species. “Take” is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.” Federal species of concern are not protected by law; however, these species could become listed, and therefore are given consideration when addressing impacts from a proposed action. Listed plants are not protected from take, although it is illegal to collect or maliciously harm them on Federal land.

Critical habitat is designated if the USFWS determines that the habitat is essential to the conservation of a threatened or endangered species. In consultation for those species with critical habitat, Federal agencies must ensure that their activities do not adversely modify critical habitat to the point that it will no longer aid in the species’ recovery. In many cases, this level of protection is similar to that already provided to species by the “jeopardy standard,” as previously discussed. However, areas that are currently unoccupied by the species, but which are needed for the species’ recovery, are protected by the prohibition against adverse modification of critical habitat.

The FWC oversees the protection and management of state-protected fauna under the Florida Endangered and Threatened Species Act (Florida Statute 372.072). Within the F.A.C., protection is provided to endangered species (68A-27.003 F.A.C.), threatened species (68A-27.004 F.A.C.), and species of special concern (68A-27.005 F.A.C.). The Florida Department of Agriculture and Consumer Services maintains the state list of plants designated as endangered, threatened, and commercially exploited (5B-40 F.A.C.) as defined under Florida Statute 581.185(2).

The MBTA of 1918 (16 U.S.C. 703–712), as amended, and EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, require Federal agencies to minimize or avoid impacts on migratory birds. Unless otherwise permitted by regulations, the MBTA makes it unlawful to (or attempt to) pursue, hunt, take, capture, or kill any migratory bird, nest, or egg. If design and implementation of a Federal action cannot avoid measurable negative impacts on migratory birds, EO 13186 directs the responsible agency to develop and implement, within 2 years, a Memorandum of Understanding with the USFWS that shall promote the conservation of migratory bird populations.

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act, which prohibits the “take” of bald or golden eagles in the United States. The Act defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.” For purposes of these guidelines, “disturb” means “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause: (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior” based on the best scientific information available. In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle’s return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.

Pursuant to Section 303(a)(7) of the Magnuson-Stevens Fisheries Conservation and Management Act (16 U.S.C. 1801 et seq.), regional fishery management councils must identify essential fish habitat (EFH) used by all life history stages of each managed species in fishery management plans. EFH is defined as habitats that are necessary to the species for spawning, breeding, feeding, or growth to maturity. EFH that is particularly important to the long-term productivity of populations of one or more managed species, or is particularly vulnerable to degradation, is identified as habitat areas of particular concern to

provide additional focus for conservation efforts. Pursuant to Section 305(b)(2) of the Magnuson-Stevens Fisheries Conservation and Management Act, Federal agencies shall consult with the NMFS regarding any action federally authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that might adversely affect EFH.

3.6.2 Existing Conditions

Vegetation. Habitat types on MacDill AFB can be generalized into developed areas (improved, industrialized areas with mowed vegetation), forested areas (pine and hardwood), wetlands (mangrove and swamp areas), and open water (fresh and brackish). The predominant types of turf and ground cover in developed areas of MacDill AFB include Bahia (*Paspalum notatum*) and St. Augustine (*Stenotaphrum secundatum*) grasses, and xeriscaping (MAFB 2010a).

In the early 1970s, 500 acres of pine (dominated by slash pine [*Pinus elliottii*]) were planted on MacDill AFB. Most of these planted pine areas still persist on the installation. The understory of this pine forest is thick, presenting extreme fuel loads with high potential for wildfires. Remnant natural forest communities on the installation consist of longleaf pine (*Pinus palustris*) and mixed hardwood species, primarily oaks (*Quercus* spp.), maples (*Acer* spp.), cabbage palm (*Sabal palmetto*), and southern magnolia (*Magnolia grandiflora*). The forest understory is dominated by wax myrtle (*Myrica cerifera*), salt bush (*Baccharis halimifolia*), saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), and the exotic, invasive Brazilian pepper (*Schinus terebinthifolius*) (MAFB 2010a). Brazilian pepper spreads aggressively and has replaced the forest understory in many places (MAFB 2010a). Forested areas of MacDill AFB are managed primarily as habitat. MacDill AFB has an active habitat restoration program, which primarily focuses on the aggressive eradication of exotic invasive species, such as Brazilian pepper, from forested areas of the installation. In 2009, MacDill completed a Wildland Fire Management Plan that outlined the prescribed burn protocol and identified priority burn areas for both planted and natural areas to increase the quality of wildlife habitat and reduce the potential for a dangerous wildfire (MAFB 2010a).

MacDill AFB has approximately 1,200 acres of wetlands. Most of these wetlands (approximately 74 percent) are estuarine scrub-shrub, dominated by black mangrove and white mangrove. Red mangroves are also commonly found in association with these two dominants, but are more waterward (MAFB 2010a). Coastal management is an important issue at MacDill AFB. The mangroves protect and stabilize the shoreline, which is particularly susceptible to erosion on the eastern bay. Other types of wetlands on MacDill AFB include palustrine (i.e., nontidal) needle-leaved forested wetlands (115 acres), palustrine open water wetlands with some floating leaved vegetation (200 acres), and palustrine emergent wetlands characterized by erect, rooted, herbaceous hydrophytes (MAFB 2010a).

Seagrasses are found along much of MacDill's eastern and southern coastline. Seagrass beds adjacent to the tidal swamp are habitat to many vertebrates and invertebrates. The dominant seagrass is shoal grass (*Halodule wrightii*) (MAFB 2010a).

The most serious vegetative threat on MacDill AFB is the exotic, invasive Brazilian pepper plant. In Florida, Brazilian pepper is an aggressive colonizer of disturbed environments, including pine flatlands, tropical hardwood hammocks, and mangrove forest (Ferriter 1997). At MacDill AFB, the Brazilian pepper is prevalent in the pine understory, particularly along the forest edge, and along the estuarine wetland margins. MacDill AFB has expended much effort removing Brazilian pepper and revegetating with native species. Another exotic invasive species on the installation is the melaleuca tree (*Melaleuca quinquenervia*), which grows in conditions ranging from aquatic to terrestrial. Lead tree (*Leucaena leucocephala*), which prefers upland habitats, is also an aggressive invasive species on MacDill AFB. The Brazilian pepper, melaleuca tree, and lead tree displace native vegetation and diminish wildlife

habitat. Other nuisance species on MacDill AFB include Australian pine (*Casuarina equisetifolia*), cattails (*Typha* spp.), cogon grass (*Imperata cylindrical*), water hyacinth (*Eichhornia crassipes*), castor bean (*Ricinus communis*), and muscadine grape (*Vitis rotundifolia*) (MAFB 2010a).

Wildlife. Wildlife species are limited on MacDill AFB because of its location on an isolated urban peninsula, which reduces immigration of terrestrial species. The installation is largely urban with relatively small tracts of wildlands, reducing its use by animals that require larger home ranges. The quality of native wildlife habitat has been declining due to fire protection, nonnative plant invasion, and a dense forest understory. Six habitat types are present on the installation: (1) paved runways and taxiways and mowed lawn areas; (2) slash pine plantations; (3) pine flatwoods; (4) mixed pine and oak woodlands; (5) creeks, bays, lagoons, and dredged channels; and (6) mangroves and high marsh (MAFB 2010a).

Much of MacDill AFB is primarily suited to wildlife species adapted to urban environments. However, the southwestern portion of the installation has considerable wildland habitat values, especially pine forest and wetland ecosystems (MAFB 2010a). Several wildlife surveys of MacDill AFB were completed in the early 1990s, all of which confirmed lower species diversity than previous literature reviews indicated. The major causes of low species diversity appear to be a loss of fresh water caused by the excavation of drainage ditches on the installation, a lack of a fire regime, and the prevalence of Brazilian pepper. Wildlife habitat value is gradually improving due to restoration efforts in the wetland and forested areas in the southern portion of MacDill AFB (MAFB 2010a). Threatened and endangered species and other protected or sensitive species are discussed in the following section, **Protected and Sensitive Species**.

One faunal survey identified 109 species of birds on the installation. Songbirds and wading birds are common at MacDill AFB, particularly in the mangrove forests and shorelines. Wading birds including the green heron (*Butorides virescens*), yellow-crowned night heron (*Nycticorax nycticorax*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), cattle egret, (*Bubulcus ibis*), and white ibis (*Eudocimus albus*) use MacDill AFB primarily for feeding. MacDill AFB has very limited value as a breeding site for colonial coastal birds due to a lack of areas isolated from terrestrial predators, especially raccoons (*Procyon lotor*) (MAFB 2010a). Conditions seem to be improving for bird species due to wetlands improvements. Noteworthy songbird species that might breed on the installation include the gray kingbird (*Tyrannus dominicensis*), black-whiskered vireo (*Vireo altilaquis*), prairie warbler (*Dendroica discolor*), and possibly the mangrove cuckoo (*Coccyzus minor*), all of which are limited to mangrove communities. However, none of these species have been identified as nesting at MacDill AFB (MAFB 2010a).

Only small mammals are present on the installation. The most numerous are raccoons, marsh rabbits (*Sylvialagus palustris*), opossums (*Didelphis virginiana*), armadillos (*Dasypus novemcinctus*), striped skunks (*Mephitis mephitis*), and gray squirrels (*Sciurus carolinensis*). Raccoons are a nuisance species on the installation (MAFB 2010a).

Nineteen reptilian and nine amphibian species were documented on MacDill AFB during surveys conducted in 1994. These include three nonnative lizard and two nonnative amphibian species, one state-listed threatened species (gopher tortoise [*Gopherus polyphemus*], and one species of special concern (gopher frog [*Rana capito*]) (MAFB 2010a). The number of herpetofaunal species found during surveys composed only 39 percent of the species expected to occur in the wetland, sandhill, and estuarine habitats of the installation. The major causes of missing species appear to be a loss of freshwater wetlands and dense understory growth due to a lack of fires (MAFB 2010a).

Smallmouth bass (*Micropterus dolomieu*) and largemouth bass (*M. salmoides*) are the primary freshwater species in MacDill AFB ponds. Lewis Lake, which tends to be brackish at least part of the year, also has blue tilapia (*Oreochromis aureus*), redfish/red drum (*Sciaenops ocellata*), mullet (*Mugil cephalus*), and

snook (*Centropomus undecimalis*). Blue tilapia is an exotic and invasive species. Generally, installation ponds are poor habitat for fish because the water is shallow and tends to have low amounts of dissolved oxygen (MAFB 2010a). Blue crabs (*Callinectes sapidus*) are common in the aquatic estuarine habitats surrounding MacDill AFB. Mangrove protection and plantings have improved habitat conditions for this species (MAFB 2010a).

Protected and Sensitive Species. Several federally and state-listed threatened and endangered species and species of special concern have been identified on MacDill AFB. These species, along with protected and sensitive species that have the potential to occur on MacDill AFB, are listed in **Table 3-8**. Biological constraints at MacDill AFB associated with these species are shown in **Figure 3-2**. The installation has some valuable foraging habitat for many of these species, particularly in the coastal and wetland areas. The USFWS has not designated any portion of MacDill AFB as critical habitat for federally listed species. **Figures 2-1** through **2-4** and **3-2** show the areas on the installation where protected species have been found.

The most diverse assemblage of fauna occurs along the shorelines, primarily in the mangrove areas. Wading and shore birds use this area for foraging and perching. Protected and sensitive wading bird species that have been documented include the roseate spoonbill (*Platalea ajaja*), little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), snowy egret, tricolored heron (*Egretta tricolor*), wood stork (*Mycteria americana*), and white ibis; shore bird species include the American oystercatcher (*Haematopus palliatus*), brown pelican (*Pelecanus occidentalis*), least tern (*Sterna antillarum*), and black skimmer (*Rynchops niger*). With the exception of the least tern, which is a summer resident, these wading and shore birds have been described as permanent residents on MacDill AFB (MAFB 1996). No nest sites have been recorded on the installation, though better control of the predatory raccoon population and habitat improvements (i.e., continued creation of new wetlands and restoration of existing wetlands) could result in more documented nesting in the future. MacDill AFB does not use the wetland and shoreline areas for military missions (MAFB 2010a).

Several protected raptor species have also been documented on the installation. Both the bald eagle and the burrowing owl are residents on MacDill AFB (MAFB 2010a). The installation contains a few relic longleaf pines, which are the preferred nest tree of bald eagles in Florida (MAFB 2010a). A pair of nesting bald eagles, protected under the Bald and Golden Eagle Protection Act, have been residents of MacDill AFB since approximately 1995, though the original nest (near McClelland MFH) was destroyed in 2001 by Tropical Storm Gabrielle. The eagles now nest in a tree within the WSA, which is protected by QD arcs (see **Figures 2-1** through **2-4** for the location of the bald eagle nest and QD arcs). In 2012, a new bald eagle nest was documented on the rotating beacon tower on the western side of the installation. The new nest was registered with the FWC in May 2012 and fledged one young during the spring 2012. According to a 2011–2012 survey, the burrowing owl population is estimated to consist of 12 adults, although there might be more individuals during the peak of the nesting season. Thirty-one active and 26 inactive owl burrows occur primarily in open grassy areas at the north end of the runway and between the taxiways (MAFB 2005a, MAFB 2012a). The 2012 threatened and endangered species survey, which has not yet been finalized, documented a new colony of burrowing owls in the open grassy area south of the South Ramp.

Table 3-8. Protected and Sensitive Species Potentially Occurring On or Near MacDill AFB

Common Name	Scientific Name	Federal Status	State Status	Notes
Amphibians/Reptiles				
American alligator ¹	<i>Alligator mississippiensis</i>	T (S/A)	SSC	Found occasionally and relocated off installation
Atlantic loggerhead turtle	<i>Caretta caretta</i>	T	T	Uses beach areas for nesting
Green sea turtle	<i>Chelonia mydas</i>	E	E	Uses beach areas for nesting
American crocodile	<i>Crocodylus acutus</i>	T	T	Prefers coastal estuarine marshes, tidal swamps, and creeks
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E	Potentially uses beach areas for nesting
Eastern indigo snake	<i>Drymarchon corais couperi</i>	T	T	Potentially occurs in woody uplands bordering mangroves
Hawksbill sea turtle	<i>Eretmochelys imbricate</i>	E	E	Potentially uses beach areas for nesting
Gopher tortoise ¹	<i>Gopherus polyphemus</i>	C	SSC	Occurs in recently burned pine flatwoods
Short-tailed snake	<i>Lampropeltis extenuata</i>	NL	T	Prefers xeric pine flatwoods
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	E	E	Potentially uses beach areas for nesting
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	NL	SSC	Prefers xeric pine flatwoods
Gopher frog ¹	<i>Rana capito</i>	NL	SSC	Prefers xeric pine flatwoods
Suwannee cooter	<i>Pseudemys concinna suwanniensis</i>	NL	SSC	Prefers rivers and large streams
Birds				
Florida scrub jay	<i>Aphelocoma coerulescens</i>	T	T	Florida oak scrub and scrubby flatwoods found on prehistoric and current sand dunes. No suitable habitat identified on MacDill AFB
Limpkin	<i>Aramus guarauna</i>	NL	SSC	Potentially occurs along shores, ditches, and in mangroves
Burrowing owl ¹	<i>Athene cunicularia</i>	NL	SSC	Nests in open, mowed areas

Common Name	Scientific Name	Federal Status	State Status	Notes
Piping plover ¹	<i>Charadrius melodus</i>	T	T	Possibly occurs along shorelines in winter
Snowy plover	<i>Charadrius alexandrinus</i>	NL	T	Possibly occurs along shorelines in winter
Little blue heron ¹	<i>Egretta caerulea</i>	NL	SSC	Common along shorelines, ditches, and mangroves
Reddish egret ¹	<i>Egretta rufescens</i>	NL	SSC	Prefers shorelines, sandbars, and shallow salt ponds. Uncommon.
Snowy egret ¹	<i>Egretta thula</i>	NL	SSC	Common along shorelines, ditches, and mangroves
Tricolored heron ¹	<i>Egretta tricolor</i>	NL	SSC	Common along shorelines, ditches, and mangroves
White ibis ¹	<i>Eudocimus albus</i>	NL	SSC	Found in marsh habitats
Southeastern American kestrel ¹	<i>Falco sparverius paulus</i>	NL	T	Prefers open stands of mature pines
Florida sandhill crane ¹	<i>Grus canadensis pratensis</i>	NL	T	Visitor to open areas
American oystercatcher ¹	<i>Haematopus palliatus</i>	NL	SSC	Prefers coastal shorelines, sandbars, and tidal flats
Bald eagle ¹	<i>Haliaeetus leucocephalus</i>	NL ²	NL	Potential for foraging and nesting on the installation
Wood stork ¹	<i>Mycteria americana</i>	E	E	Occurs regularly in coastal wetlands and open uplands
Brown pelican ¹	<i>Pelecanus occidentalis</i>	NL	SSC	Common along waterfront and mangrove areas
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	T	Prefers longleaf pine stands, occasionally slash pines
Roseate spoonbill ¹	<i>Platalea ajaja</i>	NL	SSC	Forages and roosts along shorelines and mangrove systems
Audubon's crested caracara	<i>Polyborus plancus audubonii</i>	T	T	Prefers dry, open prairies
Black skimmer ¹	<i>Rynchops niger</i>	NL	SSC	Prefers open sandy beaches
Least tern ¹	<i>Sterna antillarum</i>	NL	T	Probably forages in drainage ditches and ponds on the installation
Roseate tern	<i>Sterna dougallii</i>	T	T	Probably forages in drainage ditches and ponds on the installation

Common Name	Scientific Name	Federal Status	State Status	Notes
Bachman's warbler	<i>Vermivora bachmanii</i>	E	E	Potential for occurrence during migration
Mammals				
Florida mouse	<i>Peromyscus floridanus</i>	NL	SSC	Prefers scrubby flatwood habitat
Sherman's fox squirrel	<i>Sciurus niger shermani</i>	NL	SSC	Prefers pine flatwood habitat
West Indian manatee ¹	<i>Trichechus manatus</i>	E	E	Summer range in Tampa Bay and tributaries
Fish				
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	T	T	Prefers spring-fed, free-flowing rivers with steep banks and hard bottoms
Opossum pipefish	<i>Microphis brachyurus</i>	C	NL	Prefers coastal marine environments and freshwater tributaries within 30 miles of the coast
Plants and Lichens				
Pine-woods bluestem	<i>Andropogon arctatus</i>	NL	T	Generally found in dry sandy palmetto flatwoods
Auricled spleenwort	<i>Asplenium erosum</i>	NL	E	Generally found in dense, low hammock with royal palms
Florida bonamia	<i>Bonamia grandiflora</i>	T	E	Generally found in white sand scrub associated with scrub oaks and sand pine
Brooksville bellflower	<i>Campanula robinsiae</i>	E	E	Generally found in pond margins, wet prairies, or seepage areas in hardwood forests
Chapman's sedge	<i>Carex chapmanii</i>	NL	T	Generally found in bottomland forest
Sand butterfly pea	<i>Centrosema arenicola</i>	NL	E	Generally found in sandhill, scrubby flatwoods, dry upland woods
Florida golden aster	<i>Chrysopsis floridana</i>	E	E	Generally found in sand pine scrub
Tampa vervain	<i>Glandularia tampensis</i>	NL	E	Generally found near live oak-cabbage palm hammocks and pine-palmetto flatwoods
Nodding pinweed	<i>Lechea cernua</i>	NL	T	Generally found in burned scrub

Common Name	Scientific Name	Federal Status	State Status	Notes
Britton's beargrass	<i>Nolina brittoniana</i>	E	E	Generally found in scrub, sandhill, scrubby flatwoods, and xeric hammock
Hand fern	<i>Ophioglossum palmatum</i>	NL	E	Generally found in old leaf bases of cabbage palms
Plume polypody	<i>Pecluma pulmula</i>	NL	E	Generally found in tree branches and limestone outcrops
Giant orchid	<i>Pteroglossaspis ecristata</i>	NL	T	Generally found in sandhill, scrub, pine flatwoods
Large-plumed beaksedge	<i>Rhynchospora megaplumosa</i>	NL	E	Generally found between scrub and mesic flatwoods
Sea oats ¹	<i>Uniola paniculata</i>	NL	NL ³	Generally found in coastal sand dunes
Sea grapes ¹	<i>Coccoloba uvifera</i>	NL	NL ³	Generally found in coastal sand dunes
Toothed maiden fern	<i>Thelypteris serrata</i>	NL	E	Generally found in cypress swamps, sloughs, and floodplains
Broad-leaved nodding-caps	<i>Triphora amazonica</i>	NL	E	Generally found in bottomland forest or xeric hammock

Sources: MAFB 2010a, MAFB 2005a, USFWS 2011, USFWS 2012, FWC 2011a, FNAI 2012, ISB 2012, NMFS 2009, NMFS 2012

Notes:

¹ Species documented on MacDill AFB.

² Bald eagles are not federally or state-listed species, but are protected under the Bald and Golden Eagle Protection Act.

³ Sea oats and sea grapes are not federally or state-listed species, but are protected under the Florida Statutes Chapter 161.242.

Key:

C = Candidate species (Federal designation)

E = Endangered

NL = Not listed

SSC = Species of special concern (state designation)

T = Threatened

T (S/A) = Threatened due to similarity of appearance. These species are not biologically threatened or endangered and are not subject to Section 7 consultation.

The gopher tortoise is also a resident of MacDill AFB. This species prefers dry upland habitats including sandhills and pine flatwoods but is also found in human-altered environments like mowed fields. Gopher tortoise burrows are numerous (162 active, 31 inactive, and 17 abandoned) in the unimproved, grassy areas between the flightline runways, though they also occur in smaller numbers in other locations on the installation (MAFB 2005a). Based on the number of burrows found in the 2011–2012 survey, there could be as many as 119 gopher tortoises on MacDill AFB. This is a 27 percent decrease from the previous

survey in 2003–2004; however, only a 13 percent decrease in active burrows occurred during the same time period (MAFB 2012a). MacDill AFB periodically performs prescribed burns of forest understory, which improves habitat for the gopher tortoise. Management of gopher tortoise habitat is important for many protected species that occur or could occur on MacDill AFB (e.g., Florida pine snake [*Pituophis melanoleucus mugitus*], gopher frog, Florida mouse [*Podomys floridanus*], and burrowing owl) because other species use gopher tortoise burrows for shelter (GTC 2000). The eastern indigo snake (*Drymarchon corais couperi*) would also benefit from management of gopher tortoise habitat and could potentially occur at MacDill AFB; however, the snake has never been observed (MAFB 2010a; MAFB 2012a). Removal and eradication of the invasive Brazilian pepper and melaleuca tree would also improve gopher tortoise habitat (MAFB 2010a).

No threatened or endangered plant species have been documented on MacDill AFB. However, MacDill AFB has sea oats (*Uniola paniculata*) and sea grapes (*Coccoloba uvifera*) on its shoreline, which are protected under Florida Statutes Chapter 161.242. This regulation states: “It is unlawful for any purpose to cut, harvest, remove, or eradicate any of the grass commonly known as sea oats or *Uniola paniculata* and *Coccolobis uvifera* commonly referred to as sea grapes from any public land or from any private land without consent of the owner of such land or person having lawful possession thereof.” The purpose of this regulation is to protect the beaches and shores of the state from erosion by preserving natural vegetative cover to bind the sand (MAFB 2010a).

All bird species occurring on MacDill AFB are protected under the Migratory Bird Treaty Act and EO 13186, with the exception of nonnative species (i.e., rock pigeon [*Columba livia*], European starling [*Sturnus vulgaris*], and house sparrow [*Passer domesticus*]).

EFH has been designated for 25 species within Tampa and Hillsborough bays, which are adjacent to MacDill AFB; however, there are no habitat areas of particular concern designated in the waters adjacent to MacDill AFB. **Table 3-9** lists the species and their life stage(s) that are protected as part of the EFH within Tampa and Hillsborough bays. Pursuant to the Magnuson-Stevens Fisheries Conservation and Management Act, Federal agencies must consult with fishery managers concerning actions (including the issuance of permits for private activities) that might adversely impact EFH.

3.7 Cultural Resources

3.7.1 Definition of the Resource

Cultural resources is an umbrella term for many heritage-related resources, including prehistoric and historic sites, buildings, structures, districts, or any other physical evidence of human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason. Depending on the condition and historic use, such resources might provide insight into the cultural practices of previous civilizations, or they might retain cultural and religious significance to modern groups.

Several Federal laws and regulations govern protection of cultural resources, including the NHPA of 1966, the Archaeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act (NAGPRA) (1990).

Typically, cultural resources are subdivided into archaeological resources (prehistoric or historic sites, where human activity has left physical evidence of that activity but no structures remain standing); architectural resources (buildings or other structures or groups of structures, or designed landscapes that are of historic or aesthetic significance); or resources of traditional, religious, or cultural significance to Native American tribes.

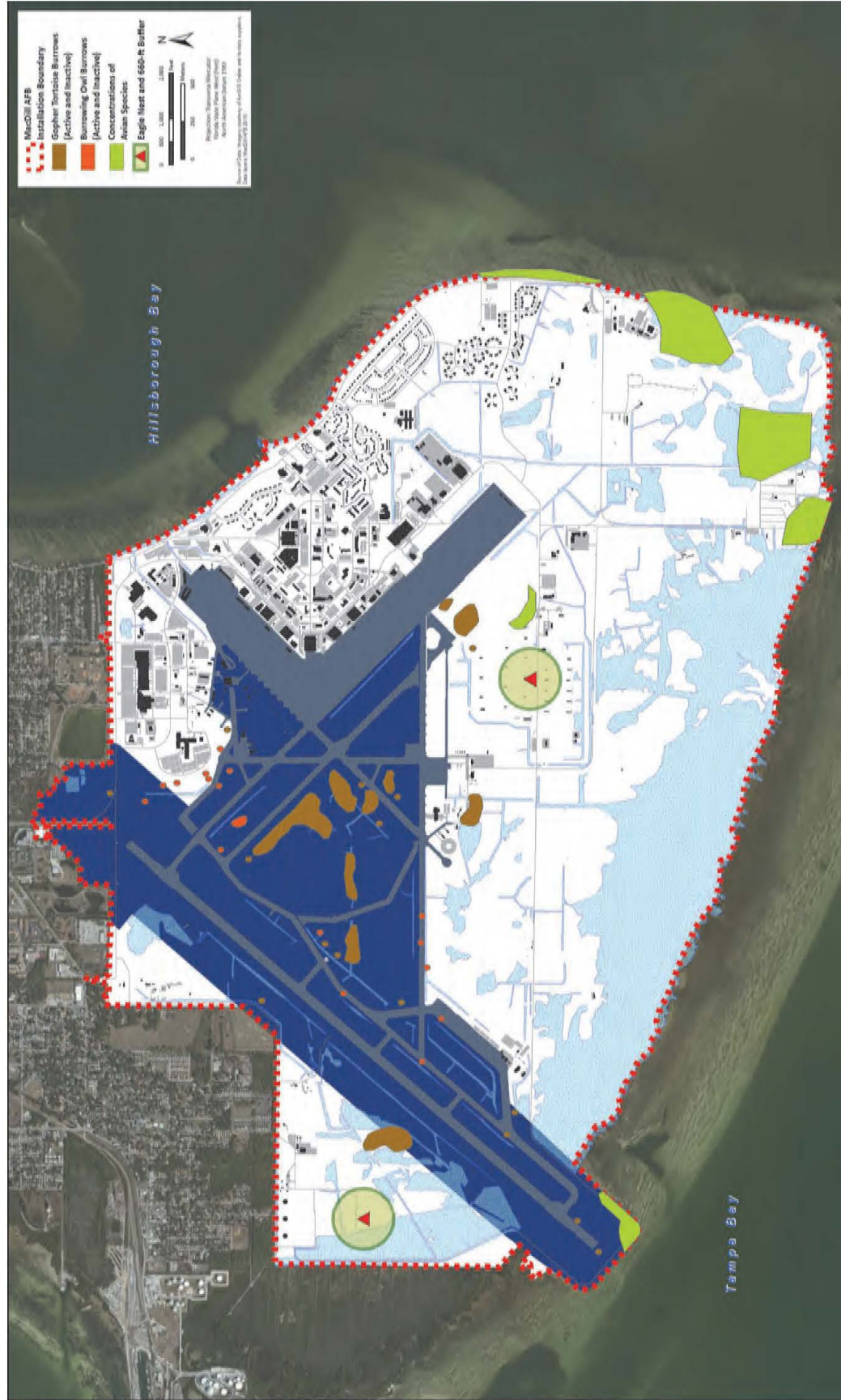


Figure 3-2. Biological Constraints at MacDill AFB

Table 3-9. Fish and Invertebrate Species with EFH in Tampa and Hillsborough Bays

Common Name	Scientific Name	Protected Life Stage			
		Eggs	Larvae	Juveniles	Adults
Great hammerhead shark	<i>Sphyrna mokarran</i>	NA	NA	X	X
Scalloped hammerhead shark	<i>Sphyrna lewini</i>	NA	NA	X	–
Nurse shark	<i>Ginglymostoma cirratum</i>	NA	NA	X	X
Blacktip shark	<i>Carcharhinus limbatus</i>	NA	NA	X	X
Bull shark	<i>Carcharhinus leucas</i>	NA	NA	X	X
Dusky shark	<i>Carcharhinus obscurus</i>	NA	NA	X	–
Lemon shark	<i>Negaprion brevirostris</i>	NA	NA	X	X
Sandbar shark	<i>Carcharhinus plumbeus</i>	NA	NA	X	X
Spinner shark	<i>Carcharhinus plumbeus</i>	NA	NA	X	–
Tiger shark	<i>Galeocerdo cuvieri</i>	NA	NA	X	X
Bonnethead shark	<i>Sphyrna tiburo</i>	NA	NA	X	X
Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>	NA	NA	X	X
Blacknose shark	<i>Carcharhinus acronotus</i>	NA	NA	X	X
Finetooth shark	<i>Carcharhinus isodon</i>	NA	NA	X	–
Pink shrimp	<i>Panaeus duorarum</i>	–	X	X	–
Gag	<i>Mycteroperca microlepis</i>	–	–	X	X
Cobia	<i>Rachycentron canadum</i>	–	X	–	X
Bluefish	<i>Pomatomus saltatrix</i>	–	X	X	X
Gray snapper	<i>Lutjanus griseus</i>	–	X	X	X
Yellowtail snapper	<i>Oxyurus chrysurus</i>	–	–	X	–
Gulf stone crab	<i>Menippe adina</i>	–	–	X	X
Lane snapper	<i>Lutjanus synagris</i>	–	X	X	–
Red drum	<i>Sciaenops ocellatus</i>	–	X	X	X
Spanish mackerel	<i>Scomberomorus maculatus</i>	–	X	–	X
Spiny lobster	<i>Panulirus argus</i>	–	X	X	X

Source: GMFMC 1998, NMFS 1999

Key:

NA = Not Applicable

– = EFH has not been designated for that life stage of that species.

Archaeological resources comprise areas where human activity has measurably altered the earth, or deposits of physical remains are found (e.g., projectile points and bottles).

Architectural resources include standing buildings, bridges, dams, and other structures of historic or aesthetic significance. Generally, architectural resources must be more than 50 years old to be considered eligible for the NRHP. More recent structures, such as Cold War-era resources, might warrant protection if they are of exceptional significance or if they have the potential to gain significance in the future.

Resources of traditional, religious, or cultural significance to Native American tribes can include archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants,

animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

The EA process and the consultation process prescribed in Section 106 of the NHPA require an assessment of the potential impact of an undertaking on historic properties that are within the proposed project's Area of Potential Effect (APE), which is defined as the geographic area(s) "within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Under Section 110 of the NHPA, Federal agencies are required to inventory resources under their purview and nominate those eligible to the NRHP. In accordance with the NHPA, consultation with the SHPO is required regarding evaluation of a property's NRHP eligibility and determination of potential effects of an undertaking on historic properties.

Federally recognized Native American tribes are consulted in accordance with EO 13175, *Consultation and Coordination With Indian Tribal Governments* (9 November 2000), to develop ongoing relationships with the tribes on a government-to-government basis. Project-specific consultation with federally recognized Indian tribes is carried out pursuant to Section 106 of the NHPA, NEPA, and other authorities.

3.7.2 Existing Conditions

MacDill AFB is in central Florida on what was historically known as Catfish Point on the southern point of Interbay Peninsula. The U.S. Congress authorized the construction of an airfield in 1935, although construction did not begin until 1939 when a Works Progress Administration crew began draining and filling the site. MacDill Field was named in honor of Colonel Leslie MacDill, an early aviation pioneer. MacDill AFB trained pilots during World War II and was scheduled for closure in 1961, but became critical for national security during the Cuban Missile Crisis. Currently, 6 AMW is the host unit at MacDill AFB, with a mission to "generate and execute air refueling, airlift, and contingency response capability, while providing base support for joint, coalition, interagency partners, including CENTCOM & SOCOM" (MAFB 2011c).

MacDill AFB has been extensively surveyed for archaeological resources and has five recorded prehistoric archaeological sites, including two that are eligible for listing in the NRHP. A summary of the significant archaeological investigations at MacDill AFB include a University of South Florida investigation of the Gadsden Point area in 1952, an extensive survey of the golf course in 1983, a Cultural Resources Reconnaissance Survey of the entire installation by the National Park Service (NPS) in 1986, a survey of a proposed utility corridor along the perimeter of the installation in 1988, and a Phase II evaluation of the Gadsden Point Site (8Hi50) and EOD Site (8Hi5656) in 1996.

The NPS survey determined that 85 percent of the installation has been disturbed by construction, development of recreational areas, and periodic use including firing ranges, tree plots, fill sites, and explosive storage. In 1986, the remaining 15 percent of the installation, which included portions that were largely undisturbed, underwent a Cultural Resources Reconnaissance Survey conducted by the NPS. The Cultural Resources Reconnaissance Survey and testing effort completed by the NPS did not identify any additional archaeological sites. At that time, the Florida SHPO concurred with the results of the NPS survey and considered the Cultural Resources Reconnaissance Survey of MacDill AFB to be complete and sufficient, but have more recently clarified that the possibility of discovering unidentified archaeological resources could still exist on the installation. The 1988 utility corridor survey discovered the Runway Site (8Hi3382), which was determined to be eligible for the NRHP following a Phase II investigation in 1991. Likewise, a portion of the Gadsden Point Site was determined eligible for the NRHP during a Phase II evaluation in 1996. Consultation with the Florida SHPO has been accomplished for both of the Phase II archaeological investigations; the SHPO concurred with the determination of eligibility for both the Runway Site and the Gadsden Point Site.

There are no known Traditional Cultural Properties at MacDill AFB. Following USAF policy, MacDill has completed the process of identifying sites sacred or important to Native Americans through consultation with federally recognized Tribes. With the exception of the burial site at archaeological site 8Hi50, there are no sacred sites identified at MacDill AFB. The ICRMP identified two federally recognized affiliated tribes organizations, the Seminole Indian Tribes of Florida and the Miccosukee Indian Tribe, as potential partners in cultural resources consultation.

MacDill AFB has been comprehensively surveyed for historic architectural resources and currently has two NRHP-eligible historic districts, the MacDill Field Historic District, and the Staff Officer's Quarters Historic District. The MacDill Field Historic District is eligible under NRHP Criterion A because of its association with events during World War II and the Cold War important to American history, and Criterion C, for its distinctive architecture.

The Staff Officer's Quarters Historic District is eligible under National Register Criterion A because of its association with the World War II training mission, and Criterion C, for its distinctive Mediterranean Revival architecture. The SHPO has concurred that 8 of the 25 remaining structures within the MacDill Field Historic District (Buildings 1, 2, 3, 4, 5, 26, 30, and 41) and 4 of the 5 remaining structures within the Staff Officer's Quarters Historic District (Buildings 401, 402, 404, and 405) are individually eligible for listing in the NRHP (MAFB 2011c). Although CENTCOM Headquarters (Building 540) was individually eligible for NRHP listing, the building was demolished in March 2012. A Memorandum of Agreement (MOA) with the Florida SHPO was executed in December 2009 (USAF 2009). Historic American Building Survey (HABS) documentation has been prepared for all NRHP-eligible buildings. The SOCOM Headquarters building (Building 501), constructed in 1968, has not been evaluated, but could be eligible for listing in the NRHP because of its continued use as integrated command headquarters during the later years of the Cold War. No HABS documentation has been prepared (for security reasons, the building has not been photographed). MacDill AFB conducted an evaluation of 20 structures that were built between 1966 and 1989 that would be affected by facility construction, demolition, or renovation activities as described in this IDEA. These facilities (Buildings 89, 119, 175, 189, 500, 510, 694, 848, 861, 863, 886, 1051, 1053, 1061, 1062, 1066, 1075, 1107, 1135, and 1161) were evaluated because they were constructed in the late Cold War period and could be eligible for listing in the NRHP. The structures were determined to be not eligible for listing under the NRHP due to a lack of historic or architectural significance (MAFB 2012b).

3.8 Socioeconomics and Environmental Justice

3.8.1 Definition of the Resource

Socioeconomic Resources. Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly characteristics of population and economic activity. Regional birth and death rates and immigration and emigration affect population levels. Economic activity typically encompasses employment, personal income, and industrial or commercial growth. Changes in these fundamental socioeconomic indicators typically result in changes to additional socioeconomic indicators, such as housing availability and the provision of public services. Socioeconomic data at county, state, and national levels permit characterization of baseline conditions in the context of regional, state, and national trends.

Demographics, employment characteristics, and housing occupancy status data provide key insights into socioeconomic conditions that might be affected by a proposed action. Demographics identify the population levels and the changes in population levels of a region over time. Demographic data might also be obtained to identify a region's characteristics in terms of race, ethnicity, poverty status, educational attainment level, and other broad indicators. Data on employment characteristics identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on personal income in a region can be used to compare the "before" and "after" effects of any jobs created or lost as a result of a proposed action. Data on industrial or commercial growth or growth in other sectors of the economy provide baseline and trend line information about the economic health of a region. Housing statistics provide baseline information about the local housing stock, the percentage of houses that are occupied, and the ratio of renters to homeowners. Housing statistics allow for baseline information to evaluate the impacts a proposed action might have upon housing in the region. In appropriate cases, data on an installation's expenditures in the regional economy help to identify the relative importance of an installation in terms of its purchasing power and influence in the job market. Socioeconomic data shown in this section are presented at census tract, county, state, and national levels to characterize baseline socioeconomic conditions in the context of regional and state trends.

Environmental Justice. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. The EO was created to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no groups of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, tribal, and local programs and policies.

Environmental justice concerns include race, ethnicity, and the poverty status of populations in the vicinity of a proposed action. Such information aids in evaluating whether a proposed action would render vulnerable any of the groups targeted for protection in the EO.

3.8.2 Existing Conditions

For this EA, the socioeconomic and environmental justice baseline conditions are presented using four spatial levels: (1) the Region of Influence (ROI); (2) the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area; (3) state-level data for the State of Florida; and (4) national level data for the United States. The ROI data are included to provide baseline conditions for locales close to the selected projects. The ROI for this project is defined as the Census Tracts including and surrounding MacDill AFB and are Census Tracts 65.01, 65.02, 66, 67, 68.01, 68.02, 69, 70.01, 70.02, 71.02, 71.03, 72, and 73. Data for the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area are included in the analysis, as this is a larger scale for where socioeconomic and environmental justice impacts could occur. Data for Florida and the United States are included to provide additional levels for comparison. **Figure 3-3** displays the ROI to be analyzed.

Demographics. The population within the ROI for this EA decreased 7 percent from 1990 to 2000, and grew by 6.9 percent from 2000 to 2010. The population in the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area grew 16 percent between the 1990 and 2000 Census and 16 percent between the 2000 and 2010 Census. The overall rate of growth for the Metropolitan Statistical Area was less than the State of Florida, but greater than the United States (U.S. Census Bureau 1990, U.S. Census Bureau 2010). **Table 3-10** displays population data for the area around MacDill AFB.

Table 3-10. Population Estimates for the Area Surrounding MacDill AFB, 1990, 2000, and 2010

Location	1990	2000	2010	Percent Change		
				1990 to 2000	2000 to 2010	1990 to 2010
ROI	44,965	41,992	44,923	-6.6%	6.9%	
Tampa-St. Petersburg-Clearwater, FL Metropolitan Statistical Area	2,067,959	2,395,997	2,783,243	15.9%	16.2%	34.6%
Florida	12,937,926	15,982,378	18,801,310	23.5%	17.6%	45.3%
United States	248,709,873	281,421,906	308,745,538	13.2%	9.7%	24.1%

Sources: U.S. Census Bureau 1990, U.S. Census Bureau 2000, U.S. Census Bureau 2010

Housing. The housing vacancy rate within the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area in 2010 was 15 percent, with approximately 200,000 vacant housing units. The housing vacancy rate within the Metropolitan Statistical Area was greater than the housing vacancy rate for the United States, which was 12 percent in 2010. The vacancy rate in Florida is 18 percent, which was greater than the 15 percent reported for the Metropolitan Statistical Area (U.S. Census Bureau 2010). See **Table 3-11** for housing data for the area around MacDill AFB.



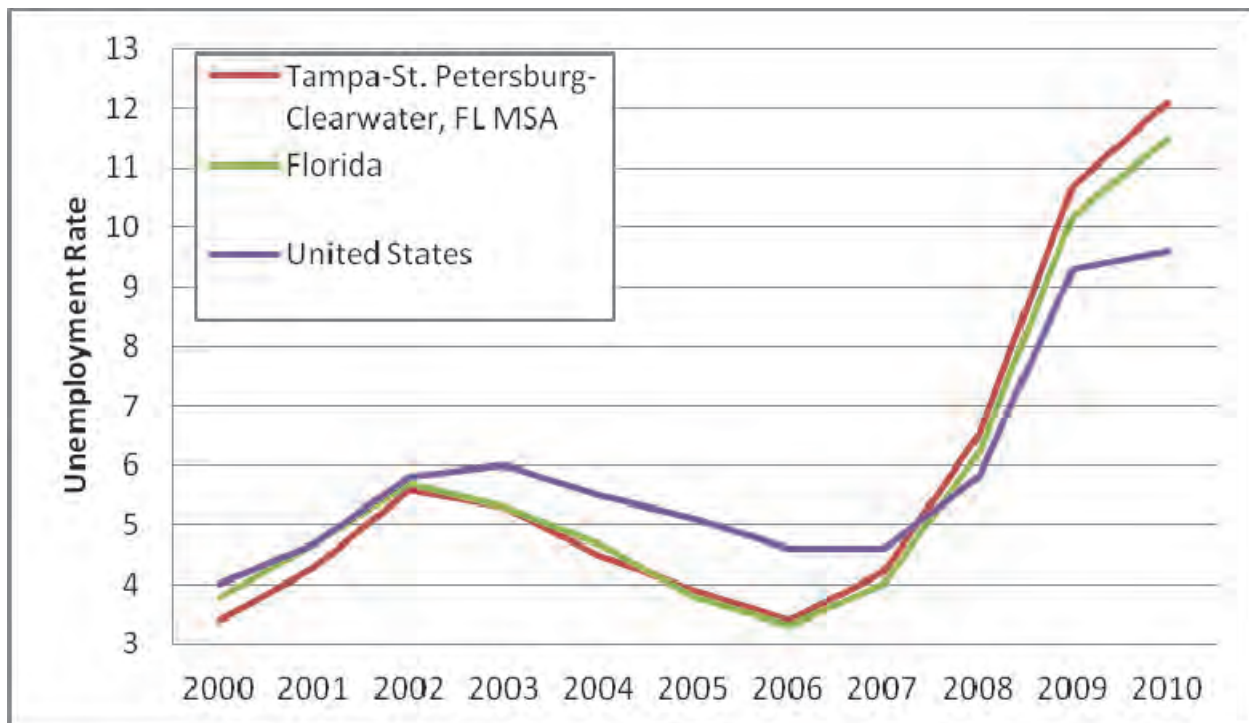
Figure 3-3. Socioeconomic Region of Influence for the Selected Projects

Table 3-11. Vacant Housing Units in the Vicinity of MacDill AFB, 2010

Location	Total Units	Vacant Units	Percent Vacant
Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area	1,353,158	201,895	14.9%
Florida	8,989,580	1,568,778	17.5%
United States	131,704,730	14,988,438	11.4%

Source: U.S. Census Bureau 2010

Employment Characteristics. The ROI contains a larger percentage of persons employed within the armed forces (5.2 percent) when compared to the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area; Florida; and the United States, which all have 0.5 percent or less of the population employed within the armed forces. Within the ROI, the largest percentage of persons are employed within the professional, scientific, management, administrative, and waste management services industry (15.3 percent). The largest industries in the Tampa-St. Petersburg-Clearwater, Florida Metropolitan Statistical Area, Florida, and the United States are the education, health, and social services industries, representing 20 percent, 19 percent, and 22 percent, respectively (U.S. Census Bureau 2009). Employment characteristics are displayed in **Table 3-12**. Unemployment rates are shown in **Figure 3-4**.



Source: BLS 2011

Figure 3-4. Unemployment Rates, 2000 to 2010

Table 3-12. Overview of Employment by Industry in the Vicinity of MacDill AFB, 2005–2010

Industry	ROI	Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area	Florida	United States
Population 16 years and over in labor force	19,206	1,240,082	8,224,422	141,303,145
Percent of population employed within the armed forces	6.8%	0.3%	0.4	0.5%
Agriculture, forestry, fishing and hunting, and mining	0.02%	0.8%	1.1%	1.8%
Construction	8.2%	8.2%	9.3%	7.4%
Manufacturing	4.3%	6.8%	5.9%	11.2%
Wholesale trade	3.2%	3.6%	3.3%	3.2%
Retail trade	12.8%	12.7%	12.9%	11.5%
Transportation and warehousing, and utilities	4.6%	4.4%	5.1%	5.1%
Information	3.9%	2.9%	2.4%	2.4%
Finance, insurance, real estate, and rental and leasing	15.6%	9.9%	8.4%	7.1%
Professional, scientific, management, administrative, and waste management services	20.2%	12.3%	11.8%	10.3%
Educational, health and social services	17.2%	20.1%	19.2%	21.5%
Arts, entertainment, recreation, accommodation and food services	12.6%	9.5%	10.7%	8.8%
Other services (except public administration)	5.5%	5.0%	5.2%	4.8%
Public administration	6.8%	3.9%	4.8%	4.7%

Source: U.S. Census Bureau 2010

Environmental Justice. Race, ethnicity, and the poverty status of people within the ROI, Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area, and Florida were characterized to establish a baseline for environmental justice analysis. To establish a baseline for environmental justice effects, income, poverty, and race were examined at the census tract level and compared to the state and Tampa-St. Petersburg-Clearwater, Florida Metropolitan Statistical Area averages. Census tracts having disproportionately low-income or high-poverty levels or percentages of minorities are discussed in more detail to determine if environmental justice impacts could occur.

The 13 census tracts that compose the ROI were compared to the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area, Florida, and the United States. Census Tracts 65.01, 65.02, 66, and 67 are approximately 2 miles north of MacDill AFB. The ROI contained a slightly elevated population reporting two or more races as their ethnicity, 3.0 percent, when compared to the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area's overall rate of 1.3 percent. The percentage of persons reporting Asian in the ROI was 5.3 percent, compared to 2.7 percent in the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area and 2.2 percent in Florida at large. The percentage of

families below the poverty line was greater in the ROI, at 10.3 percent, when compared to the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area at 9.1 percent and Florida at 9.5 percent. Median household income in the ROI, at \$50,039, is greater than the Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area at \$46,315 and Florida, at \$51,014 (U.S. Census Bureau 2009). See **Table 3-13** for race and ethnicity and low-income data.

**Table 3-13. Race, Ethnicity, and Poverty Characteristics
for the Greater MacDill AFB Area, 2005–2010**

Characteristics	Tampa-St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area	ROI	Florida	United States
Total Population	2,702,390	19,206	18,222,420	301,461,533
Population under 18 years of age	21.9%	7,271	22.3%	24.6%
White	70.5%	77%	60.5%	65.8%
Black or African American	10.9%	11.9%	14.8%	12.1%
American Indian & Alaska Native	0.2%	.1%	0.2%	0.7%
Asian	2.7%	5.3%	2.2%	4.3%
Native Pacific Islander	0.1%	.7%	0.0%	0.1%
Some Other Race	0.2%	1.6%	0.3%	0.2%
Two or More Races	1.3%	3.0%	1.2%	1.6%
Hispanic or Latino *	14.1%	12.5%	20.6%	15.1%
Families below poverty level	9.1%	9.6%	9.5%	9.9%
Median Household Income	\$46,315	50,039	47,450	51,425

Source: U.S. Census Bureau 2010

Notes: Percentages might not sum exactly to 100 due to rounding.

*Hispanic origin, could be of any race.

3.9 Infrastructure

3.9.1 Definition of the Resource

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as “urban” or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to economic growth of an area. The infrastructure components to be discussed in this section include the airfield, electrical systems, natural gas system, liquid fuel, water supply, sanitary sewer, storm water systems, transportation system, and solid waste.

The airfield includes all pavements, runways, overruns, aprons, ramps, and arm/disarm pads that are associated with aircraft maintenance and aircraft operations. Utilities include electrical supply, central heating and cooling, liquid fuel supply, natural gas supply, water supply, sanitary sewer and wastewater systems, storm water drainage, and communications systems. Transportation includes major and minor roadways that feed into the installation and the security gates, and roadways and parking areas on the installation. Public transit, rail, and pedestrian networks are also elements of transportation.

The availability of landfills to support a population's residential, commercial, and industrial needs is integral in evaluating municipal solid waste (MSW). Alternative means of waste disposal might involve waste-to-energy programs or incineration. In some localities, landfills are designed specifically for, and are limited to, disposal of C&D debris. Recycling programs for various waste categories (e.g., glass, metals, and papers) reduce reliance of landfills for disposal.

The infrastructure information contained in this section provides a brief overview of each infrastructure component and comments on its existing general condition.

3.9.2 Existing Conditions

Airfield. The MacDill AFB airfield pavements system includes the runway, paved overruns, parking/maintenance aprons, aircraft taxiways, and arm/disarm pad. The installation's single runway, Runway 04/22, runs northeast to southwest, parallel to Taxiway G. The main aircraft parking apron is connected by Taxiway K, which runs east and west, and Taxiway L, which runs northeast to southwest and intersects Taxiway K. Taxiway N originates at the same location as Taxiway L but runs northwest, becomes Taxiway F, and connects to Runway 04/22. There is an additional parking apron along Taxiway I.

Electrical Systems. Tampa Electric Company provides electrical power to MacDill AFB. The installation has two 37.5-megawatt (MW) transformers that each run at approximately 47 percent of its maximum load capacity during normal operation. However, all loads must run off of one transformer at various times throughout the year, putting the installation at approximately 95 percent load capacity. The maximum load capacity for the installation is 1,400 amperes at 13.8 kilovolts (kV). During peak demand, the installation runs at 1,356 amperes, so additional demand at the main substation could cause over amperage, which would trip the main breakers at the substation. Therefore, a second substation could be required for MacDill AFB in the near future (Drake 2012). In 2011, MacDill AFB consumed a total of 194,168,810 kilowatt-hours (kWh) of electricity (MAFB 2012d).

The majority of the electrical lines are aboveground, with a few primary cables underground. The underground cable originates in the northeastern area of the installation at the substation and continues through the installation's core to the southern area of the installation. Electricity to the WSA and MFH are also provided by underground cables.

Emergency electrical generation on the installation is provided by backup generators. Since 2003, eight backup generators have been replaced and the current condition of the backup electrical system is rated as adequate (MAFB 2011b).

In addition, two interconnected electrical projects are underway. These projects would entail relocating the existing aboveground, pole-mounted electric utility lines to underground, conduit-encased lines along Golf Course Avenue and the northern section of Marina Bay Drive in the southeastern portion of MacDill AFB. This portion of the installation is generally designated as recreational, with a small section of industrial facilities along the northern portion of Marina Bay Drive. The electric lines would continue to follow the same routes as the existing aboveground distribution system, but would be constructed underground and enclosed in concrete duct banks with regular access points and manholes.

Another project underway is to upgrade a substation by replacing load break cabinets with switch gear and upgrading transmission lines to carry full load capabilities. This project includes repairing the SOCCENT feeder by relocating transmission lines from aboveground to below grade, extending the north long feeder to the substation to provide redundancy to the Manhattan switch gear, and reconnecting the existing feed to the north short feeder to provide adequate load capacity.

The SOCOM Complex Electrical Feeder also was recently repaired. A 13.2-kV underground feeder to Building 501 was replaced by installing a new upgraded express cable from the MacDill switch station to the connection at the SOCOM complex and upgrading the feed to two parallel cable feeds to accommodate new construction at complex.

There are electrical utilities within 1,000 feet of all the proposed project locations with the exception of Project C3 (Construct EOD Bunker Barricades), which is about 1,200 feet away from the closest electrical utilities, and a component of Project NI1 (Storm Water Drainage Improvements), which is about 1,350 feet away from the closest electrical utilities (MAFB 2011b).

Natural Gas System. Peoples Gas Company of Tampa provides natural gas to MacDill AFB. The gas lines enter the installation in the northeastern area at the intersection of MacDill Avenue and North Boundary Boulevard. The lines then run along Tampa Point Boulevard where they are distributed throughout the installation, with the exception of the western section of the installation, which does not currently have a natural gas line network. In November 2005, the natural gas system was rated adequate and all leaks had been repaired (MAFB 2006a). In 2011, MacDill AFB consumed 291,330 therms (28,206,000 cubic feet [ft³]) of natural gas (MAFB 2012d).

There is no nearby natural gas infrastructure at the following proposed project locations: Project D2 (Demolish Building 1107), C3 (Construct EOD Bunker Barricades), C5 (Construct Outdoor Recreation Maintenance Facility), C6 (Alert Facility, FMSE Facility), I4 (Construct Medical Clinic Sidewalks), I6 (Construct DISA Parking Lot), NI1 (Storm Water Drainage Improvements), and S1 (Install Jogging Path Lighting). All other project locations have natural gas infrastructure available within 1,000 feet (MAFB 2011b).

Liquid Fuel. The fuel system at MacDill AFB consists of one Type III pressurized hydrant system with 35,000-barrel operating tanks (servicing 12 hydrant pits), a Type 1 hydrant system (servicing 10 hydrant pits), a pipeline transfer system consisting of 15,663 feet of 10-inch piping for distributing jet fuel, and a gas station. In November 2005, an assessment of the installation's receipt, storage, transfer, fill stands, hydrant refueling, and ground products determined that the jet fuel distribution system at MacDill AFB was adequate (MAFB 2006a).

Communication Systems. The communications system on MacDill AFB consists of copper cable, fiber optic cable, and manhole/conduit systems that provide communications support for the installation. The copper system provides support for telephones, fire and crash systems, security alarm systems, radio systems, energy monitoring and control system, and low speed point-to-point data systems (MAFB 2006a).

A new consolidated communications facility is currently under construction. This new facility will house the telephone switch and installation network control center. These functions are currently housed in Buildings 40 and 260, which are subject to flooding. In addition, the consolidated communications facility includes the installation of additional communications infrastructure such as new cables, conduits, and manholes to support the new facility.

Water Supply. The sanitary sewer system and potable water system operate under private ownership of the Florida Governmental Utility Authority (FGUA) at MacDill AFB. The City of Tampa supplies potable water to FGUA, which, in turn, supplies to MacDill AFB, which obtains drinking water from surface water sources and through purchases from Tampa Bay Water. The purchased water is obtained from Tampa Bay Water's Aquifer Storage and Recovery system, groundwater, surface water, and desalinated seawater supplies. There are no potable water supply wells on MacDill AFB.

The City of Tampa provides potable water to MacDill AFB through three service connections: (1) just outside the Dale Mabry Gate, east of Dale Mabry Highway, (2) in the grassy area between North Boundary Road and Himes Avenue, and (3) inside the installation just east of the MacDill Avenue Gate. All three connections are equipped with a parallel set of reduced pressure backflow preventers. The Dale Mabry connection consists of a 20-inch-diameter pipe reduced to 16-inch-diameter pipe inside the installation. Both the Himes Avenue and MacDill Avenue connections consist of 12-inch-diameter pipes. Each connection is equipped with a 6-inch water meter (MAFB 2006a, MAFB 2011b).

Potable water from the City of Tampa is piped directly to MacDill AFB's water plant. The water plant consists of two pump houses and two 500,000-gallon underground reservoirs. Water from the City of Tampa is piped into the reservoirs after receiving a chloramine disinfectant from the booster system. Water from the reservoirs is then pumped into the distribution system using one of two alternating 75 horsepower pumps in Facility 927. The installation has approximately 227,000 linear feet of water piping and total storage capacity of 1.75 million gallons. The pump system has a combined capacity of approximately 5.76 million gallons per day (mgd), and the daily demand ranges from 0.8 to 1.3 mgd (Harrison 2012).

A 2002 internal audit found multiple areas for improvement in MacDill AFB's existing water system due to its age and degraded condition (MAFB 2006a, MAFB 2011b).

There are water lines within 1,000 feet of all project locations, with the exception of Project C3 (Construct EOD Bunker Barricades), which is about 2,000 feet away from the nearest water line; Project I6 (Construct DISA Parking lot), which is about 1,050 feet away from the nearest water line; and a component of Project NI1 (Storm Water Drainage Improvements), which is about 1,100 feet away from the nearest water utility line (MAFB 2011b).

Sanitary Sewer. The sanitary sewer system and potable water systems operate under private ownership of the FGUA at MacDill AFB and consist of sewer lines, lift stations, and a WWTP. The WWTP is in the southeastern corner of the installation on Bayshore Drive. The WWTP is permitted to treat 1.2 mgd with a design that would provide for 2 mgd. Current operations are at 400,000 gallons per day that treat mainly domestic wastewater. The tertiary treatment process uses activated sludge, clarifiers, sand filtration, and disinfection prior to discharge into a holding pond adjacent to the WWTP. The two golf courses at the Bay Palms Golf Complex on the installation use most of the discharge for irrigation purposes. During dry periods there is not adequate discharge to irrigate the courses, and, during wet periods, the surplus water is sent to an irrigation field near Golf Course Avenue and Marina Bay Drive. A 20-million-gallon percolation pond is just northwest of the intersection of Marina Bay Drive and Southshore Avenue. The WWTP service area does not completely encompass the installation; therefore, MacDill AFB uses onsite septic systems for wastewater treatment and disposal for primarily the western portion of the installation and the gates. MacDill AFB currently has 16 septic systems (MAFB 2011). To detect any possible contamination, monitoring wells are 10 to 15 feet below ground throughout the golf course complex.

There are sanitary sewer utilities within 1,000 feet from all project locations, with the exception of Project C3 (Construct EOD Bunker Barricades), which is about 1,500 feet away from the nearest sewer line; Project I6 (Construct DISA Parking Lot), which is about 1,250 feet away from the nearest sewer line; and components of Project NI1 (Storm Water Drainage Improvements), which are up to about 4,500 feet away from the nearest water utility line (MAFB 2011b).

Storm Water Systems. The MacDill AFB storm water drainage system consists of drainage ditches, culverts, storage ponds, and other infrastructure feeding into tidal creeks and canals, or directly into Tampa Bay or Hillsborough Bay. Areas of the installation that are not served by storm water

infrastructure either drain over land into water bodies or infiltrate into the soil. Storm water flows resulting in flooding can be problematic at MacDill AFB during periods of excessive rainfall due to the flat topography and large areas of impervious surfaces that drain to undersized inlets (MAFB 2006a, MAFB 2011b).

Storm water management areas on MacDill AFB manage storm water flow and protect receiving water bodies from increased velocity and volume of storm water runoff after a storm event. In addition, increased sedimentation in receiving water bodies is reduced during storm events through capturing of sediment by retention ponds. At a minimum, the SWFWMD requires that MacDill AFB treat the first inch of storm water runoff from the contributing drainage basin when using wet detention, and the first 0.5 inches from the contributing drainage basin when using dry detention methods. In addition, EISA Section 438 requires MacDill AFB to demonstrate that post-project hydrology matches pre-project conditions in terms of volume, flow rate, temperature, and other parameters. These two requirements can increase the minimum capacity of the permitted storm water management system. Storm water retention ponds, and other storm water management techniques such as dry retention ponds, aid in complying with this requirement. An environmental resource permit from the SWFWMD is required before beginning any construction activity that would affect wetlands, alter surface water flows, or contribute to water pollution.

In accordance with Rule 40D-40.302 and 62-25.040 F.A.C., any permitted storm water management areas that are removed must be replaced. New or modified (i.e., relocated) storm water management areas require an environmental resource permit. MacDill AFB has numerous permitted storm water management areas, with Lewis Lake being the largest water body collecting runoff from the runway.

Inadequacies of MacDill AFB's storm water management system include multiple culverts thorough the installation, which have broken headwalls and drainage pipes, and have an inadequate capacity during storm events, which result in overflows of storm water (see **Figure 2-20**). In one location within the golf course, oyster colonization is impairing the integrity of a culvert by eroding the headwall. The headwall of Taxiway G was damaged by heavy equipment and concrete debris now clogs drainage. In addition, many of MacDill AFB's culverts and open drainage ditches are overgrown with brush, which restricts drainage and causes localized flooding. Therefore, storm water management features throughout the installation are inadequate for proper drainage after storm events.

Solid Waste. Municipal solid waste at MacDill AFB is managed in accordance with the guidelines specified in AFI 32-7042, *Solid and Hazardous Waste Compliance*. AFI 32-7042 establishes the requirement for installations to have a solid waste management program that incorporates the following: a solid waste management plan; procedures for handling, storage, collection, and disposal of solid waste; recordkeeping and reporting; and pollution prevention.

MacDill AFB has a Qualified Recycling Program that is responsible for the collection, recycling, disposal, tracking, and reporting of all solid waste on the installation. MacDill AFB has contracted with Waste Management and the Defense Reutilization and Marketing Office (DRMO) to handle the collection, recycling, and disposal of solid waste. Sea Coast Disposal, Inc., a solid waste management contractor, is responsible for the collection services that are provided to MFH, administrative offices, and industrial operations on the installation. The common areas of the administrative offices have recycling bins for mixed paper and aluminum cans. DRMO is responsible for the recycling of government-procured items such as car batteries, furniture, appliances, computers, paints, lubricants, and antifreeze. Cardboard is recycled by the Army and Air Force Exchange Service and the Defense Commissary Agency.

Since 2001, MacDill AFB has a diversion rate of 40 percent or higher for recycling solid waste. Solid waste generated by MacDill AFB that is not diverted is typically disposed of at the McKay Bay Refuse-To-Energy Facility located off-installation in Tampa (MAFB 2004). This facility receives an average of more than 330,000 tons of waste annually. The McKay Bay Refuse-To-Energy Facility has a design capacity of about 1,000 tons per day and the McKay Transfer Station has a design capacity of about 800 tons per day. The complex (the facility and the transfer station together) is said to have an operational capacity of about 1,639 tons per day. As of 2007, the Southeast County Landfill had a remaining capacity of about 6 million tons and a projected lifetime of 37 additional years. Two previous expansions at the landfill have already been filled, and construction of another 1.8-million-ton expansion is under construction (Tampa 2012, SWEPM undated).

C&D waste generated from specific construction, renovation, and maintenance projects on MacDill AFB, most of which are performed by contractors, is the responsibility of the contractor. Contractors are required to comply with Federal, state, local, and USAF regulations for the collection and disposal of MSW from the installation. Much of this material can be recycled or reused, or otherwise diverted from landfills. All non-recyclable C&D waste is collected in a dumpster until removal. C&D waste contaminated with hazardous waste, ACM, LBP, or other undesirable components is managed in accordance with AFI 32-7042. All new construction at MacDill AFB aims to achieve LEED Silver certification, which creates incentives for the contractor to use sustainable waste management and building materials.

Transportation System. Access to MacDill AFB is provided by four gates in the northern end of the installation at Dale Mabry Highway, Bayshore Boulevard, MacDill Avenue, and Tanker Way Gate. Most people access the installation using the gate at Dale Mabry Highway. More than 9,000 privately owned vehicles enter through the Dale Mabry Gate each day. As a result, morning rush hour traffic backs up for almost 2 miles and delays of more than 30 minutes are commonplace (MAFB 2011b).

Primary roads on the installation include North Boundary Boulevard, Bayshore Boulevard, South Boundary Boulevard, Hanger Loop Drive, Hillsborough Loop Drive, Administration Avenue, Tampa Point Boulevard, Florida Keys Avenue, Marina Bay Drive, and Zemke Avenue.

The Hillsborough Area Regional Transit Authority services MacDill AFB. The bicycle transportation network on the installation is very limited (MAFB 2010d, MAFB 2011b).

3.10 Hazardous Materials and Waste

3.10.1 Definition of the Resource

A hazardous substance, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. §9601(14)), is defined as “(A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33; (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title; (C) any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, (42 U.S.C. §6921); (D) any toxic pollutant listed under section 1317(a) of Title 33; (E) any hazardous air pollutant listed under Section 112 of the Clean Air Act (42 U.S.C. §7412); and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator of USEPA has taken action pursuant to Section 2606 of Title 15. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).”

Hazardous materials are defined by 49 CFR 171.8 as “hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions” in 49 CFR Part 173. Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations within 49 CFR Parts 105–180.

RCRA defines a hazardous waste in 42 U.S.C. §6903, as amended by the Hazardous and Solid Waste Amendments, as “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.” Subtitle C of RCRA is the primary portion of RCRA that addresses the management of hazardous waste. The goal of Subtitle C is to identify hazardous wastes/materials and to establish standards for accumulating, transporting, storing, treating, and disposing of hazardous waste. RCRA establishes a program that regulates waste from the point of generation to the point of destruction. This concept is the premise for the “cradle-to-grave” theory of RCRA. Federal regulations published by the USEPA that provide direction for the “cradle-to-grave” concept are found under 40 CFR 260–279. Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 CFR Part 273. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps.

The Toxic Substances Control Act (TSCA) of 1976 provides the USEPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and mixtures. TSCA addresses the production, importation, use, and disposal of specific chemicals including polychlorinated biphenyls (PCBs), asbestos, radon, and LBP. Special hazards are those substances that might pose a risk to human health; these special hazard substances are not regulated as contaminants under the hazardous wastes statutes but rather are addressed separately under the TSCA. Potential hazards generally associated with demolition of older buildings include ACM and LBP. Information on special hazards describing their locations, quantities, and condition assists in determining their relevance to a proposed action.

The DOD has developed the ERP, which facilitates environmentally responsible land management through investigation and cleanup of contaminated sites on military installations. Through the ERP, the DOD evaluates and cleans up sites where hazardous wastes have been spilled or released to the environment. Description of ERP activities provides a useful gauge of the condition of soils, water resources, and other resources that might be affected by contaminants. It also aids in the identification of properties and their usefulness for given purposes (e.g., activities dependent on groundwater usage might be restricted until remediation of a groundwater contaminant plume has been completed).

For the USAF, AFD 32-70, *Environmental Quality*, and the AFI 32-7000 series incorporate the requirements of all Federal regulations, and other AFIs and DOD directives for the management of hazardous materials, hazardous wastes, and special hazards. Evaluation extends to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project site of the selected projects.

In general, both hazardous materials and wastes include substances that, because of their quantity; concentration; or physical, chemical, or infectious characteristics, might present substantial danger to

public health or welfare or the environment when released or otherwise improperly managed. Evaluation of hazardous materials and wastes focuses on the storage, handling, use, transport, and disposal of these substances. In addition to being a threat to humans, the improper release of hazardous materials and wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of hazardous materials or wastes, the extent of contamination varies based on the type of soil, topography, and water resources.

3.10.2 Existing Conditions

Hazardous Materials and Petroleum Products. AFI 32-7086, *Hazardous Materials Management*, establishes procedures and standards that govern management of hazardous materials throughout the USAF. It applies to all USAF personnel who authorize, procure, issue, use, or dispose of hazardous materials, and to those who manage, monitor, or track any of those activities. Under AFI 32-7086, the USAF has established roles, responsibilities, and requirements for a hazardous materials management process (HMMP). The purpose of the HMMP is to control the procurement and use of hazardous materials to support USAF missions, ensure the safety and health of personnel and surrounding communities, and minimize USAF dependence on hazardous materials.

The 6 AMW has established an HMMP via MACDILL INSTRUCTION 32-700, *Hazardous Materials (HAZMAT) HMMP*, and an Installation Hazardous Materials Management Program (IHMP) in accordance with AFI 32-7086 and AMC Supplement 1, *Hazardous Materials Management* (MAFB 2009b). The MacDill AFB Pollution Prevention Management Action Plan supplements the MacDill AFB HMMP by identifying processes and procedures that reduce or eliminate the need for hazardous materials. Hazardous and toxic material procurements at the installation are currently managed through a centralized installation Hazardous Materials Pharmacy (HAZMART) using a standardized USAF tracking system (Enterprise Environmental Safety and Occupational Health – Management Information System [EESOH-MIS]). The main MacDill AFB HAZMART is operated out of Building 49; however, there is also a forward satellite HAZMART that supports flightline hazardous materials requirements (known as the “Flightline HAZMART”) (MAFB 2009b, MAFB 2011d). The EESOH-MIS tracks acquisition and inventory control of hazardous materials and hazardous waste disposals and emissions, and health and safety information (MAFB 2009b).

Hazardous materials and petroleum products such as fuels, flammable solvents, paints, corrosives, pesticides, and cleaners are used throughout MacDill AFB for various functions including aircraft maintenance; aircraft ground equipment maintenance; and ground vehicles, communications infrastructure, and facilities maintenance. Limited quantities of hazardous materials and petroleum products might be stored in facilities proposed to be demolished under the selected projects.

Hazardous and Petroleum Wastes. Hazardous wastes generated at MacDill AFB must be managed in accordance with Federal, state, and USAF regulatory requirements. The 6 AMW maintains a Hazardous Waste Management Plan for MacDill AFB (MAFB 2011k), which is required under AFI 32-7042, *Solid and Hazardous Waste Compliance*, and complies with 40 CFR Parts 260 to 272. The plan prescribes the roles and responsibilities of all members of MacDill AFB with respect to the waste stream inventory, waste analysis plan, hazardous waste management procedures, training, emergency response, and pollution prevention. The plan establishes the procedures to comply with applicable Federal, state, and local standards for solid waste and hazardous waste management.

Wastes generated at MacDill AFB include spent solvents, contaminated fuels and lubricants, paint/coating, stripping chemicals, waste oils, waste paint-related materials, and other miscellaneous wastes. Management of hazardous waste is the responsibility of each waste-generating organization and the environmental management flight (6 CES/CEV). As a large-quantity generator, MacDill AFB

produces more than 2,200 kilograms of hazardous waste per month. MacDill AFB collects hazardous wastes in two types of accumulation areas: initial accumulation points and a 90-day accumulation point. There are 42 initial (or satellite) accumulation points and one 90-day accumulation site (Building 1115) on the installation (MAFB 2011k). Waste containers are transferred from the satellite accumulation points to the 90-day accumulation point or the DRMO within 72 hours of being filled to capacity. A DRMO-approved contractor picks up hazardous waste for off-installation disposal. DRMO is responsible for the sale, reclamation, or disposal of hazardous materials and wastes generated at MacDill AFB. Used antifreeze, oil, and universal waste batteries are recycled. Limited quantities of hazardous and petroleum wastes might be stored in facilities proposed to be demolished under the selected projects.

Storage Tanks. AFI 32-7044, *Storage Tank Compliance*, implements AFD 32-70 and identifies compliance requirements for USTs, aboveground storage tanks (ASTs), and associated piping that store petroleum products and hazardous substances. USTs are subject to regulation under RCRA, 42 U.S.C. 6901, and 40 CFR 280.

MacDill AFB stores bulk quantities of fuel and oil in ASTs and USTs located throughout the installation. An inventory of ASTs and USTs at MacDill AFB, which includes the location, contents, capacity, containment measures, and installation dates, is maintained as part of the MacDill AFB SPCC Plan. MacDill AFB has a total aboveground storage capacity of 2,581,741 gallons and an underground storage capacity of 97,000 gallons (MAFB 2012c). The majority of the AST capacity is JP-8, including two 1,200,000-gallon ASTs used for aircraft refueling; other contents include diesel and oil. The contents of the USTs are gasoline, diesel, biodiesel, ethanol 85 (E-85), and JP-8 (MAFB 2012c).

The areas of the selected projects that contain hazardous materials, petroleum products, and hazardous and petroleum wastes in storage tanks are Building 40 (40-A [1,000-gallon diesel AST] and 40-B [58-gallon diesel AST]), Building 500 (500-A [480-gallon used oil AST] and 500-B, C, and D [three 270-gallon lube oil ASTs with 15W-40, 10W, and Dexron oil, respectively]), and Building 1051 (1051-A [10,000-gallon JP-8 “purging fuel” AST], 1051-B [10,000-gallon JP-5 AST], and 1051-C [5,000-gallon reclaimed JP-8 AST]) (MAFB 2012c).

Asbestos-Containing Material. Asbestos is regulated by the USEPA under the CAA, TSCA, and CERCLA. The USEPA has established that any material containing more than 1 percent asbestos by weight is considered an ACM. Friable ACM is any material containing more than 1 percent asbestos, and that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Nonfriable ACM is any ACM that does not meet the criteria for friable ACM. Florida has its own program and guidelines to manage ACM removal.

AFI 32-1052, *Facilities Asbestos Management*, which implements AFD 32-10, *Installations and Facilities*, ensures compliance with 40 CFR Part 61 Subpart M, *National Emissions Standard for Asbestos*, and 29 CFR 1926.1101, *Toxic and Hazardous Substances: Asbestos*. AFI 32-1052 requires installations to develop an asbestos management plan for the purpose of maintaining a permanent record of the status and condition of ACM in installation facilities, and documenting asbestos management efforts. In addition, the instruction requires installations to develop an asbestos operating plan detailing how the installation accomplishes asbestos-related projects. In 1989, USEPA promulgated its “Ban and Phase Down Rule,” which prohibited the manufacture, importation, processing, and commercial distribution of approximately 95 percent of all commercially available ACM used in the United States. Therefore, it is assumed that buildings on MacDill AFB constructed prior to the 1989 ban could contain ACM.

Asbestos at MacDill AFB is managed in accordance with the *Asbestos Management and Operations Plan*, which was most recently updated in 2011 (MAFB 2011j). This plan specifies procedures for the removal, encapsulation, enclosure, and repair activities associated with ACM-abatement projects. In addition, it is

designed to protect personnel who live and work on the installation from exposure to airborne asbestos fibers and to ensure the installation remains in compliance with Federal, state, and local regulations pertaining to asbestos. MacDill AFB maintains a record of ACM maintenance and abatement. Buildings on MacDill AFB that are scheduled for demolition under these selected projects would be surveyed and sampled, if required, for ACM. Materials that might contain asbestos include siding, ceiling tiles, roofing materials, floor tiles, floor tile mastic, joint compound, wallboard, thermal system insulation, boiler gaskets, paint, and other materials. Asbestos materials are removed on an as-needed basis to minimize health risks from release of asbestos fibers during normal activities, maintenance, renovation, or demolition.

The following buildings, which are proposed for demolition or other interior work that could disturb ACM, were built before 1989; therefore, they are assumed to contain asbestos: Buildings 13, 40, 52, 60, 64, 65, 82, 83, 85, 119, 303, 500, 510, 694, 1051, 1053, 1069, and 1107; and Facilities 46 and 47. As required under the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations, MacDill AFB completes asbestos surveys, notifies the USEPA and FDEP at least 10 days prior to demolition activities regardless of the presence of ACM, and removes ACM prior to the initiation of demolition activities.

Lead-Based Paint. Lead is a heavy, ductile metal commonly found simply as metallic lead or in association with organic compounds, oxides, and salts. It was commonly used in house paint until the Federal government banned the use of most LBP in 1978. Therefore, it is assumed that all structures built prior to 1978 could contain LBP. Paint chips that fall from the exterior of buildings can contaminate the soil if the paint contains lead. The USEPA has established recommendations for maximum lead soil contamination levels. No action is required if the lead concentration is less than 400 parts per million (ppm) in areas expected to be used by children, or less than 2,000 ppm in areas where contact by children is less likely. Soil abatement and public notice are recommended when lead levels exceed 5,000 ppm.

The Residential Lead-Based Paint Hazard Reduction Act of 1992, Subtitle B, Section 408 (commonly called Title X), passed by Congress on 28 October 1992, regulates the use and disposal of LBP on Federal facilities. Federal agencies are required to comply with applicable Federal, state, and local laws relating to LBP activities and hazards. USAF policy and guidance establishes LBP management at USAF facilities. The policy incorporates by reference the requirements of 29 CFR 1910.120, 29 CFR 1926, 40 CFR 50.12, 40 CFR 240–280, the Clean Air Act, and other applicable Federal regulations. In addition, the policy requires each installation to develop and implement a facility management plan for identifying, evaluating, managing, and abating LBP hazards. LBP at MacDill AFB is managed in accordance with the Lead-Based Paint Management Plan that was updated in 2007 (MAFB 2007a).

Priority facilities (i.e., MFH units) were surveyed for LBP in 1994. No comprehensive LBP survey of non-priority buildings has been conducted at MacDill AFB. However, non-priority buildings are surveyed on a case-by-case basis in conjunction with the work request process when renovation, maintenance, or other work practices could disturb painted surfaces (MAFB 2007a). Buildings on MacDill AFB that are proposed for demolition under these selected projects would be surveyed and sampled, if required, for LBP.

The following buildings, which are proposed for demolition or other interior work that could disturb LBP, were built before 1978; therefore, they could contain LBP: Buildings 13, 40, 52, 60, 64, 65, 82, 83, 85, 303, 500, 694, 1069, and 1107; and Facilities 46 and 47.

Polychlorinated Biphenyls. PCBs are a group of chemical mixtures used as insulators in electrical equipment, such as transformers capacitors, electric motors, and hydraulic systems, and fluorescent light ballasts. Federal regulations govern items containing between 50 and 499 ppm of PCBs. Chemicals

classified as PCBs were widely manufactured and used in the United States throughout the 1950s and 1960s. The production of PCBs was banned in the United States in 1979.

MacDill AFB has a PCB-free status; however, some of the older facilities proposed for demolition could have light fixtures or surge protectors with low concentrations of PCBs. Based on their age, it is assumed that several of the buildings associated with the selected projects might have PCB-containing equipment, particularly fluorescent light ballasts.

Pesticides. The MacDill AFB Integrated Pest Management Plan, required by AFI 32-1053 and Department of Defense Instruction (DODI) 4150.7, describes the pest management practices at the installation (MAFB 2010f). The plan outlines the pest management efforts of the three primary offices applying pesticides on the installation: pest management shop, grounds maintenance shop, and golf course maintenance shop. Chemical controls are a last-resort method implemented only after all other procedures have failed. MacDill AFB uses an integrated pest management approach, which emphasizes non-chemical strategies to minimize the types and quantities of pesticides used at the installation. MacDill AFB uses aerial spraying application of herbicides to control nuisance and invasive plant species mosquitoes on undeveloped or lesser developed portions of the installation. In FY 2010, the installation used 2,061 pounds of pesticides (MAFB 2010g). Limited quantities of pesticide products might be stored in facilities proposed to be demolished under the selected projects.

Radon. Radon is a naturally occurring radioactive gas found in soils and rocks. It comes from the natural breakdown or decay of uranium. Radon has the tendency to accumulate in enclosed spaces that are usually below ground and poorly ventilated (e.g., basements). Radon is an odorless, colorless gas that has been determined to increase the risk of developing lung cancer. In general, the risk increases as the level of radon and length of exposure increase.

The USEPA has established a guidance radon level of 4 pCi/L in indoor air for residences; however, no standards have been established for commercial structures. Radon gas accumulation greater than 4 pCi/L is considered to represent a health risk to occupants. Hillsborough County has been designated a zone 2 radon area, which means that the predicted average indoor radon screening level is between 2 and 4 pCi/L and that there is a moderate potential for elevated indoor radon levels (USEPA 2012b). The Florida Department of Health states that radon controls are generally unnecessary for new construction within Hillsborough County (Florida DOH 2012).

An initial screening survey for radon on MacDill AFB was performed in May 1988. None of the buildings selected for this survey were above the USEPA 4 pCi/L threshold. It was also determined during this survey that MacDill AFB fell under a “low probability” for elevated radon levels under the Air Force Radon Assessment and Management Program, and therefore MacDill AFB was not included in a detailed assessment. However, because the current USEPA radon map places Hillsborough County in Zone 2, verification is being sought as to whether buildings on MacDill AFB that were not surveyed in 1988 and buildings constructed since then require radon assessment surveys. No other additional radon data exist.

Environmental Restoration Program. The ERP, formerly known as the Installation Restoration Program, is a subcomponent of the Defense ERP that became law under the Superfund Amendments and Reauthorization Act of 1986 (SARA). The ERP requires each DOD installation to identify, investigate, and clean up hazardous waste disposal or release sites.

MacDill AFB contains 25 open ERP sites. **Figures 2-1 through 2-4** show the location of the open ERP sites on MacDill AFB. These ERP sites include landfills, storage tanks, drainage areas, fuel spills, spill areas, and fire-training areas. Primary contaminants in soil and water include fuels, waste solvents, dissolved phase fuels, and metals (MFAB 2010b). None of these sites have been identified on the

National Priorities List under CERCLA. In accordance with USAF policy, all ERP sites on the installation are addressed in a manner consistent with the CERCLA or RCRA process. Restoration projects on MacDill AFB are conducted under two regulatory programs: one governing petroleum releases, and one governing cleanup of SWMUs in accordance with the installation's RCRA permit. SWMUs are sites that have had solid or hazardous wastes placed at any time, or where solid wastes have been routinely and systematically released.

The FDEP regulates clean-up activities at petroleum sites, and has entered into a Petroleum Contamination Agreement with MacDill AFB. The investigation and cleanup of SWMUs is conducted in accordance with the Hazardous and Solid Waste Amendment permit issued to MacDill AFB under USEPA ID No. FL6 570 024 582 (MAFB 2010b).

A majority of selected projects are on or near ERP sites. **Table 3-14** lists the open ERP sites and their current statuses that have the potential to affect the selected projects. Closed sites are unrestricted for development and are not listed in **Table 3-14** or discussed further.

3.11 Safety

3.11.1 Definition of the Resource

A safe environment is one in which there is no, or an optimally reduced, potential for death, serious bodily injury or illness, or property damage. Human health and safety addresses both workers' health and public safety during demolition activities and facilities construction, and during subsequent operations of those facilities.

Construction site safety is largely a matter of adherence to regulatory requirements imposed for the benefit of employees and implementation of operational practices that reduce risks of illness, injury, death, and property damage. The health and safety of onsite military and civilian workers are safeguarded by numerous DOD and USAF regulations designed to comply with standards issued by OSHA and USEPA. These standards specify the amount and type of training required for industrial workers, the use of protective equipment and clothing, engineering controls, and maximum exposure limits for workplace stressors.

Safety and accident hazards can often be identified and reduced or eliminated. Necessary elements for an accident-prone situation or environment include the presence of the hazard itself together with the exposed (and possibly susceptible) population. The degree of exposure depends primarily on the proximity of the hazard to the population. Activities that can be hazardous include transportation, maintenance and repair activities, and the creation of extremely noisy environments. The proper operation, maintenance, and repair of vehicles and equipment carry important safety implications. Any facility or human-use area with potential explosive or other rapid oxidation process creates unsafe environments for nearby populations. Extremely noisy environments can also mask verbal or mechanical warning signals such as sirens, bells, or horns.

AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health* (AFOSH) Program, implements AFD 91-3, *Occupational Safety and Health*, by outlining the AFOSH Program. The purpose of the AFOSH Program is to minimize loss of USAF resources and to protect USAF personnel from occupational deaths, injuries, or illnesses by managing risks. In conjunction with the USAF Mishap Prevention Program, these standards ensure all USAF workplaces meet Federal safety and health requirements. This instruction applies to all USAF activities.

Table 3-14. Open ERP Sites in Vicinity of the Selected Projects and Alternatives

ERP Site ID	Site Name	Contaminant of Concern	Status	Potentially Affected Project
SWMU 25	Former ASTs	SWMU 25 is a former AST area where diesel fuel was stored for emergency generators. A 1,000-foot-by-1,000-foot groundwater plume with chlorinated hydrocarbons was detected approximately 60 feet below land surface. The ASTs were removed from the site. In situ enhanced bioremediation was conducted, and monitored natural attenuation (MNA) is ongoing. LUCs restrict use of groundwater for potable purposes and land use is restricted to nonresidential uses.	LTM	D1, NI1
SWMU 18	Former Chemical Warfare Storage and Training Area	The exact nature of the chemicals and their ultimate disposal at SWMU 18 were not documented. Groundwater and soils are contaminated with metals. LUCs restrict use of groundwater for potable purposes and direct contact with contaminated soils, and land use is restricted to nonresidential uses. Other LUCs include measures to prevent exposure to chemical warfare agent test kits and other Chemical Warfare Agency material that could be buried at the site.	LTM	D2, C6, S1
SWMU 61	Chlorinated Solvent Plume	A groundwater plume contaminated with PAHs, chlorinated solvents, and metals was identified at SWMU 61. In situ bioremediation was conducted at this site and MNA is ongoing. LUCs restrict use of groundwater for potable purposes and residential land uses are prohibited. SWMU 29 (Vinyl Chloride Area) was incorporated into SWMU 61.	LTM	C2, I1, NI1
TU/US-C500	Military Gas Station (F45)	TU/US-C500 has soil and groundwater contaminated with benzene, isopropyl benzene, and vinyl chloride. Contamination was addressed in accordance with the FDEP Petroleum Site Cleanup Criteria. TU/US-C500 is considered Low Risk. Remedy includes MNA of contaminated groundwater, and LUCs restrict the site to nonresidential land uses, prohibit the use of groundwater, and restrict exposure to soil.	LTM	C2, I2, C6a

ERP Site ID	Site Name	Contaminant of Concern	Status	Potentially Affected Project
Site 57 (PH 72) and includes SWMU 19/Site 19)	Flightline Refueling System	Groundwater at Pumphouse 72 and the associated USTs and piping, a component of the flightline refueling system, had been contaminated by benzene and PAHs and soil was contaminated with PAHs, PCBs, Total Recoverable Petroleum Hydrocarbons, and benzo(a)pyrene (BAP). SWMU 19 has been incorporated into Site 57. Some contaminated soils were excavated from the site. The site was granted No Further Action (NFA) status for PCB-impacted soil. LUCs for BAP soil contamination left in place; and MNA for PAHs above Groundwater Cleanup Target Levels (benzene is no longer present in groundwater at Pumphouse 72). LUCs restrict residential use, and prohibit the use of groundwater. The site is considered Low Risk and is currently approved for MNA.	LTM	I2
SWMU 5	Landfill at Civil Engineering Washrack	SWMU 5 includes groundwater and surface water contaminated with metals, and soil contaminated with PAHs. In situ groundwater bioremediation was conducted, and the site is currently under MNA for groundwater and surface water. LUCs restrict residential use of surface water and groundwater, prohibit the use of groundwater as a potable water source, and contact with contaminated surface water. A fence prevents access to the site and warning signs are posted.	LTM	S1
SWMU 6	Landfill at EOD East	While not documented, industrial or hazardous wastes might have been disposed of at SWMU 6. The site includes groundwater, surface water, and soil contaminated with metals. In situ groundwater bioremediation was conducted, and the site is currently under MNA. LUCs prohibit the use of groundwater as a potable water source, and restrict the site to nonresidential land uses and exposure to soil.	LTM	C3, S1
SWMU 7	Landfill at EOD West	While not documented, industrial or hazardous wastes might have been disposed of at SWMU 7. The site has groundwater contaminated with metals and chlorinated solvents and surface water contaminated with metals. Soil is also contaminated. In situ groundwater bioremediation was conducted, and the site is currently under MNA for surface water and groundwater. LUCs prohibit the use of groundwater and surface water, and restrict the site to nonresidential land uses and exposure to soil. In addition, a fence surrounds the site preventing access to SWMU 7.	LTM	C3, S1

ERP Site ID	Site Name	Contaminant of Concern	Status	Potentially Affected Project
SWMU 8	Landfill West	SWMU 8 includes groundwater and surface water contaminated with metals, groundwater contaminated with chlorinated solvents, and contaminated soil. In situ groundwater bioremediation was conducted. The remedies include MNA for groundwater and surface water, groundwater use restrictions, and the implementation of nonresidential LUCs. LUCs restrict residential use of surface water and groundwater, prohibit the use of groundwater as a potable water source, and contact with contaminated surface water by future residents. A fence prevents access to the site and warning signs are posted.	LTM	S1
SWMU 10	Former Rubble Landfill	SWMU 10 has groundwater contaminated with metals and soils contaminated with chloroacetic acid. In situ groundwater bioremediation was conducted. LUCs restrict use of soils and groundwater for residential uses, use of groundwater as a potable water source, and contact with contaminated soils by future residents. Two fences encompass portions of the site providing additional engineering controls and warning signs are posted.	LTM	C6, S1
SWMU 11	Former Chemical Munitions Landfill	The groundwater at SWMU 11 is contaminated with metals and the soil is contaminated with chloroacetic acid. In situ bioremediation was conducted, and MNA is ongoing for groundwater and surface water. Groundwater and surface water are being monitored for mustard degradation compounds. LUCs restrict use of groundwater for potable purposes and restrict contact with contaminated soil. Land use is restricted to nonresidential uses. Engineering controls include a fence limiting access to the site, a secondary fence that encompasses the buried munitions, and posted signs.	LTM	S1
SWMU 2	Landfill at Golf Course	No known industrial or hazardous wastes were disposed of at SWMU 2; however, such activities could have occurred. Groundwater and soils are contaminated with metals. LUCs restrict the use of the property to nonresidential and prohibit the use of groundwater for potable purposes.	LTM	C1c

ERP Site ID	Site Name	Contaminant of Concern	Status	Potentially Affected Project
Site 38	Former Fuel Storage (Building 552)	Site 38 has limited petroleum hydrocarbons and vinyl chloride in the groundwater and petroleum hydrocarbons in the soil. A dual-phase extraction system was in operation until 2007 until a fire destroyed the system. Remedial action includes the abandonment and reinstallation of 13 recovery/monitoring wells, and the removal and disposal of petroleum-contaminated soil. Remedial Action Completion Reports were approved for post-active remediation groundwater monitoring and NFA for soil. Site 38 is considered Low Risk. Site 53(Avionics UST Area) has been incorporated into Site 38.	LTM	C2
Site 52	Hospital Dorm UST Area	Site 52 includes groundwater contaminated with petroleum products (Number 2 diesel fuel), which was addressed under FDEP Petroleum Site Cleanup Criteria. Biosparging for the groundwater with the option of nutrient enhancement began at the site in July 2009 and is continuing. NFA for soil was approved in January 2006.	RA-O	I1b, S1b
Site 56	Army Air Force Exchange Service Service/Gas Station	Site 56 is impacted with petroleum hydrocarbons in the soil and groundwater, and is being addressed in accordance with the FDEP Petroleum Site Cleanup Criteria. Biosparging with soil vapor extraction was scheduled to begin in May 2011. The site is considered Low Risk .	RA-O	C2
CD-C506	Dredge Spoil Pile	The Dredge Spoil Pile, which consists of two ponds and berms in an embankment area approximately 150 feet west of Facility 60, is contaminated with PAHs. The contaminants include arsenic, benzo(a)anthracene, BAP, chromium, iron, and thallium. A Corrective Measures Study is scheduled to be completed in 2013.	CMS	C5

Sources: MAFB 2009c, MFAB 2010b, MAFB 2008b, MAFB 2011e, MAFB 2011b

Key:

AST = Aboveground storage tank

BAP = benzo(a)pyrene

CMS = Corrective Measures Study

EOD = Explosive ordnance disposal

LUC = Land use control

MNA = Monitored natural attenuation

LTM = Long-Term Management

PAH = Polycyclic aromatic hydrocarbon

PCB= Polychlorinated biphenyl

TRPH = Total recoverable petroleum hydrocarbon

NFA = No Further Action

3.11.2 Existing Conditions

Construction Safety. All contractors performing construction activities at MacDill AFB are responsible for following ground safety regulations and workers compensation programs and are required to conduct construction activities in a manner that does not pose any risk to workers or personnel. Industrial hygiene programs address exposure to hazardous materials, use of personal protective equipment, and availability of Material Safety Data Sheets (MSDSs). Industrial hygiene is the responsibility of contractors, as

applicable. Contractor responsibilities are to review potentially hazardous workplace operations; to monitor exposure to workplace chemicals (e.g., asbestos, lead, hazardous material), physical hazards (e.g., noise propagation), and biological agents (e.g., infectious waste); to recommend and evaluate controls (e.g., ventilation, respirators) to ensure personnel are properly protected or unexposed; and to ensure a medical surveillance program is in place to perform occupational health physicals for those workers subject to any accidental chemical exposures.

There are 49 areas that are ERP sites, SWMUs, or areas of concern on MacDill AFB (MAFB 2011b). There is the potential for construction workers to encounter contamination from ERP sites during C&D activities. Therefore, it is recommended that a health and safety plan be prepared in accordance with OSHA requirements prior to commencement of construction activities. Workers performing soil-removal activities within ERP Sites are required to have OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training. In addition to this training, supervisors are required to have an OSHA Site Supervisor certification. Should contamination be encountered, then handling, storage, transportation, and disposal activities would be conducted in accordance with applicable Federal, state, and local regulations; AFIs; and the MacDill AFB Hazardous Waste Management Plan.

Explosives and Munitions Safety. Explosive safety clearance zones must be established around facilities used for the storage, handling, or maintenance of munitions. Air Force Manual 91-201, *Explosives Safety Standards*, establishes the size of the clearance zone based upon QD criteria or the category and weight of the explosives contained within the facility. There are several areas that are constrained by QD clear zones at MacDill AFB. The safety zone associated with the WSA creates the largest area of the base constrained by a QD zone. The WSA has a 1,250-foot QD clear zone that limits development in this area.

A hot cargo pad is in the central part of the airfield along Taxiway O, and a suspect vehicle pad is on an abandoned dispersed aircraft parking taxiway on the northern side of the airfield. Both of these pads have 1,250-foot QD clear zones associated with them. A less-restrictive QD of 500 feet is associated with the EOD pit on the southern side of the installation. **Figures 2-1** through **2-4** show the safety zone arcs.

Both the skeet range and the small arms range on the installation have safety zones associated with their use. The small arms range, on the southern side of the installation, has the largest of these. The majority of the safety zone associated with the small arms range envelops an undeveloped wetland area adjacent to the installation and over the waters of Tampa Bay (MAFB 2011b). The safety zone associated with the skeet range, which is to the west of the WSA, is much smaller and poses less impact on future development.

Range sites on MacDill AFB contain various munitions, unexploded ordnance (UXO), and Chemical Agent Identification Sets (CAIS). Most of the munitions, UXO, and CAIS on the surface have been removed. However, munitions, UXO, and CAIS can still be found below the ground surface (MAFB 2007b). Although most of the projects are not within range sites, the possibility remains that munitions, UXO, and CAIS might be encountered within project areas.

4. Environmental Consequences

4.1 Introduction

The intention of **Section 4** of this IDEA is to present criteria for evaluating potential impacts for resource areas (**Section 4.1**) a general analysis of the environmental effects of the No Action Alternative (**Section 4.2**) installation development activities (see **Section 4.3**), and to provide potential environmental effects of selected installation development projects (see **Section 4.4**). The general analysis identifies the general environmental effects on each resource area associated with construction, demolition, infrastructure improvement, natural infrastructure upgrade activities, and strategic sustainability performance projects with a focus on avoiding those areas that are constraints to development. However, a general analysis of potential activities alone does not provide the framework to assess adequately the potential environmental consequences of a single proposed project. Therefore, **Section 4.4** presents a detailed analysis of the selected demolition, construction, infrastructure improvement, natural infrastructure improvement, and strategic sustainability performance projects under the Proposed Action as described in **Section 2.1**.

The specific criteria for evaluating the potential environmental effects of the No Action Alternative or the Proposed Action are discussed in the following text, identified by resource area. The significance of an action is also measured in terms of its context and intensity. The context and intensity of potential environmental effects are described in terms of duration, whether they are direct or indirect, the magnitude of the impact, and whether they are adverse or beneficial, and are summarized as follows:

- **Short-term or long-term.** In general, short-term effects are those that would occur only with respect to a particular activity, for a finite period, or only during the time required for construction or installation activities. Long-term effects are those that are more likely to be persistent and chronic.
- **Direct or indirect.** A direct effect is caused by an action and occurs around the same time and place. An indirect effect is caused by an action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action.
- **Negligible, minor, moderate, or significant.** These relative terms are used to characterize the magnitude or intensity of an impact. Negligible impacts are generally those that might be perceptible but are at the lower level of detection. A minor effect is slight, but detectable. A moderate effect is readily apparent. Significant effects are those that, in their context and due to their magnitude (severity), have the potential to meet the thresholds for significance set forth in CEQ regulations (40 CFR 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation or the preparation of an EIS to fulfill the policies set forth in NEPA. Significance criteria by resource area are presented in the following text.
- **Adverse or beneficial.** An adverse effect is one having unfavorable or undesirable outcomes on the man-made or natural environment. A beneficial effect is one having positive outcomes on the man-made or natural environment.

Mitigation measures, BMPs, and environmental protection measures are discussed to describe how the level of impact of a project on a resource area could be minimized. Mitigation measures only refer to those actions that could reduce impacts below significance. BMPs are actions required by statutes, regulations, or to fulfill permitting requirements that reduce potential impacts. Environmental protection measures are those actions that are used to minimize impacts that are not required as a part of statutes, regulations, or to fulfill permitting requirements, but are typically measures taken during design and construction phases of a project to reduce impacts on the environment. None of the BMPs or

environmental protection measures described is needed to bring an impact below the threshold of significance.

The following text presents the criteria that would constitute a significant environmental effect resulting from implementation of the No Action Alternative (see **Section 4.2**), or the Proposed Action. The same significance criteria are also applied to potential cumulative effects (see **Section 5**) of implementing the Proposed Action in conjunction with past, present, or reasonably foreseeable future actions.

Noise Evaluation Criteria

Potential changes in the noise environment can be beneficial (i.e., if they reduce the number of sensitive receptors that are potentially exposed to unacceptable noise levels), negligible (i.e., if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (i.e., if they result in increased noise exposure to unacceptable noise levels). Projected noise effects are evaluated quantitatively and qualitatively. Noise from construction activities is based on conformance with local ordinances. Conformance with the City of Tampa noise ordinances is used in this analysis to determine significance.

Land Use Evaluation Criteria

The significance of potential land use effects is based on the level of land use sensitivity in areas affected by a proposed action and the compatibility of a proposed action with existing conditions. A proposed action could have a significant effect with respect to land use if any of the following were to occur:

- Be inconsistent or in noncompliance with existing land use plans or policies
- Preclude the viability of existing land use
- Preclude continued use or occupation of an area
- Be incompatible with adjacent land use to the extent that public health or safety is threatened
- Conflict with installation planning criteria established to ensure the safety and protection of human life and property.

Air Quality Evaluation Criteria

The environmental consequences to local and regional air quality conditions near a proposed Federal action are determined based upon the increases or decreases in regulated air pollutant emissions, and upon existing conditions and ambient air quality. The evaluation criteria are dependent on whether the Proposed Action is located in an attainment, nonattainment, or maintenance area for criteria pollutants. Other evaluation criteria include whether Major NSR air quality construction permitting is triggered or Title V operating permitting is triggered. Major NSR air quality permitting is divided into Nonattainment Major NSR for nonattainment pollutants and PSD permitting for attainment pollutants.

MacDill AFB is in an attainment area for all criteria pollutants; therefore, General Conformity does not apply to the selected projects. This means a comparison of emissions to General Conformity *de minimis* thresholds is not necessary and a General Conformity determination is not required. With respect to permitting, Title V permitting already applies to MacDill AFB and PSD permitting could apply. The air quality evaluation criteria for the selected projects are discussed in the following paragraphs.

Attainment Area Pollutants. The attainment area pollutants for the location of these selected projects are CO, NO₂ (measured as NO_x) SO₂, Pb, PM₁₀, PM_{2.5}, and O₃ (measured as NO_x and VOCs). The impact in

NAAQS “attainment” areas would be considered significant if the net increases in these pollutant emissions from the Federal action would result in any one of the following scenarios:

- Cause or contribute to a violation of any national or state ambient air quality standard
- Expose sensitive receptors to substantially increased pollutant concentrations
- Exceed any Evaluation Criteria established by a SIP
- Cause an increase of 250 tpy for any attainment criteria pollutant (NO_x, VOCs, CO, PM₁₀, PM_{2.5}, or SO₂) from stationary plus mobile source emissions¹.

Although the 250 tpy stationary plus mobile source threshold is not a regulatory-driven threshold, it is being applied as a conservative measure of significance in attainment areas. The rationale for this conservative threshold is that it is consistent with the threshold for a PSD major source in attainment areas. This threshold is intended to include both construction activity and operational activity emissions in attainment areas.

PSD Permits. The following factors were considered in determining the significance of air quality impacts with respect to PSD permitting requirements prior to construction:

- If the net increase in stationary source emissions qualify as a PSD major source. This includes 250 tpy emissions per attainment pollutant (40 CFR 52.21(b)(1) and 40 CFR 52.21(a)(2), or 75,000 tpy emissions of GHGs.
- If the net increase in stationary source emissions qualify as a significant modification to an existing PSD major stationary source, (i.e., change that adds 15 to 40 tpy of criteria pollutants to the PSD major source’s potential to emit depending on the pollutant, or adding 75,000 tpy of GHGs).
- Only operational emissions increases were evaluated for PSD permitting impacts as construction activity emissions are typically not subject to the previously discussed PSD significance criteria. Impacts on MacDill AFB’s existing Title V operating permit would just be to incorporate new stationary sources that have applicable air quality requirements

Geological Resources Evaluation Criteria

Protection of unique geological features, minimization of soil erosion, and the siting of facilities in relation to potential geologic hazards are considered when evaluating potential effects of a proposed action on geological resources. Generally, adverse effects can be avoided or minimized if proper construction techniques, erosion-control measures, and structural engineering design are incorporated into project development. A proposed action could have a significant effect with respect to geological resources if any the following were to occur:

- Alteration of the lithology, stratigraphy, and geological structure that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability
- Changes to the soil composition, structure, or function within the environment.

¹ The lead threshold would be 250 tpy, but since emissions sources at an AFB have such low lead emissions, a comparison to this threshold was not considered necessary.

Water Resources Evaluation Criteria

Evaluation criteria for effects on water resources are based on water availability, quality, and use; existence of floodplains; and associated regulations. A proposed action could have a significant effect with respect to water resources if any the following were to occur:

- Substantially reduce water availability or supply to existing users
- Overdraft groundwater basins
- Exceed safe annual yield of water supply sources
- Substantially affect water quality adversely
- Endanger public health by creating or worsening health hazard conditions
- Threaten or damage unique hydrologic characteristics
- Violate established laws or regulations adopted to protect water resources
- Result in an increase of floodplain areas beyond the current extent, including areas with structures that are not designed for occurrence within a floodplain that could result in safety hazards.

Biological Resources Evaluation Criteria

The significance of effects on biological resources is based on the following:

- The importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource
- The proportion of the resource that would be affected relative to its occurrence in the region
- The sensitivity of the resource to proposed activities
- The duration of ecological ramifications
- The “taking” of threatened or endangered species
- Jeopardy of threatened or endangered species habitat.

Effects on biological resources would be significant if species or habitats of high concern are adversely affected over relatively large areas. Effects would also be considered significant if disturbances cause reductions in population size or distribution of a species of high concern.

Ground disturbance and noise associated with construction can directly or indirectly cause adverse effects on biological resources. Direct effects from ground disturbance are evaluated by identifying the types and locations of potential ground-disturbing activities in correlation to important biological resources. Habitat removal and damage or degradation of habitats might be adverse effects associated with ground-disturbing activities.

Cultural Resources Evaluation Criteria

Impacts on cultural resources include potential effects on buildings, sites, structures, districts, and objects eligible for or listed in the NRHP; cultural items as defined in the NAGPRA; archaeological resources as defined by the Archaeological Resources Protection Act of 1979; and archaeological artifact collections and associated records as defined by 36 CFR part 79.

Under Section 106 of the NHPA, “An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.” Specifically, adverse effects on historic properties can include any of the following:

- Physically altering, damaging, or destroying all or part of a resource
- Altering characteristics of the surrounding environment that contribute to the resource's significance
- Introducing visual or audible elements that are out of character with the property or that alter its setting
- Neglecting the resource to the extent that it deteriorates or is destroyed
- The sale, transfer, or lease of the property out of agency ownership (or control) without adequate legally enforceable restrictions or conditions to ensure preservation of the property's historic significance.

In accordance with Section 106 of the NHPA, MacDill AFB has determined the APE for each action. For the analysis of the potential effects of the selected projects on archaeological resources, the APE encompasses the area of ground disturbance. For the analysis of the potential direct and indirect effects of the selected projects on architectural resources, the MacDill AFB recommends a direct APE of the immediate area of the selected projects and an indirect APE as the area within which the undertaking could cause alterations in the character or use of architectural resources eligible for listing in the NRHP. Under Section 106 of the NHPA, impacts might have no effect, no adverse effect, or an adverse effect on historic properties. Significant effects on historic properties could result from activities such as physical destruction, damage, alterations, or introduction of visual or audible intrusions.

Socioeconomics and Environmental Justice Evaluation Criteria

Construction expenditures are assessed in terms of direct effects on the local economy and related effects on other socioeconomic resources (e.g., housing). The magnitude of potential impacts can vary greatly, depending on the location of a proposed action. For example, implementation of an action that creates ten employment positions might go unnoticed in an urban area, but could have considerable impacts in a rural region. If potential socioeconomic changes were to result in substantial shifts in population trends or a decrease in regional spending or earning patterns, those effects would be considered adverse. A proposed action could have a significant effect with respect to the socioeconomic conditions in the surrounding ROI if the following were to occur:

- Change the local business volume, employment, personal income, or population that exceeds the ROI's historical annual change
- Adversely affect social services or social conditions, including property values, school enrollment, county or municipal expenditures, or crime rates
- Disproportionately impact minority populations or low-income populations.

Infrastructure Evaluation Criteria

Effects on infrastructure are evaluated based on their potential for disruption or improvement of existing levels of service and additional needs for energy and water consumption, sanitary sewer and wastewater systems, and transportation patterns and circulation. Impacts might arise from physical changes to

circulation, construction activities, introduction of construction-related traffic on local roads or changes in daily or peak-hour traffic volumes, and energy needs created by either direct or indirect workforce and population changes related to installation activities. An effect might be considered adverse if a proposed action exceeded capacity of a utility. A proposed action could have a significant effect with respect to infrastructure if the following were to occur:

- Exceeded capacity of a utility
- A long-term interruption of the utility
- A violation of a permit condition
- A violation of an approved plan for that utility.

Hazardous Materials and Wastes Evaluation Criteria

Impacts on hazardous materials and wastes were assessed by evaluating the degree to which the selected projects could cause worker, resident, or visitor exposure to hazardous materials or wastes; whether the selected projects would lead to noncompliance with applicable Federal or state regulations or increase the amounts generated or procured beyond current waste management procedures and capacities; and whether the selected projects would disturb an ERP site or create/contribute to an ERP site resulting in adverse effects on human health or the environment.

A proposed action could have a significant effect with respect to hazardous materials and wastes if the following were to occur as a result of the selected projects:

- Noncompliance with applicable Federal and state regulations
- Disturbance or creation of contaminated sites resulting in substantial adverse effects on human health or the environment
- Inability to accommodate management policies, procedures, and handling capacities, impacting fuel management.

Safety Evaluation Criteria

Any increase in safety risks would be considered an adverse effect on safety. A proposed action could have a significant effect with respect to health and safety if the following were to occur:

- Substantially increase risks associated with the safety of construction and installation personnel, contractors, or the local community
- Substantially hinder the ability to respond to an emergency
- Introduce a new health or safety risk for which the installation is not prepared or does not have adequate management and response plans in place.

4.2 Environmental Consequences of the No Action Alternative

Under the No Action Alternative, MacDill AFB would not implement the selected projects, which would result in the continuation of existing conditions as described in **Section 3**. No direct changes in environmental effects would be expected on the noise environment, land use, air quality, geological resources, water resources, biological resources, cultural resources, socioeconomics and environmental justice, infrastructure, hazardous materials and wastes, or safety from not implementing the selected

projects. Although under the No Action Alternative the selected projects would not be implemented, it is anticipated that future development would continue to occur, but those development projects would be analyzed through the preparation of project-specific environmental documentation, as appropriate.

4.3 General Environmental Consequences of the Proposed Action by Resource Area

4.3.1 Noise

Construction and Demolition Noise. Noise from demolition and construction activities varies depending on the type of equipment being used, the area that the action would occur in, and the distance from the noise source. To predict how these activities would impact adjacent populations, noise from the probable equipment was estimated. For example, as shown in **Table 4-1**, construction usually involves several pieces of equipment (e.g., bulldozers and trucks) that can be used simultaneously. Under the selected projects, the combined noise from the equipment during the busiest day was estimated to determine the total impact of noise from construction activities at a given distance. These sound levels were estimated by calculating the noise from several pieces of equipment and then estimating the decrease in noise levels at various distances from the source of the noise. The combined noise was calculated using a conventional drop-off rate coefficient for a point source; no ground or atmospheric absorption was considered. **Table 4-1** shows estimated noise levels that would be expected outdoors at varying distances from a demolition or construction site. A typical home with standard designs and materials provides 20 to 30 dB of noise level reduction when the windows and doors are kept closed, if the home is in good condition (Navy 2005).

Table 4-1. Estimated Noise Levels from Construction and Demolition Activities

Distance from Noise Source	Estimated Combined Noise Level
50 feet	90–94 dBA
100 feet	84–88 dBA
150 feet	81–85 dBA
200 feet	78–82 dBA
400 feet	72–76 dBA
800 feet	66–70 dBA
1,200 feet	< 64 dBA

Given the extent of the selected projects and the proximity to receivers on the installation, short-term, minor to moderate, adverse effects from construction noise would be expected. However, noise generation would last only for the duration of demolition and construction activities and could be minimized through measures such as the restriction of these activities to normal working hours (i.e., between 7:00 a.m. and 5:00 p.m.), and the use of equipment exhaust mufflers. The following environmental protection measures and mitigation measures could be employed to reduce impacts on the noise environment:

- Construct noise barriers – temporary walls or piles of excavated materials placed between equipment and receivers
- Route construction traffic away from residential streets
- Place stationary noise-generating equipment as far away as possible from receivers

- Combine noisy operations to occur at the same time, as the combined noise level would not be that much greater than the noise level if all actions were performed together
- Use noise-attenuated equipment (i.e., equipment with mufflers, noise enclosures).

It is not anticipated that the short-term increase in noise levels resulting from the selected projects would exceed local regulations or cause significant adverse effects on the surrounding populations.

Vibration. Construction activities can produce varying amounts of ground vibration. The degree of vibration is dependent on the equipment and methods employed. Equipment operation produces ground vibrations that emanate out from the source and diminish in strength with distance. Buildings founded in the vicinity of the construction can respond to these vibrations. Responses can range from no perceptible effects to slight damage at the highest levels of vibration (which is extremely rare). It is usually necessary to analyze construction vibration only in instances when a historic or fragile building is nearby.

Operational Noise. Considering the current military aircraft operations and vehicle traffic at and adjacent to MacDill AFB, additional noise from building systems such as HVAC systems would not significantly increase the noise environment. One project, Project I1b, is expected to result in operational noise other than that generated by HVAC systems and is discussed further in **Section 4.5.2.2**.

No significant impacts on the noise environment would be anticipated from implementing the selected projects.

4.3.2 Land Use

The selected projects would not result in significant effects on land use. The selected projects could result in long-term, minor to moderate, beneficial and adverse impacts on land use. The selected projects would occur entirely on MacDill AFB property and would be sited in a manner compatible with installation land uses. However, Project I4 (Construct Medical Clinic Sidewalks) is within the northern runway CZ, which could result in additional long-term, minor to moderate, adverse impacts.

All proposed construction, demolition, infrastructure improvements, natural infrastructure management projects, and strategic sustainability projects would be expected to be consistent with the FCMP (see **Appendix E**). Most of the proposed projects would result in no effect or minor, adverse effects on land use. Most adverse effects would be long-term and would require a land use category change to match the intended use of the selected projects. However, land use category changes would be consistent with the future land use described in the IDP for all selected projects, and, therefore, would represent a long-term, beneficial impact. Some projects would be constructed within ERP sites or QD arcs (see **Sections 4.10** and **4.11**), and the appropriate land use restrictions would be adhered to.

Beneficial effects on land use would result from efficient use of installation land, particularly through demolition of old, underused facilities, and consolidation of like functions.

4.3.3 Air Quality

Emission Estimates. Short-term, minor, adverse effects on air quality would be expected from the implementation of the selected projects; however, these effects would not be significant. The C&D activities associated with the selected projects would generate air pollutant emissions from site-disturbing activities such as grading, filling, compacting, and trenching and the operation of C&D equipment and haul trucks transporting construction supplies, excavation material, and demolition debris. C&D activities would also generate particulate emissions as fugitive dust from ground-disturbing activities and from the combustion of fuels in C&D equipment. Fugitive dust emissions would be greatest during the

initial site preparation activities and would vary from day to day depending on the work phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a C&D site is proportional to the area of land being worked and the level of activity.

C&D activities would incorporate environmental protection measures (e.g., frequent use of water for dust-generating activities) to minimize fugitive particulate matter emissions. Additionally, the work vehicles are assumed to be well-maintained and could use diesel particulate filters to reduce emissions. C&D workers commuting daily to and from the job site in their personal vehicles would also result in criteria pollutant air emissions.

Long-term, minor, adverse, and beneficial effects on air quality would be expected from the selected projects; however, these effects would not be significant. The use of new boilers, furnaces, tanks, and emergency generators at the buildings proposed for construction would increase air emissions from MacDill AFB. However, the demolition of older and less energy-efficient buildings would remove older and more emissions-intensive boilers, furnaces, and emergency generators from the installation and decrease energy intensity at the installation. Overall, the selected projects would not result in significant long-term effects on air emissions at MacDill AFB. Air emissions from new construction of stationary sources (e.g., boilers, heaters, emergency generators) would be somewhat offset by reductions in air emissions from demolition of stationary sources. However, air permitting of new combustion sources would need to be addressed as discussed in the following paragraphs under PSD and Title V Permitting.

MacDill AFB would obtain all necessary air quality construction permits as required by Chapter 62-210.300, Stationary Sources - General Requirements of the Florida SIP for the Proposed Action. MacDill AFB could be required to obtain approval to construct from the FDEP if a new source is subject to New Source Performance Standards in 40 CFR 60 or NESHAP within 40 CFR 63.

Air emissions from the selected projects are summarized in **Table 4-2** by the year in which they would be produced. Further information and details on the individual air quality effects from the selected projects is included in **Section 4.4. Appendix D** contains a summary of the calculations and the assumptions used to estimate the air emissions.

PSD and Title V Air Permitting. Emissions increases from the selected projects due to constructing new stationary sources are expected to be somewhat offset by the removal of similar sources. The overall increase in occupied building area is approximately 1,014,792 ft². Assuming the increase in space-heating requirements would be based on the 1,014,792 ft² of space, heating emissions are not expected to be significant enough for the installation to reach the PSD major modification threshold of 40 tpy of NO_x. Although PSD permitting is not expected to be triggered by the selected projects, MacDill AFB should confirm this conclusion once projects are approved and designed. In addition, MacDill AFB is already covered under a Title V operating permit due to a potential to emit NO_x and CO of greater than 100 tpy. MacDill AFB would update its Title V operating permit to incorporate new stationary sources under the selected projects. Refer to the following *Greenhouse Gas Emissions* section with respect to GHG emissions impact on the Title V permit.

Greenhouse Gas Emissions. The selected projects would contribute directly to emissions of GHGs from the combustion of fossil fuels. Because CO₂ emissions account for approximately 92 percent of all GHG emissions in the United States, they are used for analyses of GHG emissions in this assessment. The U.S. Department of Energy, Energy Information Administration estimates that in 2009, gross CO₂ emissions in the State of Florida were 226 million metric tons and in 2009 gross CO₂ emissions in the entire United States were 5,425.6 million metric tons (USEIA 2012). **Table 4-2** shows the estimated amount of CO₂ emissions by year from the selected projects.

Table 4-2. Estimated Annual Air Emissions Resulting from the Selected Projects

Project	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Project I1	5.390	0.850	4.420	0.420	3.420	0.750	775.100
Project NI1	0.076	0.050	0.370	0.004	0.753	0.082	47.483
Total 2012 Emissions	5.466	0.900	4.790	0.424	4.173	0.832	822.583
Project D1	0.250	0.061	0.476	0.018	0.265	0.041	73.752
Project D2	0.112	0.046	0.395	0.006	0.076	0.014	56.339
Project C1	5.413	0.807	3.779	0.424	4.500	0.820	743.214
Project C2	7.110	1.231	5.626	0.563	19.716	2.495	1,007.683
Project C3	4.876	0.496	2.880	0.380	0.391	0.344	642.707
Project C4	6.562	1.438	5.962	0.515	4.783	1.003	969.020
Project I1	6.257	1.442	6.760	0.491	15.787	2.144	973.719
Project I2	0.206	0.093	0.724	0.013	2.130	0.228	99.864
Project I3	0.293	0.111	0.808	0.020	3.545	0.376	113.137
Project I4	0.112	0.070	0.619	0.005	0.194	0.026	84.807
Project I5	4.932	0.510	2.784	0.386	0.462	0.356	632.761
Project NI1	0.085	0.057	0.397	0.005	1.066	0.115	49.803
Total 2013 Emissions	36.209	6.362	31.209	2.823	52.914	7.962	5,446.805
Project D1	0.250	0.061	0.476	0.018	0.265	0.041	73.752
Project D3	0.302	0.067	0.508	0.022	0.348	0.053	80.457
Project C1	5.413	0.807	3.779	0.424	4.500	0.820	743.214
Project C5	5.508	0.732	3.676	0.431	2.841	0.652	746.151
Project C6	7.224	1.242	5.742	0.570	9.255	1.459	1,021.676
Project I6	0.147	0.080	0.663	0.008	1.069	0.116	90.612
Project NI1	0.085	0.057	0.397	0.005	1.066	0.115	49.803
Total 2014 Emissions	18.928	3.046	15.240	1.476	19.343	3.258	2,805.664
Project C5	5.508	0.732	3.676	0.431	2.841	0.652	746.151
Project C6	7.224	1.242	5.742	0.570	9.255	1.459	1,021.676
Project NI1	0.085	0.057	0.397	0.005	1.066	0.115	49.803
Total 2015 Emissions	12.817	2.031	9.814	1.006	13.162	2.226	1,817.629
Project NI1	0.085	0.057	0.397	0.005	1.066	0.115	49.803
<i>Project C6 (stationary sources)</i>	<i>8.050</i>	<i>0.250</i>	<i>1.840</i>	<i>0.004</i>	<i>0.230</i>	<i>0.230</i>	<i>388.890</i>
Total 2016 Emissions	8.135	0.307	2.237	0.009	1.296	0.345	438.693
Total 2016 and Later Emissions (stationary sources only)	8.050	0.250	1.840	0.004	0.230	0.230	388.890
Stationary Source Significance Criteria	100	100	100	100	100	100	75,000 and 100,000
Stationary Source plus Mobile Source Significance Criteria	250	250	250	250	250	250	NA

Note: Total Year emissions are the sum of mobile and stationary source emissions. Project emissions are mobile source emissions unless indicated as stationary source emissions.

Key: NA= Not Applicable.

The calculated increases in GHG emissions from the construction activities associated with the selected projects are a maximum of 5,447 tons in 2013. Considering the maximum CO₂ emissions for all years (i.e., 5,447 tons), the selected projects would represent a negligible contribution (0.0022 percent) towards statewide GHG inventories and an extremely negligible contribution (less than 0.0001 percent) toward national GHG inventories. The maximum annual increase in GHG emissions from the most significant stationary sources is 389 tons in 2016 and beyond. The overall increases in GHG emissions from stationary sources have not been calculated as adequate design information is not available at this time to conduct this calculation. However, the GHG emissions increases are expected to be well below 74,000 tpy. Therefore, the total increase in GHG emissions is expected to be well below 75,000 tpy, which is below the PSD threshold for GHGs. According to the 2008 Air Emissions Inventory for MacDill AFB, the facility already exceeds the 25,000 metric tpy threshold for reporting GHG emissions to the USEPA.

Therefore, the increase in GHG emissions still requires such reporting (MAFB 2009a). MacDill AFB is already a Title V permitted source, therefore a comparison of installation-wide stationary GHG emissions, including the selected projects, to the 100,000 tpy GHG Title V major source threshold is moot because MacDill AFB has already been triggered for a Title V permit due to another pollutant.

4.3.4 Geological Resources

The selected projects would not result in significant effects on geological resources. An erosion-and-sediment control plan (ESCP) would be prepared for projects that would disturb more than 1 acre of land. Projects of this size have a higher potential to result in adverse effects as a result of soil erosion and sedimentation; the ESCP would minimize these potentially adverse effects.

Long-term, negligible, adverse effects would be expected on the natural topography as a result of demolition, site preparation (i.e., grading, excavating, and recontouring), and construction under the selected projects. These impacts are considered negligible because MacDill AFB is fairly level in elevation, most construction would occur on previously disturbed lands, and only minor, if any, grading would be required.

Geology. No disturbance to geology would occur, therefore, no impacts on geology would be anticipated from implementing the selected projects.

Topography. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reduce the potential for impacts on the facilities during flood events.

Soils. Long-term, minor to moderate, adverse effects on soils would be expected from implementation of the selected projects due to soil compaction, disturbance, and erosion. However, impacts would be minimized through the implementation of environmental protection measures, including ESCPs. Compaction of soils would result in disturbance and modification of soil structure. Soil productivity, which is the capacity of the soil to produce vegetative biomass, would decline in disturbed areas and be eliminated within the footprint of buildings, pavements, and roadways. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns but could be mitigated by soil decompaction methods.

Site-specific soil testing would be conducted prior to implementing projects to determine if limitations exist and to determine appropriate environmental protection measures to offset potential adverse effects. No significant adverse impacts on the soils would be anticipated. Environmental protection measures could include installing silt fencing and sediment traps, applying water to disturbed soil, and revegetating disturbed areas as soon as possible after the disturbance, as appropriate. In the event of a chemical or fuel

spill, the installation's SPCC Plan would be followed to contain and clean up a spill quickly (see **Section 3.10**). There remains the possibility that a spill or leak could occur, but implementation of environmental protection measures identified in the SPCC plan would minimize the potential for and extent of associated contamination. No prime farmland soils occur on the installation, therefore no impacts on prime farmland soils would occur.

Geologic Hazards. The most common geologic hazard on MacDill AFB is erosion. Erosion- and sedimentation-control methods, described under the soils discussion, would be implemented to minimize impacts from erosion and sedimentation. In addition, although unlikely, adverse effects on humans and property could occur in the event of earthquake activity. Any new construction under the selected projects would be designed consistent with requirements established in UFC 3-310-03 (*Seismic Design for Buildings*) and EO 12699 (*Seismic Safety*), which would reduce the potential for adverse effects on humans associated with structural failure during or following a seismic event.

4.3.5 Water Resources

The selected projects would not result in significant effects on water resources. All proposed projects at MacDill AFB would avoid the water resources constraints shown in **Figures 2-1** through **2-6**, when possible. CZMA is discussed in **Section 3.2.2**; a Coastal Consistency Determination is in **Appendix G**.

No significant effects on water resources would occur from the Proposed Action. Short- and long-term, minor, adverse effects on water resources would be expected from the Proposed Action. The Proposed Action would increase the amount of impervious surface at MacDill AFB, alter natural drainage flows, and remove vegetation. Adverse effects would be minimized by implementing environmental protection measures and following the installation SWPPP. Under NPDES requirements described in **Section 3.1.1**, projects that would disturb more than 1 acre of land would be required to prepare a site-specific SWPPP and use BMPs to ensure that soil disturbed during construction activities does not pollute nearby water bodies. The following projects associated with the Proposed Action meet this criterion:

- *Project D3*—Demolish Buildings 65, 82, 83, and 85
- *Project C1*—Upgrade Fitness Center, Soccer Field, Add to and Alter Physical Fitness Center, JCAT Center
- *Project C2*—Construct Logistics Readiness Complex
- *Project C4*—Construct JSOU
- *Project C5*—Construct Outdoor Recreation Maintenance Facility
- *Project C6*—Construct Alert Facility, FMSE Facility
- *Project I1*—Construct CENTCOM Parking Garage
- *Project I3*—Construct Dining Facility Parking Lot.

All six construction projects, the natural infrastructure project and strategic sustainability performance projects, and all infrastructure projects except Project I4 occur within the 100-year floodplain. As such, these projects would require a FONSI/FONPA. Implementing these projects would result in a net gain in impervious surfaces in the 100-year floodplain and would have long-term, minor, adverse effects. Construction activities including additions in impervious surfaces increase storm water runoff and the potential for storm-related damage to infrastructure, facilities, and possibly human safety. Demolition projects that return areas to open space in the 100-year floodplain would represent a long-term, minor, beneficial effect.

Project NI1 (Storm Water Drainage Improvements) entails construction in wetlands and other waters of the United States (including upland cut ditches). As such, this project would require permitting for work within waters of the United States and a signed FONSI/FONPA. Effects on wetlands from this project would not be significant, and proper implementation of environmental protection measures and construction BMPs would minimize impacts.

Projects D2 (Demolish Building 1107), C1 (Upgrade Fitness Center, Soccer Field, Add to and Alter Physical Fitness Center, JCAT Center), C2 (Construct Logistics Readiness Complex), C3 (Construct EOD Bunker Barricades), C5 (Construct Outdoor Recreation Facility), I5 (Replace Sludge Digester Tanks), and I6 (Construct DISA Parking Lot) are within close proximity to wetlands or other waters of the United States. However, effects on adjacent wetlands and other water resources would be avoided through design, siting, proper implementation of appropriate environmental protection measures, and BMPs. Proper implementation of these measures and BMPs would ensure that no effects on surrounding wetlands or other waters of the United States would occur. Correspondence with regulatory and resource agencies prior to commencing any ground-breaking construction activities would be completed and permits would be obtained, as necessary.

Impacts would be further reduced by adhering to state storm water rules governed by Part IV of Chapter 373 Florida Statutes. These rules are administered by the SWFWMD. These rules require the treatment of storm water to avoid adverse effects on water quality and to attenuate storm water to control adverse flooding conditions. At a minimum, SWFWMD requires that MacDill AFB treat 0.5 inches of storm water runoff from new construction or redevelopment projects on the installation. MacDill AFB discharges to impaired water bodies and must therefore demonstrate that post-project pollutant loads show a net improvement of discharges. In addition, the SPCC Plan would be followed to minimize the likelihood of a spill and to respond appropriately in the event of a spill.

4.3.6 Biological Resources

The selected projects would not result in significant effects on biological resources. The following subsections describe the non-significant effects on biological resources that would result from the selected projects.

Vegetation. The selected projects would result in short- and long-term, negligible to minor, adverse effects on vegetation at MacDill AFB. The installation is predominantly within the 100-year floodplain; however, approximately 80 percent of the historic vegetation at MacDill AFB has been altered and is not considered to be high-quality habitat (MAFB 2007b). The majority of the selected projects would occur in the improved areas of MacDill AFB, which would primarily affect non-forested upland and urban upland communities. The majority of vegetation near the selected projects is modified, landscaped, and mowed regularly. All trees and vegetation impacted from the selected projects within the cantonment area would be replaced or relocated if necessary. All ground disturbed separate from site improvements would be reseeded with native species.

Short- and long-term, negligible to minor, adverse effects on vegetation would be expected from temporary disturbances during construction, demolition, and infrastructure improvement activities (e.g., trampling, crushing, and removal) and from the permanent removal of vegetation from the construction of new facilities and infrastructure. Project C6 (Alert Facility, FMSE Facility) would entail permanent tree removal. MacDill AFB would consider 10 U.S.C. 2665, *Sale of Certain Interests in Land; Logs*, as applicable, when disposing of removed vegetation.

Wildlife. The selected projects would result in short-term, negligible to minor, adverse effects on wildlife due to disturbances from noise, demolition and construction activities (i.e., increased human presence),

and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors, resulting in short-term, negligible to minor, adverse effects. The permanent loss of non-forested upland and urban upland communities would have minimal impacts on residential wildlife because these areas do not currently provide quality habitat. There is a high level of human activity associated with these areas as well. Mobile species (e.g., birds) would be expected to recover faster than more sedentary species (e.g., reptiles); however, wildlife species in the proposed project vicinities would be expected to recover quickly once the disturbances from noise, demolition and construction, and heavy equipment use have ceased. Furthermore, MacDill AFB is moderately developed and aircraft operations are frequent; therefore, wildlife currently inhabiting the project sites would be habituated to noise disturbances.

Long-term, negligible to minor, adverse effects on wildlife due to tree removal would be expected under the selected projects. Some dead trees provide habitat for wildlife species (e.g., birds and bats), which would be lost through the removal of trees associated with projects such as Project C6 (Alert Facility, FMSE Facility). Most cavity nesters or other birds that use these trees as nesting substrate are anticipated to be migratory birds as listed in 50 CFR 10.13 and would be protected under the MBTA (16 U.S.C. 703–712) as amended, and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. The MBTA and EO 13186 require Federal agencies to minimize or avoid impacts on migratory birds. Environmental protection measures are recommended for the reduction or avoidance of impacts on potential cavity nesters if trees are removed under the selected projects and would include topping trees or removing dead limbs instead of removing the entire tree, leaving as much trunk height as possible, creating artificial cavities (nest boxes), and drilling into trees to replace cavities lost during tree removal. Environmental protection measures for migratory birds are described in the following subsection addressing ***Protected and Sensitive Species***.

Impacts on a portion of high-quality wildlife habitat present on MacDill AFB generally would be avoided under the selected projects; however, four projects would be adjacent to higher quality wetland areas (Projects C3, C5, I5, and I6).

Protected and Sensitive Species. Under the ESA, Federal agencies are required to provide documentation that ensures that agency actions will not adversely affect the existence of any threatened or endangered species. The ESA requires that all Federal agencies avoid “taking” threatened or endangered species (which includes jeopardizing threatened or endangered species habitat). Section 7 of the ESA establishes a consultation process with the USFWS that ends with USFWS concurrence or a determination of the risk of jeopardy from a Federal agency project.

Although limited, projects evaluated in this document have the potential to affect protected and sensitive species and their habitat. Most of the selected projects would occur within developed portions of the installation and would not result in effects on federally listed species. A few projects would occur in or adjacent to drainage ditches or adjacent to wetlands where avian species are often observed. Proposed construction activities would cause a disturbance to the birds which use these drainage ditches for foraging, but the disturbance would be isolated and the birds would readily relocate to another ditch or other similar, suitable foraging habitat on the installation. None of the projects would occur in areas where shorebirds or colonial nesting species are likely to nest. Furthermore, there are currently no known colonial nesting areas on the installation.

The selected projects could result in short- and long-term, negligible to minor, adverse effects on the gopher tortoise (Federal-candidate and state-threatened species), burrowing owl (Florida species of special concern), and other species associated with gopher tortoise burrows (e.g., gopher frog, a Florida species of special concern). These species are known to occur in areas closer to the industrialized flightline area on MacDill AFB (see **Figure 3-2**). Although the eastern indigo snake has not been

observed on MacDill AFB, the potential exists for them to occur on the installation. The eastern indigo snake would also use gopher tortoise burrows for shelter. Short-term, minor, adverse effects would be expected from construction noise and ground vibration in areas where these species are present. These species would be expected to recover quickly once the disturbances from noise, demolition and construction, and heavy equipment use have ceased. Additionally, MacDill AFB is moderately developed and aircraft operations are frequent; therefore, these species would be somewhat habituated to noise and ground vibration disturbances. The selected projects would not result in any long-term, adverse effects on these species due to a loss of habitat associated with construction activities. Gopher tortoise management would remain consistent with the INRMP, which includes prescribed burns, relocation projects, and use of warning signs along the boundary of gopher tortoise habitat. If in the future, circumstances change and result in a selected project being sited in an area of known gopher tortoise or burrowing owl burrows, consultation would occur with the FWC to secure permits for relocation and determine what mitigation measures would be needed. If significant adverse effects on protected species are identified during the permitting process, additional NEPA analysis would be required.

Most construction activities would not affect the nesting bald eagles or their young because the proposed projects are not in close proximity to either of the two nesting locations (see **Figure 2-3**). However, Project NI1 (*Storm Water Drainage Improvements*) is proposed to occur within 660 feet of one of the active bald eagle nests. Therefore, construction noise associated with this project would have the potential to affect the bald eagles. Construction activities around the nesting locations would not occur within 660 feet of the nests during the nesting season (1 October – 15 May) (FWC 2011b). If this restriction cannot be met for any of the projects evaluated, consultation with the FWC would occur to determine the potential effects on the eagles. The FWC would determine if mitigation would be needed, and would recommend applicable mitigation measures. If adverse effects are identified, additional NEPA analysis would be required.

The MBTA and EO 13186 require Federal agencies to minimize or avoid impacts on migratory birds listed in 50 CFR 10.13. If design and implementation of a Federal action cannot avoid measurable adverse impacts on migratory birds, EO 13186 requires the responsible agency to consult with the USFWS and obtain a Migratory Bird Depredation Permit. Demolition, construction, infrastructure improvement, and natural infrastructure management activities associated with the selected projects would be conducted in a manner to avoid adverse effects on migratory birds to the extent practicable.

While mitigation measures are not required, the following environmental protection measures are recommended for reduction or avoidance of impacts on migratory birds that could occur within the project areas:

- Any groundbreaking construction activities or tree-cutting activities would be performed before migratory birds return to MacDill AFB or after all young have fledged to avoid incidental take.
- If construction is scheduled to start during the period when migratory birds are present, a site-specific survey for nesting migratory birds would be performed immediately prior to construction by a qualified biologist.
- If nesting birds are found during the survey, buffer areas would be established around nests. Construction would be deferred in buffer areas until birds have left the nest. Confirmation that all young have fledged would be made by a qualified biologist.

The USAF has determined that projects described in this document would not result in impacts on federally protected species, and consultation with the USFWS has been completed (see **Appendix B**). If circumstances or project plans change in the future, and it is determined that a project would result in impacts on a federally protected species, additional consultation with the USFWS would occur as part of

a supplemental NEPA evaluation. The consultation process would determine if mitigation measures would be needed, and, if so, what mitigation measures would be applicable.

Short-term, minor, adverse effects on EFH could occur under the selected projects due to construction activities adjacent to or near the shoreline or drainage ditches, which could increase sedimentation and turbidity in EFH if environmental protection measures were to fail. These suspended materials could clog fish gills, lower growth rates, and affect egg and larval development (MAFB 2007b). Implementation of environmental protection measures (see **Section 4.3.5**) during demolition and construction activities would limit potential impacts on EFH such as an increase in turbidity from soil disturbance. Additionally, the selected projects (specifically, Projects I5 and NI1, which are close to the shoreline) could impact the Florida manatee, which is protected under the Marine Mammal Protection Act; however, manatees have not been observed at the installation since 1992. In addition, water levels surrounding the installation are generally shallow and murky, and are not suitable habitat for the manatee. Therefore, no significant adverse impacts are anticipated.

4.3.7 Cultural Resources

The selected projects would not result in significant effects on cultural resources. The Florida SHPO has agreed that the projects associated with the IDEA are not within the archaeological APE (see **Appendix B**). Because neither of the NRHP-eligible archaeological sites (8Hi50 and 8Hi382) are within the archaeological APE for the selected projects, no effects on archaeological sites listed or eligible for listing in the NRHP would be expected. Furthermore, because the only Native American sacred site at MacDill AFB is encompassed by the archaeological site 8Hi50, and none of the selected projects are within or near 8Hi50, no effects on Native American sacred sites would be expected. In the event of inadvertent discovery of archaeological materials, procedures outlined in Standard Operating Procedure 4 in the MacDill AFB ICRMP would be followed.

No adverse effects on NRHP-eligible architectural resources would be expected from the selected projects under the NHPA and no significant impacts would be expected under NEPA. No short-term or long-term, adverse impacts would be expected from implementing any of the selected projects. All actions are outside of the NRHP-eligible historic districts and outside of the indirect APEs. Project C4 (Construct JSOU), would be across the street from Building 501, a building potentially eligible for listing in the NRHP. The area is already developed (a structure would be demolished to make room for the new structure), and all new construction would be designed and installed in accordance with the MacDill AFB design guidelines, which address compatibility within installation districts. Because the area around Building 501 has been developed, and because the new construction would take into account the design of surrounding structures including Building 501, the impact of the proposed construction on Building 501 would be negligible under NEPA and would not be considered adverse under NHPA (MAFB 2011c).

4.3.8 Socioeconomics and Environmental Justice

No significant adverse effects on socioeconomics and environmental justice would occur from the selected projects. Short-term, moderate, beneficial effects on the local economy would be expected from the selected projects due to expenditures from the implementation of the selected construction, demolition, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects from the selected projects. The Tampa St. Petersburg-Clearwater, Florida, Metropolitan Statistical Area contains approximately 73,608 construction workers (U.S. Census Bureau 2009), which should be adequate to meet the demands of the selected projects. Short-term increases in local business volume and employment within the ROI would be expected from the selected projects. The use of local construction workers would produce increases in local sales volumes, payroll taxes, and the purchases of goods and services resulting in short-term, indirect, minor, and beneficial increases in the

local economy. The selected projects would not increase or decrease the number of persons employed or stationed at MacDill AFB; therefore, no significant effects on demographics or social services and conditions would be expected.

Implementation of the selected projects would occur entirely on MacDill AFB. Possible adverse effects from construction activities could include increased traffic and noise levels and decreased air quality, but these effects would be short-term, intermittent, and minimal, and would likely affect on-installation residents more than off-installation populations. Therefore, disproportionate impacts on minority or low-income populations would not be expected.

4.3.9 Infrastructure

The selected projects would not result in significant effects on infrastructure. Utility lines within the selected project areas would be relocated and upgraded as necessary. Long-term, beneficial effects would occur replacing older, substandard facilities with new, more efficient buildings, upgrading and improving utilities, upgrading facilities, and consolidating functions. In addition, all new construction would be designed to achieve LEED Silver certification. This would promote the minimization of buildings' electricity/energy and water consumption and would optimize construction waste management and storm water management techniques to the maximum extent practicable.

Airfield. Long-term, minor, beneficial effects on the airfield would be expected due to storm water drainage improvements (Project NI1) occurring adjacent to the airfield area, which would better direct the flow of storm water off of the runway and decrease the probability of flooding, thereby increasing utilization of the airfield.

Transportation. Short-term, minor, adverse effects on the transportation network would be expected from implementing the selected projects due to increased traffic and parking lot use associated with demolition and construction equipment and contractor vehicles. The C&D phases of the selected projects would require delivery of materials to, and removal of debris from, demolition and construction sites. Construction traffic, however, would compose a small percentage of the total existing traffic on the installation. Many of the heavy construction vehicles would be driven to the site and kept on site for the duration of C&D activities, resulting in relatively few additional trips. The proposed installation development activities would occur at different times and locations on MacDill AFB over a 5-year period, which would further reduce construction traffic. Any potential increases in traffic volume associated with the proposed demolition and construction activities would be temporary.

Long-term, minor, adverse effects on traffic patterns might be expected due to possible localized traffic and pedestrian increases from consolidation and, hence, increased concentration of functions. However, because the number of total installation occupants would not be expected to change, the flow of traffic would be expected to increase as additional parking areas are added and the driving time incurred from finding parking would be reduced.

Long-term, minor to moderate, beneficial effects on transportation would be expected due to the construction and expansion of parking lots (Projects I1 [CENTCOM Parking Garage], I3 [Construct Dining Facility Parking Lot], and I6 [Construct DISA Parking Lot]) and the construction of a new pedestrian bridge (Project C1, Upgrade Fitness Center, Soccer Field, Add to and Alter Physical Fitness Center, and JCAT) and sidewalk (Project I4, Construct Medical Clinic Sidewalks). Straightening Marina Bay Drive (Project I2) would result in long-term, beneficial impacts by improving driving conditions.

Electrical Supply. Short-term, negligible, adverse effects on the electrical system would be expected during demolition and construction activities associated with the selected projects. Short-term electrical

interruptions could be experienced when buildings are disconnected from or connected to the MacDill AFB electrical distribution system during construction activities. However, the disconnection of electrical services would be temporary and coordinated with area users. Electrical utilities are in the general vicinity of and would be extended to all proposed facility locations and proposed infrastructure improvement projects.

Long-term, moderate, adverse effects on the electrical system would be expected due to the anticipated increase in electrical demand from the net increase in building space of approximately 234,354 ft² for the selected projects. However, all of the proposed construction projects would be LEED-certified Silver, which would increase energy efficiency, reduce electricity demand, and potentially influence the source of electricity through the use of alternative energy sources. The effects would be further increased by demolishing old, inefficient buildings and replacing them with new, more efficient buildings. The selected projects would result in a minor increase in electrical demands at the installation. Currently, MacDill AFB is operating at an electrical capacity of approximately 47 percent for each of its transformers, or about 90 percent when running off of one transformer, so additional electrical demands could result in required system upgrades.

Long-term, minor, beneficial effects on electrical systems and efficiency would be expected from the demolition of old facilities with outdated electrical systems and constructing new facilities with updated electrical systems, which are likely to be more efficient. In addition, the consolidation of functions would increase overall installation energy efficiency.

Liquid Fuel Supply. Short-term, negligible, adverse effects on the liquid fuel supply would be expected as a result of the selected projects due to the minimal amounts of petroleum that would be required during C&D activities. Petroleum would be brought on site by contractors and remnant amounts removed when C&D activities are complete.

Long-term, minor, beneficial effects on the liquid fuel systems would be expected due to increased fuel capacity associated with construction of three fuel tanks (Project C6).

Natural Gas. Short-term, negligible, adverse effects on the natural gas system would be expected during C&D associated with the selected projects. Short-term interruptions could be experienced when buildings are disconnected from or connected to the MacDill AFB natural gas system during construction activities. The disconnection of natural gas services would be temporary and coordinated with area users. Natural gas utilities are in the immediate vicinity of, and would be extended to, all of the proposed facility locations. The proposed projects that do not involve facility construction would not consume natural gas.

Long-term, minor, adverse effects would be expected from a net increase in building space of about 234,354 ft² that requires heating. However, the new buildings would be LEED-certified Silver, and therefore heating these buildings would be more efficient than heating buildings with outdated insulation features that would be demolished. In addition, the increase in occupied building space would be offset somewhat by the demolition of old buildings with outdated insulation features and constructing new buildings which make heating and, hence, natural gas consumption more efficient. The selected projects would result in a minor increase in natural gas demands at the installation.

Water Supply. Short-term, negligible, adverse effects on the water supply systems would be expected from the selected projects. Short-term interruptions could be experienced when buildings are disconnected from or connected to the MacDill AFB water supply system during construction activities. The pump system at MacDill AFB has a combined capacity of approximately 5.76 mgd and the daily demand ranges from 0.8 to 1.3 mgd (Harrison 2012). Therefore, it is assumed that there would be more than enough remaining capacity to accommodate the temporary increase in demand. The increase in

water consumption and work on components of the water supply system would be temporary and coordinated with area users prior to initiating the work. Water utilities are in the general vicinity of, and would be extended to, all of the proposed facility locations.

Long-term, minor, beneficial effects would be expected due to the selected projects by demolishing old buildings with outdated water fixtures with inefficient water consumption rates and constructing LEED-certified Silver facilities, which are required to reduce the water use of regulated fixtures by 20 percent below the regulations of the EPA 1992. The selected projects would not involve any increase in personnel or residents of the installation. Therefore, no long-term increase in water consumption would be expected.

Sanitary Sewer and Wastewater Treatment. Short-term, negligible, adverse effects on the sanitary sewer and wastewater systems would be expected from the selected projects. Short-term interruptions could be experienced when buildings are disconnected from or connected to the sanitary sewer and wastewater systems during construction activities. Sanitary sewer service is available in all areas of the selected projects that would include facility construction. Proposed projects that do not involve facility construction would not require sanitary sewer or wastewater treatment facilities. Work on components of the sanitary sewer and wastewater system would be temporary and coordinated with area users prior to starting the work.

Long-term, negligible to moderate, beneficial effects on sanitary sewer and wastewater treatment would be expected due to the replacement of the replacement of sludge digester tanks (Project I5) and the increase in water use efficiency associated with LEED Silver certification.

Storm Water Systems. Short-term, negligible, adverse effects would be expected from implementation of the selected projects due to temporary disturbance and increase in use of the storm water systems. A temporary increase in storm water runoff, erosion, and sedimentation would be expected during the proposed C&D activities and the removal of vegetation; however, erosion- and sediment-control practices would be implemented to minimize this impact. Storm water management areas could be a constraint to installation development if development would require the removal or relocation of a retention pond, or construction within a management area that would result in modification to the system.

Long-term, moderate, direct, adverse effects on the MacDill AFB storm water system would be expected as a result of a net increase of 899,177 ft² of impervious surfaces associated with the selected projects. As a result, there would be an increase in runoff and a reduction of groundwater recharge that could impact the impaired water bodies into which the installation discharges. However, MacDill AFB would implement environmental protection measures and SWPPPs for each project, and adhere to EISA Section 438 and other Federal, state, and local regulations so that impacts would be reduced to long-term, negligible to minor, and adverse (see **Section 4.3.5**).

Long-term, moderate, beneficial, effects on storm water management would be expected due to large-scale storm water drainage improvements, the addition of storm water retention ponds, and green spaces. Additional long-term, minor, direct, beneficial effects are possible because storm water design associated with the LEED Silver certification might improve storm water management, which could reduce the adverse runoff effects. The LEED certification points system incorporates sustainable storm water management techniques (i.e., rate reduction, quantity reduction, and treatment increase). The MacDill AFB SWPPP would further minimize the adverse effects associated with increased runoff by ensuring the implementation of the proper environmental protection measures, erosion and sediment controls, runoff management, and pollutant exposure minimization. The selected projects also would involve the use of low-impact development (LID) strategies to comply with EISA Section 438. The selected projects would incorporate site-specific storm water management features.

Communications. Short-term, negligible, adverse impacts would be expected due to the connection and disconnection of communications infrastructure during construction activities.

Long-term, negligible, adverse effects on communication systems would be expected due to the installation of communications infrastructure connecting to the Building 501/501A complex (Project C4, Construct JSOU), which would consume communications capacity.

Solid Waste Management. Short-term, minor, direct, adverse effects would result from increased C&D debris production associated with the selected projects. Solid waste generated from the proposed C&D activities would consist of building materials such as solid pieces of concrete, metals (e.g., conduit, piping, and wiring), and lumber. Contractors would be required to recycle C&D debris to the maximum extent practicable in accordance with installation policy, thereby diverting it from landfills. Clean C&D debris (e.g., concrete, asphalt) would be ground, recycled, and used for fill and roadwork rather than disposed of in a landfill. Landfill diversion rates would be maximized in accordance with the MacDill AFB Integrated Solid Waste Management Plan and the LEED certification process, which awards credits for sustainable construction waste management (e.g., landfill diversion and reuse).

Under the worst-case scenario, the contractor would dispose of nonrecyclable C&D debris at either the Southeast County Landfill or the McKay Bay Refuse-To-Energy Facility. Disposing the waste at the Southeast County Landfill would have a long-term, negligible, adverse effect on solid waste management by permanently reducing landfill capacity. As indicated in **Table 4-3**, an estimated 13,500 tons would be generated over 5 years from implementing the selected projects, averaging approximately 2,700 tpy. Based on the installation's landfill diversion rate of 40 percent, approximately 1,080 additional tons of C&D waste would be landfilled annually over a 5-year period if the waste is sent to the Southeast County Landfill and not the McKay Bay Refuse-To-Energy Facility. As of 2007, the Southeast County Landfill had a remaining capacity of about 6 million tons and a projected lifetime of 37 additional years. The total additional solid waste (from all 5 years associated with these selected projects) would represent less than 1 percent of the remaining landfill capacity.

Table 4-3. Anticipated Generation of Construction, Demolition, and Renovation Debris

Selected Projects of the MacDill AFB IDEA	Project Size (ft ²)	Multiplier (pounds/ft ²)	Total Waste Generated	
			Pounds	U.S. Tons
Demolition	159,340	158	25,175,720	12,588
Construction	235,762	4.34	1,023,207	511
Pavement Construction	667,599	1	667,599	334
Renovation	12,422	10.84	134,654	67
Total				13,500

Source: USEPA 2003

Notes:

1. Project Size includes the size of facility demolition and construction.
2. Demolition square footage includes demolition of facilities associated with demolition and construction projects.

Solid waste generated by MacDill AFB that is not diverted is typically disposed of at the McKay Bay Refuse-To-Energy Facility, which receives an average of more than 330,000 tons of waste annually and has a realistic operational capacity of about 1,639 tons per day (598,235 tpy). If waste is taken to this facility, the C&D waste generated by the selected projects would increase the yearly average amount of waste the McKay Bay Refuse-To-Energy Facility currently receives by less than 1 percent over a period

of 5 years. This would be well within the facility's capacity and would reduce the adverse effects of the selected projects on solid waste considerably. The long-term quantity of solid waste generated would be similar to existing levels because the number of personnel, long-term installation activities, and solid waste generation would remain the same.

4.3.10 Hazardous Materials and Waste

The selected projects would not result in significant effects on hazardous materials and waste. Short-term, minor, adverse effects on hazardous materials and petroleum products would be expected. C&D activities would require the use of certain hazardous materials such as paints, welding gases, solvents, preservatives, and sealants. It is anticipated that the quantity of hazardous materials used during C&D activities would be minimal and their use would be of short duration. Contractors would be responsible for the management of hazardous materials and petroleum products, which would be handled in accordance with Federal, state, and USAF regulations. In accordance with AFI 32-7086, contractors would report the use of hazardous materials to the MacDill AFB HAZMART including pertinent information (e.g., MSDSs) to mitigate any potential effects on hazardous materials. Contractors would use environmental protection measures to prevent releases and ensure that any releases do not result in contamination. Minor, adverse effects could also occur if buildings proposed for demolition store hazardous materials and petroleum products. The hazardous materials and petroleum products from these facilities would be managed in accordance with the MacDill AFB HMMP or transferred to the new facilities prior to demolition.

No long-term effects on hazardous materials and petroleum products are anticipated to occur as a result of the selected projects. Hazardous materials and petroleum products stored and used during operation of the proposed facilities would be similar in type and quantity to current conditions. Long-term, negligible, beneficial effects on hazardous materials and petroleum products could occur if buildings proposed for demolition currently store hazardous materials and petroleum products are replaced with new facilities that have modern hazardous material and petroleum product storage areas.

Hazardous and Petroleum Wastes. Short-term, minor, adverse effects on hazardous and petroleum wastes would be expected. The quantity of hazardous and petroleum wastes generated from C&D activities would be minor and would not be expected to exceed the capacities of existing hazardous and petroleum waste facilities. Contractors would be responsible for the disposal of hazardous wastes in accordance with Federal, state, and local regulations. Contractors would also be required to follow the MacDill AFB Hazardous Waste Management Plan. Minor, adverse effects could also occur if buildings proposed for demolition under the selected projects are used to store hazardous and petroleum wastes. The hazardous and petroleum wastes from these facilities would be disposed of off site or transferred to the new facilities prior to demolition.

No long-term effects on hazardous and petroleum wastes are anticipated to occur as a result of the selected projects. Hazardous and petroleum wastes generated and stored during operation of the proposed facilities would be similar in type and quantity to current conditions. Long-term, negligible, beneficial effects on hazardous and petroleum wastes could occur if buildings proposed for demolition currently store hazardous and petroleum wastes because these older buildings are replaced with new facilities that have modern hazardous and petroleum waste storage areas.

Storage Tanks. Short-term, negligible, adverse effects on storage tanks would be expected because the selected projects areas include removal of nine storage tanks. These storage tanks would be emptied of their contents and either moved to the new facilities or replaced with new storage tanks.

The selected projects would result in long-term, negligible, adverse effects from the installation of four new storage tanks (three support fuel tanks for the Alert Facility and FMSE Facility [Project C6]). If the

storage tanks from the structures proposed to be demolished in Project C6 are replaced, it would also result in a long-term, negligible, beneficial effect due to replacing older storage tanks with modern storage tanks.

Asbestos-Containing Material. Short-term, minor, adverse effects on ACM could be expected. Buildings scheduled for demolition could contain ACM and, therefore, would need to be surveyed for asbestos by a certified contractor prior to commencement of demolition activities. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition, regardless of the presence of ACMs, in accordance with NESHAP regulations. Demolition plans would be reviewed by civil engineering personnel to ensure appropriate measures were taken to reduce potential exposure to, and release of, asbestos. All friable ACM discovered would be removed prior to demolition and disposed of at a USEPA-approved landfill. Contractors would be required to adhere to all Federal, state, and local regulations in addition to the MacDill AFB management plans.

USAF regulations restrict the use of ACM for new construction. AFI 32-1023 requires that a substitution study be conducted whenever the use of an ACM in construction, maintenance, or repair is considered. If it is determined that the ACM is superior in cost and performance characteristics, and has minimal actual or potential health hazards, then the ACM should be used. In all other cases non-ACM should be used.

Long-term, negligible, beneficial effects would be expected from less exposure to and maintenance of ACM due to demolition of the older buildings.

Lead-Based Paint. Short-term, minor, adverse effects on LBP could be expected. An LBP survey of all priority facilities at MacDill AFB has not yet been completed. Several of the buildings proposed for demolition could contain LBP and, therefore, would need to be surveyed by a certified contractor prior to demolition activities. Facilities containing LBP can be demolished without removing the LBP; however, all LBP-contaminated construction debris would be disposed of in accordance with all Federal, state, and local regulations in addition to MacDill AFB management plans.

Long-term, negligible, beneficial effects would be expected from less exposure to and maintenance of LBP due to demolition of the older buildings.

Polychlorinated Biphenyls. Short-term, minor, adverse effects on PCBs could be expected. Any potential PCB-containing equipment not labeled PCB-free or missing date-of-manufacture labels discovered within the facilities proposed for demolition would be removed and handled in accordance with Federal and state regulations and the MacDill AFB Hazardous Waste Management Plan. PCB-containing materials would be transported off-installation and disposed of at a hazardous waste disposal facility.

Long-term, negligible, beneficial effects would be expected from the removal of PCB-containing equipment due to demolition of older buildings.

Pesticides. No effects on pesticides would be expected from implementation of the selected projects as it would not require any significant change in the quantities of pesticides used or significantly alter pesticide application areas. Future pesticide applications at the other proposed project sites would be conducted according to Federal, state, and local regulations and the MacDill AFB Integrated Pest Management Plan.

Radon. Short-term, negligible, adverse effects from radon could occur during construction activities associated with the selected projects. Construction workers could be exposed to radon during subsurface construction activities, but they would be in open air, which would greatly reduce their exposure.

Long-term, negligible, adverse effects from radon could be expected during implementation of the selected projects. Although there is a minimal potential for elevated indoor radon levels in Hillsborough

County, it is possible that some of the proposed structures might require radon mitigation systems. However, the Florida Department of Health states that radon controls are generally unnecessary for new construction within Hillsborough County. Radon testing at the project sites could be used to determine the presence of radon and the need for a radon mitigation system.

Environmental Restoration Program. Short-term, minor to moderate, adverse effects would be expected. Projects D1 (Demolish Buildings 65, 82, 83, and 85), D2 (Demolish Building 1107), C6 (Construct Alert Facility, FMSE Facility), I1 (CENTCOM Parking Garage), I2 (Straighten Marina Bay Drive), and NI1 (Storm Water Drainage Improvements) are on ERP sites; and Projects C1 (Upgrade Fitness Center, Soccer Field, Add to and Alter Physical Fitness Center, Construct JCAT), C2 (Construct Logistics Readiness Complex), C3 (Construct EOD Bunker Barricades), C5 (Construct Outdoor Recreation Maintenance Facility), and S1 (Install Jogging Path Lighting) are adjacent to open ERP sites; therefore, there is a potential for workers to encounter contamination during C&D activities. If contaminated groundwater or soil from nearby ERP sites is encountered during C&D activities, the handling, storage, transportation, and disposal of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and MacDill AFB management procedures. Prior to commencement of C&D activities at or within the vicinity of active ERP sites, a health and safety plan should be prepared in accordance with OSHA regulations. Workers performing soil-removal activities within ERP sites would be required to have OSHA 40-hour Hazardous Waste Operations and Emergency Response certification. In addition, supervisors would be required to have an OSHA Site Supervisor Certification. Project planning would include protection of existing ERP infrastructure, such as monitoring wells or treatment systems, to avoid disruption of monitoring and clean-up activities and minimize potential impacts on ERP infrastructure.

4.3.11 Safety

The selected projects would not result in significant effects on safety. The following subsections describe the effects on safety that would result from implementing the selected projects.

Construction Safety. Short-term, minor, adverse effects could occur from the implementation of the selected projects. The short-term risk on demolition and construction contractors would slightly increase at MacDill AFB during the normal workday as demolition and construction activity levels would increase. However, all demolition and construction contractors are required to follow and implement OSHA standards to establish and maintain safety procedures. Selected projects would not pose new or unacceptable safety risks to installation personnel or activities at the installation. The proposed projects would enable MacDill AFB to meet future mission objectives at the installation and conduct or meet mission requirements in a safe operating environment. No long-term, adverse effects on safety would be expected.

Construction workers could encounter soil or groundwater contamination as a result of ERP sites or previously unknown soil or groundwater contamination, which could result in short-term, minor, adverse impacts on workers. Projects that are within or near ERP sites (see **Section 4.3.10**) increase the potential for construction workers to encounter contamination. Prior to commencement of C&D activities at or within the vicinity of active ERP sites, a health and safety plan should be prepared in accordance with OSHA regulations. Workers performing soil-removal activities within ERP sites would be required to have OSHA 40-hour HAZWOPER training. In addition, supervisors would be required to obtain an OSHA Site Supervisor Certification. Coordination with 6 CES ERP staff would occur prior to commencement of construction activities to determine if an ERP waiver is required for each particular site. For more information on ERP sites and their associated hazards, see **Section 4.3.10, Hazardous Waste and Materials**.

Most of the buildings set for demolition were built before 1978 and would be expected to contain ACM, LBP, or PCBs. Short-term, negligible, adverse effects could be experienced during demolition, construction, and infrastructure improvement activities, but adherence to all Federal, state, and local regulations and MacDill AFB management plans would reduce these effects. Long-term, negligible, beneficial effects on safety would be expected from the removal of ACM, LBP, or PCBs by reducing potential exposure to personnel.

Demolition, construction, and infrastructure improvement activities would be accomplished in accordance with Federal, state, and local regulations to minimize safety hazards associated with hazardous materials, wastes, and substances.

Explosives and Munitions Safety. Short-term, minor, adverse effects could occur during demolition and construction activities within existing QD arcs. Contractors working within a QD arc could be exposed to an increased risk of potential explosions. Coordination with the installation Safety Office would occur so that handling or transportation of hazardous materials would not happen within QD arcs while construction workers are in these areas. This would minimize explosive safety risks to construction workers. Any construction activities within the existing munitions storage or EOD areas should be monitored for potential UXO. All proposed projects within QD arcs would be mission-necessary and consistent with current land uses inside established QD arcs.

The need for munitions, UXO, and CAIS screening at potential UXO sites will be determined on a case-by-case basis. Presence of UXO, CAIS, or other related material can result in short-term, minor to moderate, adverse impacts. An environmental restoration waiver from HQ AMC would be obtained for any projects within potential UXO sites prior to commencement of construction activities (MAFB 2006c).

4.4 Detailed Environmental Consequences of the Proposed Action

4.4.1 Selected Demolition Projects

4.4.1.1 D1. Demolish Buildings 65, 82, 83, and 85

Project D1 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project D1.

Noise. Short-term, minor to moderate, adverse effects on the noise environment would be expected from the demolition of Buildings 65, 82, 83, and 85. The noise emanating from demolition equipment would be localized, short-term, and intermittent during machinery operations. **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a demolition site. Heavy construction equipment would not be operational during the entire demolition period, which would limit the duration of increased noise levels. The D1 project site is adjacent to Hillsborough Bay and is not near off-installation land uses. The closest building to Project D1 is on-installation and approximately 50 feet from the construction site. Populations would be exposed to peak noise levels during demolition activities of approximately 90 to 94 dBA.

Land Use. Long-term, minor, beneficial effects on land use would be expected from the demolition of Buildings 65, 82, 83, and 85. Demolition activities would have beneficial effects on the installation's organizational functions by removing outdated facilities and creating space for future projects. The open space created by demolition of Buildings 65, 82, 83, and 85 would increase the amount of land available for future development. Demolition of Building 82 is consistent with the MacDill AFB IDP, which identifies this building as being demolished on the future SRM project list. This demolition would also result in a decrease of 20,136 ft² of previous impervious surface. Present land use and future land use in

this area, which is designated as administrative, would not change and would remain compatible with adjacent land use that consists of industrial to the south, outdoor recreation to the northwest, and a small section of open space to the east.

This project is on ERP Site SWMU 25, which is currently under an LUC. Project D1 would have no impact on the LUC for this area because it includes removing outdated buildings.

Air Quality. Short-term, negligible to minor, adverse effects on air quality would be expected from the demolition of Buildings 65, 82, 83, and 85. Demolition activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of demolition equipment and haul trucks transporting debris, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during demolition activities to suppress emissions. All emissions associated with demolition activities would be temporary in nature. It is not expected that emissions from the demolition of Buildings 65, 82, 83, and 85 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the demolition of Buildings 65, 82, 83, and 85 are summarized in **Table 4-4**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-4. Total Estimated Air Emissions Resulting from Project D1

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 D1 Emissions	0.250	0.061	0.476	0.017	0.266	0.040	73.752
Total 2014 D1 Emissions	0.250	0.061	0.476	0.017	0.266	0.040	73.752
Percentage of WCFI AQCR Inventory*	0.00014%	0.00005%	0.00006%	0.00001%	0.00034%	0.0002%	0.00003%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Long-term, minor, beneficial effects on air quality would be expected from the demolition of Buildings 65, 82, 83, and 85. Any long-term air emissions sources (e.g., boilers, furnaces, electrical generators) at these facilities would be deactivated and removed during the demolition process. The deactivation and removal of these air emissions sources would contribute to reducing the total air emissions produced at MacDill AFB.

Geological Resources. Project D1 would be expected to result in short-term, minor, adverse effects, and long-term, beneficial effects on soils. Soils previously were disturbed in this area when the building was constructed. Long-term effects would result from the removal of impervious surfaces and restoration of the project area to match surrounding areas.

Short-term effects would involve vegetation removal and compaction of surrounding soils under the weight of construction equipment, which would result in increased soil erosion and storm water runoff during construction activities. Adverse effects would be minimized with implementation of environmental protection measures including wetting of soils, and implementation of erosion and storm water management practices to contain soil and runoff on site. Berming along nearby water bodies would decrease the amount of potential sedimentation in adjacent water bodies. Wetting of soils would occur on a daily basis as needed to prevent erosion and generation of dust.

Short-term, minor to moderate, adverse effects on soils could occur from the disturbance of potentially contaminated soils and removal of the pavement surrounding the building that currently serves as a barrier between contaminated and clean soils. Buildings 65, 82, 83, and 85 are within the boundaries of an open ERP site (MAFB 2010a), and there is also the potential to encounter contaminated soil. Project planning should include the need for sampling and subsequent remediation within the project area to account for the discovery of contaminated soil. The handling, storage, transportation, and disposal of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and Scott AFB management procedures. This area would be repaved to contain soil and groundwater contamination. No long-term effects would be expected. No impacts on topography or geology would be anticipated.

Water Resources. Short-term, negligible, adverse effects on water resources would be expected from Project D1. The short-term, adverse effects would involve potential soil erosion and sedimentation of receiving water bodies from creating a destabilized ground surface. These impacts would be minimized through the implementation of erosion and storm water management practices to contain soil and runoff on site. Implementation of BMPs in accordance with the MacDill AFB SWPPP is required to minimize the potential for exposed soils and other contaminants reaching receiving waters. Such BMPs include the use of silt fence, covering of debris stockpiles, use of secondary containment for the temporary storage of hazardous liquids, and construction of sediment basins.

It is possible that equipment used for demolition could leak fuels or hazardous materials, or spills could occur during demolition activities. In the event of a spill or leak of fuel or other contaminants, there could be adverse effects on nearby surface waters. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up the spill quickly. See sections on *Hazardous Materials and Wastes* for further information. There remains the possibility that a spill or leak could occur, but implementation of the BMPs identified in the SPCC Plan would minimize the potential for and extent of contamination.

All of the buildings in Project D1 are in an ERP site. The contaminant is vinyl chloride in the groundwater. Therefore, there should be no contaminants of concern encountered during the proposed demolition and shallow excavation required to remove the building foundations as groundwater is not anticipated to be encountered.

Following demolition of the building, the site would be graded and covered with sod. The decrease in impervious surfaces associated with the removal of the structure would be expected to reduce the volume and velocity of storm water runoff and the associated potential for erosion and offsite transport of sediments.

The demolition activities would occur within the 100-year floodplain. The proposed demolition would have a beneficial impact on floodplains management at MacDill AFB by removing flood-prone buildings and reducing impervious surfaces within the floodplain. No wetlands are at the site of the project; therefore, no effects on wetlands would be expected. Adherence to the SWPPP and use of BMPs would prevent surface water and wetland degradation.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project D1 due to temporary disturbances (e.g., trampling and limited removal) on adjoining land and from use of heavy equipment during demolition activities. Project D1 would only affect urban upland and non-forested upland communities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by demolition activities would remain on site. Any landscaping and grass associated with Project D1 would be removed during demolition and revegetated with sod.

Short-term, negligible, adverse effects on wildlife would be expected from Project D1 due to temporary disturbances from noise, demolition activities, and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors. Project D1 would primarily affect urban upland and non-forested upland communities where human disturbance is common. Therefore, wildlife in the vicinity would be expected to be habituated to frequent disturbances. Most wildlife species in the vicinity of demolition activities would be expected to recover quickly once demolition noise and disturbances have ceased. Therefore, no long-term, adverse effects on wildlife would be expected.

No adverse effects on federally and state-listed species or other sensitive and protected species (e.g., migratory birds) would be expected from Project D1. High noise events could cause sensitive species to engage in escape or avoidance behaviors; however, the project is in previously disturbed areas with high human activity. Sensitive species in the area would be habituated to frequent disturbances and would be expected to recover quickly once demolition noise and disturbances have ceased. Nesting sites for bird species do not occur on MacDill AFB; however, the project could be completed outside of the nesting season (February 1 – September 1), further reducing potential effects.

No adverse effects on EFH would be anticipated from demolition activities because the project is away from the shoreline. In addition, environmental protection measures would minimize the potential for sedimentation to adjacent water bodies.

Cultural Resources. The proposed demolition of Buildings 65, 82, 83, and 85 are outside of the archaeological APE and would have no effect on archaeological resources listed or determined eligible for listing in the NRHP.

The proposed demolition of Buildings 65, 82, 83, and 85, which have all been determined ineligible for listing in the NRHP, would have no effect on architectural resources listed or determined eligible for listing in the NRHP (MAFB 2006b). Building 65 (built in 1959), Building 82 (built in 1954), and Building 83 (built in 1958) are all part of a radar site more than a mile from the historic districts; Buildings 65, 82, 83, and 85 have been determined not eligible for listing in the NRHP, primarily because of their lack of integrity.

Socioeconomics and Environmental Justice. Short-term, negligible to minor, beneficial effects on socioeconomic resources would be expected from the demolition of Building 65, 82, 83, and 85 and if remediation of surrounding soil and groundwater occurred. It is assumed that equipment and supplies necessary to complete the demolition and remediation activities would primarily be obtained locally, and local contractors would primarily be used. The demand for workers as part of the demolition would be minor and would not outstrip the local supply of workers. Proposed activities would occur entirely on MacDill AFB and, therefore, would have little potential to affect off-installation residents adversely. No long-term effects on socioeconomic resources are expected to result from the proposed demolition of Buildings 65, 82, 83, and 85 or possible remediation activities.

Infrastructure. Project D1 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to demolition activities. Adverse effects on utilities would be expected due to possible interruptions from disconnecting Buildings 65, 82, 83, and 85 from the utilities prior to demolition.

Debris generated during demolition activities that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, beneficial effects on utilities would be expected due to the removal of outdated infrastructure and decrease in utility use. Project D1 would involve the removal of 20,136 ft² of

impervious surface, which would result in long-term, negligible, beneficial effects on storm water management.

Hazardous Materials and Waste. Short-term, minor, adverse effects associated with hazardous materials and waste would be expected as a result of this project. Project D1 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill AFB HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). It is possible that hazardous materials or wastes could be present in Buildings 65, 82, 83, and 85. If hazardous materials or wastes are present in any of the buildings proposed to be demolished under Project D1, the materials would need to be managed in accordance with the MacDill AFB HMMP, and wastes would need to be disposed of off site in accordance with applicable laws and regulations.

No adverse effects are anticipated from demolishing buildings within an ERP site. One ERP site (SWMU 25) is associated with the project site, and groundwater contamination has been confirmed. Remedial action has been conducted at SWMU 25, and it is currently under MNA. The main contaminant of concern is vinyl chloride in the groundwater; therefore, no contaminants are anticipated to be encountered during the proposed shallow excavation and demolition activities above the groundwater table. If contaminated media are encountered during demolition activities, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines. Existing monitoring wells would need to be protected from damage during demolition activities.

Short-term, minor, adverse effects could result from demolishing Buildings 65, 82, 83, and 85, which, because of their age, could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Long-term, minor, beneficial effects would be expected due to the removal of older buildings that could result in less exposure to and maintenance of ACM and LBP, and possibly PCBs. No long-term effects on hazardous materials and wastes, storage tanks, pesticides, radon, and ERP sites would be expected from Project D1.

Safety. Short-term, minor, adverse effects could occur during demolition activities. Demolition activities pose an increased risk of demolition-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear personal protective equipment (PPE) such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Demolition areas would be fenced and appropriately marked with signs. Demolition equipment and associated trucks transporting material to and from demolition sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

Because of the age of these buildings, it should be assumed they contain ACM, LBP, and PCBs. These materials require appropriate characterization, removal, handling, and disposal during demolition activities by qualified personnel. Short-term, minor, adverse impacts on safety during removal of ACM,

LBP, and PCBs could occur, and long-term, beneficial effects on safety would also be expected from the removal of ACM, LBP, and PCBs by reducing exposure to personnel.

These buildings are also within ERP site SWMU 25. Remedial action has been conducted at SWMU 25, and it is currently under MNA. There is a possible chance for workers to be exposed to contamination in this area. This would result in short-term, minor to moderate, adverse impacts but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.1.2 D2. Demolish Building 1107

Project D2 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project D2.

Noise. Negligible effects on the noise environment would be expected from the demolition of Building 1107. The noise emanating from demolition equipment would be localized, short-term, and intermittent during machinery operations. **Table 4-2** shows estimated combined noise levels that would be expected at varying distances from a demolition site. Heavy construction equipment would not be operational during the entire demolition period, which would limit the duration of increased noise levels. The D2 project site is adjacent to the airfield; it is not near off-installation land uses. The closest on-installation building is approximately 270 feet from the construction site; populations would be exposed to temporary noise levels of approximately 78 to 82 dBA.

Land Use. Long-term, minor, beneficial effects would be expected from the demolition of Building 1107. Demolition activities would have beneficial effects on the installation's organizational functions by removing an outdated facility and creating space for future projects. The open space created by demolition of Building 1107 would increase the amount of land available for future development. Demolition of Building 1107 is consistent with the MacDill AFB IDP, which identifies this building as being demolished on the future SRM project list. This site is within the aircraft operations and maintenance land use category and would allow 5,395 ft² of impervious surface land to become available for future use. Present and future land use would remain unchanged and would be compatible with adjacent land that consists of airfield pavements to the north and open space to the south.

This project is on ERP Site SWMU 18, which is currently under an LUC. Project D2 would have no impact on the LUC for this site because it includes removing an outdated building and terminating associated utilities to restore the site to a land use that is similar to adjacent areas.

Air Quality. Short-term, negligible to minor, adverse effects on air quality would be expected from the demolition of Building 1107. Demolition activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of demolition equipment and haul trucks transporting debris, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during demolition activities to suppress emissions. All emissions associated with demolition activities would be temporary in nature. It is not expected that emissions from the demolition of Building 1107 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the demolition of Building 1107 are summarized in **Table 4-5**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Long-term, minor, beneficial effects on air quality would be expected from the demolition of Building 1107. Any long-term air emissions sources (e.g., boilers, furnaces, electrical generators) at these facilities would be deactivated and removed during the demolition process. The deactivation and removal of these air emissions sources would contribute to reducing the total air emissions produced at MacDill AFB.

Table 4-5. Estimated Air Emissions Resulting from Project D2

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total D2 Emissions	0.112	0.046	0.395	0.006	0.077	0.013	56.338
Percentage of WCFI AQCR Inventory	0.00006%	0.00003%	0.00005%	0.000004%	0.0001%	0.00007%	0.00002%*

Note: * Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Impacts on soils from the demolition of Building 1107 would be short-term, minor, and adverse, and long-term, beneficial effects on soils. Soils previously were disturbed in this area when the building was constructed. Long-term effects would result from the removal of impervious surfaces and restoration of the project area to match surrounding areas.

Short-term effects would involve vegetation removal and compaction of surrounding soils under the weight of construction equipment, which would result in increased soil erosion and storm water runoff during construction activities. Adverse effects would be minimized with implementation of environmental protection measures including wetting of soils, and implementation of erosion and storm water management practices to contain soil and runoff on site. Berming along nearby water bodies would decrease the amount of potential sedimentation in adjacent water bodies. Wetting of soils would occur on a daily basis as needed to prevent erosion and generation of dust. No impacts on topography or geology would be anticipated.

Water Resources. Short-term, negligible, adverse effects on water resources would be expected from Project D2. The short-term, adverse effects would involve potential soil erosion and sedimentation of receiving water bodies from creating a destabilized ground surface. These impacts would be minimized through the implementation of erosion and storm water management practices to contain soil and runoff on site. Implementation of BMPs in accordance with the MacDill AFB SWPPP is required to minimize the potential for exposed soils and other contaminants reaching receiving waters. Such BMPs include the use of silt fences, covering of debris stockpiles, use of secondary containment for the temporary storage of hazardous liquids, and construction of sediment basins.

It is possible that equipment used for demolition could leak fuels or hazardous materials, or spills could occur during demolition activities. In the event of a spill or leak of fuel or other contaminants, there could be adverse effects on nearby surface waters. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up the spill quickly. See sections on *Hazardous Materials and Wastes* for further information. There remains the possibility that a spill or leak could occur, but implementation of the BMPs identified in the SPCC Plan would minimize the potential for and extent of contamination.

The building is in an ERP site, but groundwater interaction is not anticipated. The site is to be leveled and sod installed, which would have a beneficial effect from the decrease of impervious surface area. The decrease in impervious surfaces associated with the removal of the structure would be expected to reduce the volume and velocity of storm water runoff and the associated potential for erosion and offsite transport of sediments. However, the long-term plan is to turn the area into an alert facility. If this occurs, storm water management would have to be addressed.

Building 1107 is within the 100-year floodplain and demolition would result in a long-term, minor, beneficial effect because the facility would be removed from flood-prone areas and impervious surfaces would be reduced. No surface waters or wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed construction project. However, the site is adjacent to wetland areas. Effects on adjacent wetlands would be avoided through proper implementation of environmental protection measures and BMPs. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project D2 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by demolition activities would remain on site. Any landscaping and grass associated with Project D2 would be removed during demolition and disturbed areas would be revegetated with sod.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition activities, and heavy equipment use. Wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition activities would be expected to recover quickly once demolition noise and disturbances have ceased. Therefore, no long-term, adverse effects on wildlife would be expected.

No effects on protected and sensitive species would be expected from this project; however, short-term, negligible, adverse effects on EFH could occur due to increased sediment runoff associated with the construction activities adjacent to the shoreline, which would increase sedimentation and turbidity in EFH. Implementation and maintenance of environmental protection measures (see Section 4.3.5) during demolition and construction activities would limit potential impacts on EFH, insects, and benthic fauna. Therefore, no significant adverse impacts are anticipated.

Cultural Resources. The proposed demolition of Building 1107 is outside of the archaeological APE and would have no effect on archaeological resources listed or determined eligible for listing in the NRHP.

Building 1107 (Warehouse Supply and Equipment) was constructed in 1974 and was evaluated for NRHP eligibility during a 2012 Cold War facilities evaluation. Building 1107 does not meet any of the criteria considerations for eligibility for the NRHP. The building is not architecturally unique or associated with any significant people or actions that occurred on MacDill AFB (MAFB 2012b). Therefore, Project D2 would have no impact on historic properties.

Socioeconomics and Environmental Justice. Impacts on socioeconomics and environmental justice would be short-term, negligible to minor, and beneficial. Short-term, negligible to minor, beneficial effects on socioeconomic resources would be expected from the use of local contractors for demolition work. The demand for workers as part of the demolition would be minor and would not outstrip the local supply of workers. Proposed activities would occur entirely on MacDill AFB and, therefore, would have little potential to affect off-installation residents adversely. No long-term effects on socioeconomic resources are expected to result from Project D2.

Infrastructure. Project D2 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to demolition activities. Adverse effects on utilities would be expected due to possible interruptions from disconnecting Building 1107 from the utilities prior to demolition.

Debris generated during demolition activities that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, beneficial effects on utilities would be expected due to the removal of outdated infrastructure and decrease in utility use. Project D2 would involve the removal of 5,359 ft² of impervious surface, which would result in long-term, negligible, beneficial effects on storm water management.

Hazardous Materials and Waste. Short-term, minor, adverse effects associated with hazardous materials and waste would be expected as a result of this project. Project D2 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill AFB HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). It is possible that hazardous materials or wastes could be present in Building 1107. If hazardous materials or wastes are present in any of the buildings proposed to be demolished under Project D2, the materials would need to be managed in accordance with the MacDill AFB HMMP, and wastes would need to be disposed of off site in accordance with applicable laws and regulations.

Short-term, minor to moderate, adverse effects could result from demolishing buildings within an ERP site. One ERP site (SWMU 18) is associated with Building 1107, and soil and groundwater contamination has been confirmed. Sampling and remedial action could be necessary prior to demolition activities due to the possible burial of Chemical Warfare Agency test kits and other Chemical Warfare Agency material at the site. If Chemical Warfare Agency material or other contaminated media are encountered during demolition activities, the project work would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Short-term, minor, adverse effects could result from demolishing Building 1107, which, because of its age, could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Long-term, minor, beneficial effects would be expected due to the removal of an older building that could result in less exposure to and maintenance of ACM and LBP, and possibly PCBs. No long-term effects on hazardous materials and wastes, storage tanks, pesticides, radon, and ERP sites would be expected from Project D2.

Safety. Impacts on safety would be short-term, minor, and adverse on workers. Demolition activities pose an increased risk of demolition-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Demolition areas would be fenced and appropriately marked with signs. Demolition equipment and associated trucks transporting material to and from demolition sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

Because of the age of Building 1107, it would be assumed to contain ACM, LBP, and PCBs; therefore, impacts would also be the same as Project D1 and would be long-term and beneficial after removal of

these substances. Sampling and remedial action could be necessary prior to demolition activities. There is a possible chance for workers to be exposed to contamination in this area. This would result in short-term, minor, adverse impacts but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.1.3 D3. Demolish Building 40

Project D3 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project D3.

Noise. Short-term, minor to moderate, adverse effects on the noise environment would be expected from the demolition of Building 40. The noise emanating from demolition equipment would be localized, short-term, and intermittent during machinery operations. **Table 4-2** shows estimated combined noise levels that would be expected at varying distances from a demolition site. Heavy construction equipment would not be operational during the entire demolition period, which would limit the duration of increased noise levels. The D3 project site is in the middle of the installation; it is not near off-installation land uses. The closest on-installation building is approximately 100 feet from the construction site; populations would be exposed to noise levels of approximately 84 to 88 dBA.

Land Use. Long-term, minor, beneficial effects would be expected from the demolition of Building 40. Demolition activities would have beneficial effects on the installation's organizational functions by removing an outdated facility and creating space for future projects. The open space created by demolition of Building 40 would increase the amount of land available for future development. Demolition of Building 40 is consistent with the MacDill AFB IDP, which identifies this building as being demolished on the future SRM project list. This site is within the Administrative land use category, and would make 11,737 ft² of impervious surface land available for future use. Present and future land use for this project would remain unchanged and would be compatible with adjacent land that consists of administrative to the south and housing (accompanied) to the northeast.

Air Quality. Short-term, negligible to minor, adverse effects on air quality would be expected from the demolition of Building 40. Demolition activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of demolition equipment and haul trucks transporting debris, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during demolition activities to suppress emissions. All emissions associated with demolition activities would be temporary in nature. It is not expected that emissions from the demolition of Building 40 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the demolition of Building 40 are summarized in **Table 4-6**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-6. Estimated Air Emissions Resulting from Project D3

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total D3 Emissions	0.302	0.067	0.508	0.022	0.348	0.053	80.456
Percentage of WCFI AQCR Inventory	0.00017%	0.00005%	0.00007%	0.00001%	0.00045%	0.00026%	0.00003%*

Note: * Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Project D3 would be expected to result in short-term, minor, adverse effects, and long-term, beneficial effects on soils. Soils previously were disturbed in this area when the building was constructed. Long-term effects would result from the removal of impervious surfaces and restoration of the project area to match surrounding areas.

Short-term effects would involve vegetation removal and compaction of surrounding soils under the weight of construction equipment, which would result in increased soil erosion and storm water runoff during construction activities. Adverse effects would be minimized with implementation of environmental protection measures including wetting of soils, and implementation of erosion and storm water management practices to contain soil and runoff on site. Berming along nearby water bodies would decrease the amount of potential sedimentation in adjacent water bodies. Wetting of soils would occur on a daily basis as needed to prevent erosion and generation of dust. No impacts on topography or geology would be anticipated.

Water Resources. Short-term, negligible, adverse effects on water resources would be expected from Project D3. The short-term, adverse effects would involve potential soil erosion and sedimentation of receiving water bodies from creating a destabilized ground surface. These impacts would be minimized through the implementation of erosion and storm water management practices to contain soil and runoff on site. Implementation of BMPs in accordance with the MacDill AFB SWPPP is required to minimize the potential for exposed soils and other contaminants reaching receiving waters. Such BMPs include the use of silt fence, covering of debris stockpiles, use of secondary containment for the temporary storage of hazardous liquids, and construction of sediment basins.

It is possible that equipment used for demolition could leak fuels or hazardous materials, or spills could occur during demolition activities. In the event of a spill or leak of fuel or other contaminants, there could be adverse effects on nearby surface waters. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up the spill quickly. See sections on *Hazardous Materials and Wastes* for further information. There remains the possibility that a spill or leak could occur, but implementation of the BMPs identified in the SPCC Plan would minimize the potential for and extent of contamination.

Following demolition of the building, the site would be graded and covered with sod. When sod is established and the area is maintained as green space, long-term, minor, beneficial effects would be expected as sedimentation and impervious surface area would decrease. Storm water runoff velocity and volume would decrease, which would contribute to an increase in groundwater recharge. No wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed demolition project.

Building 40 is within the 100-year floodplain; therefore, the proposed demolition would have a beneficial impact on floodplains management at MacDill AFB by removing flood-prone buildings and reducing impervious surfaces within the floodplain.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project D3 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by demolition activities would remain on site. Any landscaping and grass associated with Project D3 would be removed during demolition and disturbed areas would be revegetated with sod.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition activities, and heavy equipment use. Wildlife in the vicinity would

be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition activities would be expected to recover quickly once demolition noise and disturbances have ceased. Therefore, no long-term, adverse effects on wildlife would be expected. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. The proposed demolition of Buildings 40 (Communications Facility) is outside of the archaeological APE and would have no direct effect on archaeological resources listed or determined eligible for listing in the NRHP.

Building 40, which was built in 1953, is just south of Building 501 and has been determined ineligible for listing in the NRHP in 2006. Therefore, demolition would have no effect on architectural resources listed or determined eligible for listing in the NRHP (MAFB 2006b).

Socioeconomics and Environmental Justice. Impacts on socioeconomics and environmental justice from the demolition of Building 40 would be short-term, negligible to minor, and beneficial. Short-term, negligible to minor, beneficial effects on socioeconomic resources would be expected from the use of local contractors. The demand for workers as part of the demolition would be minor and would not outstrip the local supply of workers. Proposed activities would occur entirely on MacDill AFB and, therefore, would have little potential to affect off-installation residents adversely. No long-term effects on socioeconomic resources are expected to result from Project D3.

Infrastructure. Project D3 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to demolition activities. Adverse effects on utilities would be expected due to possible interruptions from disconnecting Building 40 from the utilities prior to demolition.

Debris generated during demolition activities that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, beneficial effects on utilities would be expected due to the removal of outdated infrastructure and decrease in utility use. Project D3 would involve the removal of 11,737 ft² of impervious surface, which would result in long-term, negligible, beneficial effects on storm water management.

Hazardous Materials and Waste. Short-term, minor, adverse effects associated with hazardous materials and waste would be expected as a result of this project. Project D3 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill AFB HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). It is possible that hazardous materials or wastes could be present in Building 40. If hazardous materials or wastes are present in any of the buildings proposed to be demolished under Project D3, the materials would need to be managed in accordance with the MacDill AFB HMMP, and wastes would need to be disposed of off site in accordance with applicable laws and regulations.

Short-term, minor, adverse effects could result from demolishing Building 40, which, because of its age, could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly

characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Long-term, minor, beneficial effects would be expected due to the removal of an older building that could result in less exposure to and maintenance of ACM and LBP, and possibly PCBs. No long-term effects on hazardous materials and wastes, storage tanks, pesticides, radon, and ERP sites would be expected from Project D2.

Short-term, negligible, adverse effects would be expected on storage tanks because Building 40 contains two ASTs. The demolition of this building would require proper closure or disposal of the ASTs.

Safety. Impacts on safety would be short-term, minor, and adverse. Demolition activities pose an increased risk of demolition-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Demolition areas would be fenced and appropriately marked with signs. Demolition equipment and associated trucks transporting material to and from demolition sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

Because of the age of Building 40, it would also be assumed to contain ACM and LBP; therefore, impacts would also be the same as Project D1 and would be long-term and beneficial after removal of these substances.

4.4.2 Selected Construction Projects

4.4.2.1 C1. Upgrade Fitness Center, Soccer Field, Add to and Alter Physical Fitness Center, Joint Combat Aquatic Training Center

Project C1 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C1.

Noise. Intermittent, short-term, moderate, adverse impacts on the noise environment would result from construction of C1 projects. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The project site is in the middle of the installation; it is not near off-installation land uses. Residences are within 400 feet from the project site (Dorms 375 and 376, and Temporary Living Facilities 360, 361, 363, and 364). The closest on-installation building is directly adjacent to the proposed site and would be exposed to construction noise levels of approximately 90 to 94 dBA.

Land Use. Long-term, minor, adverse and beneficial impacts on land use would be expected from the upgrade to the existing fitness center soccer field, the Physical Fitness Center and the construction of the Joint Combat Aquatic Training (JCAT) Center. A portion of Project C1 is classified as community (service) land use; however, a majority of the proposed construction is within the outdoor recreation land use category. The construction of the JCAT Center would require a land use change from outdoor recreation to community (service). Construction of the JCAT Center and the addition to/alteration of the existing fitness center is consistent with the MacDill AFB IDP long-range development goals (MAFB 2011b). This project is also consistent with the MacDill AFB IDP due to its location within the Core District overlay. After changing the land use, the location of the new JCAT and existing Fitness Center

would be compatible with existing and future land uses for the surrounding area. Construction activities related to Project C1 would have beneficial effects on the installations organizational functions by consolidating similar functions in the same general area and by removing outdated structures.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the construction of Project C1. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

Long-term, minor, adverse effects on air quality would be expected from the use of natural gas boilers to provide comfort heating to the proposed facility. While these operating emissions would increase the overall air emissions from MacDill AFB, the added emissions would be offset by a reduction in air emissions from the demolition of older buildings that use more emissions intensive heating systems. It is not expected that emissions from Project C1 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction and operation of the proposed Project C1 (Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, JCAT Center) are summarized in **Table 4-7**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-7. Estimated Air Emissions Resulting from Project C1

Activity (Year)	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 C1 Emissions	5.413	0.806	3.779	0.424	4.500	0.820	743.214
Total 2014 C1 Emissions	5.413	0.806	3.779	0.424	4.500	0.820	743.214
Percentage of WCFI AQCR Inventory *	0.003%	0.001%	0.001%	0.0003%	0.006%	0.004%	0.0003%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, minor, and long-term, moderate, adverse effects on geology and soils would be expected from Project C1. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, grading, paving, and excavation or trenching. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C1, long-term, minor to moderate, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity, which is the capacity of the soil to produce vegetative biomass, would decline in disturbed areas and be eliminated in those areas within the footprint of roadways. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor infiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The Urban land complex is the only soil mapped at this project location. Construction limitations are not rated for urban land (NRCS 2012).

The site is not adjacent to any open ERP sites, and no soil contamination is known on site. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to raise the facility above the floodplain. No impacts on geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C1. The project is in the 100-year floodplain and would include a pedestrian bridge over an upland cut drainage ditch classified as jurisdictional waters of the United States. Short-term effects could occur from the removal of vegetation and grading and excavation of soil for construction of the facility and installation of the pedestrian bridge. Impacts on wetlands would be avoided through design of the bridge (i.e., installing the bridge beyond wetland areas) and therefore no impacts on wetlands would occur. Disturbance of soil and removal of vegetation associated with development could result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm water flow events. To minimize the impact, the project would adhere to BMPs identified in site-specific SWPPPs in compliance with the NPDES general permit for construction activities for projects greater than one acre.

Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. This could cause an increase in water runoff and storm-related damages to facilities and possibly result in human safety risks. The JCAT Center would be constructed above the 100-year flood elevation of 11.5 feet, reducing potential flood damage to the structure; however, the addition to the Fitness Center would not be elevated.

Increases in impervious surfaces or modifications to storm water systems, and impacts on wetlands or surface waters require an environmental resource permit from the SWFWMD. The Environmental Resource Program implemented by the SWFWMD has a requirement to manage storm water quantity and quality leaving the site. Any necessary agency coordination and required permits would be obtained prior to commencing any construction activities. Effects on wetlands and other waters of the United States would be avoided through design and implementation of environmental protection measures.

In the event of a spill or leak of fuel or other contaminants, there could be adverse effects on the receiving water bodies. All fuels and other potentially hazardous materials would be contained and stored appropriately. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up a spill quickly. BMPs identified in the SPCC Plan would minimize the potential for and extent of associated contamination.

Biological Resources. Short- and long-term, negligible, adverse effects on vegetation would be expected from Project C1 due to temporary disturbances (e.g., trampling and limited removal) on adjoining land, from use of heavy equipment during demolition and construction activities, and from the permanent loss of habitat. Project C1 would primarily affect urban upland and non-forested upland communities. Adverse effects resulting from the permanent loss of vegetation associated with this project would be negligible. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by demolition activities would remain on site. Any landscaping and grass associated with Project C1 would be removed during construction and disturbed areas would be revegetated with sod.

Short-term, negligible to minor, adverse effects on wildlife would be expected from Project C1 due to temporary disturbances from noise, demolition and construction activities; and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors. This project would primarily affect urban upland and non-forested upland communities where human disturbance is common. Therefore, wildlife in the vicinity would be expected to be acclimated to frequent disturbances.

Most wildlife species would be expected to recover quickly once demolition and construction noise and disturbances have ceased.

Long-term, minor, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. All trees and vegetation impacted from construction activities would be replaced or relocated as practicable. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project C1 is outside of the archaeological APE and would have no direct effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project C1 is more than 1,700 feet from the MacDill Field Historic District and the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,700 feet from Building 501, a building potentially eligible for listing in the NRHP. The proposed project would be at a sufficient distance not to affect the integrity of setting or feeling of the historic districts or Building 501. This project is in an area of the installation that was developed within the past 40 years and was identified in the ICRMP as having no effect on historic properties.

Socioeconomics and Environmental Justice. Short- and long-term, negligible to minor, beneficial effects would be expected from Project C1. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction and renovation activities would occur entirely on MacDill AFB and adjacent to an on-installation residential area. Therefore, short-term, negligible, adverse impacts on environmental justice issues might be expected due to construction noise and traffic for those residents living near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely.

Infrastructure. Project C1 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to C&D and renovation activities. Short-term, negligible, adverse effects on utilities would be expected due to possible interruptions from connecting the proposed facilities to the utilities and disconnecting the facilities proposed for demolition from the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of C&D and renovation debris. This is a short-term, adverse effect as debris would only be generated during the C&D and renovation activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, negligible, beneficial effects on utility use efficiency would be expected by demolishing old outdated facilities and constructing new, more efficient, facilities.

Long-term, minor, adverse, effects on utilities would be expected due to the additional infrastructure and net increase in building space, and hence, utility use. Project C1 would involve the addition of 142,219 ft² of impervious surface, which would result in long-term, minor, adverse effects on storm water management. However, because Project C1 would be designed and constructed to achieve LEED Silver certification, adverse effects on utilities and storm water management would be minimized.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C1 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

Short-term, minor, adverse effects could result from demolishing Buildings 46 and 47 and renovating Building 303, which, because of their ages, could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Long-term, minor, beneficial effects would be expected due to the removal of older buildings that could result in less exposure to and maintenance of ACM, LBP, and PCBs. No new long-term, adverse effects on hazardous materials and wastes would be anticipated from operation of Project C1; and the installation's waste streams would not be altered. No long-term effects on storage tanks, pesticides, radon, and ERP sites would be expected from Project C1.

Safety. Short-term, negligible to minor, adverse effects associated with safety could occur during C&D activities. C&D activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. C&D areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

Because of the age of Buildings 46 and 47, it should be assumed they contain ACM, LBP, and PCBs. These materials require appropriate characterization, removal, handling, and disposal during demolition activities by qualified personnel. Long-term, beneficial effects on safety would also be expected from the removal of ACM, LBP, and PCBs by reducing exposure to personnel.

4.4.2.2 C2. Construct Logistics Readiness Complex

Project C2 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C2.

Noise. Short-term, minor to moderate, adverse effects on the noise environment would be expected from Project C2. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The proposed construction site is between open space and community (service) land uses. Site C2 is adjacent to the airfield; it is not near off-installation land uses. The closest on-installation building is 305, which is an Auto Hobby Shop, approximately 80 feet from the construction site; populations would be exposed to noise levels of approximately 85 to 90 dBA.

Land Use. Long-term, negligible to minor, adverse and beneficial impacts on land use would be expected from the construction of a new Logistics Readiness Complex. A majority of the project footprint is on administrative land use and would remain unchanged with implementation of Project C2. Portions of the project overlap with aircraft operations and maintenance and community (service) land uses and would subsequently need to be changed to administrative. The construction of the Logistics Readiness Complex is consistent with the MacDill AFB IDP current development goals (MAFB 2011b). This project is also consistent with the MacDill AFB IDP due to its location within the Core District overlay.

Long-term, beneficial impacts from the removal of outdated structures would occur under Project C2. After changing the land use, the location of the new Logistics Readiness Complex would be compatible with existing and future land uses and the surrounding area. Construction activities related to Project C2 would have beneficial effects on the installation's organizational functions by consolidating similar functions in the same general area.

Four ERP sites (TU/US-C500, Site 38 [including Site 53], Site 56, and SWMU 61 [including SWMU 29]) are immediately adjacent to or within 165 feet of the demolition and construction project areas. TU/US-C500 is considered Low Risk and is currently approved for MNA (MAFB 2011e). No constituents of concern have been identified in the soil, surface water, or sediment at SWMU 61 and it is currently under long-term management via LUCs and MNA of contaminants. Site 38 and Site 56 are considered Low Risk. The LUCs for SWMU 61 would have no impact on the land use of the proposed project.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the construction of the proposed Logistics Readiness Complex. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

Long-term, minor, adverse effects on air quality would be expected from the use of natural gas boilers to provide comfort heating to the proposed facility. While these operating emissions would increase the overall air emissions from MacDill AFB, the added emissions would be offset by a reduction in air emissions from the demolition of older buildings that use more emissions intensive heating systems. It is not expected that emissions from Project C2 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions were not calculated for natural gas boilers because they are subject to NSR requirements, which ensure that air quality is not significantly degraded from the addition of new and modified industrial boilers. Emissions from the construction and operation of the proposed Logistics Readiness Complex are summarized in **Table 4-8**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-8. Estimated Air Emissions Resulting from Project C2

Activity (Year)	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 C2 Emissions	7.110	1.231	5.626	0.563	19.716	2.495	1,007.682
Percentage of WCFI AQCR Inventory *	0.0040%	0.0009%	0.0008%	0.0003%	0.0255%	0.0120%	0.0004%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions. See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on geology and soils would be expected from Project C2. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, grading, paving, and excavation or trenching. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C2, long-term, minor to moderate, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity would decline in disturbed areas and be eliminated in those areas within the footprint of buildings and roadways. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The Urban land complex is the only soil mapped at this project location. Construction limitations are not rated for urban land (NRCS 2012).

Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to raise the facility above the floodplain. No impacts on geology would be anticipated.

Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on facilities during flood events. No impacts on topography would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C2. Adverse effects would occur from the removal of vegetation and excavation of soil for construction of the facility and installation of utilities, resulting in increased sedimentation in storm water runoff. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. Additionally, the facility would be constructed above the 100-year flood elevation and require an Environmental Resource Permit from the SWFWMD.

Project I2, Straighten Marina Bay Drive, must be accomplished prior to construction of the Logistics Readiness Complex to create a site footprint big enough for the new LRS facilities. Impacts associated with C&D activities within the drainage ditch, classified as a jurisdictional water of the United States, are discussed under Project I2 (see **Section 4.4.3.2**). The project site is adjacent to a drainage ditch that is classified as a jurisdictional water of the United States. Additional effects on adjacent water resources including the drainage ditch would be avoided through design, siting, and proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, establishing a wetland buffer, and following policies and procedures as detailed in the installation SWPPP and site-specific SWPPP required by the NPDES general permit for construction activities.

In the event of a spill or leak of fuel or other contaminants, there might be adverse effects on the receiving water bodies. All fuels and other potentially hazardous materials would be contained and stored appropriately. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up a spill quickly. BMPs identified in the SPCC Plan would minimize the potential for and extent of associated contamination.

Biological Resources. Short-term, negligible to minor, adverse effects on vegetation would be expected from Project C2 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition and construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, minor, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. Short-term, negligible, adverse effects on aquatic species could occur due to increased sediment runoff associated with demolition activities and the straightening of Marina Bay Drive, which would increase sedimentation and turbidity. Implementation of environmental protection measures (see **Section 4.3.5**) during demolition activities would limit potential impacts on aquatic species, insects, and benthic fauna. Therefore, no significant adverse impacts are anticipated. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. The proposed construction of a Logistics Readiness Complex is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Project C2 would be more than 700 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District and, therefore, would not affect the integrity of setting or feeling of the historic districts. Therefore, Project C2 would have no adverse effect on architectural resources listed or eligible for listing in the NRHP. This project is just north of Building 49, an early Cold War era structure that has been determined not eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources and environmental justice from Project C2 would be short- and long-term, negligible to minor, and beneficial. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB. No impacts on environmental justice would be expected because no residential areas are near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely.

Infrastructure. Project C2 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities. Short-term, negligible, adverse effects on utilities would be expected due to possible interruptions from connecting the proposed facilities to the utilities and disconnecting the facilities proposed for demolition from the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of C&D debris. This is a short-term, adverse effect as debris would only be generated during the C&D

activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, negligible, beneficial, effects on utilities would be expected due to the removal of outdated infrastructure and net decrease in building space and utility use. Additional beneficial effects on electrical utilities would be expected due to improvements in electrical efficiency, as the existing vehicle maintenance shop has an insufficient electrical capacity. The new facility would collocate logistics readiness functions, and would result in an estimated energy savings of \$60,000 per year by implementing more energy-efficient functionality. Project C2 would involve the addition of 293,878 ft² of impervious surface, which would result in long-term, minor, adverse effects on storm water management. A storm water retention pond and green space are proposed, and a box culvert would be constructed to ensure storm water management functionality.

Long-term, negligible, adverse effects on traffic might be possible due to the consolidation of functions. This would involve the same amount of vehicles but less possible travel routes because the functions would be consolidated into one location rather than several. Therefore, increased congestion is a possibility. However, in conjunction with the implementation of Project I2, long-term, beneficial impacts on infrastructure would occur from the straightening of Marina Bay Drive, which would improve the flow of traffic (see **Section 4.4.3.2**).

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C2 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). There would be no impacts associated with pesticides and radon.

No adverse effects are anticipated from constructing Project C2 near ERP sites. One ERP site (TU/US-C500 [F45]) is within 165 feet of the construction project area, and groundwater and soil contamination had been confirmed. TU/US-C500 is considered Low Risk and is currently approved for MNA (MAFB 2011e). Three ERP sites (Site 38 [including Site 53], Site 56, and SWMU 61 [including SWMU 29]) are immediately adjacent to or within 165 feet of the demolition project areas. No constituents of concern have been identified in the soil, surface water, or sediment at SWMU 61 and it is currently under long-term management via LUCs and MNA of contaminants. Site 38 and Site 56 are considered Low Risk. Site 38 is currently under long-term management, including groundwater monitoring. Site 56 is under remedial action, including biosparging with soil vapor extraction (MAFB 2011e, MAFB 2011k). C&D activities are not anticipated to make contact with contaminated media. Therefore, it is unlikely that contaminated media would be encountered during construction activities; however, if it is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Short-term, negligible adverse effects would be expected on storage tanks because Building 500 contains one AST. The demolition of Building 500 would require the AST to be properly emptied and relocated to the new facility.

Short-term, minor, adverse effects could result from demolishing Buildings 119, 500, and 510. Because of their ages, Building 500 could contain ACM, LBP, and PCBs, and Buildings 119 and 510 could contain asbestos. Existing records in the asbestos database for MacDill AFB indicate that

asbestos-containing building materials were identified in Building 500. The 2008 limited survey report for Building 500 identified asbestos-containing black floor tile with mastic, which was abated in 1991 (MAFB 2011e). Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Safety. Impacts on safety related to C&D would be short-term, minor, and adverse. C&D activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. C&D areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic.

Project C2 is adjacent to or within 165 feet of ERP sites TU/US-C500, SWMU 61, Site 38 (including Site 53), and Site 56. TU/US-C500, Site 38 and Site 56 are considered Low Risk while SWMU 61 is currently under long-term management. It is unlikely contaminated material would be encountered; however, there is still a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on worker safety but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

Because of the age of Buildings 119, 500, and 510, they would also be assumed to contain ACM, LBP and PCBs; therefore, impacts would also be the same as Project C1 and would be long-term and beneficial after removal of these substances.

4.4.2.3 C3. Construct EOD Bunker Barricades

Project C3 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C3.

Noise. Negligible effects on the noise environment would be expected from Project C3. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. This site is not near off-installation land uses; however, it is approximately 2,400 feet from the bald eagle nesting area buffer. Noise levels at this site would be approximately 56 to 60 dBA.

Land Use. No effects on land use would be expected from the construction of the EOD Bunker Barricades. The EOD range is within open space land use and would not change from the addition of the EOD Bunker Barricades. Because there is no change in the land use for this project, existing and future surrounding land uses would remain the same. This project is consistent with the MacDill AFB IDP due to its location within the “A” Industrial District overlay. The EOD Bunker Barricades would be within a QD arc associated with the EOD ranges; however, since the project would improve the safety of the EOD facility and associated personnel and operations, this project would be expected to have long-term, beneficial impacts.

This project is adjacent to ERP Sites SWMU 6 and SWMU 7, which have LUCs; however, the LUCs for these ERP sites would have no impact on the proposed project.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from Project C3. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

No long-term air emissions would be expected from Project C3. It is not expected that emissions from Project C3 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction and operation of the proposed Construct EOD Bunker Barricades are summarized in **Table 4-9**. Emissions estimation spreadsheets and a summary of the methodology used are included in **Appendix D**.

Table 4-9. Estimated Air Emissions Resulting from Project C3

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total C3 Emissions	4.876	0.496	2.880	0.380	0.391	0.345	642.707
Percentage of WCFI AQCR Inventory *	0.0027%	0.0004%	0.0004%	0.0002%	0.0005%	0.0017%	0.00026%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, negligible to minor, and long-term, minor, adverse effects on geology and soils would be expected from Project C3. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, and grading. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C3, long-term, minor, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity would decline in disturbed areas and be eliminated in those areas within the footprint of permanent structures. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The Myakka fine sand is the only soil mapped at the site of the proposed EOD Bunker Barricades. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone and ponding (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation. No impacts on topography or geology would be anticipated.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse. Short-term, minor, adverse effects would occur from the disturbance of soil for construction of the bunker and barricades, resulting in increased sedimentation in storm water runoff. To reduce impacts, the project would adhere to BMPs identified in the installation SWPPP. Long-term, minor, adverse effects on water resources would occur from construction within the 100-year floodplain, resulting in an increase in impervious surfaces and a slight modification of flood flow and volume characteristics. However, these facilities would not be required to be elevated above the 100-year flood elevation because they would not

be occupied structures. Effects would be minimized by implementing environmental protection measures.

No wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed construction project. However, the site is adjacent to wetland areas. Effects on adjacent wetlands would be avoided through proper implementation of environmental protection measures and BMPs. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible to minor, adverse effects on vegetation would be expected from Project C3 due to temporary disturbances on adjoining land and from use of heavy equipment during construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, construction activities, and heavy equipment use. Wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. No protected and sensitive species have been observed in the project area; therefore, no effects on protected species would be expected from this project.

C&D activities would be accomplished in areas adjacent to mangrove wetlands; however, a sufficient setback between the project area and the adjacent wetlands exists, which would reduce the potential for sedimentation or turbid runoff to the wetlands. Furthermore, implementation of environmental protection measures (see **Section 4.3.5**) during demolition activities would limit potential impacts on EFH, insects, and benthic fauna.

Cultural Resources. Project C3 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because the proposed construction of the EOD Bunker Barricade is in a remote part of the installation and would be more than a mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, no effect on architectural resources listed or eligible for listing in the NRHP would occur. The action would also be more than a mile from Building 501, which is potentially eligible for listing in the NRHP. There are no unevaluated buildings in the area.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project C3 would be short- and long-term, negligible to minor, and beneficial. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB. No impacts on environmental justice would be expected because no residential areas are near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely.

Infrastructure. Project C3 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, adverse, effects on utilities would be expected due to the additional infrastructure and net increase in building space, and hence, utility use. Project C3 would involve the addition of 1,080 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management. However, because Project C3 would be designed and constructed to achieve LEED Silver certification, adverse effects on utilities and storm water management would be minimized.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C3 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

There would be no impacts associated with pesticides and radon.

Short-term, minor, adverse effects could be anticipated from constructing Project C3 near ERP sites. Two ERP sites (SWMU 6 and SWMU 7) are within 165 feet of the construction project area, and groundwater, surface water, and soil contamination have been confirmed. Both ERP sites are under long-term management, including LUCs and MNA. It is unlikely that contaminated media would be encountered during construction activities. However, if contaminated media is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

No long-term, adverse effects would be expected from the siting and use of the EOD Bunker Barricade.

Safety. Safety impacts related to construction activities would be short-term, negligible to minor, and adverse. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic.

The northern portion of Project C3 is adjacent to ERP Sites SWMU 6 and SWMU 7. Both sites are under LUCs and MNA. It is unlikely contaminated material would be encountered; however, contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers in this area but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

This project would also be within a QD arc; puts workers at an increased exposure to explosions; and have short-term, minor, adverse impacts on safety for workers in this area. However, constructing a new EOD range in this area would have long-term, negligible to minor, beneficial impacts on personnel because of its collocation within the QD arc.

4.4.2.4 C4. Construct Joint Special Operations University

Project C4 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C4.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from Project C4. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The proposed construction is on administrative land use and is not near off-installation land uses. The closest on-installation building is 451, housing (accompanied), approximately 160 feet from the construction site. Populations would be exposed to noise levels of approximately 80 to 84 dBA.

Land Use. Long-term, beneficial impacts on land use would be expected from the removal of temporary buildings 506A and 506E. Construction of this facility would be within administrative land use and would require no land use change. Existing and future land uses would remain the same and would remain compatible. This project is consistent with the MacDill AFB IDP as a current development CIP and because it is within the Core District overlay.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the construction of the proposed JSOU. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

Long-term, minor, adverse effects on air quality would be expected from the use of natural gas boilers to provide comfort heating to the proposed facility. While these operating emissions would increase the overall air emissions from MacDill AFB, the added emissions would be offset by a reduction in air emissions from the demolition of older buildings that use more emissions-intensive heating systems. It is not expected that emissions from Project C4 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions were not calculated for natural gas boilers because they are subject to NSR requirements, which ensure that air quality is not significantly degraded from the addition of new and modified industrial boilers. Emissions from the construction and operation of the proposed JSOU are summarized in **Table 4-10**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-10. Estimated Air Emissions Resulting from Project C4

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 C4 Emissions	6.562	1.438	5.962	0.515	4.783	1.004	969.020
Percentage of WCFI AQCR Inventory *	0.0037%	0.0011%	0.0008%	0.0003%	0.0062%	0.0048%	0.00039%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, negligible to minor, and long-term, minor, adverse effects on geology and soils would be expected from Project C4. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, grading, paving, and excavating and trenching. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C4, long-term, minor, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity would decline in disturbed areas and be eliminated in those areas within the footprint of permanent structures. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The St. Augustine-Urban Land complex is the only soil mapped at the site of the proposed JSOU. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be somewhat limited due to the depth to the saturated zone (NRCS 2012). However, it is not anticipated that depth to the saturated zone would impact construction because fill would be added to raise the facility above the floodplain. Standard environmental protection measures for erosion and sediment control, such as installing silt fencing, should be implemented to minimize any impacts, and site-specific soil testing should be conducted prior to project implementation.

Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to raise the facility above the floodplain. No impacts on geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C4. Short-term, adverse effects would occur from ground disturbance for demolition of existing buildings and construction of the new facility, resulting in increased impacts from storm water runoff. To reduce impacts, the project would adhere to BMPs identified in site-specific SWPPPs in accordance with the NPDES general permit for construction activities. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation reducing the potential for impact on the building from flooding.

No wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed construction project. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project C4 due to temporary disturbances on adjoining land and from use of heavy equipment during facility removal and construction activities. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, facility removal, and construction activities, and heavy equipment use. Wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of construction activities would be expected to recover quickly once all disturbances have ceased. No habitat loss would be expected from this project; therefore, no long-term, adverse effects on wildlife would be expected. No protected and sensitive species have

been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project C4 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

The proposed construction of a JSOU would have no direct effect on architectural resources listed or eligible for listing in the NRHP. Project C4 would be immediately across the street from Building 501, a property potentially eligible for listing in the NRHP. Under NEPA, this project would have an indirect, long-term, negligible effect; however, under NHPA, no adverse effects would occur. The proposed site currently has two temporary structures (Buildings 506A and 506E, built circa 2000), which would be removed to make way for the proposed parking lot. Because of the presence of other large multi-story structures adjacent to Building 501, including buildings across Tampa Point Boulevard to the northwest, the visual effect would not be adverse under the NHPA. The proposed JSOU would not affect the MacDill Field Historic District or the Staff Officer's Quarters Historic District, which are more than 1,000 feet from the project. This project would not alter the qualities that make Building 501 eligible for listing in the NRHP; nor would it alter the qualities that make either historic district eligible for listing in the NRHP. This project was identified in the ICRMP as having no adverse effect on historic properties.

Socioeconomics and Environmental Justice. Impacts on socioeconomics and environmental justice from implementing Project C4 would be short- and long-term, negligible to minor, and beneficial. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB. No impacts on environmental justice would be expected because no residential areas are near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely. Although the JSOU would be constructed adjacent to on-installation housing, this project is not anticipated to result in disproportionate impacts on minority or low-income populations at MacDill AFB. Therefore, no impacts would be anticipated.

Infrastructure. The effects of Project C4 on infrastructure would be short-term, negligible, and adverse on transportation, liquid fuel supply, water supply, and storm water due to C&D and renovation activities. Short-term, negligible, adverse effects on utilities would be expected due to possible interruptions from connecting the proposed facilities to the utilities and disconnecting the facilities proposed for demolition from the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, negligible, adverse effects on communications systems would be expected due to the installation of communications infrastructure connecting to the Building 501/501A complex, and thus, consuming communications capacity.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C4 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to construction activities. Contractors would be responsible for the management of these

materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). There would be no impacts associated with storage tanks, ACM, LBP, PCBs, pesticides, radon, or ERP sites.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected. Project C4 does not contain an ERP site or any ACM, LBP, or PCBs.

4.4.2.5 C5. Construct Outdoor Recreation Maintenance Facility

Project C5 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C5.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from Project C5. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. This site is not near off-installation land uses. There is a recreational vehicle camping facility on MacDill AFB property approximately 100 feet southeast of the construction site. Populations would be exposed to construction noise levels of approximately 84 to 88 dBA. To reduce noise impacts on campers, campground staff could close portions of the camp impacted by construction noise or inform incoming campers of construction activities.

Land Use. Long-term, beneficial impacts on land use would be expected from the demolition of existing Buildings 13, 60, and 694. The proposed land use at this location is outdoor recreation. Present and future land uses would be compatible, and no changes in the current land use category would be expected. This site is within 150 feet of ERP Site CD-C506, which is under investigation for the extent and nature of contamination; no LUCs are in place. This project is consistent with the MacDill AFB IDP as a short-range development CIP and with its placement within the Outdoor Activity District overlay.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the construction of the proposed Outdoor Recreation Maintenance Facility. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

Long-term, minor, adverse effects on air quality would be expected from the use of natural gas boilers to provide comfort heating to the proposed facility. While these operating emissions would increase the overall air emissions from MacDill AFB, the added emissions would be offset by a reduction in air emissions from the demolition of older buildings that use more emissions-intensive heating systems. It is not expected that emissions from Project C5 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions were not calculated for natural gas boilers because they are

subject to NSR requirements, which ensure that air quality is not significantly degraded from the addition of new and modified industrial boilers. Emissions from the construction and operation of Project C5 are summarized in **Table 4-11**. Emissions estimation spreadsheets and a summary of methodologies used are included in **Appendix D**.

Table 4-11. Estimated Air Emissions Resulting from Project C5

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2014 C5 Emissions	5.508	0.732	3.676	0.432	2.842	0.652	746.151
Total 2015 C5 Emissions	5.508	0.732	3.676	0.432	2.842	0.652	746.151
Percentage of WCFI AQCR Inventory *	0.003%	0.001%	0.0005%	0.0003%	0.004%	0.003%	0.0001%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project C5. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, grading, paving, and excavating and trenching. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C5, long-term, minor, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity would decline in disturbed areas and be eliminated in those areas within the footprint of permanent structures. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The Malabar fine sand is the only soil mapped at the site Project C5. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation.

Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reduce the potential for impacts on facilities during flood events. No impacts on geology would be anticipated.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse. Short-term, adverse effects would occur from ground disturbance for demolition of existing buildings and construction of the new facility, resulting in increased impacts from storm water runoff. This project would require an NPDES general permit for construction activities. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation. The increase in impervious surface would require an environmental resource permit from SWFWMD and compensation for 100-year floodplain filling.

The project site is in close proximity to wetlands but is proposed to be designed without impacts on wetlands. If impacts on wetlands would occur, wetland construction permits from the appropriate Federal, state, and county agencies would be obtained. Effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, establishing a wetland buffer, and following policies and procedures as detailed in the site-specific SWPPP. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible to minor, adverse effects on vegetation would be expected from Project C5 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition and construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible to minor, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality within the project footprint is low. Protected and sensitive species do not permanently occupy the project area but have been observed in areas adjacent to the project area. However, the observed protected species (avian) are highly mobile and would be expected to move away from construction activities. Therefore, no effects on protected and sensitive species would be expected from this project.

No effects on EFH would be expected from this project. Any potential effects would be avoided through the design and implementation of environmental protection measures which reduce the potential for sedimentation to wetlands, streams, and EFH (see **Section 4.3.5**).

Cultural Resources. Project C5 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because the proposed construction of an Outdoor Recreation Maintenance Facility would be more than a mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, Project C5 would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than a mile from Building 501, a building potentially eligible for listing in the NRHP. There are no buildings in the immediate area that have not been evaluated for NRHP eligibility (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project C5 would be short- and long-term, minor, and beneficial. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB. No impacts on environmental justice would be expected because no residential areas are near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely.

Infrastructure. Project C5 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities. Short-term, negligible, adverse effects on utilities would be expected due to possible interruptions from connecting the proposed facilities to the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, adverse, effects on utilities would be expected due to the additional infrastructure and net increase in building space, and hence, utility use. Project C5 would involve the addition of 64,805 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management. However, because Project C5 would be designed and constructed to achieve LEED Silver certification, adverse effects on utilities and storm water management would be minimized.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C5 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

Short-term and long-term, adverse effects could result from constructing Project C5 near an ERP site. One ERP site (CD-C506) is within 150 feet of the construction project area. CD-C506 is under investigation to determine the nature and extent of contamination. If contamination is encountered during construction activities, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Short-term, minor, adverse effects could result from demolishing Buildings 13, 60, and 694, which, because of their ages, could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Long-term, minor, beneficial effects would be expected due to the removal of older buildings that could result in less exposure to and maintenance of ACM, LBP, and PCBs. No new long-term, adverse effects on hazardous materials and wastes would be anticipated from operation of Project C5; and the installation's waste streams would not be altered.

There would be no impacts associated with storage tanks, pesticides, and radon.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs.

Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic.

Because of the age of Buildings 13, 60, and 694, it would be assumed they contain ACM, LBP, and PCBs; therefore, impacts would also be the same as Project C1 and would be long-term and beneficial after removal of these substances.

Project C5 is adjacent to ERP site CD-C506. This site is under investigation and could increase the chances that contaminated material would be inadvertently discovered. This would result in short-term, minor, adverse impacts on worker safety but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.2.6 C6. Alert Facility, FMSE Facility

Project C6 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C6.

Noise. Short-term, minor to moderate, and long-term, negligible adverse effects on the noise environment would be expected from Project C6. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The closest on-installation building is Building 3105E, which is approximately 100 feet from the construction site. Populations would be exposed to noise levels of approximately 84 to 88 dBA during construction activities.

Land Use. Long-term, minor, adverse impacts on land use would be expected from construction of the Alert Facility, FMSE Facility, and storage facility with associated loading dock, fuel containment area, and three support fuel tanks. Construction of these facilities would be within the aircraft operations and maintenance land use and would further support operational testing and operator's maintenance and troubleshooting for the airfield functions. However, a portion of this project is in the open space land use and would require a land use category change to aircraft operations and maintenance. Present and future land uses would be compatible with this change in land use. In addition, construction and renovation of these facilities is consistent with the MacDill AFB IDP, which identifies building the Alert Facility and FMSE Facility as a long-range development goal. This project is also consistent with the MacDill AFB IDP by placing these facilities in the Airfield District overlay.

Construction related to this project is within ERP site SWMU 18 and adjacent to SWMU 10. SWMU 18 and SWMU 10 currently have LUCs associated with them; however, the LUCs for these ERP sites would have no impact on the proposed project. Buildings that are proposed for demolition under this project that are within or adjacent to SWMU 61. SWMU 61 currently has LUC associated with it; however, the LUC for this ERP site would have no impact on the proposed project.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from Project C6. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction and paving equipment and haul trucks transporting building materials to the work site, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature.

Long-term, minor, adverse effects on air quality would be expected from the use of natural gas boilers to provide comfort heating to the proposed facility, the use of an emergency electrical generator and

operational emissions from two 10,000-gallon JP-8 Fuel Tanks and one 5,000-gallon Petroleum Contact Water Tank. While these operating emissions would increase the overall air emissions from MacDill AFB, the added emissions would be offset by a reduction in air emissions from the demolition of older buildings that use more emissions intensive heating systems and emergency electrical generators. It is not expected that emissions from Project C6 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions were not calculated for natural gas boilers because they are subject to NSR requirements, which ensure that air quality is not significantly degraded from the addition of new and modified industrial boilers. Emissions from the JP-8 tanks were not calculated because emissions are negligible due to JP-8's low volatility. Emissions from the construction and operation of the proposed Alert Facility, FMSE Facility are summarized in **Table 4-12**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**.

Table 4-12. Estimated Air Emissions Resulting from Project C6

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2014 C6 Emissions	7.224	1.243	5.742	0.571	9.255	1.459	1,021.676
Total 2015 C6 Emissions	7.224	1.243	5.742	0.571	9.255	1.459	1,021.676
Total 2016+ C6 Emissions	8.050	0.250	1.840	0.004	0.230	0.230	388.890
Percentage of WCFI AQCR Inventory *	0.004%	0.001%	0.001%	0.0003%	0.012%	0.007%	0.0005%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project C6. Short-term impacts during construction would result from disturbance of soils, clearing of vegetation, and grading. Clearing of vegetation would increase erosion and sedimentation potential.

As a result of implementing Project C6, long-term, minor, adverse effects would occur as soils would be compacted, and soil structure disturbed and modified. Soil productivity would decline in disturbed areas and be eliminated in those areas within the footprint of permanent structures. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The Myakka fine sand is the only soil mapped at the site of the proposed facilities. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation.

Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on facilities during flood events. No impacts on geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C6. Short-term, adverse effects would occur from ground disturbance for demolition of existing buildings and construction of the new facility, resulting in increased impacts from storm water runoff. To reduce impacts, the project would adhere to BMPs identified in site-specific SWPPPs required by the NPDES general permit for construction activities. Long-term, minor, adverse effects on water resources would occur from construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facilities would be constructed above the 100-year flood elevation reducing the potential for impact on the building from flooding.

Wetland areas are in close proximity to the project area. However, the facilities would be designed to avoid impacts on wetlands. Therefore, long-term, minor, indirect, adverse effects could occur from impacts on the wetland area. Effects on wetlands could be reduced through design, siting, and proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, establishing a wetland buffer, and following policies and procedures as detailed in the SWPPP. If direct impacts on wetlands cannot be avoided, all required permits would be obtained. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, minor, adverse effects on vegetation would be expected from Project C6 due to temporary disturbances on adjoining land, the use of heavy equipment during demolition and construction activities, and tree removal. Affected vegetation would consist primarily of native grasses and wildflowers surrounded by a mixture of scrubby native trees with some nuisance, exotic vegetation. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Tree removal could cause arboreal species (e.g., birds, squirrels) to have slower recovery rates than other species; however, most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, minor, adverse effects on wildlife would be expected from this project. A permanent loss of moderate quality habitat would occur from the implementation of this project. No protected and sensitive species have been observed in the project area; however, tree habitat associated with this project could be used by protected bird species. Therefore, long-term, minor, adverse effects on protected and sensitive species would be expected from this project.

No adverse effects on EFH would be expected due to erosion and runoff from construction activities and potential adverse effects on wetlands would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project C6 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project C6 would be more than a mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than a mile from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from the construction of the Alert Facility and FMSE Facility would be short- and long-term, minor, and beneficial. It is assumed that equipment and supplies necessary to complete the construction activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB. No impacts on environmental justice would be expected because no residential areas are near the construction site. Long-term, minor, beneficial impacts on environmental justice issues might be expected from the value added to the MacDill AFB community by these facilities. The project would have little potential to affect off-installation residents adversely.

Infrastructure. Project C6 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities. Short-term, negligible, adverse effects on utilities would be expected due to possible interruptions from connecting the proposed facilities to the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, minor, adverse effect.

Long-term, minor, beneficial effects on utilities would be expected due to the net decrease building space and, hence, utility use. Project C6 would involve the addition of 208,534 ft² of impervious surface, which would result in long-term, minor, adverse effects on storm water management. Long-term, minor, beneficial effects on liquid fuel systems would be expected due to the 10,000-ft² fuels containment area with three support fuel tanks (two 10,000-gallon tanks and one 5,000-gallon tank) that would be installed to support operational testing and operator's maintenance and troubleshooting.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project C6 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

Short-term, minor, adverse effects could result from demolishing Facilities 1051, 1052, 1053, 1069, 1079, and 1081. Because of their ages, these buildings could contain ACM, LBP, and PCBs. Notification of demolition would be provided to the USEPA and FDEP at least 10 days prior to demolition activities in accordance with NESHAP regulations. Sampling for these materials would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Short-term and long-term, minor to moderate, adverse effects could result from construction of Project C6 within one ERP site (SWMU 18). SWMU 18 is in LUCs. New facilities can be constructed within certain ERP sites depending upon the level of contamination, clean-up efforts, and LUCs. Approval of new construction within ERP sites must be obtained from the FUB and coordinated with 6 CES/CEVR. The proposed construction site is also within 165 feet of one ERP site (SWMU 10). SWMU 10 is in LTM. The buildings proposed to be demolished under Project C6 are within or adjacent to one ERP site (SWMU 61). No constituents of concern have been identified in the soil, surface water or sediment at

SWMU 61 and it is currently being monitored to evaluate the potential for long-term monitoring and natural attenuation of contaminants in groundwater. SWMU 61 is considered Medium Risk and is currently under MNA. It is unlikely that contaminated media would be encountered during C&D activities. However, if it is encountered the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Short-term, negligible, adverse effects would be expected on storage tanks because Building 1051 contains three ASTs. The demolition of Building 1051 would require proper closure or disposal of the ASTs. There would be no short-term impacts on pesticides and radon. No long-term effects on storage tanks, pesticides, and radon would be expected from Project C6. Project C6 would include the installation of three support fuel tanks; however, these tanks would be installed and operated in accordance with Federal, state, and local regulations.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. C&D activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. C&D areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic.

Because of the age of Facilities 1051, 1052, 1053, 1069, 1079 and 1081, it would be assumed to contain ACM and LBP; therefore, impacts would also be the same as Project C1 and would be long-term and beneficial after removal of these substances.

Construction related to Project C6 is entirely contained within ERP Site SWMU 18. ERP sites AOC-85/1105 and SWMU 10 are adjacent to construction related to this project. Buildings that are proposed for demolition under this project are within or adjacent to ERP site SWMU 61. C&D within or adjacent to these areas could pose an impact on safety for workers in this area. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.3 Selected Infrastructure Improvement Projects

4.4.3.1 11. Construct CENTCOM Parking Garage

Project I1 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I1.

Noise. Negligible effects on the noise environment would be expected from Project I1. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The closest on-installation building is Building 565 and is approximately 300 feet from the construction site. Populations would be exposed to temporary noise levels of approximately 78 to 82 dBA.

Land Use. Effects on land use would be expected to be long-term, minor, and adverse. The current land use category is aircraft operations and maintenance. This project would require a land use category change from aircraft operations and maintenance to administrative because the parking garage would be

associated with the HQ building currently being constructed. Present and future land uses would be compatible with the adjacent land uses, which includes aircraft operations and maintenance to the south, administrative to the north and community (commercial) to the northwest. In addition, this project is consistent with the MacDill AFB IDP, which identifies this project as a long-range CIP.

C&D related to this project would be within or adjacent to ERP Site SWMU 61. A LUC is in place for SWMU 61. No impacts associated with the LUC would be expected.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from construction of the CENTCOM Parking Garage. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and paving equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I1 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction of the CENTCOM Parking Garage are summarized in **Table 4-13**. Note that the emissions in **Table 4-13** are the total for 2012 through 2013. Emissions for each year have been prorated at 15 percent for 2012 and 75 percent for 2013. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I1.

Table 4-13. Estimated Air Emissions Resulting from Project I1

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2012 I1 Emissions	5.389	0.847	4.419	0.421	3.421	0.746	775.102
Total 2013 I1 Emissions	6.258	1.442	6.760	0.490	15.787	2.144	973.719
Percentage of WCFI AQCR Inventory *	0.004%	0.001%	0.001%	0.0003%	0.02%	0.01%	0.0004%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor to moderate, adverse effects on soils would be expected from site preparation and construction of the CENTCOM garage, including pile driving. Short-term, minor, adverse effects would result from grading, recontouring, paving of soils, and removal of vegetation. Construction vehicles would compress soils, decreasing permeability and rates of storm water runoff infiltration. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events. An ESCP would be developed and implemented both during and following site development to contain soil and runoff on site, and would reduce potential for adverse effects associated with erosion and sedimentation, and transport of sediments in runoff.

Short-term, minor to moderate, adverse effects on soils could occur from the removal of the pavement surrounding the building that currently serves as a barrier between the contaminated and clean soils. The site proposed for the CENTCOM Parking Garage is within the designated limits of SWMU 61, and there is the potential to encounter soils contaminated with chlorinated solvents. Project planning should include the potential need for sampling and subsequent remediation within the project area to account for the discovery of contaminated soil. The handling, storage, transportation, and disposal of hazardous

substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and MacDill AFB management procedures. This area would be repaved to contain soil and groundwater contamination. No long-term effects would be expected.

The Urban land complex is the only soil mapped at this project location. Construction limitations are not rated for urban land (NRCS 2012).

Short-term, moderate impacts could be anticipated on soils from pile-driving activities, which could, depending on the clay content of the soil, induce loss of strength due to shearing, and excess pore water pressure from compaction. These effects would be temporary, and, over time, loss of strength and excess pore water pressure should dissipate (University of Iowa undated). No impacts on topography or geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project I1. The project is in the 100-year floodplain and in proximity to a wetland tidal drainage canal. Short-term effects could occur from the demolition of existing buildings and infrastructure, and grading and excavation of soil for construction of the parking facility. Ground disturbances associated with the project could result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm events. To minimize the impact, the project would adhere to BMPs identified in site-specific SWPPPs in compliance with the NPDES general permit for construction activities. The project would also have to comply with an Environmental Resource Permit for storm water from SWFWMD.

Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. This could cause an increase in water runoff and storm-related damages to facilities and possibly result in human safety risks. To manage the effects, MacDill AFB would implement environmental protection measures. This structure would not be required to be elevated above the floodplain because it would be used for storage only and would not be an occupied structure.

In the event of a fuel spill or leak or of other contaminants during construction, there could be adverse effects on the receiving water bodies. All fuels and other potentially hazardous materials would be contained and stored appropriately. In the event of a spill, procedures identified in the installation's SPCC Plan would be followed to contain and clean up a spill quickly. BMPs identified in the SPCC Plan would minimize the potential for and extent of associated contamination.

Biological Resources. Short- and long-term, negligible, adverse effects on vegetation would be expected from Project I1 due to temporary disturbances (e.g., trampling and limited removal) on adjoining land, from use of heavy equipment during demolition and construction activities, and from the permanent loss of habitat. Project I1 would primarily affect urban upland and non-forested upland communities. Adverse effects resulting from the permanent loss of vegetation associated with this project would be negligible. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible to minor, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, construction activities, and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors. This project would primarily affect urban upland and non-forested upland communities where human disturbance is common. Therefore, wildlife in the vicinity would be expected to be habituated to frequent disturbances. Most wildlife species

in the vicinity of demolition and construction activities would be expected to recover quickly once demolition and construction noise and disturbances have ceased.

Long-term, negligible to minor, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project I1 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I1 would be more than 1,000 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on historic architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,000 feet from Building 501, which is potentially eligible for listing in the NRHP. This project was identified in the ICRMP as having no effect on historic properties.

Socioeconomics and Environmental Justice. Short-term, negligible, beneficial effects on socioeconomic resources would be expected from the site preparation and construction of the CENTCOM Parking Garage, the associated demolition of Buildings 1051, 1052, and 1053, and possible groundwater remediation. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed preparation and construction activities would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have little potential to affect on- or off-installation residents adversely. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed construction of the garage.

Infrastructure. Project I1 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities. Short-term, negligible, adverse effects on electrical utilities would be expected due to possible interruptions from connecting the lighting system and possible photovoltaic system to the utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, irreversible, adverse effect.

Long-term, minor, beneficial effects on transportation would be expected due to the increase of 1,500 vehicles and 112-motorcycle-parking space capacity. Additional beneficial effects on transportation would be expected due to construction of the elevated 5,580-ft² walkway above Zemke Avenue, which would connect the parking garage to the replacement headquarters building and reduce pedestrian traffic crossing Zemke Avenue.

Long-term, minor, beneficial effects on electrical systems might be expected (if the possible photovoltaic system option is selected) due to the increase in capacity and renewable source of electricity.

Project I1 would involve the addition of 160,000 ft² of impervious surfaces, which would result in long-term, minor, adverse effects on storm water management. However, constructing a multistory parking garage instead of a flat parking lot would minimize the increase of impervious surfaces. These effects could be exacerbated due to the position of the site northwest of an existing tidal drainage channel.

Storm water runoff from the proposed parking garage would be directed toward existing, onsite perimeter storm water conveyance and treatment systems, with eventual discharge to Tampa Bay.

Long-term, negligible, adverse, effects on electrical utilities would be expected due to increase in electrical consumption due to the lighting system if the lighting system is not solar-powered.

The effects of the demolition of Buildings 1051, 1052, and 1053 are addressed in Project C6.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I1 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

Short-term, negligible, adverse effects would be expected on storage tanks because Building 1051 contains three ASTs. The demolition of Building 1051 would require proper closure or disposal of the ASTs.

Short-term, minor, adverse effects on ACM could result from demolishing Buildings 1051 and 1053, which because of their age could contain ACM. Sampling for ACM would occur prior to any demolition activities so that these materials can be properly characterized, handled, and disposed of in accordance with the MacDill AFB Asbestos Management Plan, MacDill AFB Lead-Based Paint Management Plan, MacDill AFB Hazardous Waste Management Plan, and USAF policy.

Short-term and long-term, minor to moderate, adverse effects could result from construction of Project I1 within one ERP site (SWMU 61). Ongoing remedial actions are occurring at SWMU 61. New facilities can be constructed within certain ERP sites depending upon the level of contamination, clean-up efforts, and LUCs. Approval of new construction within ERP sites must be obtained from the FUB and coordinated with 6 CES/CEVR. The buildings proposed to be demolished under Project I1 are within or adjacent to one ERP site (SWMU 61). No constituents of concern have been identified in the soil, surface water, or sediment at SWMU 61 and it is currently being monitored to evaluate the potential for long-term monitoring and natural attenuation of contaminants. SWMU 61 is considered Medium Risk and is currently under Corrective Measures Study. It is unlikely that contaminated media would be encountered during C&D activities. However, if it is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Long-term, minor, beneficial effects would be expected due to the removal of older buildings that could result in less exposure to and maintenance of ACM. No long-term effects on hazardous materials, hazardous wastes, storage tanks, LBP, PCBs, pesticides, and radon would be expected from Project I1.

Safety. Short-term, negligible to minor, adverse effects associated with safety could occur during C&D activities. C&D activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adherence to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. C&D areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and

streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

Because of the age of Buildings 1051 and 1053, it should be assumed they contain ACM and LBP. These materials require appropriate characterization, removal, handling, and disposal during demolition activities by qualified personnel. Long-term, beneficial effects on safety would occur after removal of ACM and LBP materials by reducing exposure to personnel.

C&D related to this project would be within ERP site SWMU 61. SWMU 61 is undergoing monitoring and is under LUC. C&D within or adjacent to this areas could pose an impact on worker safety. There is a chance contaminated material could be discovered inadvertently. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.3.2 I2. Straighten Marina Bay Drive

Project I2 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I2.

Noise. Short-term, minor to moderate, adverse effects on the noise environment would be expected from the construction of Project I2. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. This site is not near off-installation land uses. The closest on-installation are Buildings 48, 49, 52, and 90, which are approximately 125 feet from the construction site; populations would be exposed to noise levels of approximately 81 to 88 dBA.

Land Use. Long-term, negligible, adverse impacts and long-term, beneficial impacts would be expected from Project I2. Project I2 would result in improved accessibility to this area. This project could create temporary, minor inconveniences to installation personnel using this roadway from the construction of a temporary access road. Land use for this project is primarily within aircraft operations and maintenance, with some work occurring in administrative land use. These land use categories would remain unchanged from implementing Project I2. This project is consistent with the MacDill AFB IDP, which identifies Marina Bay Drive improvements on the future SRM project list.

The project is within ERP Site TU/US -C500 and adjacent to Site 57 (including SWMU 19). Both sites are under LUCs. Project I2 would have no impact on the LUCs. For more information on these ERP sites, refer to **Section 4.3.10, Hazardous Materials and Wastes**.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from straightening Marina Bay Drive. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and paving equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I2 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the straightening of Marina Bay Drive are summarized in **Table 4-14**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I2.

Table 4-14. Estimated Air Emissions Resulting from Project I2

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 I2 Emissions	0.207	0.093	0.724	0.013	2.130	0.228	99.864
Percentage of WCFI AQCR Inventory *	0.00012%	0.00007%	0.00010%	0.00001%	0.00275%	0.00109%	0.00004%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project I2. Short-term, minor, adverse effects would result from grading, recontouring, paving, and removal of vegetation. Construction vehicles would compress soils, decreasing permeability and rates of storm water runoff infiltration. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events. An ESCP would be developed and implemented both during and following site development to contain soil and runoff on site, and would reduce potential for adverse effects associated with erosion and sedimentation, and transport of sediments in runoff.

The Urban land complex is the only soil mapped at this project location. Construction limitations are not rated for urban land (NRCS 2012). No impacts on topography or geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project I2. The project is in the 100-year floodplain and culverts would be constructed in two upland cut drainage ditches classified as waters of the United States. Short-term, minor, adverse effects would occur from ground disturbance for removal of the existing road and construction of the new roadway, resulting in increased impacts from storm water runoff. Construction of the culverts could cause erosion and turbidity within the drainage ditches. The project would require permits for the culvert placement and increased impervious surface. To reduce impacts, the project would adhere to BMPs identified in the SWPPP. No wetlands are within the project site and therefore no impacts on wetlands would occur.

Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. Effects would be minimized by implementing environmental protection measures and adhering to SWFWMD regulations. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project I2 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition and construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however,

wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project I2 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I2 would be more than 500 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 500 feet from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources and environmental justice from straightening Marina Bay Drive would be short-term, negligible, and beneficial effects from Project I2. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have little potential to affect on- or off-installation residents adversely. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed straightening of Marina Bay Drive.

Infrastructure. Short-term, negligible, adverse effects on electrical utilities would be expected due to possible interruptions from connecting the street lights of the relocated Marina Bay Drive to the utilities and disconnecting the current Marina Bay Drive from electrical utilities.

Long-term, minor, beneficial effects on transportation would be expected because the flow of traffic on Marina Bay Drive would be improved. This project would also construct an entrance to Buildings 49, 52, 10, and 90; and Facility 45 (gas station), and a sidewalk and reconfigure the intersection at Hangar Loop Drive and Marina Bay Drive, and the intersection at Nighthawk Place and Marina Bay Drive, resulting in additional long-term beneficial effects.

Project I2 would involve the addition of 9,100 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management. This project would involve culverts for two drainage ditches that cross Marina Bay Drive to minimize adverse effects on storm water management.

Long-term, negligible, adverse effects on electrical utilities due to an increase in electrical consumption would be expected if Project I2 involves installing a non-solar lighting system.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I2 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations.

Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

It is unlikely that contaminated media would be encountered during C&D activities. However, if it is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

There would be no impacts associated with ACM, LBP, PCBs, storage tanks, pesticides, and radon.

Short-term and long-term, minor, adverse effects could result from construction of Project I2 within one ERP site (TU/US-C500). Site TU/US-C500 is undergoing MNA for groundwater, but is considered low risk (MAFB 2011e). Project I2 is within 165 feet of ERP Site 57, including SWMU 19. This site is undergoing long-term management, including use of LUCs and MNA. If contaminated media are encountered, the project work at the sites would be halted, and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects of Project I1. Construction associated with Project I2 is within ERP site TU/US-C500 and adjacent to ERP Site 57 (including SWMU 19). ERP Site TU/US-C500 is considered low-risk and ERP Site 57 is under an LUC. Both of these sites are undergoing MNA. Construction within or adjacent to these areas could pose an impact on safety for workers in this area. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.3.3 I3. Construct Dining Facility Parking Lot

Project I3 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I3.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from the construction of Project I3. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. This site is not near off-installation land uses. The proposed construction is located within an area that is currently used for unaccompanied housing, approximately 150 feet away. Populations would be exposed to construction noise levels of approximately 80 to 85 dBA.

Land Use. No effects on land use would be expected from Project I3. The dining facility parking lot would be constructed on administrative land use. No changes to land use would be anticipated from this project and it would be compatible with adjacent land uses: Community (service) to the west, community (commercial) to the east, and housing (unaccompanied) to the north.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the Dining Facility Parking Lot. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and paving equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I3 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction of the Dining Facility Parking Lot are summarized in

Table 4-15. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I3.

Table 4-15. Estimated Air Emissions Resulting from Project I3

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 I3 Emissions	0.294	0.111	0.808	0.02	3.545	0.377	113.137
Percentage of WCFI AQCR Inventory *	0.00017%	0.00008%	0.00011%	0.00001%	0.00459%	0.00181%	0.00005%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project I3. Short-term, minor, adverse effects would result from grading, recontouring, paving, and removal of vegetation. Construction vehicles would compress soils, decreasing permeability and rates of storm water runoff infiltration. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events. An ESCP would be developed and implemented both during and following site development to contain soil and runoff on site, and would reduce potential for adverse effects associated with erosion and sedimentation, and transport of sediments in runoff.

The Urban land complex is the only soil mapped at this project location, and no construction limitations are rated. No impacts on topography or geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project I3. Short-term, minor adverse effects would occur from ground disturbance for demolition of existing buildings and construction of the new parking lot, resulting in increased impacts from storm water runoff. To reduce adverse effects, the project would adhere to BMPs identified in the site-specific SWPPP as required by the NPDES general permit for construction activities. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain for the increase in impervious surface. Effects would be minimized by implementing environmental protection measures and adhering to SWFWMD regulations.

No wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed construction project. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project I3 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition and construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high

human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low and would not be expected to be used by an abundance of wildlife. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project I3 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I3 would be more than 1,000 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,000 feet from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project I3 would be short-term, negligible, and beneficial. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The Dining Facility site is adjacent to residential areas of MacDill AFB, but no disproportionate impacts on minority or low-income populations would be anticipated.

Infrastructure. Short-term, minor, and long-term, negligible impacts on infrastructure would occur under Project I3. If Project I3 involves the installation of a non-solar lighting system, short-term electrical utility interruptions would be expected when the system is connected to the installation's electrical infrastructure.

Project I3 would involve the addition of 48,000 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management. Long-term, negligible, adverse effects on electrical utilities would be expected due to electrical consumption if Project I3 involves installing a non-solar lighting system. Long-term, minor, beneficial effects on transportation would be expected due to the increase in parking capacity.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I3 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

There would be no impacts associated with ACM, LBP, PCBs, storage tanks, pesticides, radon, and ERP sites.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. There is no demolition or ERP site associated with this project.

4.4.3.4 I4. Construct Medical Clinic Sidewalks

Project I4 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I4.

Noise. Short-term, minor to moderate, and long-term, negligible adverse effects on the noise environment would be expected from Project I4. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The closest on-installation building is Building 934 (Pharamcare), which is approximately 100 feet from the construction site. Populations would be exposed to temporary noise levels of approximately 84 to 88 dBA.

Land Use. Short- and long-term, minor to moderate, adverse impacts would be expected from Project I4. The Medical Clinic Sidewalks would be constructed in the open space and medical land uses. This site is also in the northern CZ associated with the airfield at MacDill AFB and in the 70 to 74 dBA DNL noise contours; however, this project would not violate obstacle clearance criteria. According to AFI 32-7063, the USAF should not plan or construct new uses within the boundaries of a CZ. A sidewalk linking the Medical Clinic to the Dale Mabry Gate in the CZ would be considered a new use. It would also encourage people to walk through the CZ. USAF guidelines recommend that people-intensive facilities other than flight-operations be located outside the CZs where possible.

This project is consistent with the MacDill AFB IDP, which states that one of its goals is to build stronger communities by improving access between various land uses, and to reduce travel time between facilities by strengthening the relationships between land uses (MAFB 2011b). No changes to the land use category would be anticipated from this project and it would be compatible with adjacent land uses; community (commercial) to the east, aircraft operations and maintenance to the south, and open space to the southwest.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from Project I4. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and paving equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I4 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction of the Medical Clinic Sidewalks are summarized in **Table 4-16**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I4.

Table 4-16. Estimated Air Emissions Resulting from Project I4

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 I4 Emissions	0.113	0.071	0.619	0.005	0.194	0.026	84.807
Percentage of WCFI AQCR Inventory *	0.000063%	0.000052%	0.000084%	0.000003%	0.000251%	0.000123%	0.00003%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project I4. Short-term, minor, adverse effects would result from grading, recontouring, paving, and removal of vegetation. Construction vehicles would compress soils, decreasing permeability and rates of storm water runoff infiltration. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events. An ESCP would be developed and implemented both during and following site development to contain soil and runoff on site, and would reduce potential for adverse effects associated with erosion and sedimentation, and transport of sediments in runoff.

The Urban land complex is the only soil mapped at this project location, which is not rated for construction limitations. Site-specific soil surveys should be completed prior to the initiation of construction activities to determine the extent and breadth of any engineering limitations. No impacts on topography or geology would be anticipated.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse from Project I4. Short-term, adverse effects would occur from removal of vegetation and ground disturbance for construction of the new sidewalks, resulting in increased impacts from storm water runoff. The use of BMPs identified in the SWPPP would reduce adverse effects. The project site is outside the 100-year floodplain and no wetlands are present. Therefore, no impacts on the floodplain or wetlands are anticipated from this project. Long-term, minor, and adverse effects would result from the increase in impervious surface.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project I4 due to temporary disturbances on adjoining land and from use of heavy equipment during demolition and construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all disturbances have ceased.

Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low.

Gopher tortoise habitat is within the proposed construction area for Project I4, but no burrows would be directly impacted by construction activities. Short-term, minor, adverse effects would be expected from construction noise and ground vibration. Any tortoises in the vicinity of the site would be expected to recover quickly once the disturbances from noise, construction, and heavy equipment use have ceased. Additionally, aircraft operations are frequent; therefore, the tortoises would be habituated to noise and vibration disturbances. Long-term, minor, adverse effects on the gopher tortoise would be expected due to a loss of habitat as a result of construction activities. If a tortoise burrow cannot be avoided, consultation with the FWC would occur to determine if mitigation (including a potential take permit) would be needed, and whether mitigation measures would be applicable. If significant adverse effects are identified, additional NEPA analysis would be required.

Cultural Resources. Project I4 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I4 would be more than 0.5 miles from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 0.5 miles from Building 501, which is potentially eligible for listing in the NRHP. There are no unevaluated buildings in the vicinity of the proposed undertaking (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project I4 would be short-term, negligible, and beneficial. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have little potential to affect on- or off-installation residents adversely. Beneficial impacts would be expected from the additional routes of egress from the Medical Clinic. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed construction of the medical clinic sidewalks.

Infrastructure. Project I4 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities. No short-term utility interruptions would be expected because Project I4 would not be connected to any utilities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, irreversible, adverse effect.

Long-term, minor, beneficial effects on transportation would be expected due to the increase in pedestrian mobility from the Main Gate on Dale Mabry Avenue, south along the eastern side of Dale Mabry Avenue, continuing east along northern side of North Boundary Boulevard, and south along the western side of Zemke Avenue, ending at the new Medical Clinic.

Project I4 would involve the addition of 1,575 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management. No long-term effects on utilities would be expected because Project I4 would not consume any utilities.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I4 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

There would be no impacts associated with ACM, LBP, PCBs, storage tanks, pesticides, radon and ERP sites.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. Construction activities pose an increased risk of construction-related accidents, but this level of

risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

There is no demolition or ERP site associated with this project. There could be long-term, minor, adverse impacts on safety of installation personnel from the collocation of Project I4 within the north runway CZ.

4.4.3.5 I5. Replace Sludge Digester Tanks

Project I5 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I5.

Noise. Short-term, minor, and long-term, negligible adverse effects on the noise environment would be expected from the construction of Project I5. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. The closest on-installation building is Building 892 (WWTP Operations Facility), which is approximately 200 feet from the construction site. Populations would be exposed to temporary noise levels of approximately 78 to 82 dBA.

Land Use. No effects on land use would be expected from Project I5. The land use at this site is industrial, which would remain unchanged under this project. The current land use category is compatible with existing adjacent land uses, which include outdoor recreation to the west, administrative to the north, and open space to the west and south.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from the replacement of Sludge Digester Tanks under Project I5. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and haul trucks transporting materials and excavated soil, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I2 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from replacing Sludge Digester Tanks are summarized in **Table 4-17**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I5.

Table 4-17. Estimated Air Emissions Resulting from Project I5

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 I5 Emissions	4.932	0.510	2.784	0.385	0.462	0.356	632.761
Percentage of WCFI AQCR Inventory *	0.0028%	0.00038%	0.00038%	0.00023%	0.0006%	0.0017%	0.00025%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, minor, adverse impacts on soils would be expected from replacing the tanks. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor infiltration would minimize the potential for erosion and sediment production as a result of future storm events.

The St. Augustine-Urban Land complex is the only soil mapped at the site of the proposed sludge digester tanks. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be somewhat limited due to the depth to the saturated zone (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation.

Short- and long-term, minor, adverse impacts on soils could occur in the event of a sludge spill. In the event of a spill, the installation's SPCC Plan would be followed to contain and clean up a spill quickly. There remains the possibility that a spill or leak could occur, but implementation of BMPs identified in the SPCC plan would minimize the potential for and extent of associated contamination. An SPCC plan would be followed to contain any leaks or spills generated from construction vehicles quickly. No impacts on topography or geology would be anticipated.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse for Project I5. Short-term, minor, adverse effects would occur from ground disturbance for installation of the new tanks, resulting in increased impacts from storm water runoff. Long-term, minor, adverse effects on water resources would occur from construction within the 100-year floodplain resulting in increased impervious surfaces and modified flood flow and volume characteristics. The sludge digester tanks would not be required to be elevated above the floodplain because they would not be occupied structures. Effects would be minimized by implementing environmental protection measures and adhering to SWFWMD regulations.

The project site is in close proximity to wetlands and surface waters. However, effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, and following policies and procedures as detailed in the SWPPP.

Biological Resources. Short-term, negligible, adverse effects on vegetation would be expected from Project I5 due to temporary disturbances on adjoining land and from use of heavy equipment during replacement activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, replacement activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of replacement activities would be expected to recover quickly once all disturbances have ceased. Therefore, no long-term, adverse effects on wildlife would be expected.

Project I5 would occur within an area that has a concentration of avian species; however, no effects on federally and state-listed species, or other sensitive and protected species (e.g., migratory birds), would be expected from this project. High noise events could cause sensitive species to engage in escape or avoidance behaviors; however, the project site is previously disturbed and within areas of high human activity. Sensitive species in the area would be habituated to frequent disturbances and would be expected to recover quickly once construction noise and disturbances have ceased. Nesting sites for bird

species do not occur on MacDill AFB; however, the project could be completed outside of the nesting season (February 1 – September 1), further reducing potential effects. Therefore, no short- or long-term, adverse effects on protected and sensitive species would be expected. If sensitive species cannot be avoided, consultation with the USFWS or FWC, as appropriate, would occur to determine if mitigation (including a potential take permit) would be needed, and whether mitigation measures would be applicable. If significant adverse effects are identified, additional NEPA analysis would be required.

Short-term, minor, adverse effects on EFH would be expected due to erosion and runoff from construction activities, which could increase the amount of sedimentation to wetlands, streams, and EFH; however, adverse effects on aquatic resources would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project I5 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I5 would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP. There are no unevaluated buildings in the vicinity of the proposed undertaking (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project I5 would be short-term, negligible, and beneficial. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have little potential to affect on- or off-installation residents adversely. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed replacement of the sludge digester tanks.

Infrastructure. Project I5 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, irreversible, adverse effect.

Long-term, moderate, beneficial effects on wastewater treatment infrastructure would be expected due to the replacement of the aging, leaking digester tanks and improve the overall efficiency of the wastewater treatment system.

Project I5 would involve the addition of 3,300 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I5 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to demolition and construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent

information (e.g., MSDSs). There would be no impacts associated with ACM, LBP, PCBs, storage tanks, pesticides, radon and ERP sites.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. Short-term, negligible to minor, adverse effects associated with safety could occur during C&D activities. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected. There is no demolition or ERP site associated with this project.

4.4.3.6 I6. Construct DISA Parking Lot, Building 805

Project I6 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I6.

Noise. Negligible effects on the noise environment would be expected from the construction of Project I5. **Table 3-2** shows the predicted noise levels for various pieces of construction equipment 50 feet from the source, and **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site. Heavy construction equipment would not be operational during the entire construction period, which would limit the duration of increased noise levels. This site is not near off-installation land uses or near noise-sensitive uses on MacDill AFB. **Table 4-2** shows estimated combined noise levels that would be expected at varying distances from a construction site.

Land Use. No effects on land use would be expected from Project I6. The land use category for this site would remain unchanged because this project involves expanding the current parking lot by 52 spaces. The current land use category is administrative and is compatible with surrounding open space land use.

Air Quality. Short-term, minor, adverse effects on air quality would be expected from Project I6. Construction activities would result in temporary effects on local and regional air quality, primarily from site-disturbing activities, the operation of construction equipment and paving equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. All emissions associated with construction activities would be temporary in nature. It is not expected that emissions from Project I6 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the construction of the DISA Parking Lot, Building 805 are summarized in **Table 4-18**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project I6.

Table 4-18. Estimated Air Emissions Resulting from Project I6

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2014 I6 Emissions	0.15	0.08	0.66	0.01	1.07	0.10	90.61
Percentage of WCFI AQCR Inventory *	0.000083%	0.000059%	0.00009%	0.000005%	0.00138%	0.00056%	0.00004%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short- and long-term, minor, adverse effects on soils would be expected from Project I6. Short-term, minor, adverse effects would result from grading, recontouring, paving, and removal of vegetation. Construction vehicles would compress soils, decreasing permeability and rates of storm water runoff infiltration. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns. Soil erosion- and sediment-control measures would be included in site plans to minimize long-term erosion and sediment production at each site. Use of storm water-control measures that favor reinfiltration would minimize the potential for erosion and sediment production as a result of future storm events. An ESCP would be developed and implemented both during and following site development to contain soil and runoff on site, and would reduce potential for adverse effects associated with erosion and sedimentation, and transport of sediments in runoff.

The Myakka fine sand is the only soil mapped at the site of the proposed facilities. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project I6. Short-term, adverse effects would occur from ground disturbance for construction of the new parking lot, resulting in increased impacts from storm water runoff. To reduce impacts, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from construction within the 100-year floodplain for the increased impervious surface. The DISA parking lot would not be required to be elevated above the floodplain because it would not be an occupied structure. Effects on water resources would be minimized by implementing environmental protection measures and adhering to SWFWMD regulations.

The project site is in close proximity to wetlands and surface waters. Effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, establishing a wetland buffer, and following policies and procedures as detailed in the SWPPP. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short-term, negligible to minor, adverse effects on vegetation would be expected from Project I6 due to temporary disturbances on adjoining land and from use of heavy equipment during construction activities. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Any trees that would not be affected by construction activities would remain on site. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use; however, wildlife in the vicinity would be expected to be habituated to frequent disturbances because of high human activity. Most wildlife species in the vicinity of demolition and construction activities would be expected to recover quickly once all construction disturbances have ceased.

Long-term, minor, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Erosion and runoff from construction activities could result in sedimentation to wetlands and EFH; however, these impacts would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project I6 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I6 would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP. Building 805 was constructed in 1961 and has been evaluated for NRHP eligibility; however, the project would not affect the building's integrity.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from Project I6 would be short-term, negligible, and beneficial. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained locally, and local contractors would be used. The demand for workers as part of the construction would be minor and would not outstrip the local supply of workers. The proposed construction activities would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have little potential to affect on- or off-installation residents adversely. Beneficial impacts would be expected from the additional routes of egress from the Medical Clinic. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed construction of the DISA parking lot.

Infrastructure. Project I6 would result in short-term, negligible, adverse effects on transportation, liquid fuel supply, water supply, and storm water due to construction activities.

Short-term, negligible, adverse effects on solid waste would be expected as a result of the generation of construction debris. This is a short-term, adverse effect as debris would only be generated during the construction activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, irreversible, adverse effect.

If Project I6 involves the installation of a non-solar lighting system, short-term electrical utility interruptions would be expected when the system is connected to the installation's electrical infrastructure.

Grading, excavating, and vegetation-removal activities would add to the solid waste produced. However, most of the waste generated from the removal of vegetation, tree cutting, grading, and excavating would consist of biomass and would not be landfilled. This is a short-term, adverse effect, as debris would only be generated during the construction, grading, excavating, and vegetation-removal activities; however, debris that is not recycled or used for energy production would be landfilled, which would be considered a long-term, irreversible, adverse effect.

Long-term, minor, beneficial effects on transportation would be expected due to the increase in parking capacity.

Project I6 would involve the addition of 18,000 ft² of impervious surface, which would result in long-term, negligible, adverse effects on storm water management.

Long-term, negligible, adverse effects on electrical utilities would be expected due to electrical consumption if Project I6 involves installing a non-solar lighting system.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project I6 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

There would be no impacts associated with ACM, LBP, PCBs, storage tanks, pesticides, radon, and ERP sites.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adhering to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected. There is no demolition or ERP site associated with this project.

4.4.4 Selected Natural Infrastructure Management Projects

4.4.4.1 NI1. Storm Water Drainage Improvement

Project NI1 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project NI1.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from the construction at one of the identified storm water improvement sites. This site is southeast of Billy Mitchell Loop. This location is on-installation and used for accompanied housing. It is approximately 150 feet from the construction site; populations would be exposed to construction noise levels of approximately 80 to 85 dBA.

Land Use. No effects on land use would be expected from Project NI1. Land use categories for these projects include administrative, open space, industrial, outdoor recreation, aircraft operations and maintenance, and airfield pavements. These land use categories would remain unchanged under Project NI1. Construction activities could invoke minor inconveniences to airfield activities; however, work would be short-term in nature.

Project NI1 occurs within two ERP sites: SWMU 25 and SMWU 61. Both of these sites are under LUCs. Implementing Project NI1 would have no impact on the LUCs associated with these ERP sites. For additional information on these ERP sites, refer to **Section 4.3.10, Hazardous Materials and Wastes**.

Air Quality. Short-term, negligible to minor, adverse effects on air quality would be expected from Project NI1 at MacDill AFB. Storm Water Drainage Improvement construction activities would result in temporary effects on local and regional air quality primarily from site-disturbing activities, the operation of construction equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during work activities to suppress emissions. All emissions associated with the proposed Storm Water Drainage Improvement project would be temporary in nature. It is not expected that emissions from Project NI1 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the Storm Water

Drainage Improvement construction activities are summarized in **Table 4-19**. Note that the emissions in **Table 4-19** are the total for all years 2012 through 2016. Emissions for each year have been prorated at 15 percent for 2012 and 21 percent for each year after through 2016. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project NI1.

Table 4-19. Estimated Air Emissions Resulting from Project NI1

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2012 NI1 Emissions	0.076	0.050	0.369	0.004	0.741	0.081	47.493
Total 2013 NI1 Emissions	0.085	0.057	0.397	0.004	1.065	0.115	49.803
Total 2014 NI1 Emissions	0.085	0.057	0.397	0.004	1.065	0.115	49.803
Total 2015 NI1 Emissions	0.085	0.057	0.397	0.004	1.065	0.115	49.803
Total 2016 NI1 Emissions	0.085	0.057	0.397	0.004	1.065	0.115	49.803
Percentage of WCFI AQCR Inventory*	0.00005%	0.00004%	0.00005%	0.000003%	0.00138%	0.00055%	0.00002%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, negligible, adverse impacts on soils would be expected from construction, renovation, and repair of storm water drainage infrastructure on the installation. Loss of soil structure due to compaction from foot and vehicle traffic could result in changes in drainage patterns, though environmental protection measures would be implemented and no significant impacts are expected.

In the event of a spill of chemical herbicides, the installation's SPCC Plan would be followed to contain and clean up a spill quickly (see **Section 3.10**). There remains the possibility that a spill or leak could occur, but implementation of BMPs identified in the SPCC plan would minimize the potential for and extent of associated contamination.

Long-term, minor, beneficial impacts on soils would be expected from improved storm water drainage and infiltration, reducing flooding and erosion. No impacts on topography or geology would be anticipated.

Water Resources. Effects on water resources would be short- and long-term, minor, adverse and beneficial for Project NI1. Short-term adverse effects would occur from removal of vegetation, ground disturbance for construction of new culverts, and grading ditches. This construction would occur in wetlands and waters of the United States and would result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm events. The use of BMPs, including the use of erosion-control devices would reduce the effects. Projects would be coordinated with the SWFWMD for determination of permit requirements associated with wetland and surface water impacts. Individual projects with areas greater than one acre would require an NPDES general permit for

construction activities. Long-term, minor, and adverse effects could occur from loss of water quality treatment through the interaction of vegetation in the ditches and storm water prior to reaching receiving waters. In addition, vegetation can help trap contaminants in the ditch sediment, slow down water movement, and reduce turbidity.

Long-term, minor, beneficial effects would be expected from the storm water drainage system improvements by reducing localized flooding and reducing standing water in the ditches. This action would comply with the Storm Water Management Plan for MacDill AFB.

Biological Resources. Short- and long-term, negligible to minor, adverse effects on vegetation would be expected from Project NI1 due to temporary disturbances (e.g., trampling and limited removal) on adjoining land, from use of heavy equipment during improvement activities, and from the permanent loss of vegetation within the ditches. Affected vegetation would consist primarily of hydrophytic vegetation. Project NI1 would occur within the upland cut ditches that compose the installation's storm water drainage system. All ground disturbed during construction activities that does not include site improvements would be reseeded with appropriate species.

Short-term, negligible to minor, adverse effects on wildlife would be expected from Project NI1 due to temporary disturbances from noise, demolition and construction activities, and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors. Therefore, wildlife in the vicinity would be expected to be habituated to frequent disturbances. Most wildlife species in the vicinity of site improvements would be expected to recover quickly once project noise and disturbances have ceased.

Long-term, minor, adverse effects on wildlife would occur due to the permanent loss of vegetation within the drainage ditches. Since the project improvements would occur throughout the installation, the potential to affect wildlife would be greater than most other projects. Birds often inhabit the vegetation associated with storm water ditches and are drawn to drainage ditches with standing water to forage. Removing the vegetation would reduce the amount of habitat used by bird species on the installation; therefore, BASH incidents would also decrease because many of these culverts are on the flightline. Replacement of the culverts and repair of headwalls is not expected to have an adverse effect on wildlife.

Project NI1 would occur near an area with a concentration of avian species; however, no effects on federally and state-listed species, or other sensitive and protected species (e.g., migratory birds), would be expected from this project. High noise events could cause sensitive species to engage in escape or avoidance behaviors; however, the project site is previously disturbed and within areas of high human activity. Sensitive species in the area would be habituated to frequent disturbances and would be expected to recover quickly once construction noise and disturbances have ceased. If sensitive species cannot be avoided, consultation with the USFWS or FWC, as appropriate, would occur to determine if mitigation (including a potential take permit) would be needed, and whether mitigation measures would be applicable. If significant adverse effects are identified, additional NEPA analysis, such as an EIS, would be required.

Most improvement activities associated with this project would not affect the nesting bald eagles or their young (see **Figure 2-3**). However, two of the culvert repair locations, which would require vegetation and sediment removal, are within 1,000 feet of identified bald eagle nests. Noise associated with these projects would have the potential to affect the bald eagles. Improvement activities would not occur within 660 feet of the nest during the nesting season (1 October–15 May) (MAFB 2007b). If this restriction cannot be met for any of the projects evaluated, consultation with the FWC would occur to determine the potential effects on the eagles. The FWC would determine if mitigation would be needed, and would recommend applicable mitigation measures. If significant adverse effects are identified, additional NEPA analysis would be required.

Short-term, minor, adverse effects on EFH would be expected due to erosion and runoff from construction activities, which could increase the amount of sedimentation to wetlands, streams, and EFH. Clearing sediment from drainage channels at the installation has the potential to impact EFH more than other projects at the installation; however, adverse effects on aquatic resources would be minimized through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project NI1 is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project NI1 would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Short-term, negligible, beneficial effects on socioeconomic resources would be expected from Project NI1. It is assumed that equipment and supplies necessary to complete the proposed activities would be obtained primarily locally, and local contractors would primarily be used. The demand for workers would be negligible and would not outstrip the local supply of workers in the region. The proposed improvements would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have no potential to affect on- or off-installation residents adversely. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the proposed improvements.

Infrastructure. Project NI1 would result in short-term, negligible, adverse effects on transportation and liquid fuel supply due to use of equipment and vehicles, and activities associated with the storm water drainage improvements.

Short-term, negligible, adverse effects on solid waste management would be expected due to repair activities and the removal of vegetation, dirt, and concrete. The majority of the solid waste would consist of biomass and concrete and would be recycled.

Long-term, minor, beneficial effects on the airfield would be expected to result from storm water drainage improvements that would partially take place on the airfield area.

Long-term, moderate, beneficial effects on storm water management would be expected due to the culvert and headwall repair, the removal of drainage clogs, and ditch improvement. These activities would allow storm water runoff to flow efficiently off the installation and into receiving water bodies, aid in preventing flooding of the installation, and allow the installation to comply with MacDill AFB's Storm Water Management Plan.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and wastes would be expected from Project NI1. The project would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes from use of equipment for vegetation removal and culvert repair. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill AFB HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs). Additional impacts would result from the removal of excess sediment contaminated with VOCs, polycyclic aromatic hydrocarbons (PAHs), and metals from four drainage ditches. The soil would be removed and disposed of off site in accordance with appropriate regulations.

No effects on ERP sites would be anticipated to occur. Two ERP sites (SWMU 25 and SWMU 61) occur within the project sites, and groundwater contamination has been confirmed. Remedial action has been conducted at both ERP sites, and both sites are currently under long-term management, including use of LUCs and MNA. Because the contaminants are in the groundwater, it is less likely that they would be encountered during the proposed work activities. If contaminated media are encountered during demolition activities, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Long-term, minor, beneficial effects on hazardous wastes would be expected from the removal of excess sediment contaminated with VOCs, PAHs, and metals from four drainage ditches. The soil would be removed and disposed of off site in accordance with appropriate regulations. No other long-term effects on hazardous materials or wastes would be anticipated to result from Project NI1.

Safety. Short-term, negligible to minor, adverse effects associated with safety could occur during construction activities. Construction activities pose an increased risk of construction-related accidents, but this level of risk would be managed by adherence to established Federal, state, and local safety regulations. Workers would be required to wear PPE such as ear protection, steel-toed boots, hard hats, gloves, and other appropriate safety gear. Construction areas would be fenced and appropriately marked with signs. Construction and associated trucks transporting material to and from construction sites would be directed to roads and streets that have a lesser volume of traffic. Therefore, no long-term, adverse effects on safety would be expected.

There are a number of storm water drainage improvements within the vicinity of the airfield. Safety impacts during airfield operations could be minor but adverse to workers and contractors working within these areas due to airfield activities.

A portion of Project NI1 is also within a QD arc in the center of the installation. This QD arc could pose short-term, minor, adverse impacts on workers in this area, but no long-term impacts would be expected once construction work has been completed.

There are two ERP sites associated with Project NI1: SWMU 25 and SMWU 61. Both of these sites are undergoing long-term monitoring and include LUCs and MNA. Construction activities within these areas could pose an impact on worker safety in this area. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.4.5 Selected Strategic Sustainability Performance Project

4.4.5.1 S1. Install Jogging Path Lighting

Project S1 would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project S1.

Noise. Negligible effects on the noise environment would be expected from Project S1. This site is not near off-installation land uses or near noise-sensitive uses on MacDill AFB. **Table 4-1** shows estimated combined noise levels that would be expected at varying distances from a construction site.

Land Use. No effects on land use would be expected from Project S1. Land use at this site is open space, industrial, and aircraft operations and maintenance. The western portion of the jogging path is within the noise contours from airfield operations and the eastern portion of the jogging path is within a QD arc;

however, because the jogging path is already within these noise contours and QD arc, no impact would be expected from the installation of lighting.

The jogging path is adjacent to SWMU 5, SWMU 6, SWMU 7, SWMU 8, SWMU 11, and SWMU 18, and within 165 feet of SWMU 10. All of these sites are under LUCs (MAFB 2011b). Prior to the installation of lighting, the site would need to be sampled for contamination. Project S1 would have no impact on the LUC associated with these ERP sites. For additional information on these ERP sites, refer to **Section 4.3.10, Hazardous Materials and Wastes**.

Air Quality. Short-term, negligible to minor, adverse effects on air quality would be expected from Project S1. Jogging Path Lighting construction activities would result in temporary effects on local and regional air quality primarily from site-disturbing activities, the operation of construction equipment and haul trucks transporting materials, and workers commuting to the job site. Appropriate fugitive dust-control measures would be employed during work activities to suppress emissions. All emissions associated with from the proposed Jogging Path Lighting project would be temporary in nature. It is not expected that emissions from Project S1 would contribute to or affect local or regional attainment status with respect to the NAAQS. Emissions from the Jogging Path Lighting activities are summarized in **Table 4-20**. Emissions estimation spreadsheets and a summary of methodology used are included in **Appendix D**. No long-term air emissions would be produced as a result of Project S1.

Table 4-20. Estimated Air Emissions Resulting from Project S1

Activity	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Total 2013 S1 Emissions	0.060	0.039	0.324	0.002	0.218	0.026	43.512
Percentage of WCFI AQCR Inventory*	0.000034%	0.000029%	0.000044%	0.000002%	0.000283%	0.000124%	0.00002%**

Note: * Based on maximum year emissions. ** Percentage of State of Florida CO₂ emissions.

See **Appendix D** for a breakdown of air emissions calculations.

Geological Resources. Short-term, negligible, adverse impacts on soils would be expected from Project S1. Loss of soil structure due to compaction from foot and vehicle traffic during installation could result in changes to drainage patterns, though environmental protection measures would be implemented and no significant impacts would be expected.

The Myakka fine sand is the only soil mapped at the site of the proposed Jogging Path Lighting. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone and ponding (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation.

No impacts on topography or geology would be anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project S1. The project is in the 100-year floodplain and close to wetland areas. Short-term effects could occur from ground disturbance for construction of the lighting project. Ground disturbances could result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm events. To reduce impacts, the project would adhere to environmental protection measures

such as the use of erosion-control devices around the construction area. Long-term, minor, adverse effects would occur from construction within the 100-year floodplain resulting in an increased potential for damage to the lighting system.

The project site is in close proximity to wetlands. Direct impacts on wetlands would be avoided through design and siting of the project. Effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, and installing silt fencing. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Short- and long-term, negligible, adverse effects on vegetation would be expected from Project S1 due to temporary disturbances (e.g., trampling and limited removal) on adjoining land, from use of heavy equipment during demolition and construction activities, and from the permanent loss of habitat. Project S1 would primarily affect urban upland and non-forested upland communities. Adverse, negligible effects would result from the permanent loss of vegetation associated with this project. Affected vegetation would consist primarily of manicured lawns and associated landscaping. Disturbed areas would be revegetated with sod, if practicable.

Short-term, negligible to minor, adverse effects on wildlife would be expected from this project due to temporary disturbances from noise, construction activities, and heavy equipment use. High noise events could cause wildlife to engage in escape or avoidance behaviors. This project would occur where human disturbance is common. Therefore, wildlife in the vicinity would be expected to be habituated to frequent disturbances. Most wildlife species would be expected to recover quickly once demolition and construction noise and disturbances have ceased. Long-term, negligible, adverse effects on wildlife would be expected from this project. A permanent loss of habitat would occur; however, the habitat quality associated with this project is low.

Most improvement activities associated with this project would not affect the bald eagle nests or their young (see **Figure 2-1**). However, a portion of the jogging path is within the WSA and noise associated with these projects would have the potential to affect the bald eagle pair. Installation activities would not occur within 660 feet of the nest (MAFB 2007b). If this restriction cannot be met for any of the projects evaluated, consultation with the FWC would occur to determine the potential effects on the eagles. The FWC would determine if mitigation would be needed, and would recommend applicable mitigation measures. If significant adverse effects are identified, additional NEPA analysis would be required.

Short-term, minor, adverse effects on EFH would be expected due to erosion and runoff from construction activities, which could increase the amount of sedimentation to wetlands, streams, and EFH; however, adverse effects on aquatic resources would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project S1 along an existing jogging path outside of the archaeological APE would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project S1 would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP (MAFB 2011c).

Socioeconomics and Environmental Justice. Short-term, negligible, beneficial effects on socioeconomic resources would be expected from Project S1. It is assumed that equipment and supplies necessary to complete the proposed installation would be obtained primarily locally, and local contractors would primarily be used. The demand for workers would be negligible and would not outstrip the local supply

of workers in the region. The proposed installation would occur entirely on MacDill AFB in a non-residential portion of the installation, and it would have no potential to adversely affect on- or off-installation residents. Therefore, no environmental justice issues would be anticipated. No long-term effects on socioeconomic resources are expected to result from the installation of the lighting.

Infrastructure. Project S1 would result in short-term, negligible, adverse effects on transportation and liquid fuel supply due to the vehicles and equipment associated with the installation of the jogging path lighting.

Long-term, negligible, beneficial effects on electrical infrastructure would be expected because the electricity consumed by the lighting system would be generated by solar power, hence avoiding being connected to the installations electrical infrastructure which would add to the installations electrical consumption. Long-term, negligible, beneficial effects on transportation would be expected by increasing nighttime visibility along Southshore Avenue.

Hazardous Materials and Waste. Short-term, negligible, adverse effects associated with hazardous materials and waste would be expected from this project. Project S1 would result in a short-term increase in the use of hazardous materials and petroleum products and the generation of hazardous and petroleum wastes due to construction activities. Contractors would be responsible for the management of these materials, which would be handled in accordance with the MacDill HMMP; MacDill AFB Hazardous Waste Management Plan; and Federal, state, and USAF regulations. Contractors must report the use of hazardous materials to the HAZMART, including pertinent information (e.g., MSDSs).

Short-term and long-term, minor, adverse effects could result from installation of lighting within six ERP sites (SWMU 5, SWMU 6, SWMU 7, SWMU 8, SWMU 11, and SWMU 18) and within 165 feet of one ERP sites (SWMU 10). SWMU 5, SWMU 6, SWMU 7, SWMU 8, SWMU 10, SWMU 11, and SWMU 18 have contaminated groundwater and soil and some surface water. The sites are undergoing MNA for groundwater and have LUCs and engineering controls for soil and surface water. While the soil disturbance required for Project S1 would not be significant, the installation of the proposed lighting could disturb contaminated soils. Therefore, if contaminated media is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

No long-term effects on hazardous materials, hazardous wastes, storage tanks, ACM, LBP, PCBs pesticides, radon, and ERP sites would be expected from Project S1.

Safety. Long-term, minor, beneficial impacts on safety would result from the installation of jogging path lighting. This would provide a safety benefit to pedestrians and drivers in the area. It will also make the jogging path more user-friendly in low-visibility situations.

A small section in the eastern portion of the jogging path is within a QD arc. This could pose short-term, negligible to minor, adverse impacts on workers installing the lighting in this area. Long-term impacts would be negligible because the jogging path is already within the QD arc.

The jogging path is adjacent to ERP Sites SWMU 5, SWMU 6, SWMU 7, SWMU 8, SWMU 11, and SWMU 18, and within 165 feet of SWMU 10. All these sites are under LUCs and MNA. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.5 Detailed Environmental Consequences of the Alternatives to the Selected Projects

4.5.1 Alternatives to the Selected Construction Projects

4.5.1.1 C1a. Revised Location for Proposed Fitness Center and JCAT Center

Project C1a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C1a.

Noise. Short-term, minor, adverse effects on the noise environment would be expected from the construction of Project C1a, and would be similar to the impacts described for Project C1. This site is not near off-installation land uses. This location is approximately 750 feet from the Tinker Elementary School. Populations outside the school would be exposed to noise levels of approximately 67 to 71 dBA during the construction period.

Land Use. Long-term, negligible to minor, adverse impacts on land use would be expected from Project C1a. Effects related to land use for Project C1a would be similar to those described for Project C1. Project C1a would be constructed in an open space land use. A land use change to community (service) from open space would be required and a loss of open space would occur under this alternative. This land use change would be compatible with existing and future land uses.

Air Quality. The air emissions from Project C1a would not appreciably change the total annual estimated emissions as compared to Project C1. Therefore, impacts from the implementation of Project C1a would be similar to those described for Project C1.

Geological Resources. Impacts on soils from Project C1a would be similar to, but greater than, those described for Project C1, due to increased construction area, addition of fill to raise the facility above the floodplain, and soil construction constraints.

The Myakka fine sand is the only soil mapped at the Project C1a site. The soil was analyzed for building construction limitations associated with shallow excavations and local roads, and was considered to be very limited due to the depth to the saturated zone and ponding (NRCS 2012). Environmental protection measures should be implemented to minimize these constraints, and site-specific soil testing should be conducted prior to project implementation. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reduce the potential for impacts on facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C1a. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facility, resulting in increased impacts from sedimentation and storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP and would be consistent with guidelines in Section 438 of EISA. Long-term, minor, adverse effects on water resources would occur from construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation, reducing the potential for impacts on facilities during flood events.

Biological Resources. The change in site location under Project C1a would not appreciably change the effects on biological resources when compared to Project C1. Therefore, impacts on vegetation, wildlife,

and protected species would be similar to those described for Project C1 and would be short- and long-term, negligible, and adverse on vegetation and short-term, negligible to minor, and long-term, minor, adverse on wildlife. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from Project C1a.

Cultural Resources. Project C1a is outside of the archaeological APE and would have no direct effects on archaeological resources listed or eligible for listing in the NRHP. Project C1a would be more than 1,700 feet from Building 501, the MacDill Field Historic District, and the Staff Officer's Quarters Historic District; therefore, Project C1a would have no effect on architectural resources listed or eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources would be similar to, but greater than, those described for Project C1 due to the construction of an entirely new fitness center, which would result in the need for more jobs than would be required for Project C1. Impacts on environmental justice would be similar to those described for Project C1, and would be long-term, minor, and beneficial from the value added to the MacDill AFB community.

Infrastructure. The change in site location under Project C1a would not appreciably change effects on installation infrastructure when compared to Project C1. Therefore, the effects of Project C1a would be similar to those described for Project C1, and would be short-term, negligible, and adverse for transportation, liquid fuel supply, water supply, and storm water due to C&D and renovation activities; short-term, negligible, and adverse on utilities and solid waste due to possible interruptions and the generation of debris. Long-term, negligible, beneficial effects utility use efficiency would be expected by demolishing old outdated facilities and constructing new, more efficient, facilities.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C1a would be similar to those described for Project C1, except there would be less potential exposure to ACM, LBP, and PCBs because Building 303 would not be renovated.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects described under Project C1.

4.5.1.2 C1b. Revised Location for Proposed Fitness Center and JCAT Center

Project C1b would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C1b.

Noise. Short-term, minor, adverse effects on the noise environment would be expected from the construction of Project C1b. The impacts would be similar to the description for Project C1. This site is not near off-installation land uses. This location is approximately 250 feet from Building 987, accompanied housing, and approximately 750 feet from the Tinker Elementary School. Populations approximately 250 feet away would be exposed to noise levels of approximately 76 to 80 dBA and populations approximately 750 feet away noise levels of approximately 67 to 71 dBA during the construction period.

Land Use. Long-term, negligible to minor, adverse impacts on land use would be expected from Project C1b, and would be similar to the effects of Project C1. Project C1b would be constructed in open space land use. A land use change to community (service) from medical land use would be required. This land use change would be compatible with existing and future land uses.

Air Quality. The air emissions from Project C1b would not appreciably change the total annual estimated emissions as compared to Project C1. Therefore, impacts from the implementation of Project C1b would be similar to those described for Project C1, and would be short- and long-term, minor, and adverse.

Geological Resources. Impacts on soils from Project C1b would be similar to, but greater than those described for Project C1, due to increased construction area, addition of fill to raise the facility above the floodplain, and soil construction constraints.

The Urban land complex is the only soil mapped at this project location; therefore, no rating exists for construction limitations. Site-specific soil surveys should be conducted prior to initiation of construction activities to determine the extent and breadth of constraints. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reduce the potential for impacts on the facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C1b. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facility, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation, reducing the potential for impacts on the facilities during flood events.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to those described for Project C1; however, because this project is closer to the shoreline, the erosion and runoff from construction activities could increase the amount of sedimentation to EFH if environmental protection measures are not implemented. Adverse effects on aquatic resources would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**). Implementation of environmental protection measures during demolition and construction activities would limit potential impacts on EFH, insects, and benthic fauna. Therefore, short-term, minor, adverse effects on EFH would be expected.

Cultural Resources. Project C1b is outside of the archaeological APE and would have no direct effect on archaeological resources listed or eligible for listing in the NRHP. Project C1b would be more than 1,700 feet from Building 501, the MacDill Field Historic District, and the Staff Officer's Quarters Historic District; therefore, Project C1b would have no effect on architectural resources listed or eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources would be similar to, but greater than, those described for Project C1 due to the construction of an entirely new fitness center, which would require additional jobs. Impacts on environmental justice would be similar to those described for Project C1, and would be long-term, minor, and beneficial because of the value added to the MacDill AFB community.

Infrastructure. The change in site location under Project C1b would not appreciably change effects on infrastructure when compared to Project C1. Therefore, the effects of Project C1b would be similar to those described for Project C1. Alternative C1b could have long-term, negligible, beneficial effects on transportation due to its close proximity to MFH.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C1b would be similar to those described for Project C1, except there would be less potential exposure to ACM, LBP, and PCBs because Building 303 would not be renovated.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects described under Project C1.

4.5.1.3 C1c. Revised Location for Proposed Fitness Center and JCAT Center

Project C1c would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C1c.

Noise. Short-term, minor to moderate, adverse effects on the noise environment would be expected from the construction of Project C1c. The impacts would be similar to the description Project C1. This site is not near off-installation land uses. This site is approximately 160 feet from Building 858, accompanied housing. Populations would be exposed to noise levels of approximately 80 to 84 dBA during the construction period.

Land Use. Long-term, negligible to minor, adverse impacts on land use would be expected from Project C1c, and would be similar to the effects of Project C1. Project C1c would be constructed in open space. A land use change to community (service) from open space would be required. This land use change would be compatible with existing and future land uses.

SWMU 2 is within 165 feet of Project C1c and is currently under LUC. For more information on these ERP sites, refer to **Section 4.3.10, Hazardous Materials and Wastes**.

Air Quality. The air emissions from Project C1c would not appreciably change the total annual estimated emissions as compared to Project C1. Therefore, impacts from the implementation of Project C1c would be similar to those described for Project C1.

Geological Resources. Impacts on soils from Project C1c would be similar to those described for Project C1a. The Myakka fine sand is the only soil mapped at this project location; therefore, building restrictions would be similar to those described for Project C1a. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on the facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C1c. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facility, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation reducing the potential for impact on the facilities during flood events.

The project site is in close proximity to wetlands. Effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. These environmental protection measures and BMPs include flagging the resource boundary, installing silt fencing, and following policies and procedures as detailed in the SWPPPs. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. The change in site location under Project C1a would not appreciably change the effects on biological resources when compared to Project C1. Therefore, impacts on vegetation, wildlife, and protected species would be similar to those described for Project C1 and would be short- and long-term, negligible, and adverse on vegetation and short-term, negligible to minor, and long-term, minor, adverse on wildlife. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from Project C1c.

Cultural Resources. The proposed Project C1c is outside of the archaeological APE and would have no direct effect on archaeological resources listed or eligible for listing in the NRHP. Because Project C1c is more than 1,700 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, there would be no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,700 feet from Building 501, a building potentially eligible for listing in the NRHP. The proposed project would be at a sufficient distance not to affect the integrity of setting or feeling of the historic districts or Building 501. This project is in an area of the installation that was developed within the past 40 years and was identified in the ICRMP as having no effect on historic properties.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources would be similar to, but greater than, those described for Project C1, due to the construction of an entirely new fitness center, which would result in an increase in jobs when compared to Project C1. Impacts on environmental justice would be similar to those described for Project C1.

Infrastructure. The change in site location under Project C1c would not appreciably change effects on infrastructure when compared to Project C1. Therefore, the effects of Project C1c would be similar to those described for Project C1.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C1c would be similar to those described for Project C1, except there would be less potential exposure to ACM, LBP, and PCBs because Building 303 would not be renovated and there could be an adverse effect from performing work near an ERP site. One ERP site (SWMU 2) is within 165 feet of Project C1c, and it is currently under long-term management, including use of LUCs.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects described under Project C1. Project C1c is within 165 feet of ERP site SWMU 2, which is currently under long-term management. Construction activities within this area could pose an impact on worker safety. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers but could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

4.5.1.4 C3a. Use of Pre-Constructed Barricades and Personnel Bunker

Project C3a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C3a.

Noise. Negligible effects on the noise environment would be expected from the construction of Project C3a. The impacts would be similar to the description in **Section 4.4.2.1**. This site is not near off-installation land uses or near noise-sensitive uses on MacDill AFB. **Table 4-2** shows estimated combined noise levels that would be expected at varying distances from a construction site.

Land Use. No effects on land use would be expected from Project C3. Effects related to land use for Project C3a would be similar to those discussed for Project C3.

Air Quality. The air emissions from Project C3a do not appreciably change the total annual estimated emissions as compared to Project C3. Therefore, impacts from the implementation of Project C3a would be similar to those described for Project C3.

Geological Resources. Impacts on soils from Project C3a would be less than those described for Project C3, and would be short-term, negligible to minor, and long-term, negligible because prefabricated units would be installed in the location.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse from Project C3a. Short-term, minor, adverse effects would occur from the disturbance of soil for construction of the bunker and barricades, resulting in increased sedimentation in storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain resulting in an increase in impervious surfaces and modification of flood flow and volume characteristics. Effects would be minimized by implementing environmental protection measures.

No wetlands are present on the project site; therefore, no direct impacts on wetlands would be expected from this proposed construction project. However, the site is adjacent to wetland areas. Effects on adjacent wetlands would be avoided through proper implementation of environmental protection measures. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. The change in site location under Project C3a would not appreciably change the effects on biological resources when compared to Project C3. Therefore, impacts on vegetation, wildlife, and protected species would be similar to those described for Project C3, and would be short-term, negligible to minor, and adverse on vegetation and short-term, negligible, and adverse on wildlife. Long-term, negligible, adverse effects on wildlife would be expected from a permanent loss of habitat; however, the habitat quality associated with this project is low. No protected and sensitive species have been observed in the project area; therefore, no effects on protected species would be expected from this project.

Cultural Resources. Project C3a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project C3a is in a remote part of the installation and would be more than a mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, Project C3a would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than a mile from Building 501, which is potentially eligible for listing in the NRHP. There are no unevaluated buildings in the area.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from this alternative would be similar to, but less than, those described for Project C3, and would be short- and long-term, negligible to minor, and beneficial. The use of pre-constructed facilities instead of constructing permanent barricades would likely employ fewer workers for a shorter period of time. Impacts on environmental justice would be similar to those described for Project C3 and would be long-term and beneficial.

Infrastructure. Effects on infrastructure from the implementation of Project C3a would be similar to those described for Project C3 and would be short-term, negligible, and adverse on transportation, liquid fuel supply, water supply, and storm water due to C&D and renovation activities. Short-term, negligible,

adverse effects on utilities and solid waste would be expected due to possible interruptions and from the generation of debris.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C3a would be similar to those described for Project C3, which would be short-term, negligible to minor, and adverse.

Safety. This alternative is in the same location as Project C3 and would have similar effects on safety. Impacts would be short-term, negligible to minor, and adverse.

4.5.1.5 C4a. Revised Location for JSOU

Project C4a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C4a.

Noise. Negligible effects on the noise environment would be expected from the construction of Project C4a. The impacts would be similar to those described for Project C4.

Land Use. No impacts would be expected from the construction of the JSOU at this location. Construction of this facility would be within administrative land use and would require no land use change. Existing and future land uses would remain the same and would remain compatible.

Air Quality. The air emissions from Project C4a would be slightly less than under Project C4 because the temporary facilities would not be removed; however, this activity would not appreciably change the total annual estimated emissions when compared to Project C4. Therefore, impacts from the implementation of Project C4a would be similar to, but slightly less than, those described for Project C4.

Geological Resources. Impacts on soils from Project C4a would be similar to those described for Project C4. The St. Augustine-Urban land complex is the only soil mapped at this project location; therefore, building restrictions would be similar to those described for Project C4, and would be somewhat limited due to the depth to the saturated zone. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on the facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C4a. This project would result in a slightly greater impact on water resources when compared to Project C4 due to the increase in impervious surfaces since the temporary facilities would not be removed. Short-term, minor, adverse effects would occur from ground disturbance from demolition of existing buildings and construction of the new facility, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation, reducing the potential for impacts on the facilities during storm events.

Biological Resources. Project C4a would not change effects on biological resources when compared to Project C4. Therefore, impacts on vegetation, wildlife, and protected species would be similar to those described for Project C4, and would be short-term, negligible, and adverse on vegetation and wildlife. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project C4a is outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Project C4a would have no direct effect on architectural resources listed or eligible for listing in the NRHP. Project C4a would be approximately 230 feet from Building 501, a property potentially eligible for listing in the NRHP. Under NEPA, this project would have an indirect, long-term, negligible effect; however, under NHPA, no adverse effects would occur. Because of the presence of other large multi-story structures adjacent to Building 501 the visual effect would not be adverse under the NHPA. It is unlikely that the proposed JSOU would affect the MacDill Field Historic District or the Staff Officer's Quarters Historic District, which are more than 1,000 feet from the project. This project would not alter the qualities that make Building 501 eligible for listing in the NRHP, and would not alter the qualities that make either historic district eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from this alternative would be similar to, but slightly less than, those described for Project C4 because the temporary facilities would not be removed. The site for Project C4a is adjacent to a residential area of MacDill AFB. Therefore, short-term, negligible, adverse impacts on environmental justice would be expected due to construction noise and traffic for those residents living near the construction site.

Infrastructure. The effects of Project C4a would be similar to, but greater than, those described for Project C4. The project would be sited at an existing parking lot instead of the site for Buildings 506A and 506E. Therefore, removal of these facilities would not be required and would not result in short-term, adverse effects due to utility interruptions from disconnecting these buildings from utilities. Since these buildings would not be demolished, the overall net increase in building space, and subsequent adverse effects from an increased utilities consumption, would be greater than those described under Project C4, but would remain negligible. All necessary utilities would be extended to the JSOU as needed.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C4a would be similar to, but slightly less than, those described for Project C4, because the temporary facilities would not be removed. Impacts would be short-term, negligible, and adverse.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects described under Project C4.

4.5.1.6 C5a. Revised Location of the Proposed Outdoor Recreation Maintenance Facility

Project C5a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C5a.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from the construction of Project C5a. The impacts would be similar to the description in **Section 4.4.2.1**. This site is not near off-installation land uses and is within an accompanied housing area (mobile home park) on the installation. This site is approximately 100 feet from closest camper pad. Populations would be exposed to noise levels of approximately 84 to 88 dBA during the construction period. To minimize noise impacts on campers, campground staff could close portions of the camp impacted by construction noise or inform incoming campers of construction activities.

Land Use. Long-term, minor, adverse impacts would be expected from the construction of the proposed Outdoor Recreation Maintenance Facility at this location. Project C5a would be on housing (accompanied) land use, which would need to be changed to outdoor recreation. This would not result in

a long-term, impact on land use because of the proximity of outdoor recreation land use area adjacent to housing (accompanied) and community (service).

Air Quality. The air emissions from Project C5a would not appreciably change the total annual estimated emissions as compared to Project C5. Therefore, impacts from the implementation of Project C5a would be similar to those described for Project C5.

Geological Resources. Impacts on soils from Project C5a would be similar to, but less than, those described for Project C5, due to suitability of the site's soils for development.

The Urban land complex is the only soil mapped at this project location. No rating exists for construction limitations. Site-specific soil surveys should be conducted prior to initiation of construction activities to determine the extent and breadth of constraints. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on the facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C5a. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facility, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation reducing the potential for impacts on facilities during storm events.

Biological Resources. The change in site location under Project C5a would not appreciably change effects on biological resources when compared to Project C5. Therefore, impacts on vegetation, wildlife, and protected species would be similar to those described for Project C5, and would be short-term, negligible to minor, and adverse on vegetation and wildlife. Long-term, negligible, adverse effects on wildlife would be expected from a permanent loss of habitat. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project C5a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project C5a would be more than a mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than a mile from Building 501, a building potentially eligible for listing in the NRHP. There are no buildings in the immediate area that have not been evaluated for NRHP eligibility (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomics from this alternative would be similar to, but less than, those described for Project C5, as no existing buildings would need to be demolished. Impacts on environmental justice would be similar to those described for Project C5.

Infrastructure. The change in site location under Project C5a would not appreciably change effects on installation infrastructure when compared to Project C5. Therefore, the effects of Project C5a would be similar to those described for Project C5. All necessary utilities would be extended to the Outdoor Recreation Maintenance Facility as needed.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C5a would be similar to those described for Project C5. No ERP sites are adjacent or within the site for Project C5a.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects of Project C5. There would be short-term, minor, adverse impacts associated with this alternative due to UXO, CAIS, or other related material at this location because this alternative is on a former EOD Facility.

4.5.1.7 C6a. Revised Location for Alert Facility, FMSE Facility

Project C6a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project C6a.

Noise. Short-term, negligible effects on the noise environment would be expected from construction activities associated with Project C6a, and impacts would be similar to those described for Project C6. This site is not near off-installation land uses or near noise-sensitive uses on MacDill AFB. **Table 4-2** shows estimated combined noise levels that would be expected at varying distances from a construction site.

Long-term, negligible effects on the noise environment would result from the operation of the proposed 1,000-kW emergency generator. This site is not near off-installation land uses. The closest noise-sensitive receptor is an unaccompanied housing facility, approximately 2,700 feet from the proposed site. Using data provided by a generator manufacturer (Cummins 2008), estimated noise levels resulting from operation of the generator would be approximately 35 dBA. The generator would only be in operation during emergency situations and when undergoing routine maintenance.

Land Use. Long-term, minor, adverse effects on land use would occur. Construction of new facilities would occur within an area classified as administrative land use and would require a land use category change to aircraft operations and maintenance. Present and future land uses would be compatible with this change in land use. The proposed site of Project C6a is within 740 feet of ERP Site TU/US-C500, which is under LUC. However, no construction would occur within this ERP site, and no effect on land use would be anticipated. Renovation of Building 52 would not affect land use.

Air Quality. The air emissions from Project C6a would not appreciably change the total annual estimated emissions as compared to Project C6. Therefore, impacts from the implementation of Project C6a would be similar to those described for Project C6.

Geological Resources. Impacts on soils from Project C6a would be less than those described for Project C6 because no new construction would occur. Short-term, negligible to minor, adverse impacts from soil compaction due to foot and vehicle traffic during renovation activities would be expected, but environmental protection measures and soil decompaction methods would be implemented to minimize and mitigate these impacts. Impacts on topography would be long-term and minor, due to the requirement to construct occupied facilities on a minimum 11.5-foot elevated pad to reducing the potential for impacts on the facilities during flood events. No impacts on geology are anticipated.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project C6a. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facilities, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year

floodplain. Effects would be minimized by implementing environmental protection measures. Additionally, the facility would be constructed above the 100-year flood elevation reducing the potential for impacts on the facility during storm events. This alternative would result in fewer impacts on water resources than Project C6 because less construction would occur, and Building 52 would only require interior renovations, so the project footprint could be smaller. In addition, Project C6a would be outside of wetland areas whereas Project C6 is adjacent to a wetland, although impacts on wetlands would be avoided through design.

Biological Resources. The change in site location under Project C6a would not generally change effects on biological resources when compared to Project C6; however, the project would be near gopher tortoise habitat. Impacts on vegetation and wildlife, would be similar to those described for Project C6, and would be short-term, minor, and adverse on vegetation and short-term, negligible, and adverse on wildlife. Long-term, minor, adverse effects on wildlife would be expected from a permanent loss of habitat. Long-term, negligible to minor, adverse effects on protected and sensitive species would be expected from decreased tree habitat from this project.

Gopher tortoise habitat would be within 1,000 feet of the proposed construction areas, but no burrows would be directly impacted by construction activities. Short-term, minor, adverse effects would be expected from construction noise and ground vibration. Any tortoises in the vicinity of the site would be expected to recover quickly once the disturbances from noise, construction, and heavy equipment use have ceased. Additionally, aircraft operations are frequent; therefore, the tortoises would be habituated to noise and vibration disturbances. Long-term, minor, adverse effects on the gopher tortoise would be expected due to a loss of habitat as a result of construction activities. If gopher tortoises cannot be avoided, consultation with the FWC would occur to determine if mitigation (including a potential take permit) would be needed, and whether mitigation measures would be applicable. If significant adverse effects are identified, additional environmental documentation may be required.

Short-term, minor, adverse effects on EFH would be expected due to erosion and runoff from construction activities, which could increase the amount of sedimentation to wetlands, streams, and EFH; however, adverse effects on aquatic resources would be avoided through design and the implementation of environmental protection measures (see **Section 4.3.5**).

Cultural Resources. Project C6a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Project C6a would require the renovation of Building 52, which was constructed in 1954 and determined not eligible for listing in the NRHP. Project C6a is more than 1,000 feet from both the MacDill Field Historic District and the Staff Officer's Quarters Historic District and, therefore, would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,000 feet from Building 501, which is potentially eligible for listing in the NRHP (MAFB 2006b).

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from this alternative would be similar to, but less than, those described for Project C6 and would be short- and long-term, negligible to minor, and beneficial because fewer jobs would be required since no construction or pad elevation would take place, only renovations to existing facilities. Impacts on environmental justice would be similar to those described for Project C6 and would be long-term and beneficial.

Infrastructure. The change in site location under Project C6a would not appreciably change effects on installation infrastructure when compared to Project C6. Therefore, the effects of Project C6a would be similar to those described for Project C6. All necessary utilities would be extended to the FMSE Facility as needed.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project C6a would be similar to those described for Project C6. The proposed site of Project C6a is within 740 feet of ERP Site TU/US-C500. TU/US-C500 is currently MNA for groundwater (MAFB 2011e). LUCs restrict the site to nonresidential land uses, prohibit the use of groundwater, and restrict exposure to soil. Therefore, there could be impacts associated with construction of a new facility within a contaminated area. If contaminated media associated with an ERP site is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects of Project C6. There is no demolition associated with this alternative; however, Building 52 would require renovation, which could pose short-term, negligible to minor, adverse impacts because ACM or LBP could be present.

4.5.2 Alternatives to the Selected Infrastructure Projects

4.5.2.1 I1a. Revised Location for the Proposed CENTCOM Parking Garage

Project I1a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I1a.

Noise. Short-term, minor, adverse effects on the noise environment would be expected from the construction of Project I1a. The impacts would be similar to the description in **Section 4.4.2.1**. This site is approximately 500 feet from off-installation housing on Bayshore Trails. Populations would be exposed to noise levels of approximately 70 to 74 dBA during the construction period. This residential area is within the 65 to 69 dBA DNL noise contours from aircraft operations at MacDill AFB. These populations are accustomed to fluctuations in noise levels from the aircraft operations.

Land Use. No effects on land use would be expected from Project I1a. Effects related to land use for Project I1a would be similar to, but less than, the effects of Project I1 because this alternative is only associated with ERP Site SS061. The LUCs for this ERP site would have no impact on this alternative.

Air Quality. The air emissions from Project I1a would not appreciably change the total annual estimated emissions as compared to Project I1. Therefore, impacts on air quality from implementing I1a would be similar to those described for I1.

Geological Resources. Impacts on geological resources from Project I1a would be similar to those described for Project I1, and would be short- and long-term, minor, and adverse.

Water Resources. Short- and long-term, minor, and adverse effects on water resources would be expected from Project I1a. Short-term, minor, adverse effects would occur from ground disturbance for demolition of existing buildings and construction of the new facility. This would result in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to those described for Project I1, and would be short- and long-term, negligible, adverse effects on vegetation and wildlife. No protected and sensitive species have been observed in the project area; therefore, no effects on protected and sensitive species would be expected from this project.

Cultural Resources. Project I1a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project I1a would be more than 1,000 feet and across the runway from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on historic architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,000 feet from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources and environmental justice from this alternative would be the same as those described for Project I1.

Infrastructure. Effects on infrastructure from Project I1a would be similar to those described for Project I1.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project I1a would be similar to those described for Project I1.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects described under Project I1. This alternative is also entirely contained in ERP Site ST022.

4.5.2.2 I1b. Revised Location and Design for the Proposed CENTCOM Parking Garage with Shuttle Buses

Project I1b would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project I1b.

Noise. Short-term, minor, adverse effects on the noise environment would be expected from the construction of Project I1b. The impacts would be similar to the description in **Section 4.4.2.1**. This site is approximately 500 feet from off-installation housing near Bayshore Boulevard. Populations would be exposed to noise levels of approximately 70 to 74 dBA during the construction period. This residential area is outside of the 65 dBA DNL noise contours from aircraft operations at MacDill AFB.

The Remote Parking Area is approximately 250 feet from Building 987, the closest accompanied housing. Populations would be exposed to noise levels of approximately 76 to 80 dBA during the construction period.

Long-term, minor, adverse effects on on-installation residential areas could result from the operation of shuttle buses to and from the Building 540 lot and the Remote Parking Area. Bus service would run 24 hours a day along Bayshore Boulevard, which is adjacent to installation housing for approximately 1 mile. Noise impacts on the housing area could vary depending on the type of shuttle vehicle and frequency of shuttle trips; however, it is not likely that a single shuttle bus would have a significant effect on the ambient noise environment. Mitigation measures could include reducing shuttle frequency and selecting quieter running shuttle vehicles.

Land Use. Long-term, minor, adverse impacts would be expected from Project I1b. This project proposes the CENTCOM Parking Garage within the medical and housing accompanied land uses. Under this project, land uses would need to be changed from medical and housing (accompanied) to administrative. This change in land use would be compatible with existing and future adjacent land uses.

Air Quality. Table 4-21 provides a comparison of the estimated annual air emissions resulting from implementing Projects I1 and I1b. Implementing Project I1b would result in slightly higher emissions than Project I1, due to the addition of long-term emissions associated with shuttle buses.

Table 4-21. Estimated Annual Air Emissions Resulting from Implementing Project I1 and I1b

Project	NO _x tpy	VOC tpy	CO tpy	SO ₂ tpy	PM ₁₀ tpy	PM _{2.5} tpy	CO ₂ tpy
Project I1	5.390	0.850	4.420	0.420	3.420	0.750	775.100
Project I1b (2012)	5.450	0.727	3.972	0.427	6.453	1.027	758.535
Project I1b (2013)	0.201	0.145	0.590	0.016	0.239	0.062	50.790
Project I1b (2014)	0.201	0.145	0.590	0.016	0.239	0.062	50.790
Project I1b (2015)	0.201	0.145	0.590	0.016	0.239	0.062	50.790
Project I1b (2016)	0.201	0.145	0.590	0.016	0.239	0.062	50.790

Geological Resources. Impacts on geological resources from Project I1b would be similar to those described for Project I1, and would be short- and long-term, minor, and adverse on soils.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project I1b. Short-term, minor, adverse effects would occur from ground disturbance for construction of the new facility, resulting in increased impacts from storm water runoff. To reduce effects on water resources, the project would adhere to BMPs identified in site-specific SWPPPs. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to, but greater than, those described for Project I1. The addition of a 24-hour bus service could increase wildlife mortality on the installation; however, the increase in mortality events would be negligible.

Cultural Resources. Project I1b would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Project I1b would be more than 1,000 feet from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District; therefore, the project would have no effect on historic architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1,000 feet from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from this alternative would be similar to, but greater than, those described for Project I1 due to the larger footprint of the proposed parking area. Impacts on environmental justice would be similar to those described for Project I1.

Infrastructure. Effects on storm water management under Project I1b would be less than those described for Project I1 because the project would not be sited northwest of an existing tidal drainage channel. Additional beneficial effects on transportation would occur because many employees would be transported via shuttle buses adjacent to privately owned vehicles (POVs). This would translate to

additional beneficial effects on liquid fuel supply because it is more efficient to travel in groups rather than individual POVs.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project I1b would be similar to those described for Project I1, except the proposed site of Project I1b would not be within an ERP site. Project I1b is within 165 feet of ERP Site ST052, which has petroleum product-contaminated groundwater. Construction of the CENTCOM parking garage would not require deep excavation; therefore, it is unlikely that contaminated groundwater would be encountered during construction activities. However, if it is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Safety. Impacts on safety related to construction activities would be short-term, negligible to minor, and adverse, similar to the effects of Project I1. This alternative is adjacent to ERP Site ST052, which is undergoing long-term monitoring for a previous leaking 2,000-gallon UST containing No.2 fuel oil and that poses short-term, minor, adverse impacts on workers exposed to groundwater and soils in the area.

4.5.3 Alternatives to the Selected Natural Infrastructure Projects

4.5.3.1 NI1a. Line Storm Water Drainage Ditches with Geotextile or Geoweb

Project NI1a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project NI1a.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected at one of the identified storm water improvement sites. This site is southeast of Billy Mitchell Loop. This location is on the installation and used for accompanied housing. It is approximately 150 feet from the construction site; populations would be exposed to noise levels of approximately 80 to 85 dBA.

Land Use. No effects on land use would be expected from Project NI1a. Impacts on land use would be similar to Project NI1.

Air Quality. Project NI1a would require more manual labor and less use of heavy equipment than Project NI1. Therefore, Project NI1a would generate less air emissions than Project NI1, and impacts on air quality would be less than those described for Project NI1.

Geological Resources. Impacts on geological resources from Project NI1a would be short-term, minor to moderate, and adverse during installation when vegetation is removed and soils would be subject to erosion and sedimentation. However, localized, long-term, minor, beneficial impacts could occur. With proper installation, geosynthetic fabrics can aid in storm water drainage while controlling erosion and sedimentation (USEPA 2006).

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse for Project NI1a. Short-term, minor, adverse effects would occur from removal of vegetation, ground disturbance for construction placement of the geotextile or geoweb in the ditches, resulting in increased impacts from storm water runoff. The use of BMPs, including the use of erosion-control devices, could reduce the effects. Long-term, minor, and adverse effects could occur from loss of water quality treatment through the interaction of vegetation in the ditches and storm water prior to reaching receiving waters. In addition, artificial ditch lining can speed up water flows changing the flow rates, reducing treatment, and causing scour where the lining terminates. Long-term, minor, beneficial effects would be expected from the storm water drainage system improvements by reducing localized flooding

and reducing standing water in the ditches. This action would comply with the Storm Water Management Plan for MacDill AFB.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to, but greater than, those described for Project NI1. Removal of vegetation would result in short- and long-term, minor to moderate, adverse impacts on vegetation depending on the area and level of disturbance and the type of geosynthetic material used. Lining storm water drainage ditches would increase the amount of turbidity and sedimentation during installation resulting in short- and long-term, minor, adverse effects on wildlife and EFH.

Cultural Resources. Project NI1a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project NI1a would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources and environmental justice from this alternative would be similar to those described under Project NI1.

Infrastructure. Effects on infrastructure associated with Project NI1a would be similar to, but greater than, those described under Project NI1. Long-term, beneficial effects on storm water management would be expected because installation of geosynthetic fabrics would allow more efficient flow of storm water.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project NI1a would be similar to those described for Project NI1. It is assumed that removal of excess sediment contaminated with VOCs, PAHs, and metals from four drainage ditches would occur during the proposed installation of the geotextile or geoweb material. Similar to Project NI1, this contaminated sediment would be treated as a hazardous waste and would be removed and disposed of off site in accordance with appropriate regulations.

Safety. Impacts on safety related to Project NI1a would be short-term, negligible to minor, and adverse, similar to the effects described under Project NI1.

4.5.3.2 NI1b. Treat Storm Water Drainage Ditches with Chemical Herbicide

Project NI1b would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project NI1b.

Noise. The application of chemical herbicide to the Storm Water Drainage Ditches would have no effect on the noise environment.

Land Use. No effects on land use would be expected from Project NI1b. Impacts on land use would be the same as Project NI1.

Air Quality. Project NI1b would require more manual labor and less use of heavy equipment than Project NI1. Therefore, NI1b would generate fewer air emissions than NI1 and impacts on air quality would be less than those described for Project NI1.

Geological Resources. Impacts from Project NI1b would be similar to, but greater than, those described for Project NI1. Short-term, negligible to minor, adverse impacts would be anticipated from chemical applications, as some chemicals adsorb strongly to soil, and soil chemistry could be altered temporarily until the chemicals have adequately degraded from microbial action.

Short-term, negligible impacts could occur after vegetation has died as soil could be more susceptible to erosion and sedimentation. Long-term, beneficial impacts on soil productivity could occur in areas where pesticides are broken down by microbial action, thereby providing additional sources to the microbial soil food web.

Water Resources. Effects on water resources would be short- and long-term, minor, and adverse for Project NI1b. Short-term, minor, adverse effects would occur from chemical spraying of vegetation, ground disturbance for construction of new culverts, and grading ditches. This would result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm events. The use of BMPs, including the use of erosion-control devices, could reduce the effects. Long-term, minor, and adverse effects could occur from the loss of vegetation in the ditch that naturally filters pollutants and improves storm water quality prior to reaching receiving waters. The use of only herbicides approved for aquatic environments and strict adherence to label directions for use should be followed to prevent water quality impacts. Long-term, minor, beneficial effects would be expected from the storm water drainage system improvements by reducing localized flooding and reducing standing water in the ditches. This action would comply with the Storm Water Management Plan for MacDill AFB.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to, but greater than, those described for Project NI1. Application of chemical herbicides could be harmful to aquatic species and EFH due to the proximity of some ditches to the shoreline. Depending on the type of herbicide used, short- and long-term, minor to moderate, adverse effects on aquatic species would be expected from this alternative. Proper application per label instructions and environmental protection measures associated with herbicide application would be required.

Cultural Resources. Project NI1b would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project NI1b would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources from this alternative would be similar to, but less than, those described for Project NI1, as the use of chemical herbicides could reduce the number of workers required to remove vegetation from drainage ditches. Impacts on environmental justice would be similar to those described for Project NI1.

Infrastructure. Effects on infrastructure associated with Project NI1b would be similar to, but greater than, those described under Project NI1. Short-term, minor, adverse effects on storm water management would be expected due to reduced quality of storm water runoff and could further impair the receiving water bodies of the installation's storm water.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project NI1b would be similar to those described for Project NI1, except contaminated sediments would not be removed from drainage ditches and chemical herbicides would be applied to drainage ditches. It is

assumed that removal of excess sediment contaminated with VOCs, PAHs, and metals from four drainage ditches would not occur during Project NI1b; therefore, this contaminated sediment would remain in the drainage ditches. It is assumed that the herbicide would need to be reapplied at regular intervals to effectively prevent vegetation growth. The herbicides would be approved for aquatic environments, and their application would comply with all appropriate regulations.

Implementation of Project NI1b could have long-term, minor, adverse effects from the ongoing application of chemical herbicide to the installation's drainage ditches. This impact would be minimized by using only herbicides approved for aquatic environments, and by complying with all appropriate regulations for herbicide application.

Safety. There would be short-term, negligible to minor, adverse impacts on workers applying chemical herbicide due to exposure. These risks can be minimized by following all label and application guidelines included with the herbicide. Otherwise, safety related to Project NI1b would be similar to the effects described under Project NI1.

4.5.3.3 NI1c. Integrated Control of Vegetation in Storm Water Drainage Ditches

Project NI1c would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project NI1c.

Noise. Project NI1c would have short-term, minor, adverse impacts on the noise environment. Impacts would be similar to those described for Project NI1.

Land Use. No effects on land use would be expected from Project NI1c. Impacts on land use would be similar to Project NI1.

Air Quality. Project NI1c would require more manual labor and less use of heavy equipment than Project NI1. Therefore, NI1c would generate less air emissions than NI1, and impacts on air quality would be less than those described for Project NI1.

Geological Resources. Impacts from Project NI1c would be similar to, but greater than, those described for Project NI1a and Project NI1b, as chemical herbicides would not be the only means used to control vegetation. There remains the possibility that a spill or leak could occur, but implementation of BMPs identified in the SPCC plan would minimize the potential for an extent of associated contamination.

Water Resources. Effects on water resources would be short- and long-term, minor, adverse for Project NI1c. Short-term, minor, adverse effects would occur from removal of vegetation, ground disturbance for construction of new culverts, and grading ditches. This would result in erosion of disturbed soils and transport of sediment and other pollutants into nearby water bodies during storm events. The use of BMPs, including the use of erosion-control devices, could reduce the effects. Long-term, minor, adverse effects could occur from loss of water quality treatment through the interaction vegetation in the ditches and storm water prior to reaching receiving waters. Artificial ditch lining can speed up water flows changing the flow rates and causing downstream scour and erosion. The use of herbicides approved for aquatic environments and strict adherence to label directions for use should be followed to prevent water quality impacts. Long-term, minor, beneficial effects would be expected from the storm water drainage system improvements by reducing localized flooding and reducing standing water in the ditches. This action would comply with the Storm Water Management Plan for MacDill AFB.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to those described for Project NI1. By combining Projects NI1a and NI1b, the impacts from each method on

vegetation, wildlife, and protected species would be less than those from one individual method; however, impacts would not be expected to be less than those described for Project NI1. Lining storm water drainage ditches would increase the amount of turbidity and sedimentation during installation resulting in short-term, minor, adverse effects on wildlife and EFH. Application of chemical herbicides could be harmful to aquatic species and EFH. Depending on the type of herbicide used, short- and long-term, minor, adverse effects on aquatic species would be expected from this alternative. Proper application per label instructions and environmental protection measures associated with herbicide application would be required.

Cultural Resources. Project NI1c would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project NI1c would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP.

Socioeconomics and Environmental Justice. Impacts on socioeconomic resources and environmental justice from this alternative would be similar to, but less than those described for Project NI1 because less long-term maintenance would be anticipated.

Infrastructure. Effects on infrastructure associated with Project NI1c would be similar to, but greater than, those described under Project NI1. Long-term, beneficial effects on storm water management would be expected because Project NI1c would be more effective in helping to prevent future storm water management issues.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project NI1c would be similar to those described for Project NI1, except Project NI1c would include the application of chemical herbicides to drainage ditches, and would have long-term, minor, adverse effects from the ongoing application of chemical herbicide to the installation's drainage ditches. It is assumed that the herbicide would need to be reapplied at regular intervals to prevent vegetation growth effectively. The herbicides would be approved for aquatic environments, and their application would comply with all appropriate regulations.

Safety. Impacts on safety related to Project NI1c would be short-term, negligible to minor, and adverse, similar to the effects described under Project NI1.

4.5.4 Alternative to the Selected Strategic Sustainability Performance Project

4.5.4.1 S1a. Install Jogging Path Lighting along Golf Course Avenue

Project S1a would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project S1a.

Noise. Short-term, minor, adverse effects on the noise environment would be expected from Project S1a. The impacts would be similar to the description in **Section 4.4.2.1**. This site is not near off-installation land uses and is approximately 500 feet from accompanied housing. Populations would be exposed to noise levels of approximately 70 to 74 dBA during the construction period.

Land Use. No effects on land use would be expected from Project S1a. Land use effects would be similar to Project S1. Project S1a would run adjacent to ERP Site ST025; see Project D1 for LUCs related to this ERP site.

Air Quality. The air emissions from Project S1a would not appreciably change the total annual estimated emissions as compared to Project S1. Therefore, impacts on air quality from implementing Project S1a would be the same as those described for Project S1.

Geological Resources. Impacts from Project S1a would be similar to, but less than, those described for Project S1, due to greater suitability of the underlying soil for construction. No impacts on topography or geology would be expected.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project S1a. Short-term, minor, adverse effects would occur from ground disturbance for construction of the lighting system, resulting in increased impacts from storm water runoff. To reduce impacts, the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures.

Biological Resources. The change in site location under Project S1a would not appreciably change effects on biological resources when compared to Project S1. Therefore, impacts on vegetation, wildlife, and protected species would be similar to those described for Project S1.

Cultural Resources. Project S1a would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project S1a would be more than 1 mile from both the MacDill Field Historic District and the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomics and environmental justice from this alternative would be the same as those described for Project S1.

Infrastructure. The change in site location under Project S1a would not appreciably change effects on installation infrastructure when compared to Project S1.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project S1a would be similar to those described for Project S1, except the effects associated with performing construction work within an ERP site would be less. Project S1a is within 165 feet of one ERP site (SWMU 25) where groundwater contamination has been confirmed. Remedial action has been conducted at SWMU 25, and it is currently under LUCs and MNA. It is unlikely that installation of lighting under Project S1a would encounter contaminated groundwater. However, if contaminated groundwater is encountered during construction activities, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Safety. A portion of Project S1a runs adjacent to ERP Site ST025 (see Project D1). This would result in short-term, negligible to minor impacts on workers; however, there would be no construction involved with this project since it is just installing solar lighting. The eastern portion of this project is within a QD arc. This could pose short-term, negligible to minor, adverse impacts on workers installing the lighting in

this area. Long-term impacts would be negligible because the jogging path is already within the QD arc. Safety related to Project S1a would otherwise be similar to the effects described under Project S1.

4.5.4.2 S1b. Install Jogging Path Lighting along Bayshore Boulevard

Project S1b would not result in significant effects. The following subsections break down by resource areas the non-significant effects that would result from Project S1b.

Noise. Short-term, moderate, adverse effects on the noise environment would be expected from Project S1b. The impacts would be similar to the description in **Section 4.4.2.1**. This site is not near off-installation land uses and is approximately 80 feet to the nearest building, which is residential housing. Populations would be exposed to noise levels of approximately 86 to 90 dBA during the construction period.

Land Use. No effects on land use would be expected from Project S1a. Land use effects would be similar to Project S1. No LUCs associated with ERP Site ST052, which is within 165 feet of the project site, have been established. Project S1b would have no impact on the monitoring of this site and would not require any land use changes.

Air Quality. The air emissions from Project S1b would not appreciably change the total annual estimated emissions as compared to Project S1. Therefore, impacts on air quality from implementing Project S1b would be the same as those described for Project S1.

Geological Resources. Impacts on geological resources from Project S1b would be similar to those described for Project S1a.

Water Resources. Short- and long-term, minor, adverse effects on water resources would be expected from Project S1a. Short-term, minor, adverse effects would occur from ground disturbance for construction of the lighting system, resulting in increased impacts from storm water runoff. To reduce impacts the project would adhere to BMPs identified in the SWPPP. Long-term, minor, adverse effects on water resources would occur from the construction within the 100-year floodplain. Effects would be minimized by implementing environmental protection measures.

The project site is in close proximity to surface waters. Effects on adjacent water resources would be avoided through proper implementation of environmental protection measures and BMPs. In the event of a spill, SPCC Plan procedures would be implemented to contain and clean up the spill.

Biological Resources. Impacts on vegetation, wildlife, and protected species would be similar to, but less than, those described for Project S1. This alternative would not occur within the WSA and impacts on the bald eagle nesting pair would not be expected.

Cultural Resources. Project S1b would be outside of the archaeological APE and would have no effect on archaeological resources listed or eligible for listing in the NRHP.

Because Project S1b would be more than 1 mile from either the MacDill Field Historic District or the Staff Officer's Quarters Historic District, the project would have no effect on architectural resources listed or eligible for listing in the NRHP. The action would also be more than 1 mile from Building 501, which is potentially eligible for listing in the NRHP (MAFB 2011c).

Socioeconomics and Environmental Justice. Impacts on socioeconomics and environmental justice from this alternative would be similar to those described for Project S1.

Infrastructure. The change in site location under Project S1a would not appreciably change effects on installation infrastructure when compared to Project S1.

Hazardous Materials and Waste. Impacts on hazardous materials and wastes associated with Project S1b would be similar to those described for Project S1, except there would be no effects associated with ERP sites. Project S1b is within 165 feet of ERP Site ST052, which has groundwater contaminated with petroleum products and is being addressed through MNA. If contaminated media is encountered, the project work at the sites would be halted and the MacDill AFB ERP office would be contacted to ensure that any contaminated material is managed in accordance with ERP guidelines.

Safety. Impacts on safety related to Project S1b would be long-term, minor, and beneficial, similar to the effects described under Project S1. There is no QD arc associated with this area. However, this alternative does run adjacent to ERP Site ST052. Lighting installation activities within this area could pose an impact on worker safety. There is a chance contaminated material could be inadvertently discovered. This would result in short-term, minor, adverse impacts on workers, but these could be mitigated by following guidance provided in **Section 4.3.10, Hazardous Materials and Wastes**.

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5. Cumulative Effects, Best Management Practices, and Adverse Effects

5.1 Cumulative Effects

CEQ regulations stipulate that the cumulative effects analysis in an EA should consider the potential environmental effects resulting from “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions” (40 CFR 1508.7). CEQ guidance in considering cumulative effects affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with a proposed action. The scope must consider other projects that coincide with the location and timetable of a proposed action and other actions. Cumulative effects analyses must also evaluate the nature of interactions among these actions (CEQ 1997).

5.1.1 Projects Identified with the Potential for Cumulative Effects

The scope of the cumulative effects analysis involves both timeframe and geographic extent in which effects could be expected to occur, and a description of what resources could be cumulatively affected. For the purposes of this analysis, the temporal span of the selected projects is 5 years (i.e., FY 2012 to FY 2017). For most resources, the spatial area for consideration of cumulative effects is MacDill AFB, though a larger area is considered for some resources. An effort was undertaken to identify projects at MacDill AFB and in the areas surrounding the installation for evaluation in the context of the cumulative effects analysis.

5.1.1.1 Past Actions at MacDill AFB

Past activities are those actions that occurred within the geographic scope of cumulative effects that have shaped the current environmental conditions of the project area. Flying operations began at MacDill AFB in 1941. The installation has supported numerous aircraft, including several generations of bombers, fighters, and aerial refuelers, and numerous organizations. Today, MacDill AFB is home to the 6 AMW, 927 ARW, CENTCOM, SOCOM, SOCCENT, JCSE, National Oceanic and Atmospheric Administration (NOAA), and numerous other tenant organizations. The installation currently has three squadrons of KC-135 R/T aircraft and one squadron of C-37A aircraft. MacDill AFB has been intensely developed and redeveloped as mission requirements changed. For many resource areas, such as biological resources, infrastructure, and hazardous materials and waste, the effects of past actions are now part of the existing environment and are included in the description of the affected environment.

The 6 AMW prepared the MFH Privatization Initiative EA in 2007 that analyzed the effects of leasing land to a private developer to provide MFH for 50 years (MAFB 2007c). The developer constructed 330 new units and demolished 507 units. Five of the units conveyed (i.e., Staff Circle) are NRHP-eligible and protected under a Programmatic Agreement. MFH areas are on the eastern side of the installation within the 100-year floodplain.

Also, in 2007, HQ AMC and 6 AMW prepared an IDEA and FONSI/FONPA analyzing 17 demolition projects, 62 facilities construction and renovation projects, and 42 infrastructure projects, all spanning 5 years (MAFB 2007b). The projects analyzed in the 2007 IDEA added a maximum of 600,000 ft² of new facility footprints and 1.1 million ft² of new, repaired, or extended sidewalks, roads, parking lots, or sports fields. Old buildings were removed, existing facilities were repaired and expanded, and new facilities were constructed, resulting in better land use function and organization. The 2007 IDEA identified the following environmental consequences:

- Short-term, minor, adverse effects localized to construction areas on the noise environment, air quality, safety, geological resources, water resources, biological resources, and hazardous materials and wastes.
- Short-term, indirect, minor, beneficial effects on socioeconomics on the local community from construction costs; however, expenditures associated with construction have no long-lasting community benefits.
- Long-term, direct, minor, beneficial effects on land use, safety, and infrastructure from the construction of new facilities and demolition of existing facilities on the installation.
- Short-term, minor, adverse and long-term, minor, beneficial effects from the removal of ACM and LBP in older buildings.
- Long-term, minor, adverse effects on the 100-year floodplain from the creation of impervious surfaces. A Floodplain Management Plan was prepared concurrently with the 2007 IDEA that outlined construction practices for all new construction within the floodplain to minimize adverse effects.
- No short- or long-term effects on wetlands, threatened and endangered species, archaeological resources, or historic architectural resources.

Examples of past projects from FY 2006 to FY 2011 include constructing an EOD facility, the Center for Special Operations and Special Operations Acquisition Logistics facilities, facilities to support the associate KC-135R Wing, a 120-room dormitory, a detached addition to Building 1882, a SOCCENT HQ complex, a JCSE squadron building, a new child development center, and a consolidated communications facility; adding to and altering SOCOM Building 501B; and demolishing the pumphouse and USTs.

5.1.1.2 Present and Reasonably Foreseeable Future Actions at MacDill AFB

Construction, demolition, and infrastructure upgrades are a continuously occurring activity at MacDill AFB. There are several recently completed, ongoing, or reasonably foreseeable future projects that are summarized in the following text. It is anticipated that construction for these projects will already have begun prior to the completion of this IDEA or occur concurrently with the projects identified in this IDEA.

Other Installation Development Activities

Many installation development projects are planned and reasonably foreseeable at MacDill AFB. In addition to the selected projects, **Appendix A** is a compilation of all other demolition (**Table A-1**), construction (**Table A-2**), and infrastructure improvement (**Table A-3**) projects that could be completed during the lifespan of this IDEA, as funding becomes available. These projects are reasonably foreseeable, and so they are included in this cumulative effects analysis. **Table 5-1** summarizes the areas of disturbance and changes in impervious surfaces from the selected projects and all other present and reasonably foreseeable future installation development activities that have been identified to date.

Figures 5-1, 5-2, 5-3, and 5-4 show the proposed project locations as currently planned. Some of these projects are in the early planning stages, so the final siting has not been completed for all projects. **Table 5-2** summarizes in tabular form the potential environmental consequences associated with the installation development projects that are identified in **Appendix A** but not analyzed as a selected project in **Section 4** of this IDEA.

Table 5-1. Project Areas and Changes in Impervious Surfaces for all Present and Reasonably Foreseeable Installation Development Actions (including the Selected Projects)

Project Type	Total Project Area (ft²)	Change in Impervious Surfaces (ft²)
Selected Projects ¹	2,027,726	+890,677
All Other Demolition Projects ²	481,109	-217,329
All Other Construction Projects ²	3,658,518	+1,236,159
All Other Infrastructure Improvement Projects ²	690,727	+388,075
All Other Natural Infrastructure Projects ²	372,618	No change
Total of All Projects	7,230,698	+2,297,582

Notes: Changes in impervious surfaces are not necessarily equivalent to the project area square footage because some facilities proposed for demolition are multiple stories, and many new facilities would be multiple stories. Furthermore, some projects would disturb area but not add impervious surfaces.

1. See **Table 2-6**.

2. Calculated from Tables A-1, A-2, and A-3 in **Appendix A**.

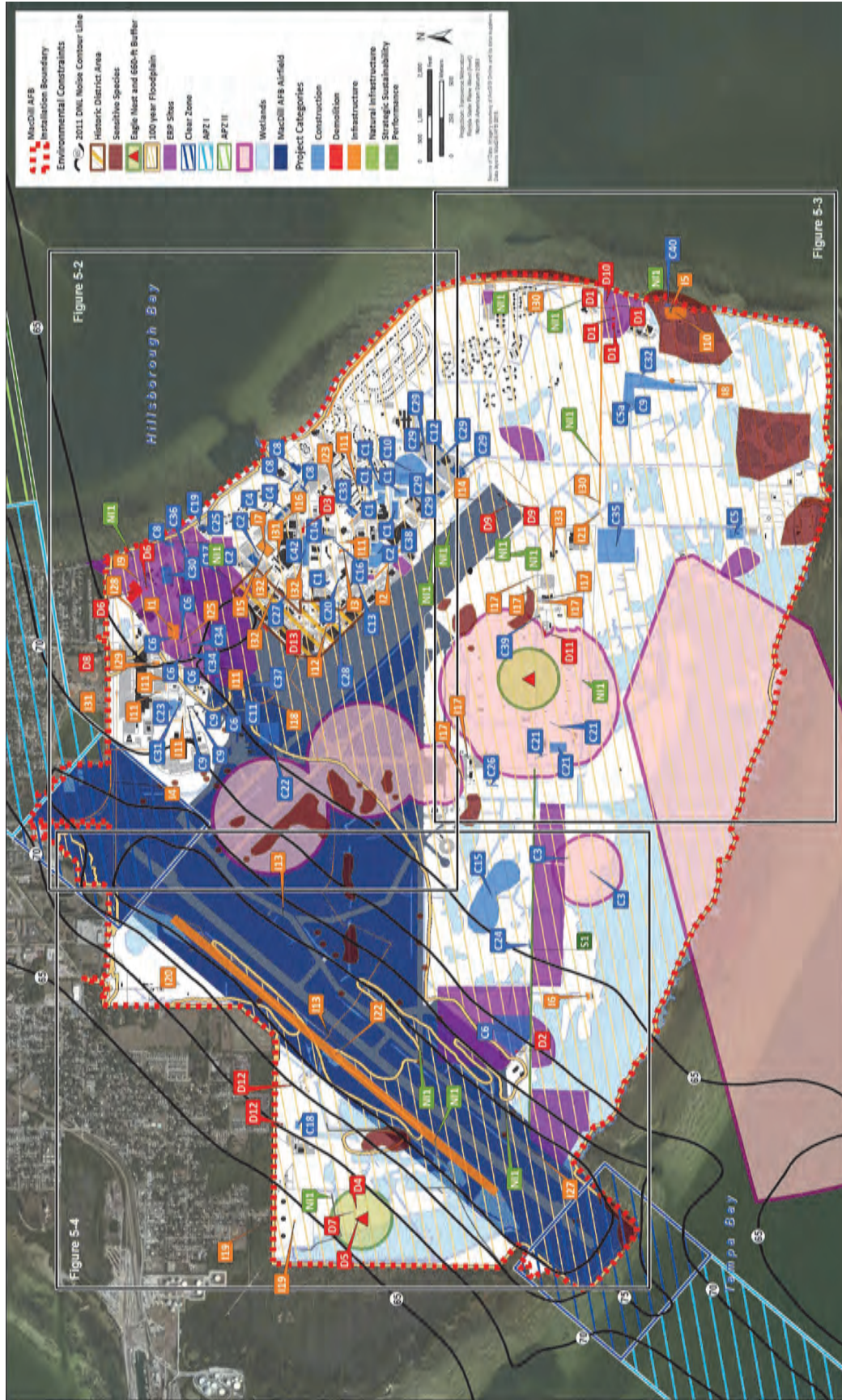
All demolition and construction activities generally would be expected to result in some increased noise, increased air emissions, potential for erosion and transport of sediment into surface water bodies, generation of small amounts of hazardous materials and wastes, and generation of C&D waste. All demolition and construction activities generally would be expected to result in short-term job creation and materials procurement. These types of short-term, construction-related effects would occur regardless of project location and are not constraints to development. In the absence of unique constraints, the potential for environmental effects from a demolition or construction project smaller in scope than those analyzed as selected projects in this IDEA would be expected to result in less than significant environmental effects.

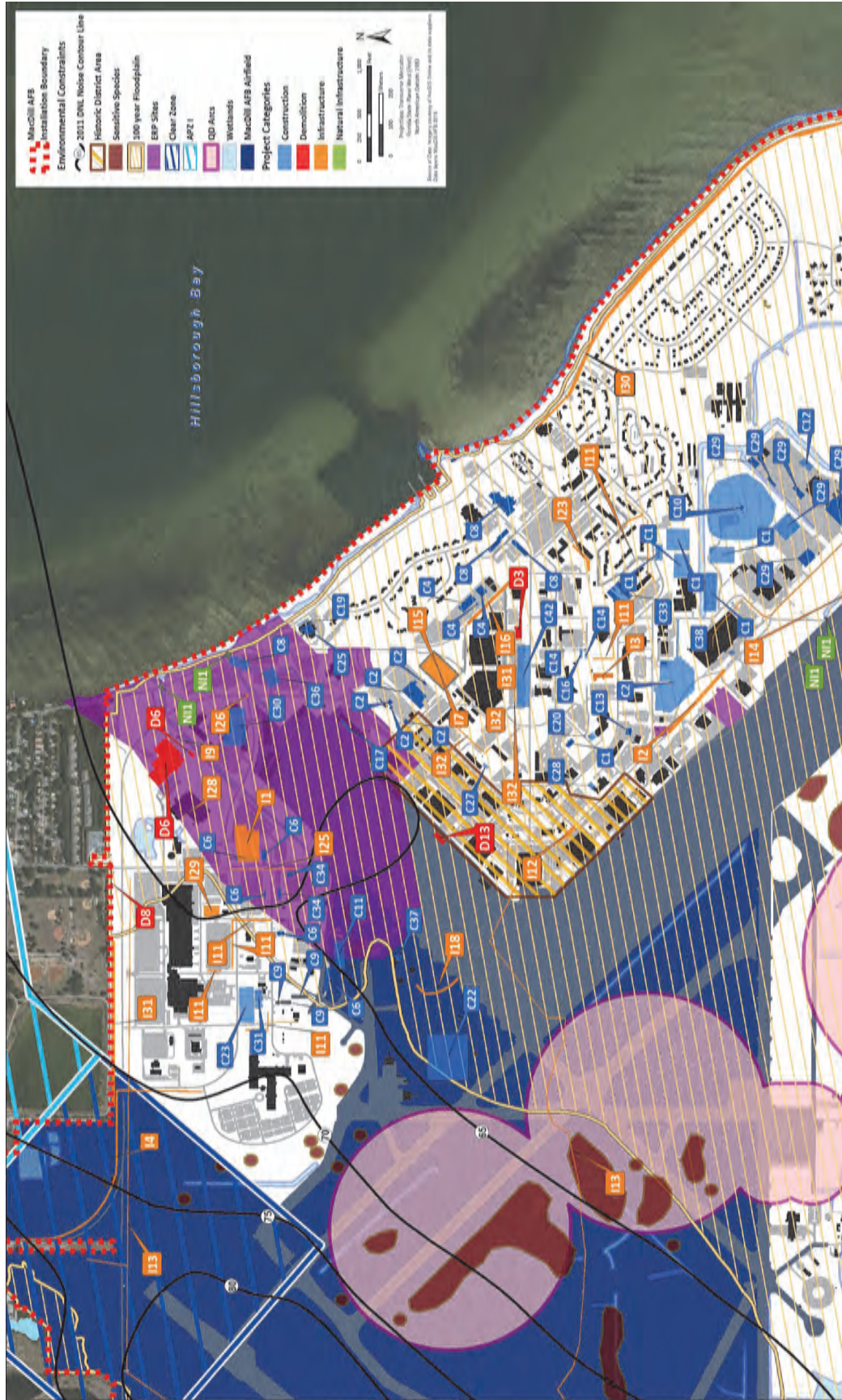
Airfield Drainage Improvements

During periods of heavy rainfall, portions of Runway 04-22 experience drainage deficiencies. Under this project, low-lying areas of the runway would be filled in and graded. The total project area is 30.27 acres. An additional component of this project is to demolish and replace the Rattlesnake Road box culvert, which currently does not have adequate capacity. An EA was prepared in 2011 indentifying long-term, beneficial effects on airfield safety, avian species, and infrastructure systems, and potential long-term, adverse effects on wetlands and the floodplain (MAFB 2011g). Two wetland mitigation areas would be created, totaling 10.01 acres, to offset the project's permanent effects on 9.58 acres of wetlands, which would have long-term, beneficial effects on wetlands. This project is anticipated to be completed in 2014.

Marine Habitat Wave Barrier

The shoreline surrounding MacDill AFB has historically experienced moderate to severe erosion, particularly the southeastern corner of the installation. The 6 AMW proposes to construct a marine habitat wave barrier along roughly 300 to 500 feet of Gadsden Point. The barrier would be approximately 2,000 linear feet long, consisting of about 800 structures in two rows. Short-term, adverse effects could occur during barrier placement, but the project would ultimately be expected to have long-term, beneficial effects on water quality, seagrasses, shoreline stability, fish resources, and wildlife resources (MAFB 2011h). This project is in the planning stage, dates for implementation have not yet been determined.





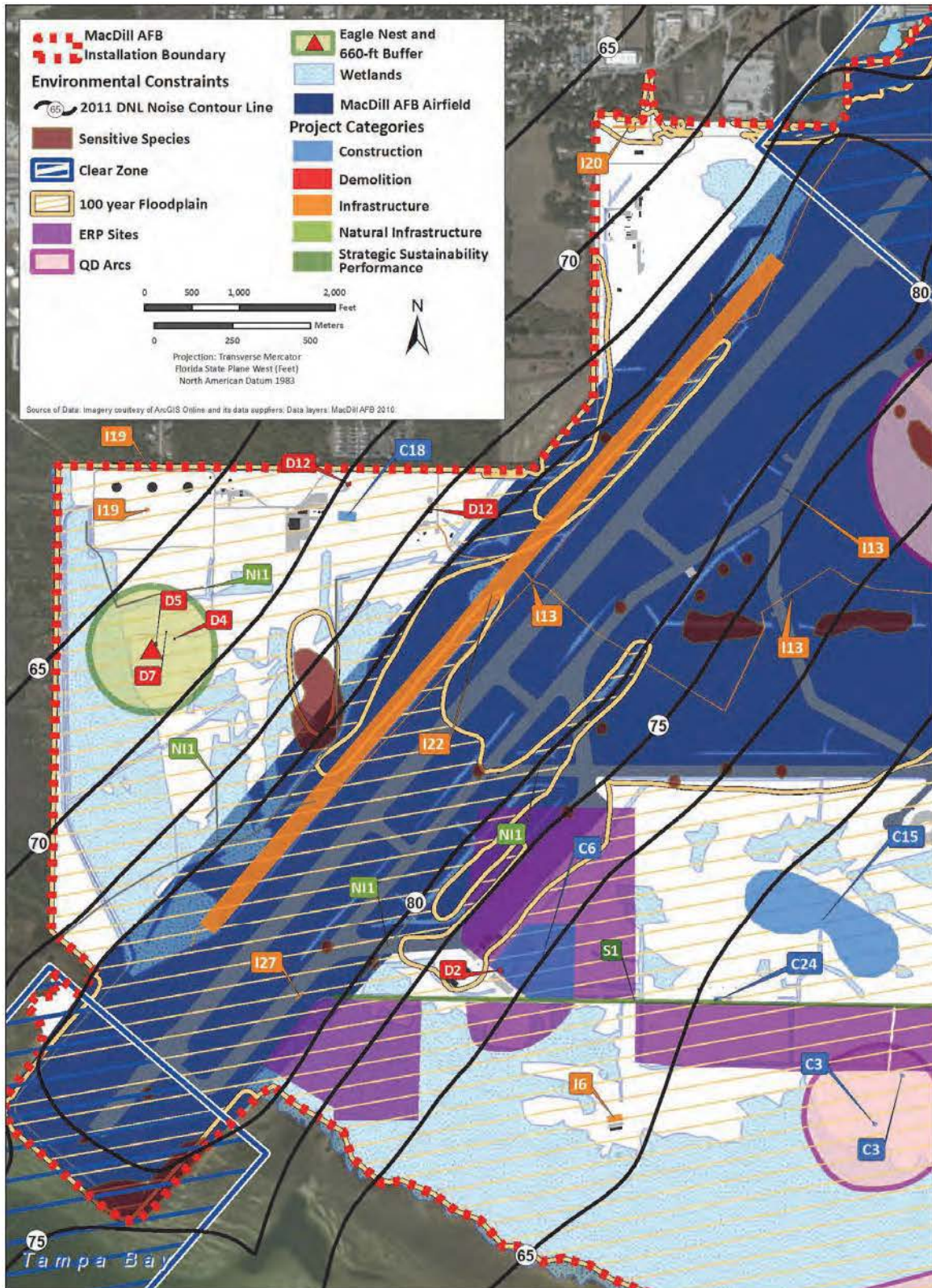
Notes: Project numbers and associated descriptions are shown in Tables A-1 through A-5. Project I24 is not shown because it involves numerous roadways.

Figure 5-2. Possible Locations and Environmental Constraints Associated with All Projects (Northeast)



Notes: Project numbers and associated descriptions are shown in Tables A-1 through A-5. Project I24 is not shown because it involves numerous roadways.

Figure 5-3. Possible Locations and Environmental Constraints Associated with All Projects (Southeast)



Notes: Project numbers and associated descriptions are shown in **Tables A-1 through A-5**.
Project I24 is not shown because it involves numerous roadways.

Figure 5-4. Possible Locations and Environmental Constraints Associated with All Projects (West)

Table 5-2. Potential Environmental Consequences Associated with Constraints to Development from All Other Proposed Projects Listed in Appendix A

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Demolition Projects											
D4. Demolish Building 1132 (Figure 5-4)	-	-	♦	+	+	-	-	-	-	♦ ACM LBP	-
D5. Demolish Building 1135 (Figure 5-4)	-	-	♦	+	+	-	-	-	+	♦ ACM LBP	- ERP
D6. Demolish Buildings 540 and 543 (Figure 5-2)	-	-	♦	+	+	-	-	-	-	♦ ERP ACM	♦ ERP
D7. Demolish Building 1144 (Figure 5-4)	-	-	♦	+	+	-	-	-	-	♦	-
D8. Demolish Building 595 (Figure 5-2)	-	-	♦	+	+	-	-	-	-	♦ ACM LBP	-
D9. Demolish Building 826 and 827 (Figure 5-3)	-	-	♦	+	- FP	-	-	-	-	♦ ACM LBP	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM	Might disturb asbestos-containing material	Hab	Near/in wildlife habitat	LPA	Large project area	SC	Soil Constraint
CZ	Within Clear Zone	Hyd	Hydric Soil	LUD	Change in Land Use Designation	SSZ	Near/in sensitive species zone
ERP	In an Environmental Restoration Program Site	HAZ	Change in quantity or storage for hazardous materials or wastes	QD	Within QD arcs	W	In or near wetlands
FP	Within 100-year Floodplain	LBP	Might disturb lead-based paint				

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Demolition Projects (continued)											
D10. Demolish Building 1205 (Figure 5-3)	-	-	♦	+	+	-	-	-	+	♦ ERP ACM LBP	♦ ERP
D11. Demolish Building 821 (Figure 5-4)	-	-	♦	+	+	-	-	-	+	♦ ERP ACM LBP	♦ QD ERP
D12. Demolish Buildings 1101 and 1161 (Figure 5-4)	-	-	♦	+	+	-	-	-	+	♦ ACM LBP	- ERP
D13. Demolish Building 189 (Figure 5-2)	-	-	♦	+	-	-	-	-	-	♦ ERP ACM	♦ ERP
Other Construction Projects											
C8. Construct Visitor's Quarters Phase I and Phase II* (Figure 5-2)	-	-	♦	♦ SC	♦ FP	♦ Hab	-	+	♦	♦ ERP ACM LBP	♦ ERP
C9. Construct Storage Facility* (Figure 5-2)	-	-	♦	-	-	-	-	-	-	♦ ERP ACM	♦ ERP

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM	Might disturb asbestos-containing material	Hab	Near/in wildlife habitat	LPA	Large project area	SC	Soil Constraint
CZ	Within Clear Zone	Hyd	Hydric Soil	LUDD	Change in Land Use Designation	SSZ	Near/in sensitive species zone
ERP	In an Environmental Restoration Program Site	HAZ	Change in quantity or storage for hazardous materials or wastes	QD	Within QD arcs	W	In or near wetlands
FP	Within 100-year Floodplain	LBP	Might disturb lead-based paint				

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Construction Projects (continued)											
C16. Construct Recreational Pavilion Dorm Area (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C17. Construct Aerospace Ground Equipment Canopies, Building 552 (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦ ERP	♦ ERP
C18. Construct Medical Group Storage Facility (Figure 5-4)	-	♦ LUD	♦	♦ SC	♦ FP	-	-	-	-	♦	-
C19. Construct Security Forces Training Pad (Figure 5-2)	-	♦ LUD	♦	-	♦ FP	-	-	-	-	♦ ERP	♦ ERP
C20. Education Center Addition (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C21. Miscellaneous Munitions Storage Area (MSA) Upgrades (Figure 5-3)	-	-	♦	♦ SC	♦ FP	- SSZ	-	-	-	♦	♦ QD
C22. NOAA Airfield Operations Center (Figure 5-2)	-	-	♦	-	♦ FP	♦ Hab	-	+	♦	♦ ERP HAZ	♦ ERP

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab Near/in wildlife habitat

LPA Large project area

LUD Change in Land Use Designation

SC Soil Constraint

SSZ Near/in sensitive species zone

W In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Construction Projects (continued)											
C23. Postal Service Center (Figure 5-2)	-	-	♦	-	-	-	-	+	-	♦	-
C24. Construct Skeet Range Facility (Figure 5-4)	-	-	♦	♦ SC	♦ FP	-	-	-	-	♦ ERP	♦ ERP
C25. Renovate and Add to Surf's Edge Club, Building 499 (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦ ERP ACM LBP	♦ ERP
C26. Construct EOD Addition, Building 108 (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C27. Construct Covered Parking Shelter (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C28. Construct Boom Operator Weapon System Trainer Building 295 Addition (Figure 5-2)	-	-	♦	♦ SC	♦ FP	-	-	-	-	♦	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM	Might disturb asbestos-containing material	Hab	Near/in wildlife habitat	LPA	Large project area	SC	Soil Constraint
CZ	Within Clear Zone	Hyd	Hydric Soil	LUDD	Change in Land Use Designation	SSZ	Near/in sensitive species zone
ERP	In an Environmental Restoration Program Site	HAZ	Change in quantity or storage for hazardous materials or wastes	QD	Within QD arcs	W	In or near wetlands
FP	Within 100-year Floodplain	LBP	Might disturb lead-based paint				

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Construction Projects (continued)											
C29. Joint Operations and Logistics Mobility Facility* (Figures 5-2 and 5-3)	-	-	♦	-	♦ FP	-	-	+	-	♦ ERP, ACM LBP	♦ ERP
C30. Coalition Village (Figure 5-2)	-	♦ LUD	♦	-	♦ FP	♦ Hab	-	+	-	♦ ERP ACM LBP	♦ ERP
C31. Mission Support Facility* (Figure 5-2)	-	-	♦	-	♦	- Hab	-	+	-	♦	-
C32. Construct FAMCAMP Annex (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C33. Dormitory (120-Room)* (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦ ACM LBP	-
C34. Fuels Management Facility* (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	+	♦ ERP HAZ ACM LBP	♦ ERP
C35. Base Civil Engineering Complex (Figure 5-3)	-	♦ LUD	■ LPA	♦ SC	♦ FP	♦ Hab	-	+	♦	♦	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab Near/in wildlife habitat

Hyd Hydric Soil

HAZ Change in quantity or storage for hazardous materials or wastes

LBP Might disturb lead-based paint

LPA Large project area

LUD Change in Land Use Designation

QD Within QD arcs

SC Soil Constraint

SSZ Near/in sensitive species zone

W In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Construction Projects (continued)											
C36. Construct Wing Headquarters (Figure 5-2)	-	♦ LUD	♦	-	♦ FP	-	-	+	-	♦ ERP	♦ ERP
C37. Construct Fuel Containment System, Building 105 (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	+	♦ ERP	♦ ERP
C38. Daily Full-Time – Construct Pavilion, Building 49 (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C39. Munitions Administration Facility (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
C40. U.S. Water Operations Building (Figure 5-3)	-	-	♦	♦ SC	♦ FP	- SSZ	-	-	+	♦	-
C41. Construct Security Forces Boat Dock	-	-	-	-	♦ FP	♦ SSZ	-	+	+	-	+
C42. SOCOM Utility Plant	-	♦	♦	-	♦ FP	-	-	+	-	♦ HAZ	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab Near/in wildlife habitat

Hyd Hydric Soil

HAZ Change in quantity or storage for hazardous materials or wastes

LBP Might disturb lead-based paint

LPA Large project area

LUD Change in Land Use Designation

QD Within QD arcs

SC Soil Constraint

SSZ Near/in sensitive species zone

W In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Infrastructure Projects											
I7. Construct SOCOM Garage (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	+	♦	-
I8. Repair FAMCAMP Electrical Distribution System (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	+	♦	-
I9. Install High Electromagnetic Pulse Shelter Generator Fuel Tank, Building 541	-	-	♦	-	♦ FP	-	-	-	+	♦ ERP HAZ	♦ ERP
I10. Furnish and install WWTP Effluent Pumping Station (Figure 5-3)	-	-	♦	-	♦ FP, W	♦ SSZ W	-	-	+	♦	-
I11. Gravity Sewer Installation and Repair (Figure 5-2)	-	-	♦	-	- FP	-	-	-	+	♦ ERP	♦ ERP
I12. Repair Secondary Electrical Distribution (Figure 5-2)	-	-	♦	-	- FP	-	-	-	+	♦ ERP	♦ ERP
I13. Replace Cables 25/1180-1079 (Figure 5-2, 5-4)	-	-	♦	♦ Hyd	- FP, W	- W	-	-	+	♦ ERP	♦ QD ERP

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab

Hyd

HAZ

LBP

Near/in wildlife habitat

Hydric Soil

Change in quantity or storage for hazardous materials or wastes

Might disturb lead-based paint

LPA

LUUD

QD

Change in Land Use Designation

Large project area

SSZ

Within QD arcs

SC

Soil Constraint

W

In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Infrastructure Projects (continued)											
I14. Install Fiber Optic Connectivity between ITN 49 and ITN 1750 (Satellite Communications) (Figure 5-2)	-	-	♦	-	- FP	-	-	-	-	♦	-
I15. Special Operations Forces Acquisition Center (Phase II) (SOCOM Parking Garage) (Figure 5-2)	-	-	♦	-	♦ FP	-	-	+	-	♦	-
I16. Repair SOCOM Southeast Gate Entrance (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	-	-
I17. Install Fire Hydrants, MSA (Figure 5-3)	-	-	♦	-	- FP	-	-	-	-	♦	-
I18. Install Vehicle Entry Gate and Concrete Pavement Roadway, Building 105 (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦ ERP	♦ ERP

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM	Might disturb asbestos-containing material	Hab	Near/in wildlife habitat	LPA	Large project area	SC	Soil Constraint
CZ	Within Clear Zone	Hyd	Hydric Soil	LUDD	Change in Land Use Designation	SSZ	Near/in sensitive species zone
ERP	In an Environmental Restoration Program Site	HAZ	Change in quantity or storage for hazardous materials or wastes	QD	Within QD arcs	W	In or near wetlands
FP	Within 100-year Floodplain	LBP	Might disturb lead-based paint				

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Infrastructure Projects (continued)											
I19. Repair Defense Fuel Supply Point Fire Hydrant System; Repair Defense Fuel Supply Point Overhead Electrical Distribution (Figure 5-4)	-	-	♦	-	- FP	-	-	-	+	-	♦ QD - ER P
I20. Widen Road to Accommodate Rapidscan GaRDS System; Port Tampa Gate Improvements (Figure 5-4)	-	-	♦	♦	-	-	-	-	-	-	-
I21. New Constant Run Booster and Automated Chlorine Feed (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦ HAZ	-
I22. Direct Bury Communication Infrastructure (Figure 5-4)	-	-	♦	♦ Hyd	- FP	♦ Hab	-	-	+	♦	♦ Airfield
I23. Construct Building 372 Service Delivery Road (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	-	♦	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab Near/in wildlife habitat

Hyd Hydric Soil

HAZ Change in quantity or storage for hazardous materials or wastes

LBP Might disturb lead-based paint

LPA Large project area

SC Soil Constraint

SSZ Near/in sensitive species zone

W In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Infrastructure Projects (continued)											
I24. Multiple Roadway Improvement Projects (not shown)	-	-	♦	♦ SC Hyd			-	+	+	-	-
I25. Repair Lift Station (Figure 5-2)	-	-	♦	-	- FP	-	-	-	+	♦ ERP	♦ ERP
I26. Install new Lift Station and Force Main (Figure 5-2)	-	-	♦	-	♦ FP	-	-	-	+	♦ ERP	♦ ERP
I27. Reestablish Drainage Taxiway G (Figure 5-4)	-	-	♦	-	- FP	-	-	-	+	♦ ERP	♦ ERP Airfield
I28. Repair Vince Drainage, Building 565 (Figure 5-2)	-	-	♦	-	- FP	-	-	-	+	♦ ERP	♦ ERP
I29. Construct CENTCOM Parking Lot (Figure 5-2)	-	-	♦	-	-	♦ Hab	-	-	+	-	-
I30. Construct Bike Paths/Lanes (Figure 5-3)	-	-	♦	♦ SC	♦ FP	-	-	-	+	♦	-
I31. Repair Water Distribution System (Figure 5-2)	-	-	♦	-	-	-	-	-	+	♦	-

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM Might disturb asbestos-containing material

CZ Within Clear Zone

ERP In an Environmental Restoration Program Site

FP Within 100-year Floodplain

Hab Near/in wildlife habitat

Hyd Hydric Soil

HAZ Change in quantity or storage for hazardous materials or wastes

LBP Might disturb lead-based paint

LPA Large project area

LUD Change in Land Use Designation

QD Within QD arcs

SC Soil Constraint

SSZ Near/in sensitive species zone

W In or near wetlands

Project Identification Number and Title (Figure showing location indicated in parentheses)	Noise	Land Use	Air Quality	Geological Resources	Water Resources	Biological Resources	Cultural Resources	Socioeconomics and Environmental Justice	Transportation and Infrastructure	Hazardous Materials and Wastes	Safety
Other Infrastructure Projects (continued)											
I32. Replace Cable 16 (Figure 5-2)	-	-	♦	-	- FP	-	-	-	+	♦	-
I33. Construct Satellite Communications Parking Lot, Building 1750 (Figure 5-3)	-	-	♦	-	♦ FP	-	-	-	-	♦	-
Other Natural Infrastructure Management Project											
NI2. Airfield Tree Violations	♦	-	-	♦	♦ W	♦	-	-	+	-	+

Note: * = Denotes projects that include demolition of facilities

Legend:

- No effects or negligible effects + Potential minor beneficial effects ♦ Potential minor adverse effects ■ Potential moderate adverse effects

Key:

ACM	Might disturb asbestos-containing material	Hab	Near/in wildlife habitat	LPA	Large project area	SC	Soil Constraint
CZ	Within Clear Zone	Hyd	Hydric Soil	LUD	Change in Land Use Designation	SSZ	Near/in sensitive species zone
ERP	In an Environmental Restoration Program Site	HAZ	Change in quantity or storage for hazardous materials or wastes	QD	Within QD arcs	W	In or near wetlands
FP	Within 100-year Floodplain	LBP	Might disturb lead-based paint				

Radial Arm Spill Gates

Due to MacDill AFB's proximity to Hillsborough and Tampa bays, an accidental spill or discharge of JP-8 or other petroleum products has the potential to damage environmentally sensitive areas. The 6 AMW plans to construct three radial arm spill gates in storm water drainage ditches to prevent a petroleum spill on the parking apron from reaching Hillsborough or Tampa bays. This project could have short-term, adverse effects during construction and would be within the floodplain, but it would be expected to have long-term, beneficial effects on water resources and infrastructure (MAFB 2011i). This project is expected to be implemented in 2012 or 2013.

Multiple Roadway Improvements

Multiple roadway improvement projects are ongoing and planned in the near future. In general, all of the projects are aimed at addressing the following needs: (1) improving traffic flow, (2) reducing congestion around the CENTCOM Complex, (3) increasing pedestrian safety, (4) alleviating parking shortages in the CENTCOM Complex area, and (5) improving AT/FP reaction time at the installation gates. The specific roadway improvement projects include the following:

- *SOCOM Memorial Drive Extension.* Project would extend SOCOM Memorial Drive and remove the Tampa Point Boulevard/Bayshore Boulevard intersection.
- *Zemke Avenue Extension.* Project would extend Zemke Avenue and remove CENTCOM Avenue and also meets the need of improved AT/FP standards.
- *South Boundary Boulevard Widening.* Project would widen South Boundary Boulevard.
- *Great Egret Avenue Extension.* Project would connect the east end of Great Egret Avenue to South Boundary Boulevard.
- *Potential Roadway Improvements.* Projects would provide left turn lanes on Hangar Loop Drive, widen Bayshore Boulevard to four lanes north of Tampa Point Boulevard and add turn lanes south of Tampa Point Boulevard, add signals or roundabout at Bayshore/Florida Keys Avenue intersection, and improve/reconfigure MacDill Gate.
- *Relocation of Aircraft Wash Rack.* Project would relocate the current aircraft wash rack for the Great Egret Avenue extension.
- *Parking Lot Construction.* Project would create 10,000 ft² of permanent parking in the CENTCOM Complex area.

The Final EA identified short-term, minor, adverse effects from construction activities (MAFB 2011m). In particular, the widening of South Boundary Boulevard and extension of Great Egret Avenue would involve disturbance of two drainage canals, which could have short-term, adverse, effects on surface water, wetlands, and wildlife. Long-term, beneficial effects on transportation systems would be expected. It is anticipated that these roadway projects would coincide with implementation of the selected projects, so they are included in this cumulative analysis.

Ecosystem Restoration Masterplan Implementation

The 6 AMW is in the early planning stages of implementing the MacDill AFB Ecosystem Restoration Conceptual Masterplan (MAFB 2011f). Full implementation will involve 25 multiphase, multiyear mangrove wetland restoration projects. Two project sites are scheduled for implementation in 2012, and five additional sites are priorities for the next 5 years. Environmental analyses are in the early stages of preparation. Ground-disturbance could result in short-term, minor, adverse effects, but mangrove

restoration activities would be expected to have long-term, beneficial effects on water quality, vegetation, wetlands, floodplains, and wildlife habitats. All of these projects are in the southern portion of MacDill AFB. It is anticipated that these projects would coincide with implementation of the selected projects, so they are included in this cumulative analysis.

5.1.1.3 Actions Outside MacDill AFB

MacDill AFB is bordered by the City of Tampa to the north, and the remaining sides are surrounding by Hillsborough and Tampa bays. The environmental effects of the selected projects are limited to within the installation boundaries. Consequently, it is not anticipated that installation development activities would affect off-installation areas. No specific development projects have been identified in Ballast Point, the neighborhood north of MacDill AFB, or in other areas outside MacDill AFB that would affect planned installation development activities.

5.1.2 Cumulative Effects Analysis

A cumulative effects analysis must be conducted within the context of the resource areas. The magnitude and context of the effect on a resource area depends on whether the cumulative effects exceed the capacity of a resource to sustain itself and remain productive (CEQ 1997). The following discusses potential cumulative effects that could occur as a result of implementing the selected projects and other past, present, and reasonably foreseeable future actions. No significant adverse, cumulative effects were identified in the cumulative effects analysis.

Noise

Military training and development activities have occurred at MacDill AFB since 1941. Aircraft activities, automobile traffic, and, in some areas of the installation, ground and weapons training, are the dominant noise sources. C&D activities occurring at the same time and in the same vicinity could have short-term, minor, adverse cumulative effects on the noise environment. Most installation development activities would occur at different times and different locations over the next 5 years. Construction activities would result in short-term, localized increased noise levels. Cumulative effects from construction noise would not be significant.

Two projects are planned that would result in long-term impacts on the noise environment as part of their functions: Project C24 (Construct Skeet Range Facility) and Project C42 (SOCOM Utility Plant); however, effects are anticipated to be negligible. Project C24 is planned in an area of MacDill AFB that does not contain sensitive noise receptors, such as a church or residential area (noise impacts on biological species are discussed under *Biological Resources*). Project C42 would generate noise, but nine generators would also be demolished. Replacement generators would be expected to have noise-attenuating technology and operate more quietly than current units. Furthermore, the generators would only operate during periods of maintenance and electrical outages, so they would not be a continuous source of noise. Cumulatively, aircraft activities would remain the dominant noise source at MacDill AFB. Cumulative effects on noise would not be significant.

Land Use

Military training and development activities have occurred at MacDill AFB since 1941. Land use at MacDill AFB is guided by the IDP (MAFB 2011b) to ensure safe, compatible development. Cumulatively, implementation of all installation development projects would be expected to result in long-term, beneficial effects on land use. Demolition projects would remove old, outdated facilities and make land available in previously disturbed areas for new construction. Projects C15, C18, C19, C30,

C35, and C36 would require changes in land use designations. Cumulative installation development activities would be compatible with existing and future land uses.

Several planned demolition, construction, infrastructure, natural infrastructure management, and strategic sustainability performance projects are sited in areas with safety concerns, including airfield infrastructure; munitions and QD arcs; and ERP sites. From a land use perspective, development activities that would violate existing USAF plans or policies would be incompatible and adverse. Project I4 is planned within the CZ, but this project would not violate obstacle clearance criteria. Some proposed construction activities would occur within QD arcs (see projects identified in **Table 5-2** and discussion in the *Safety* cumulative effects subsection); none of these projects conflict with land use planning criteria. Any ground-disturbing activities in and around ERP sites have the potential to encounter contaminated soil or groundwater (see projects identified in **Table 5-2** and discussion in the *Hazardous Materials and Wastes* cumulative effects subsection). Construction activities and project design within ERP sites would conform to applicable LUCs governing how the land can be developed. No long-term, adverse, cumulative effects on land use are expected.

Air Quality

Historically, air quality in the WCFI AQCR has not been significantly adversely affected from anthropogenic sources. MacDill AFB is within an unclassified/attainment area for all criteria pollutants. Individual installation development projects would be expected to have short-term, minor, adverse effects on air quality while demolition and construction activities are occurring. Project C35 (Base Civil Engineering Complex) is noted in **Table 5-2** as having the potential for moderate, adverse effects during construction because of the large project area. C&D activities occurring at the same time and in the same vicinity could have short-term, minor to moderate, adverse cumulative effects on air quality. To provide a cumulative air quality analysis, the estimated emissions for implementation of all planned installation development projects are shown in **Table 5-3**. The total annual emissions are compared to the stationary source plus mobile source significance criteria. Construction-related emissions would last only during the year(s) of those construction activities and cumulatively would not be significant. The estimated emissions for implementation of all planned installation development projects with the alternative projects are shown in **Table 5-4**. The level of emissions in **Table 5-3** compared to **Table 5-4** are very similar; therefore, the cumulative impacts with alternative projects are not significant.

Considering facility demolition and construction cumulatively, there would be an increase in the amount of occupied facility space on MacDill AFB (approximately 1,014,792 ft²). New facilities would use boilers, furnaces, and emergency generators, all of which would be sources of air emissions. However, the demolition of older and less energy-efficient buildings would remove older and more emissive boilers, furnaces, and emergency generators from the installation and decrease energy intensity for MacDill AFB. It is anticipated that long-term, minor, adverse cumulative effects on air quality could occur considering this overall increase in occupied space. Assuming the increase in space heating requirements would be based on the additional 1,014,792 ft² of space, heating emissions are not expected to be significant enough for the installation to reach the PSD major modification threshold of 40 tpy of NO_x. All required air permits would be obtained prior to construction of each project.

The selected and other projects would cumulatively generate GHG emissions during construction activities. All installation development activities would generate an estimated 7,818 tpy of CO₂ in 2013, the highest anticipated year. This is equivalent to 7,093 metric tpy of CO₂. Estimated gross CO₂ emissions in the State of Florida were 226 million metric tons in 2009 (USEIA 2012). Cumulative estimated CO₂ emissions in 2013 would represent 0.0031 percent of the State of Florida's 2009 CO₂

Table 5-3. Estimated Annual Air Emissions Resulting from the Selected Projects and Other Installation Development Projects

Project	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO₂ (tpy)	PM₁₀ (tpy)	PM_{2.5} (tpy)	CO₂ (tpy)
Total 2012 Selected Projects Emissions	5.466	0.900	4.790	0.424	4.173	0.832	822.583
Total 2012 Other Project Emissions	17.973	6.660	28.539	1.404	48.795	6.789	3,529.053
Total 2012 Emissions	23.439	7.560	33.329	1.828	52.968	7.621	4,351.636
Total 2013 Selected Projects Emissions	36.209	6.362	31.209	2.823	52.914	7.962	5,446.805
Total 2013 Other Project Emissions	10.663	4.731	20.031	0.812	26.434	3.864	2,371.590
Total 2013 Emissions	46.872	11.093	51.241	3.635	79.348	11.827	7,818.395
Total 2014 Selected Projects Emissions	18.928	3.046	15.240	1.476	19.343	3.258	2,805.664
Total 2014 Other Project Emissions	10.976	3.571	16.327	0.843	26.017	3.632	2,204.070
Total 2014 Emissions	29.904	6.618	31.566	2.319	45.360	6.889	5,009.734
Total 2015 Selected Projects Emissions	12.817	2.031	9.814	1.006	13.162	2.226	1,817.629
Total 2015 Other Project Emissions	9.413	2.884	13.660	0.719	30.620	3.899	1,914.331
Total 2015 Emissions	22.229	4.915	23.474	1.725	43.782	6.125	3,731.960
Total 2016 Selected Projects Emissions	13.548	1.171	6.571	0.429	12.565	1.857	1,231.499
Total 2016 Other Project Emissions	5.176	0.813	4.705	0.393	1.167	0.453	871.107
Total 2016 Emissions	8.135	0.307	2.237	0.009	1.296	0.345	438.693
Total 2017 Selected Projects Emissions	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total 2017 Other Project Emissions	5.134	0.802	3.739	0.399	1.437	0.496	723.631
Total 2017 Emissions	5.134	0.802	3.739	0.399	1.437	0.496	723.631
Stationary Source plus Mobile Source Significance Criteria	250	250	250	250	250	250	NA

NA = Not Applicable.

Note: Total Year emissions are the sum of mobile and stationary source emissions.

Table 5-4. Estimated Annual Air Emissions Resulting from the Selected Projects and Alternatives and Other Installation Development Projects

Project	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO₂ (tpy)	PM₁₀ (tpy)	PM_{2.5} (tpy)	CO₂ (tpy)
Total 2012 Selected Projects Emissions	5.526	0.777	4.342	0.431	7.206	1.109	806.018
Total 2012 Other Project Emissions	17.973	6.660	28.539	1.404	48.795	6.789	3,529.053
Total 2012 Emissions	23.499	7.437	32.881	1.835	56.001	7.898	4,335.071
Total 2013 Selected Projects Emissions	30.665	5.180	25.566	2.392	38.065	5.995	4,601.181
Total 2013 Other Project Emissions	10.663	4.731	20.031	0.812	26.434	3.864	2,371.590
Total 2013 Emissions	41.328	9.911	45.597	3.204	64.499	9.859	6,972.771
Total 2014 Selected Projects Emissions	19.130	3.191	15.831	1.494	19.583	3.318	2,856.455
Total 2014 Other Project Emissions	10.976	3.571	16.327	0.843	26.017	3.632	2,204.070
Total 2014 Emissions	30.105	6.762	32.157	2.336	45.600	6.950	5,060.525
Total 2015 Selected Projects Emissions	13.018	2.176	10.405	1.022	13.401	2.288	1,868.420
Total 2015 Other Project Emissions	9.413	2.884	13.660	0.719	30.620	3.899	1,914.331
Total 2015 Emissions	22.430	5.060	24.064	1.741	44.020	6.187	3,782.752
Total 2016 Selected Projects Emissions	13.834	1.373	7.557	0.450	13.870	2.034	1,332.093
Total 2016 Other Project Emissions	5.176	0.813	4.705	0.393	1.167	0.453	871.107
Total 2016 Emissions	19.009	2.186	12.262	0.842	15.037	2.487	2,203.200
Total 2017 Selected Projects Emissions	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total 2017 Other Project Emissions	5.134	0.802	3.739	0.399	1.437	0.496	723.631
Total 2017 Emissions	5.134	0.802	3.739	0.399	1.437	0.496	723.631
Stationary Source plus Mobile Source Significance Criteria	250	250	250	250	250	250	NA

NA= Not Applicable.

Note: Total Year emissions are the sum of mobile and stationary source emissions.

missions and less than 0.0001 percent of the United States' 2009 CO₂ emissions. The overall increases in GHG emissions from stationary sources have not been calculated. However, based on the cumulative increase in occupied facility space, this increase is expected to be well below the PSD threshold for GHGs, which is 75,000 tpy. Cumulatively, GHG emissions would not be significant for the installation development activities at MacDill AFB.

Geological Resources

Soils at MacDill AFB have undergone modifications as a result of development and military activities. Individually, all C&D activities could have short-term, negligible to minor, adverse effects as a result of vegetation removal, compaction of surrounding soils, and increased soil erosion and sedimentation. The Myakka fine sand and the Malabar fine sand soil series are hydric; projects planned on these series are noted in **Table 5-2**. Construction activities on hydric soils would not be considered an adverse effect on soil resources, but the presence of hydric soils could indicate the presence of wetlands. Some projects in **Table 5-2** are noted as having soil constraints based on the underlying soil series; site-specific soil surveys should be conducted prior to implementation of these projects to determine the breadth and severity of any engineering limitations. Considered cumulatively, planned installation development activities have the potential for short-term, minor, adverse effects and long-term, minor, adverse effects on topography, soil, and sediments. C&D activities occurring at the same time and in the same vicinity could have short-term, minor, adverse cumulative effects on soil resources, but implementation of erosion- and sediment-control BMPs and environmental protection measures would be expected to limit potentially adverse cumulative effects.

Demolition of facilities would partially offset potentially long-term, adverse, cumulative effects from construction of facilities by providing areas of previously disturbed soil requiring minimal grading. Site plans are not available for all projects since most are in the early planning stages. Based on the planned demolition and construction footprints, and the infrastructure improvement and natural infrastructure management project sizes, it is estimated that, cumulatively, the selected projects and all other installation development activities have the potential to disturb as much as 7.2 million ft² (approximately 166 acres) of soil over the next 5 years; this is 3 percent of the total installation area.

Any ground-disturbing activities in and around ERP sites have the potential to encounter contaminated soil or groundwater (see projects identified in **Table 5-2** and discussion in the *Hazardous Materials and Wastes* cumulative effects subsection). If contaminated groundwater or soil from nearby ERP sites is encountered during construction or demolition activities, the handling, storage, transportation, and disposal of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and MacDill AFB management procedures. Long-term, beneficial, cumulative effects could occur from the removal of contaminated soils.

Water Resources

MacDill AFB is surrounded on three sides by Hillsborough and Tampa bays. Past military and installation activities have contributed to some degradation of aquifers and surface water quality. Approximately 80 percent of MacDill AFB is within the 100-year floodplain, and approximately 20 percent is wetlands. It is USAF policy to avoid constructing new facilities in the 100-year floodplain or wetlands in order to protect the functional uses of those resources, unless there is no practicable alternative. However, given the large area of the installation that is within the 100-year floodplain, it is not practicable or feasible to avoid putting new facilities in the floodplain entirely.

Individual projects disturbing more than 1 acre would require an NPDES permit and the use of BMPs identified in an ESCP and an SWPPP. C&D activities occurring at the same time and in the same vicinity

could have short-term, minor, adverse cumulative effects on water resources. Adherence to the NPDES construction permits (for projects greater than 1 acre) would minimize the potential for short-term, adverse, cumulative effects on water quality. BMPs would be used to control erosion and sedimentation and minimize storm water from leaving the construction site, reducing the potential for short-term, adverse, cumulative effects.

Demolition of facilities would partially offset potentially long-term, adverse, cumulative effects from construction of facilities and infrastructure by reducing the overall creation of impervious surfaces. Site plans are not available for all projects since most are in the early planning stages. Individual construction projects disturbing more than 5,000 ft² would be subject to EISA Section 438, which requires that predevelopment site hydrology be maintained or restored to the greatest extent possible following construction. Additionally, a minimum of 0.5 inches of storm water runoff from new construction or redevelopment projects would be treated per SWFWMD regulations. Based on the planned demolition and construction footprints, and the infrastructure improvement and natural infrastructure management project sizes, it is estimated that, cumulatively, the selected projects and other installation development activities have the potential to create approximately 2.5 million ft² (57 acres) of impervious surfaces, which is approximately 1 percent of the total installation area, over the next 5 years (see **Section 5.1.1.2** for summaries and **Appendix A** for individual project sizes). Adherence to EISA Section 438 and SWFWMD regulations would minimize the potential for long-term, adverse, cumulative effects on water quality. Post-construction hydrological conditions would be expected to remain comparable to preconstruction hydrological conditions, which would reduce the potential for long-term, adverse, cumulative effects on water quality and flood conditions.

Any ground-disturbing activities in and around ERP sites have the potential to encounter contaminated soil or groundwater (see projects identified in **Table 5-2** and discussion in the *Hazardous Materials and Wastes* cumulative effects subsection). Groundwater monitoring wells that have been installed around ERP sites would need to be protected from damage or replaced during C&D activities. If contaminated groundwater or soil from nearby ERP sites is encountered during construction or demolition activities, the handling, storage, transportation, and disposal of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and MacDill AFB management procedures. Long-term, beneficial, cumulative effects could occur from the remediation of contaminated groundwater.

As discussed in **Section 4.3.5**, the selected projects would affect the 100-year floodplain (Projects D1, D2, D3, C1, C2, C3, C4, C5, C6, I1, I2, I3, I5, I6, and S1). Given the extent of the 100-year floodplain at MacDill AFB, it is not practicable or feasible to avoid the floodplain entirely. A majority of installation development activities are planned within the 100-year floodplain (see **Table 5-2**). Cumulatively, planned installation development activities, as presented in **Appendix A**, could increase impervious surfaces within the 100-year floodplain by 2.5 million ft² (57 acres), which is approximately 1 percent of the entire installation area. The creation of impervious surfaces within the floodplain is a long-term, adverse effect due to increased storm water runoff and the potential for storm-related damage to infrastructure, facilities, and possibly human safety. MacDill AFB manages construction activities within the floodplain by implementing environmental protection measures, which would reduce adverse cumulative effects.

As discussed in **Section 4.3.5**, the selected projects could affect wetlands (Project I2, and other projects that are near wetlands). In addition to the Proposed Action, the following projects are also planned in wetlands (see **Table 5-2**, and **Figures 5-1** through **5-4** for project locations):

- C41. Construct Security Forces Boat Dock
- I13. Replace Cables 25/1180-1079

- NI2. Airfield Tree Violations.

Approximately 20 percent of MacDill AFB is wetlands. The majority of wetlands are in the southern portion of the installation. However, wetlands also occur along the many waterways and drainage ditches present at MacDill AFB, making avoidance of all wetlands impracticable. In addition to the projects listed, other projects are preliminarily sited adjacent to wetlands; the final sitings of all of these projects are subject to change when they are ripe for implementation. For example, Projects C15 (Construct Obstacle Course), C32 (Construct FAMCAMP Annex), and I10 (Furnish and Install WWTP Effluent Pumping Station) are sited near wetlands, but wetlands would be avoided upon final citing and implementation. Ground-disturbing activities in or adjacent to wetlands have the potential for indirect, adverse effects on wetlands. During final project planning, impacts on wetlands and other water resources would be avoided to the greatest extent possible through design, siting, and proper implementation of appropriate environmental protection measures, and BMPs. Construction activities occurring in wetlands (i.e., filling or dredging) could have adverse effects and would require consultation with the FDEP, SWFWMD, and USACE and other agencies. The consultation process would determine if mitigation is required. If it is determined that mitigation would be required for a proposed project, the consultation process would also determine the level of mitigation required and how the mitigation would be monitored. Cumulatively, multiple construction activities occurring on MacDill AFB affecting wetlands would be considered both a short- and long-term, adverse effect. Implementing BMPs and the consultation process would reduce adverse cumulative effects.

Airfield drainage improvements (see **Section 5.1.1.2**) would affect wetlands, and MacDill AFB will create two compensatory wetland mitigation areas in the southern portion of the installation, resulting in a net gain of wetlands area. The 6 AMW also plans to implement the Ecosystem Restoration Conceptual Masterplan (discussed in **Section 5.1.1.2**), which is a multiyear, multiphase effort to repair areas that were heavily impacted by creation of drainage ditches and canals in the southern portions of MacDill AFB prior to 1976. Seven project sites are planned in the next 5 years. Individual projects are meant to work synergistically to provide greater ecological improvements than each project could yield alone. Project work would include clearing exotic and invasive species, filling in ditches, reestablishing hydrologic connections between areas, and revegetating with desired species. This project would be expected to have long-term, moderate, beneficial effects on wetlands, vegetation, wildlife, and protected and sensitive species by improving the quality and quantity of suitable habitat. The creation and reestablishment of mangrove wetlands and improvement of existing wetlands would offset adverse effects on wetlands from other installation activities.

Biological Resources

Most of the natural vegetation at MacDill AFB has been highly modified by past development and military operations. The southern portion of the installation contains the best habitat for wildlife. Several protected and sensitive species have been identified at MacDill AFB; refer to **Table 3-7** and **Section 3.6.2**. MacDill AFB has an INRMP that is a reference and planning document for managing the installation's natural resources while maintaining mission readiness (MAFB 2010a). Other relevant plans include an Endangered Species Management Plan and the Wildland Fire Management Plan.

Considered cumulatively, planned installation development activities have the potential for short-term, minor, adverse effects and long-term, minor, adverse effects on vegetation and wildlife. The majority of all planned installation development projects would occur in the improved areas of MacDill AFB, which would primarily affect non-forested upland and urban upland communities that are modified, landscaped, and mowed regularly. The permanent removal of modified and landscaped areas would be a long-term, negligible, adverse, cumulative effect. Demolition of facilities would partially offset potentially long-term, adverse, cumulative effects from construction of facilities by providing previously developed

areas that require less vegetation removal. Projects that result in the permanent removal of trees, including Project C6 (Alert Facility, FMSE Facility) and Project NI1 (Storm Water Drainage Improvements) would contribute to long-term, minor, adverse, cumulative effects on vegetation and wildlife. Projects C6 and NI1 are analyzed in detail in **Sections 4.6.2.6, 4.6.4.1, and 4.6.4.2**, respectively. Projects C8, C15, C22, C30, C31, C35, I22, and I29 would also be expected to result in short- and long-term, minor, adverse effects on vegetation and wildlife as a result of loss of vegetation. All trees and affected vegetation would be replaced or relocated, if possible. Cumulative effects from vegetation removal would not be significant.

C&D activities occurring at the same time and in the same vicinity could have short-term, minor, adverse cumulative effects on wildlife as a result of noise. Construction-related noise emissions would only last during those activities and would not be cumulatively significant. Installation development projects could generate noise from new mechanical equipment or changes in vehicle traffic accessing different facilities; these changes in noise would have negligible long-term, cumulative effects on wildlife because wildlife inhabiting the installation are accustomed to noise disturbances in developed areas. Cumulative effects on wildlife would not be significant.

There are several planned projects that are proposed in areas of MacDill AFB where protected or sensitive species might occur (see **Figure 3-2** for locations of protected and sensitive species). Projects along the shorelines and wetlands, particularly mangrove areas, have the greatest potential to affect sensitive bird species, but these areas of MacDill AFB are not used for military missions and development activities. However, the gopher tortoise, burrowing owl, and other species that use abandoned gopher tortoise burrows occur in the industrialized flightline area of MacDill AFB. An active bald eagle nest is within the restricted Munitions Storage Area (MSA). The following projects are planned within protected or sensitive species areas:

- D4. Demolish Building 1132: bald eagle nest
- D5. Demolish Building 1135: bald eagle nest
- D7. Demolish Building 1105: bald eagle nest
- D10. Demolish Building 1205: bald eagle nest
- C21. Miscellaneous MSA Upgrades: bald eagle nest
- C40. U.S. Water Operations Building: concentration of avian species
- I4. Construct Medical Clinic Sidewalks: gopher tortoise habitat
- I5. Replace Sludge Digester Tanks: concentration of avian species
- I10. WWTP Effluent Pumping Station: concentration of avian species
- NI1. Storm Water Drainage Improvements: bald eagle nest

Development activities in the vicinity of protected or sensitive species could result in short-term, minor, adverse effects as a result of noise and ground-disturbance, and long-term, adverse effects as a result of habitat loss. Wildlife inhabiting MacDill AFB, particularly along the industrialized flightline in the case of gopher tortoise and burrowing owl, are generally accustomed to noisy environs. Several construction or demolition activities occurring at the same time and in the same vicinity could have short-term, minor, adverse, cumulative effects as a result of noise. Environmental protection measures have been identified that would minimize the potential for adverse construction effects on migratory birds and bald eagles are discussed in **Sections 4.3.6 and 5.2**; implementation of environmental protection measures for individual projects would reduce the potential for cumulative effects. Projects C40 and I4 could result in loss of habitat for sensitive species, which could result in long-term, adverse effects; projects that would directly affect or remove gopher tortoise or burrowing owl burrows would require consultation with FWC.

Considering its coastal location, all development activities, and particularly those development activities in or near surface water or drainage ditches, have the potential to affect EFH. Individual development projects could result in short-term, minor, adverse effects due to increased sediment runoff associated with demolition and construction activities, which could increase sedimentation and turbidity in EFH. Implementation of all projects presented in **Section 5.1.1.2** and **5.1.1.3** could have minor, adverse, cumulative effects on EFH. BMPs implemented as part of NPDES and EISA requirements for individual construction projects would minimize sediment runoff leaving construction sites, thereby minimizing the potential for adverse effects. Cumulative effects on EFH would not be significant.

The 6 AMW plans to implement the Ecosystem Restoration Conceptual Masterplan (discussed in **Section 5.1.1.3** and in the *Water Resources* cumulative effects subsection). Seven project sites are planned in the next 5 years that would include clearing exotic and invasive species, filling in ditches, reestablishing hydrologic connections between areas, and revegetating with desired species. This project would be expected to have long-term, moderate, beneficial effects on vegetation, wildlife, and protected and sensitive species by improving the quality and quantity of suitable habitat. The 6 AMW also plans to construct a marine habitat wave barrier (see **Section 5.1.1.2**) just offshore of Gadsden Point, which has historically experienced moderate to shoreline severe erosion. This project is expected to result in long-term, moderate, beneficial effects on seagrasses, wildlife, and shoreline habitats, including EFH, at Gadsden Point. The beneficial effects of improving mangrove wetlands and shoreline areas and other high-value biological areas would have a beneficial contribution to cumulative effects, offsetting minor, adverse effects on vegetation, wildlife, and sensitive species habitat from other installation activities.

Cultural Resources

MacDill AFB has and continues to meet its stewardship responsibilities toward cultural resources under Section 106 of the NHPA. The installation has an ICRMP that is a reference and planning document for managing and preserving the installation's cultural resources while maintaining mission readiness (MAFB 2011c). Through systematic archaeological surveys, MacDill AFB has identified two NRHP-eligible archaeological sites. MacDill AFB also has two NRHP-eligible historic districts, the MacDill Field Historic District and the Staff Officer's Quarters Historic District, which includes 12 individually eligible buildings. In addition, Building 501 could be individually eligible for listing in the NRHP. Building 540 has been determined eligible for listing in the NRHP but was demolished in March 2012 following the preparation of Historic American Building Survey documentation and completion of a MOA with the Florida SHPO.

The selected projects would be expected to have no adverse effects on known archaeological resources or Native American sacred sites and no direct, adverse effects on NRHP-eligible architectural resources (see **Section 4.3.7**). As shown in **Table 5-2**, other planned installation development activities would be expected to have no effect on cultural resources. Taken collectively and considering past and future effects on cultural resources at MacDill AFB, the selected projects and other planned installation development activities would not be expected to have a significant impact on cultural resources under NEPA.

Socioeconomics and Environmental Justice

MacDill AFB contributes substantially to the local economy. Cumulatively, installation development activities would have short-term, minor to moderate, beneficial effects on the local community through the procurement of goods and services. Larger construction projects would be expected to have a larger contribution to overall beneficial effects (as identified in **Table 5-2**). Construction-related expenditures would not generate any long-lasting cumulative benefits. Implementation of the projects identified in this

cumulative effects discussion would occur entirely on MacDill AFB. Disproportionate impacts on minority or low-income populations would not occur.

Infrastructure

MacDill AFB has well-developed infrastructure systems that are maintained and improved as needed. The electrical, communications, and potable water systems are in need of upgrades in the coming years to ensure reliable service and capacity (Drake 2012, MAFB 2006a). Many of the installation development activities planned over the next 5 years would provide necessary maintenance and increase capacity. Individually, installation development activities could have short-term, negligible, adverse effects during construction, demolition, or installation activities on infrastructure systems (e.g., power supply or communications connections could be temporarily lost while new facilities are connected).

Numerous infrastructure improvement projects are planned that would improve reliability and safety of utilities communications, and transportation system to support the population and military mission. These include constructing fuel containment systems and improving the liquid fuels system (Projects C34 and C37), constructing a utility plant to meet SOCOM requirements (Project C42), repairing electrical systems (Projects I8, I12, and I19), maintaining the WWTP and sanitary sewer infrastructure (Projects I5, I10, I11, I25, and I26), improving the potable water system (Projects C40 and I31), improving communications infrastructure (Projects I14, I22, and I32), improving transportation and parking (Projects I1, I2, I3, I6, I18, I20, I24 [Multiple Roadway Improvements], I29, and I33), maintaining airfield safety and drainage (Projects NI2, I27, and Airfield Drainage Improvement Project [see **Section 5.1.1.2**]), improving storm water drainage (Project NI1), and constructing spill gates in storm drainage ditches (see **Section 5.1.1.2**). Demolition of old, outdated, or obsolete infrastructure (Projects D5, D10, D11, and D12) would also have long-term beneficial effects. Implementation of planned installation development projects would have long-term, minor to moderate, beneficial, cumulative effects on the airfield, transportation systems, electrical supply, water supply, and communications systems.

Considering facility demolition and construction cumulatively, there would be an increase in the amount of facility space (approximately 1 million ft²) and impervious surfaces (approximately 2.5 million ft² or 57 acres) on MacDill AFB, which is approximately 1 percent of the total installation area. In addition to the selected projects, several of the large installation development activities include Project C8 (Visitor's Quarters, Phase I and II), Project C22 (NOAA Airfield Operations Center), and Project C35 (Base Civil Engineering Complex), which would have large increases in facility space and impervious surfaces. An increase in facility space and impervious surfaces could be expected to require slightly increased use of electrical supply, natural gas, water supply, sanitary sewer and wastewater treatment, storm water, and communications systems, although there would be no or negligible increases in personnel associated with the installation development projects. However, older and less efficient buildings would be removed, and newer facilities would be expected to be more energy- and water-efficient, offsetting long-term, minor, adverse, cumulative effects on utility systems.

Implementation of all planned installation development projects would result in short- and long-term adverse effects as a result of increased solid waste generation. As shown in **Table 5-5**, approximately 67,383 tons of C&D debris would be generated over the next 5 years. Demolition waste is managed by individual contracts, but it is anticipated that much of the clean demolition and construction debris could be recycled instead of disposed of in a landfill or rubble fill. C&D waste is a short-term, adverse effect in that it would only be generated during those activities, but the disposal of C&D waste in a landfill would be a permanent effect.

Table 5-5. Cumulative Anticipated Generation of Construction and Demolition Debris

Project Type	Project Size (ft ²)	Multiplier (pounds/ft ²)	Total Waste Generated	
			Pounds	U.S. Tons
Selected Projects ¹	--	--	--	13,500
All Other Demolition Projects ²	481,109	158	90,929,601	45,465
All Other Construction Projects ²	3,658,581	4.34	15,878,241	7,939
All Other Infrastructure Improvement Pavement Projects ²	957,823	1	957,823	479
			Total	67,383

Source: USEPA 2003

Notes:

1. See **Table 4-4**.
2. Project areas calculated from Tables A-1, A-2, and A-3 in **Appendix A**.

Hazardous Materials and Wastes

Hazardous wastes and materials and 25 open ERP sites occur at MacDill AFB as a result of its historic use as a military installation. MacDill AFB has an HMMP, Pollution Prevention Management Action Plan, Hazardous Waste Management Plan, Asbestos Management and Operations Plan, Lead-Based Paint Management Plan, and Integrated Pest Management Plan that guide the use, handling, storage, and disposal of regulated materials in accordance with USAF, Federal, state, and local laws and regulations.

Individual installation development projects would require the use of small quantities of hazardous materials and generate small quantities of hazardous wastes, resulting in short-term, negligible, adverse effects. C&D activities occurring at the same time and in the same vicinity could have short-term, negligible to minor, adverse cumulative effects on hazardous materials and waste management. Adherence to construction site management plans for hazardous materials and wastes would limit potentially adverse cumulative effects. Some installation development projects could increase the use or storage of hazardous or petroleum materials, including the JCSE Paint Facility (Project C12), NOAA Airfield Operations Facility (Project C22), Fuels Management Facility (Project C34), SOCOM Utility Plan (Project C42), High Electromagnetic Pulse Shelter Generator Fuel Tank (Project I9), and Constant Run Booster and Automated Chlorine Feed (Project I21). It is anticipated that increased hazardous or petroleum material used and wastes generated would be managed by existing MacDill AFB management plans and practices. Cumulatively, long-term effects would not be significant.

Buildings constructed prior to 1989 could contain asbestos. Buildings constructed prior to 1978 should be assumed to contain LBP. Buildings constructed prior to 1979 could have PCB-containing equipment. The risk of exposure to ACM, LBP, or PCBs during demolition activities would be a short-term, adverse effect. The appropriate identification, handling, removal, and disposal of those ACM and LBP would occur in accordance with MacDill AFB management plans and USAF, Federal, state, and local laws and regulations. PCB-containing materials must be disposed of at a hazardous waste disposal facility. Cumulatively, long-term, beneficial effects would be expected from the removal of ACM, LBP, and PCBs from MacDill AFB.

Any ground-disturbing activities in and around ERP sites has the potential to encounter contaminated soil or groundwater. Under the selected projects and alternatives (see **Table 3-13** and **Section 4.3.10**), Projects D1, D2, C1c, C2, C3, C5, C6/C6a, I1/I1b, I2, NI1, and S1/S1b would be in the vicinity of open

ERP sites. Other projects within 100 feet of open ERP sites include D6, D10, D11, D13, C8, C9, C11, C15, C17, C19, C22, C24, C25, C29, C30, C34, C36, C37, I9, I11, I12, I13, I18, I25, I26, I27, and I28. Projects D5, D12, C23, and I19 are sited in the vicinity of closed ERP sites, and no adverse effects would be expected from these projects. The risk of exposure to soil or groundwater contamination during ground-disturbing activities would be a short-term, adverse effect; the increased risk would not necessarily be considered an adverse cumulative effect when considering all installation development projects together.

Safety

MacDill AFB complies with all applicable USAF AFOSH and OSHA regulations and munitions safety criteria to provide a safe working environment while supporting military readiness and training activities. Individual installation development projects could pose an increased risk for a safety mishap during C&D activities. C&D activities occurring at the same time and in the same vicinity could have short-term, minor, adverse cumulative effects by increasing local construction traffic accessing sites, increasing maintenance and repair activities, and creating highly noisy environs that could mask verbal or mechanical warning signals. Adherence to USAF AFOSH and OSHA regulations would minimize the potential for adverse effects on construction workers. Cumulative effects on construction safety would be short-term and negligible to minor.

Installation development activities in some areas of MacDill AFB inherently pose a greater risk because of operational or environmental safety issues, including QD arcs, the airfield, and ERP sites. Some proposed construction activities would occur within QD arcs (Projects NI1, Storm Water Drainage Improvements [see **Section 4.11.4.1**]; S1, Install Jogging Path Lighting [see **Section 4.11.5.1**]; D10, Demolish Building 1205; D11, Demolish Building 821; C21, Miscellaneous MSA Upgrades; and I13, Replace Cables). Construction activities within QD arcs must be coordinated with appropriate airfield or weapons safety personnel to ensure the safety of construction workers. Demolition and infrastructure upgrade activities within QD arcs would have no long-term effects. The planned MSA upgrades (Project C21) would comply with established explosives safety criteria. No long-term, adverse, cumulative effects would be expected.

Projects I22 (Direct Bury Communications Infrastructure), I27 (Reestablish Drainage Taxiway G), and NI2 (Airfield Tree Violations) would involve work in the airfield, which could pose safety concerns due to airfield operations. All construction activities would be coordinated with airfield safety personnel to ensure the safety of construction workers. No long-term, adverse, cumulative effects would be expected.

Ground-disturbing activities that are near or within ERP sites increase the potential for construction workers to encounter contaminated soil or groundwater (see projects identified in **Table 5-2** and discussion in the *Hazardous Materials and Wastes* cumulative effects subsection). If contaminated groundwater or soil from nearby ERP sites is encountered during construction or demolition activities, the handling, storage, transportation, and disposal of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulations; USAF regulations; and MacDill AFB management procedures. Prior to commencement of C&D activities at or within the vicinity of active ERP sites, a health and safety plan should be prepared in accordance with OSHA regulations. Workers performing soil-removal activities within ERP sites would be required to have OSHA 40-hour Hazardous Waste Operations and Emergency Response certification. In addition, supervisors would be required to have an OSHA Site Supervisor Certification. The risk of exposure to soil or groundwater contamination during ground-disturbing activities would be a short-term, adverse effect; the increased risk would not necessarily be considered an adverse cumulative effect when considering all installation development projects together.

Installation development activities would be expected to have long-term, beneficial, cumulative effects on safety by maintaining and improving facilities, pavements, and infrastructure systems. Demolition of old and underused facilities would remove ACM, LBP, and other health and safety concerns. Many planned projects would upgrade force protection and security measures (Projects I16, Repair SOCCOM Southeast Gate Entrance; I18, Install Vehicle Entry Gate; and I20, Widen Road to Accommodate Rapidscan GaRDS System) and upgrade fire hydrants and other fire safety systems (Project I17, Install Fire Hydrants in Munitions Storage Area, and Project I19, Repair Defense Fuel Supply Point Fire Hydrant System). Two projects would improve airfield safety by reducing BASH (Project I27, Reestablish Drainage at Taxiway G and Airfield Drainage Improvements [see **Section 5.1.1.2**]). Cumulatively, these projects would contribute to a safer working environment for all personnel at MacDill AFB.

5.2 Reasonable and Prudent Measures and Best Management Practices

The selected projects would not result in significant adverse effects on the land or the surrounding area. However, BMPs, environmental protection measures, and other minimization measures would be implemented to eliminate or reduce the impacts of non-significant adverse effects.

General environmental protection measures that would be included, as practicable, as parts of installation development projects are summarized as follows:

- Clearing and grubbing would be timed with construction to minimize the exposure of cleared surfaces. Such activities would not be conducted during periods of wet weather. Construction activities would be staged to allow for the stabilization of disturbed soils. These environmental protection measures would minimize adverse effects associated with soil and water resources.
- Fugitive dust-control techniques such as watering and stockpiling would be used to minimize adverse effects. All such techniques would comply with applicable regulations. These environmental protection measures would minimize adverse effects associated with air quality, soil, and water resources.
- Soil erosion-control measures, such as soil erosion-control mats, silt fences, straw bales, diversion ditches, riprap channels, water bars, water spreaders, vegetative buffer strips, and hardened stream crossings, would be used as appropriate. These environmental protection measures would minimize adverse effects associated with soil and water resources.
- Storm water management would be used as appropriate during construction to minimize offsite runoff. Following construction, storm water management systems would ensure that predevelopment site hydrology is maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. These environmental protection measures would minimize adverse effects associated with water resources.
- Minimize the disturbance of environmental resources and topography by integrating existing vegetation, trees, and topography into site design. These environmental protection measures would minimize adverse effects associated with soil and biological resources.
- Construction activities around the bald eagle nesting tree in the MSA would not occur during the nesting season (1 October–15 May), or within 330 feet of the nest.
- Any groundbreaking construction activities should be performed before migratory birds return to MacDill AFB or after all young have fledged to avoid incidental take (February 1 through September 1).

- If construction is scheduled to start during the period when migratory birds are present, a site-specific survey for nesting migratory birds should be performed immediately prior to construction.
- If nesting birds are found during the survey, buffer areas should be established around nests. Construction should be deferred in buffer areas until birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.
- Where feasible, minimize areas of impervious surface through shared parking, decked or structured parking, increased building height, or other measures as appropriate. These environmental protection measures would minimize adverse effects associated with soil and water resources.
- Provisions would be taken to prevent pollutants from reaching the soil, groundwater, or surface water. During project activities, contractors would be required to perform daily inspections of equipment, maintain appropriate spill-containment materials on site, and store all fuels and other materials in appropriate containers. Equipment maintenance activities would not be conducted on construction sites. These environmental protection measures would minimize adverse effects associated with soil, water resources, and hazardous materials and waste.
- Physical barriers and “no trespassing” signs would be placed around the demolition and construction sites to deter children and unauthorized personnel. All construction vehicles and equipment would be locked or otherwise secured when not in use. These environmental protection measures would minimize adverse effects associated with health and safety.
- Construction equipment would be used only as necessary during the daylight hours and would be maintained to the manufacturer’s specifications to minimize noise impacts. These environmental protection measures would minimize adverse effects associated with health and safety.

The following environmental protection measures would reduce adverse effects from development within the floodplain or wetland areas:

- All new structures not used solely for parking, storage, or infrastructure utilities that cannot be impacted by flooding constructed on MacDill AFB should be elevated by at least 11.5 feet and must be able to withstand sustained winds of 100 miles per hour and wind gusts of 120 miles per hour.
- Implement the creation of new storm water retention areas as needed for all projects that add impervious surfaces. Storm water retention areas should be maintained for invasive plant species, which can interfere with the drainage.
- Sidewalks, parking lots, and roads should be constructed with pervious material. Pervious materials permit water to enter the ground by virtue of their porous nature or by large spaces in the material. This material limits the direct discharge of pollutants into the environment and reduces the impacts of pollution. Pervious surfaces can be made of concrete, asphalt, open-celled stones, and gravel that are mixed in a manner that creates an open cell structure allowing water and air to pass through.
- The wetlands and other waters of the United States should be clearly flagged prior to commencement of construction activities with appropriate buffers. This would help prevent construction workers from entering these wetlands and potentially trampling wetland vegetation or placing fill within the wetlands.

- Construction activities should be phased so that smaller areas of land are disturbed at one period of time. This would result in less soil exposed at one time and would reduce the potential for erosion and deposition of sediment into wetlands or other waters of the United States.
- A construction grading plan should be developed to show existing and proposed topography. Grading should be conducted in a manner that would direct storm water runoff away from nearby wetlands or waters of the United States while maintaining existing drainage patterns and hydrology. BMPs such as installation of silt fencing along wetland buffers would aid in prevention of siltation if natural site contours convey storm water runoff to the wetlands.
- Construction activities should be restricted to drier periods during the year (winter months), when practicable.

5.3 Unavoidable Adverse Effects

Unavoidable adverse effects would result from implementation of the selected projects. As discussed in detail in **Section 4**, the selected projects would result in short-term, adverse effects associated with construction activities, including increased noise, increased air emissions, minor interruptions to traffic flow, use and generation of small amounts of hazardous materials and wastes, and generation of C&D waste. None of these effects would be significant.

The selected projects would entail construction of structures or impervious surfaces in the 100-year floodplain (Projects C1, C2, C3, C4, C5, C6, I1, I2, I3, I5, and I6). Given the extent of the 100-year floodplain at MacDill AFB, it is not practicable or feasible to avoid the floodplain entirely. All development within the regulated floodplain on MacDill AFB must comply with Federal, state, and local floodplain management and construction guidelines.

Wetlands. The selected projects would entail construction or ground-disturbing activities in wetlands (Project NI1); several other projects are in close proximity to wetlands. Effects on wetlands from these projects would not be significant and proper implementation of environmental protection measures and construction environmental protection measures would minimize impacts. All development with the potential to affect wetlands on MacDill AFB must comply with Federal, state, and local floodplain management and construction guidelines.

5.4 Compatibility of the Proposed Action and Alternatives with the Objectives of Federal, Regional, State, and Local Land Use Plans, Policies, and Controls

Effects on the ground surface as a result of the selected projects would occur within the boundaries of MacDill AFB. The selected projects would be consistent with all applicable land use ordinances.

5.5 Relationship Between the Short-term Use of the Environment and Long-term Productivity

Short-term uses of the biophysical components of the human environment include direct construction-related disturbances and direct effects associated with an increase in activity that occurs over a period of less than 5 years. Long-term uses of human environment are those effects occurring over a period of more than 5 years, including permanent resource loss.

The selected projects would not result in an intensification of land use in the surrounding area. Development of the selected projects would not represent a significant loss of open space. The long-term beneficial effects of implementing the selected projects and other planned installation development

activities would support the ongoing and future training missions and other readiness training and operational assignments.

HQ AMC plans to reduce their overall building footprint by 6.6 million ft² by 2020. The planned demolition activities at MacDill AFB over the next 5 years would contribute to that goal by removing excess, obsolete, and underused infrastructure capacity and focusing time and funding on maintaining only infrastructure that is needed. This is a long-term benefit for HQ AMC and the USAF.

5.6 Irreversible and Irretrievable Commitments of Resources

The irreversible environmental changes that would result from implementation of the selected projects involve the consumption of material resources, energy resources, and human resources. The use of these resources is considered to be permanent. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources will have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable timeframe (e.g., energy and minerals).

Floodplains. The selected projects would entail construction of structures or impervious surfaces in the 100-year floodplain (C1, C2, C3, C4, C5, C6, I1, I2, I3, I5, and I6). All development within the regulated floodplain on MacDill AFB must comply with Federal, state, and local floodplain management and construction guidelines.

Wetlands. The selected projects would entail construction or ground-disturbing activities in wetlands (Project NI1); several other projects are in close proximity to wetlands. Effects on wetlands from these projects would not be significant and proper implementation of environmental protection measures and construction BMPs would minimize impacts.

Biological Habitat. The selected projects would result in the loss of vegetation and wildlife habitat. This is an adverse effect, but the best habitat areas at MacDill AFB are in the southern portion of the installation where no military operations and only limited development activities occur. Losses would not be significant.

Material Resources. Material resources used for the selected projects include building materials (for renovation or construction of facilities), concrete and asphalt (for parking lots and roads), and various material supplies (for infrastructure) would be irreversibly lost. Most of the materials that would be consumed are not in short supply, would not limit other unrelated construction activities, and would not be considered significant.

Energy Resources. No significant effects would be expected on energy resources used as a result of the selected projects, though any energy resources consumed would be irretrievably lost. These include petroleum-based products (e.g., gasoline and diesel fuel) and electricity. During construction, gasoline and diesel fuel would be used for the operation of construction vehicles. During operation, gasoline or diesel fuel would be used for the operation of privately owned and government-owned vehicles. Electricity would be used by operational activities. Consumption of these energy resources would not place a significant demand on their availability in the region.

Human Resources. The use of human resources for construction and operation is considered an irretrievable loss, only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the selected projects and alternatives represent employment opportunities, and is considered beneficial.

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APPENDIX A

INVENTORY OF INSTALLATION DEVELOPMENT PROJECTS

Table A-1. Proposed Demolition Projects

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Facilities Demolition (ft²)	Total Project Area (ft²)	Change in Impervious Surface (ft²)
Selected Demolition Projects								
D1. Demolish Buildings 65, 82, 83, and 85	NVZR090025 NVZR120102 No Number Assigned	2013 & 2014	Industrial	Demolish Buildings 65 (Morale, Welfare, and Recreation Offices, 9,522 ft ²), 82 (USAF Plant Administration Office, 3,898 ft ²), 83 (WHSE Supply and Equipment BSE, 2,579 ft ²), and 85 (BE Storage Shed, 70 ft ²). Terminate utilities and restore site to match surrounding areas. Approximately 2,367 ft ² of associated pavement would be removed.	ERP, Floodplain, ACM, LBP, PCB	16,069	54,923	-20,136
D2. Demolish Building 1107	NVZR100154	2013	Open Space	Demolish Building 1107 (Warehouse Supply and Equipment, 2,431 ft ²). Terminate utilities and restore site to match adjacent areas.	ERP, Floodplain, ACM, LBP, PCB, Historic resources	2,431	11,320	-5,395
D3. Demolish Building 40	NVZR100179	2014	Administrative	Demolish Building 40 (Communications Facility, 11,737 ft ²).	Floodplain, ACM, LBP, PCB	11,737	45,614	-11,737
Other Demolition Projects								
D4. Demolish Building 1132	NVZR100141	2012	Open Space	Demolish Building 1132 (AFCS Maintenance Facility).	Floodplain	345	1,533	-345
D5. Demolish Building 1135	NVZR100139	2012	Open Space	Demolish Building 1135 (Electric Power Station Building).	Floodplain	694	18,313	-694

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Facilities Demolition (ft ²)	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Demolition Projects (continued)								
D6. Demolish Buildings 540 and 543	NVZR053714B	2012	Administrative	Demolish Buildings 540 (CENTCOM HQ Major Command, 187,215ft ²) and 543 (Special Operations, 3,069 ft ²).	ERP, Floodplain	190,284	392,255	-190,284
D7. Demolish Building 1144	NVZR100140	2012	Open Space	Demolish Building 1144 (Warehouse).	Floodplain	192	2,640	-192
D8. Demolish Building 595	NVZR100132	2012	Open Space	Demolish Building 595 (Utility Vault) near the MacDill Avenue gate, terminate utilities, and restore site to match surrounding areas. Building is obsolete, serves no useful purpose and has been vacated by 6 CS.	Floodplain	96	828	-1,700
D9. Demolish Building 826 and 827	NVZR110086	2012	Open Space	Demolish Building 826 and 827 (Calibration Docks).	Floodplain	6,112	7,356	No change
D10. Demolish Building 1205	NVZR100084	2012	Industrial	Demolish Building 1205 (Wastewater Treatment Facility, 1,700 ft ²) and 1,211 ft ² of associated pavement.	ACM, LBP, ERP, Floodplain,	7,780	1,700	-2,900
D11. Demolish Building 821	NVZR100142	2013	Industrial	Demolish Building 821 (Communications Facility). Cable maintenance operations are to move into vacated Hangar 3 space upon completion of Building 6 Add to /Alter BRAC project.	ERP, QD, Floodplain	4,121	16,000	-4,121
D12. Demolish Buildings 1101 and 1161	No Project Number assigned	2013	Industrial	Demolish Buildings 1101 (WHSE Supply and Equipment BSE, 1,270 ft ²) and 1161(Communications Facility, 2,944 ft ²). Terminate utilities and restore site to match adjacent areas.	Floodplain, ACM, LBP	17,093	29,284	-17,093

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Facilities Demolition (ft ²)	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Demolition Projects (continued)								
D13. Demolish Building 189	NVZR100064	2013	Open Space	Demolish Building 189 and restore site to match adjacent areas (i.e., runway ramp). Building 189 is located on the flightline and will be vacated upon completion of Building 6. Building 189 would be demolished to comply with the installation's Architectural Compatibility Plan, which does not support the presence of small, independent structures.	Airfield, ERP, Floodplain	5,600	11,200	No change
Total Square Feet							592,966	-254,597

Note: Total Project Area includes additional laydown area required for demolition activities.

Key:

ACM = asbestos-containing material

BRAC = Base Realignment and Closure

CENTCOM = U.S. Central Command

CS = Communication Squadron

ERP = Environmental Restoration Program

ft² = square feet

HQ = headquarters

LBP = lead-based paint

QD = quantity-distance

UST = underground storage tank

Table A-2. Proposed Construction Projects

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft²)	Change in Impervious Surface (ft²)
Selected Construction Projects							
C1. Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Joint Combat Aquatic Training (JCAT) Center *	NVZR103707, NVZR063705, NVZR103706	2013, 2014	Outdoor Recreation	Construct a new 36,000-ft ² indoor JCAT Center in the area of the Base Fitness Center. Project includes demolition of Facilities 46 (Pool, 7,011 ft ²) and 47 (Bathhouse, 3,795 ft ²). Total project area needed for demolition is 54,961 ft ² because the site is elevated. Renovate south and southwest sections of existing facility (12,422 ft ²); and pave and stripe the parking area south of the existing facility (includes a new pedestrian bridge and retention pond). Two parking areas totaling 104,603 ft ² would be constructed.	Floodplain, ACM, LBP, PCB	Facilities: 48,422 Pavements: 104,603 Demolition: 54,961 Total Project Area: 278,961	+142,219
C2. Construct Logistics Readiness Complex*	NVZR043704	2013	Administrative, Open Space	Construct a 32,132-ft ² Logistics Readiness Complex to replace inadequate facilities. Project relocates the transportation function and consolidates functions adjacent to the Supply Warehouse (Building 49). Demolishes 5 substandard facilities (Buildings 119, 175, 178, 500, and 510) totaling 41,059 ft ² and remove a leased modular facility. Total project area, including building footprints, paved areas, roadway work, storm water retention pond(s), and green spaces, is 344,974 ft ² with 293,878 ft ² of impervious surfaces. Straightening Marina Bay Drive entails a new 35,700 ft ² -roadway to replace the existing 26,600 ft ² -roadway (see Project 14). Parking areas would be constructed for vehicle maintenance, vehicle operations, and POVs.	ACM, LBP, ERP, Floodplain	Facilities: 32,132 Pavements: 261,746 Demolition: 41,059 Site Improvements: 51,096 Total Project Area: 344,974	+293,878

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Selected Construction Projects (continued)							
C3. Construct EOD Bunker Barricades	NVZR110193	2013	Outdoor Recreation	Construct new EOD range with 780-ft ² detonation point barricades and a 300-ft ² , 3-sided reinforced-concrete personnel bunker.	ERP, QD, wetlands, floodplain	Facilities: 1,080 Pavements: 0 Site Improvements: 0 Total Project Area: 1,080	+1,080
C4. Construct Joint Special Operations University (JSOU)*	NVZR083702	2013	Administrative	Demolish two temporary structures (Buildings 506A and 506E, totaling 39,027 ft ²) with a total demolition project area of 94,234 ft ² ; construct a three-story, 85,000-ft ² education building elevated above the floodplain to collocate the JSOU with SOCOM. Utilities would be upgraded.	Floodplain	143,234	-22,546
C5. Construct Outdoor Recreation Maintenance Facility*	NVZR103710, NVZR110160	2014, 2015	Outdoor Recreation	Construct a 20,500-ft ² building behind Building 60. Facility would serve as the storage and maintenance building for outdoor recreation equipment. The 50,000 ft ² -parking area would be reconfigured. The project also includes the demolition of Buildings 13, 60, and 694 (5,695 ft ²).	ERP, Floodplain, ACM, LBP, PCB	Facilities: 20,500 Pavements: 50,000 Site Improvements: 98,839 Demolition: 37,000 Total Project Area: 169,339	+64,805

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Selected Construction Projects (continued)							
C6. Alert Facility, Fuels Mobility Support Equipment Facility*	NVZR103712 NVZR063716 NVZR110053	2014, 2015	Open Space	Construct a 2-story, 30,000-ft ² facility to house crew readiness operational, recreational, and administrative functions adjacent to the Alert Aircraft Parking Ramp. Construct an 18,000-ft ² facility to house FMSE and FORCE, and a 3,050-ft ² facility for administrative functions. A 10,000-ft ² fuels containment area with three support fuel tanks would be included. Includes demolition of obsolete facilities (1051, 1052, 1053, 1069, 1079, and 1081) for a total demolition project area of 144,273 ft ² , and relocation of operational testing equipment. An 180,000 ft ² parking area would be constructed.	ERP, Floodplain, ACM, LBP, PCB, AST	Facilities: 61,050 Pavements: 180,000 Site Improvements: 144,273 Total Project Area: 385,323	+208,534
Other Construction Projects							
C8. Construct Visitor's Quarters Phase I and II*	NVZR103709 A	2012	Community	Demolish Building 312 (18,400 ft ²), 366 (20,730 ft ²), 397 (30,672 ft ²), and the associated parking area. Construct a three-story, 175,000-ft ² (Phase I) at the site of the old Officer's Club (Building 397) and construct a two-story, 50,000 ft ² VQ facility (Phase II) at the intersection of Tampa Point Blvd and Bayshore Blvd. Parking would be constructed.	ERP	689,153	+250,700
C9. Construct Storage Facility*	NVZR120028	2012	Aircraft Operations, Maintenance	Construct a storage facility near Building 700. Demolish buildings 1075, 1083, and 1084. Storage facility would collocate functions from demolished buildings. Supports the Clinic/SOCCENT/Mission Support Facility Area Development Plan.	ERP, Floodplain	61,734	+2,340
C10. Construct Fitness Assessment Cell Running Track	NVZR110037	2012	Outdoor Recreation	Construct a 1/4 mile regulation running track with internal soccer field and adjacent exercise pad and sidewalks. Demolish existing soccer and softball fields. Relocate bleachers and area lighting. All new surfaces would be pervious.	Floodplain, Wetlands	276,469	No change

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C11. Florida Army National Guard Special Operations Detachment	NVZR123711	2012, 2014	Aircraft Operations, Maintenance	Construct two administrative/storage facilities (4,000 ft ² each) and parking lot(s) north of Building 1071 and south of North Aspen Drive.	ERP, Floodplain	55,913	+23,400
C12. Construct JCSE Paint Facility	NVZR093702	2013	Aircraft Operations, Maintenance	Construct a 5,500-ft ² JCSE Vehicle Paint Facility on a paved area just north of Building 862. Once the new vehicle paint facility is constructed the existing paint booth in Building 862 would be shut down and the space would be reused.	Floodplain	21,780	No change
C13. Construct CE Storage Area, Building 293	NVZR110064	2013	Industrial	Construct a covered, secured area for storage of plumbing equipment and materials at Building 293.	Floodplain	400	No change
C14. Construct Dorm Area Recreational Courts	NVZR100028	2013	Medical	Construct outdoor basketball and volleyball courts to support "block party" functions near Dorm 253 and the future Dorm 370.	Floodplain	109,000	+21,800
C15. Construct Obstacle Course	NVZR100150	2013	Industrial	Construct a 12-station obstacle course and storage facility for safety equipment.	Floodplain, Wetlands	435,597	+57,600
C16. Construct Recreational Pavilion Dorm Area	NVZR100029	2013	Housing	Construct a recreational pavilion near Dorm 253 and the future Dorm 370. Facility will have restrooms and showers to support "block party" functions.	Floodplain	1,200	+1,200
C17. Construct AGE Canopies, Building 552	NVZR110031	2013	Industrial	Install a canopy over the AGE wash rack and along the western side of Building 552.	ERP, Floodplain	21,000	No Change
C18. Construct Medical Group Storage Facility	NVZR090104	2013	Industrial	Construct a 4,500-ft ² War Reserve Materiel warehouse for the 6th Medical Group.	Floodplain	4,500	+4,500

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C19. Construct SFS Training Pad	NVZR110175	2013	Industrial	Construct a fitness-training pad near the Bayshore Running Trail across from Building 499 (Surf's Edge Club).	ERP, Floodplain	3,000	+2,500
C20. Education Center Addition	NVZR093708	2013	Community	Construct one 4,000 ft ² -addition to Building 252. The addition would be two stories and would provide seven classrooms to replace those lost when Building 258 is demolished (demolition of Building 258 is not part of this project). Wing to be added to the northern side of the building. Close and demolish Snowy Egret Street and Condor Street adjacent to the education center, and restore to green space to comply with AT/FP requirements. Redesign/relocate existing ponds and drainage to support new construction. Additional parking to be added if necessary.	Floodplain	8,000	+4,000
C21. Miscellaneous MSA Upgrades	NVZR100114	2013	Industrial	Miscellaneous upgrades to the MSA. Construct 776 linear feet of 12-foot-wide pavement within the MSA. Fill and level field between Buildings 843 and 845.	QD, Bald Eagle Nest, Floodplain	9,312	+9,312
C22. NOAA Airfield Operations Center	NVZR103701	2013	Open Space	Construct replacement facilities to relocate the NOAA Airfield Operations Center. Replacement facilities include general purpose maintenance hangar(s) with parts storage and shop areas; HAZMAT Storage, administrative space, AGE storage, Life Safety Equipment storage, and 40,500-ft ² Aircraft Parking Apron. The proposed site is near Buildings 1195/1196 (old Hush Houses).	Airfield	161,051	+161,051
C23. Postal Service Center	NVZR083709	2013	Medical	Construct a 10,000-ft ² facility to receive and inspect mail. A 40,000-ft ² parking lot would be constructed.	None	50,000	+50,000
C24. Construct Skeet Range Facility	NVZR110174	2013	Open Space	Construct a new 2,000-ft ² skeet range facility. Current operations are conducted from a temporary single-wide trailer.	ERP, Floodplain	5,174	+2,000

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C25. Renovate and Add to Surf's Edge Club, Building 499	NVZR120066	2013	Community Commercial	Renovate and upgrade the Surf's Edge Club to improve the functionality and aesthetics of the facility. Construct an addition (4,400 ft²) to accommodate storage and free-up interior space. Interior renovations include removing the raised stage area; replacing existing windows and installing additional windows; rearranging interior partition walls; and upgrading lighting, floor, and wall coverings and finishes and fixtures throughout the facility.	ACM, LBP, ERP, Wetlands, Floodplain	8,800	+4,400
C26. Construct EOD Addition, Building 108	NVZR120055	2013	Open Space	Construct an addition to Building 108 that includes separate office space for 6 to 8 personnel (approximately 270 ft ²), an equipment storage area (540 ft ²), and an additional drive through vehicle bay (approximately 810 ft ²). The addition would be on the western side of Building 108 and would be built off a preexisting exterior wall.	Floodplain	12,557	+1,500
C27. Construct Covered Parking Shelter	NVZR120060	2013	Administrative	Construct a parking ramp with a weatherproof cover and power supply for two new electrically powered personnel buggies on the western end of Building 147A (Auditorium). The parking shelter would provide permanent parking and electrical service for the buggies. A culvert pipe would be installed under the structure's concrete slab to preserve flow from adjacent downspout roof drains. A driveway would be constructed to connect to the sidewalk.	Floodplain	2,500	+288
C28. Construct BOWST Building 295 Addition	NVZR100136	2013	Aircraft Operations, Maintenance	Construct a one-story, 1,296-ft ² addition to Building 295 (Flight Simulator Facility) to house the BOWST. The addition would be on the northeastern side of Building 295.	Floodplain, SWMU-61	11,299	+1,296

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C29. Joint Operations and Logistics Mobility Facility*	NVZR103708	2014	Industrial	Construct a 50,000-ft ² Joint Network Operations Center and a 47,000-ft ² Logistics/Mobility Facility to support the JCSE mission. Demolition of five buildings (Buildings 89, 848, 861, 863, and 886) for a total of 82,042 ft ² (project area of 193,014 ft ²). Three of the buildings would remain on the site, Building 79 and 862 and the new Squadron Operations Facility. The headquarters has a leaky roof, asbestos, and lead.	Floodplain	290,014	+14,958
C30. Coalition Village	NVZR033711	2014	Administrative	Construct a facility to permanently house international representatives working directly for and with CENTCOM in support of the global war on terrorism. Remove all CV temporary facilities.	Floodplain, ERP	77,400	+77,400
C31. Mission Support Facility*	NVZR033709	2014	Administrative	Construct a Mission Support Facility, demolish Buildings 373 (27,738 ft ²), 1066 (4,000 ft ²), and 1070 (864 ft ²) (total demolition project area of 94,872 ft ²), and minor exterior renovations of Building 27 (construction of a handicap ramp and planter box) to relocate displaced functions.	Potentially eligible buildings	124,871	+29,999
C32. Construct FAMCAMP Annex	NVZR080003	2015	Outdoor Recreation	Construct 300 full-service RV parking pads and an Activity Center. Upgrade 121 RV parking pads. Construct RV Parking Spaces: Concrete parking pads with attached patios, and sanitary sewer, water, electrical, telephone, and cable TV service. Construct 15,000-ft ² Activity Center: Coin-operated laundry, male and female toilets and showers, check-in and registration office, mailroom, recreation room, and food preparation and storage areas.	Wetlands, Floodplain	27,360	+27,360

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C33. Dormitory (120-Room)*	NVZR073701	2015	Housing	Construct a 36,753-ft ² , 120-room dormitory and demolish dormitories 377 (25,350 ft ²) and 378 (25,350 ft ²) (total demolition project area of 83,555 ft ²). Phase 3 of a 5-phase program to replace existing dormitories. A 21,613-ft ² parking area would be constructed.	Floodplain	162,000	+7,666
C34. Fuels Management Facility*	NVZR053706	2015	Industrial	Construct a new Fuels Management Facility (8,611 ft ²) to replace Building 1062 and renovate the Refueling Vehicle Shop, Building 1061. Building 1062 (3,520 ft ²) would be demolished, with a total demolition project area of 22,294 ft ² .	ERP, Floodplain	30,905	+8,611
C35. Base Civil Engineering Complex	NVZR073722	2015	Open Space, Administrative	Construct an 86,725-ft ² BCE complex. A 234,703-ft ² parking area would be constructed. Total construction project area is 704,111 ft ² . Demolition of 11 facilities would occur (not analyzed in this IDEA).	None	704,111	+321,428
C36. Construct Wing Headquarters	NVZR083705	2015	Administrative, Industrial	Construct a 25,000-ft ² replacement Wing HQ facility for Building 299. Two parking areas totaling 72,000 ft ² are proposed to be constructed along the Zemke Avenue Extension.	ERP, Floodplain	Facilities: 25,000 Pavements: 72,000 Site Improvements: 89,390 Total Project Area: 186,390	+97,000
C37. Construct Fuel Containment System, Building 105	NVZR070115	2016	Industrial	Construct concrete containment and curbing under fuel piping and valves outside Building 105 pump room (secondary containment).	Floodplain	3,750	+3,750

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Construction Projects (continued)							
C38. DFT - Construct Pavilion, Building 49	NVZR050233	2016	Industrial	Construct a new pavilion to replace the existing one. Estimated DFT manpower is 11 personnel (1,600 man-hours).	Floodplain	300	No change
C39. Munitions Administration Facility	NVZR103711	2016	Industrial	Construct a new administration facility to replace existing Building 825. Facility should be sized to accommodate 17 personnel, be sited in the general location of Building 821 (scheduled for demolition in FY 2011; not analyzed in this IDEA), and comply with the Munitions Facilities Standards Guide.	QD, Floodplain	5,000	+5,000
C40. U.S. Water Operations Building	No project number assigned	2016	Industrial	Construct a new 5,000 ft ² -U.S. Water Operations Building across from the WWTP. A 10-space, approximately 1,600-ft ² parking area would be constructed.	Wetlands, Floodplain	6,600	+6,600
C41. Construct Security Forces Boat Dock	NVZR070157	2016	Open Space	Construct a dedicated boat dock for SF water patrol craft. Install a refueling tank.	Sensitive species, Wetlands	Facilities: 10,000 Pavements: 7,500 Site Improvements: 1,000 Total Project Area: 18,500	+8,500

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Total Project Area (ft ²)	Change in Impervious Surface (ft ²)
C42. SOCOM Utility Plant	No project number assigned	2017	Administrative	Construct a new 25,000-ft ² Central Utility Plant to houses chillers, cooling towers, switchgear, and generators for the SOCOM compound. Project would demolish nine existing generators, chillers, cooling towers, and switchgear within the compound. Project would also include new utility lines to all of the facilities within the SOCOM compound.	Air Quality	72,878	+30,000
Total Square Feet						4,981,429	+1,924,129

Note: * = Denotes projects that include demolition of facilities.

Key:

ACM = asbestos-containing material
AGE = aerospace ground equipment
AST = aboveground storage tank
AT/FP = anti-terrorism/force protection
BCE = Base Civil Engineering
BOWST = Boom Operator Weapon System Trainer
CATM = Combat Arms Training and Maintenance
CDC = Child Development Center
CENTCOM = U.S. Central Command
COM = communications
CSO = Center for Special Operations
CV = Coalition Village
DFT = daily full-time

EOD = explosive ordnance disposal
ERP = Environmental Restoration Program
FAMCAMP = family campground
FMSE = Fuels Mobility Support Equipment
FORCE = Fuels Operation Readiness Capability Equipment
ft² = square feet
FY = Fiscal Year
HAZMAT = hazardous materials
HQ = headquarters
JCAT = Joint Combat Aquatic Center
JCSE = Joint Communications Support Element
JSOU = Joint Special Operations University
LBP = lead-based paint

MSA = munitions storage area
NOAA = National Oceanic and Atmospheric Administration
PCB = polychlorinated biphenyl
POV = privately owned vehicle
QD = quantity-distance
RV = recreational vehicle
SF = Security Forces
SOAL = Special Operations and Acquisition Logistics
SOCENT = Special Operations Command Control
SOCOM = U.S. Special Operations Command
SWMU = Storm Water Management Unit
VQ = visitor's quarters
WWTP = waste water treatment plant

Table A-3. Proposed Infrastructure Improvement Projects

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft²)	Change in Impervious Surface (ft²)
Selected Infrastructure Improvement Projects							
I1. Construct CENTCOM Parking Garage	NVZR083712A, NVZR083712	2012, 2013	Industrial	Site preparation (including soil compaction) and construction of a four-story, 595,981-ft ² parking garage (footprint of ~149,000 ft ²) to accommodate approximately 1,500 vehicles and 112 motorcycles. An elevated 5,580-ft ² walkway above Zemke Avenue would connect the garage to the replacement headquarters building currently under construction. Access roadways and sidewalks would be approximately 11,000 ft ² . Project includes demolition of Facilities 1051, 1052, and 1053 to clear the site and all necessary roadway modifications, landscaping, utilities, communications, site improvements, and construction of replacement facilities (covered under Project C6). Possible photovoltaic system.	Floodplain, ACM, AST	280,432	+ 160,000
I2. Straighten Marina Bay Drive	NVZR100044	2013	Open Space	Fix problems of Marina Bay Drive near Building 49, Base Supply by straightening the road and adding sidewalks and landscaping.	ERP, Floodplain	36,000	+9,100
I3. Construct Dining Facility Parking Lot	NVZR110153	2013	Community Service	Construct parking lot where Building 258 (Education Center) currently stands. Demolition of Building 258 is not part of the IDEA.	Floodplain	60,000	+48,000
I4. Construct Medical Clinic Sidewalks	NVZR100054	2013	Medical	Construct 3,150 linear feet of a 6-foot-wide concrete sidewalk.	Airfield, CZ, Sensitive species	3,150	+ 1,575
I5. Replace Sludge Digester Tanks	NVZR100051	2013	Industrial	Replace two 170,000-gallon sludge digestion tanks. Tanks are original equipment installed in the 1950s and have developed several minor leaks. The tanks would be within the wastewater treatment plant compound north of the existing digesters (Facility 64).	Sensitive species, Floodplain, EFH	3,300	+3,300
I6. Construct DISA Parking Lot, Building 805	NVZR110059	2014	Open Space	Expand Building 805 parking lot to support increased personnel from 18 to 70 spaces.	Floodplain	18,000	+18,000

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Infrastructure Improvement Projects							
I7. Construct SOCOM Garage	NVZR123709	2012	Administrative	Construct a four-story, 204,000-ft ² vehicle parking garage within the SOCOM compound (estimated footprint of 51,000 ft ²).	Floodplain	114,948	No change
I8. Repair FAMCAMP Electrical Distribution System	NVZR100080	2012	Outdoor Recreation	Install new electrical ground transformers and load centers at 86 RV parking with wiring to all pedestals.	Floodplain	3,000	+16
I9. Install HEMP Shelter Generator Fuel Tank, Building 541	NVZR100131	2012	Administrative	Install a 400-gallon diesel fuel tank (AST) at the HEMP shelter, Building 541.	ERP, Floodplain	36	+36
I10. F&I WWTP Effluent Pumping Station	No project number assigned	2012	Industrial	F&I WWTP effluent disposal pumping station to be located adjacent to the existing station, which splits duty among pumping to the golf course and to the effluent disposal areas, thereby allowing the transfer of the entire asset to the Golf Course.	Sensitive species, Floodplain	500	+500
I11. Gravity Sewer Installation and Repair	No project number assigned	2012	Community, Housing, Industrial, Medical	The gravity collection system in the area north of the installation, upstream of manhole G110A, is highly deficient and is in need of immediate repair. The repair of these components is to include the installation of new lines and lining of existing lines (totaling 5,830 feet), installation of new manholes and lining of others (totaling 35 manholes). The gravity collection system in the area north of Lift Station 21 and the area along Hanger Loop is also in need of immediate repair. The repair of these components includes the installation of new lines and lining of existing lines (total of 5,250 feet), and the installation of new manholes and the lining of others (total of 36 manholes). Reroute the gravity sewer lines around temporary housing in the area of Hanger loop south of manhole C44.	Floodplain, ERP	33,240	No change
I12. Repair Secondary Electrical Distribution	NVZR110044	2013	Community, Industrial, Open Space	Upgrade the secondary electrical distribution system by burying overhead lines and removing poles.	Historic District, Floodplain	6,500	No change

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Infrastructure Improvement Projects (continued)							
I13. Replace Cables 25/1180-1079.	No project number assigned	2013	Airfield, Open Space	CS project to replace copper cable that feeds all of the flightline weather and navigation equipment connecting Building 1180 (Air Traffic Control Tower) with Hanger 3 (weather station). Most would be direct-buried throughout the flightline; to run across existing lines. Fiber optic 1180 to 1079 (ITNs) would replace current fiber optic cable 1180-1079. This fiber cable runs from Building 1180 into 540 then to 1079. Building 540 is due for demolition within the next 2 years and if this cable is not replaced, the demolition will disable connectivity between 1180 and 1079. The conduits would likely be installed by directional boring.	Historic District, Sensitive Species, QD, Wetland, Floodplain	19,000	No change
I14. Install Fiber Optic Connectivity between ITN 49 and ITN 1750 (SATCOM)	No project number assigned	2013	Industrial, Open Space	CS project: The existing fiber cable between the ITN in Building 49 (Base Supply) and the ITN in Building 1750 (SATCOM Facility) is saturated. The JCSE is attached off this ITN Bldg 49 and the ITN in Building 40 passes through 49 to reach the ITN in Building 1750.	Floodplain	12,000	No change
I15. SOF Acquisition Center (Phase II) (SOCOM Parking Garage)	NVZR123709	2013	Administrative	Current parking spaces only support 43 percent of SOCOM's FY12 population. Construct a 204,000-ft ² , four-story vehicle parking garage within HQ SOCOM compound, with a capacity for at least 600 vehicles. Lightweight roof to be added to existing parking structure (Building 512). Construction of pedestrian walkways, service access areas, and lighting would be included. Parking structure would not be required to be constructed above the 100-year floodplain. One existing, temporary gravel parking area (271 spaces) would be demolished. Existing disturbed areas would be landscaped.	Historic District Viewshed, Floodplain	204,000	+68,000
I16. Repair SOCOM SE Gate Entrance	NVZR100171	2013	Administrative	Alter the southeast entrance to the SOCOM compound to allow two lanes of incoming traffic.	Floodplain, ERP	1,000	+1,000
I17. Install Fire Hydrants, MSA	NVZR050066	2013	Industrial	Install six fire hydrants throughout the MSA.	Floodplain	25,200	No change

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Infrastructure Improvement Projects (continued)							
I18. Install Vehicle Entry Gate and Concrete Pavement Roadway, Building 105	NVZR070017	2013	Industrial	Construct a paved access road and add a vehicle gate to the southeast side of the Type III hydrant fuel system building, Building 105.	ERP, Floodplain	5,004	+5,004
I19. Repair DFSP Fire Hydrant System; Repair DFSP Overhead Electrical Distribution	NVZR100113, NVZR090109	2013, 2015	Industrial	Upgrade the fire hydrant system serving the DFSP to ensure functionality in the event of an emergency. Remove overhead electrical distribution serving area lighting at the DFSP.	Floodplain	6,500	No change
I20. Widen Road to Accommodate RapidsScan GaRDS System; Port Tampa Gate Improvements	NVZR100190, NVZR093706	2013	Industrial, Open Space	Widen the north entry road into the commercial gate area, between the perimeter gate and the pre-screen waiting area, for moving operation of the RapidsScan GaRDS (gamma-ray detection system) truck. Construct a 1,830-ft ² traffic-control facility with traffic lanes dedicated to processing entry of POVs to alleviate congestion. Reconfigure roads.	ERP, Floodplain, Wetlands	6,690	+5,947
I21. New Constant Run Booster and Automated Chlorine Feed	No project number assigned	2013	Open Space	Install a new CRB and automated chlorine feed system near marine and Golf Course Boulevard to improve water quality on the south installation area.	Floodplain	400	+200
I22. Direct Bury Communication Infrastructure	NVZR120057	2013	Industrial	Excavate a 3-ft-deep trench for direct burial fiber cable from two Air Traffic Control and Landing Systems (ATCOLS) weather stations (Buildings 1201 and 1202) to the Air Traffic Control Tower (Building 1180). The fiber cable would be installed from Buildings 1201 to 1202 along the treeline, if possible, and would branch out to Building 1180 in order to replace the existing copper communications infrastructure.	Floodplain, Wetlands	36,800	No change

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Infrastructure Improvement Projects (continued)							
I23. Construct Building 372 Service Delivery Road	NVZR120093	2013	Housing	Construct a delivery service road and employee parking lot adjacent to Building 372 on the north side of the building. The delivery service road would allow for weekly linen service delivery and would prevent these service vehicles from driving on the lawn. The parking lot would provide parking for five service vehicles and would prevent the use of limited guest parking spaces by service vehicles.	Floodplain	15,419	+6,500
I24. Multiple Roadway Improvement Projects	NVZR100035 NVZR100033 NVZR100047 NVZR100036 NVZR100042 NVZR050254	2013	Housing, Community, Industrial, Administrative	Multiple roadway improvements, including extending SOCOM Memorial Drive, Zemke Avenue, and Great Egret Avenue. The aircraft wash rack would be relocated for the Great Egret Avenue extension. South Boundary Blvd would be widened and a 10,000-ft ² parking area would be constructed.	Floodplain, Wetlands	127,200	+84,800
I25. Repair Lift Station	NVZR060124	2014	Industrial	Repair Lift Station 1063. Replace piping from lift station to manhole G123 at the intersection of MacDill Avenue and Zemke Avenue. Lift Station 1063 errantly receives storm water in addition to sewage during rain events and is prone to overflow. The main reason for overflow is the restricted force main.	ERP, Floodplain	1,500	No change
I26. Install new Lift Station and Force Main	No project number assigned	2014	Industrial	Install new lift station and force main to permanently remove a portion of flow from Lift Station 22 within SOCOM. New station to be in area near the intersection of Zemke Avenue and South Boundary Boulevard and would receive all flows from the northern section of the installation. To replace project NVZR030240.	ERP, Floodplain	2,000	+2,000
I27. Reestablish Drainage Taxiway G	NVZR100191	2014	Airfield	Clean and reestablish drainage from northeast pavement edge to relieve high spots holding water at South Perimeter Road and Taxiway G shoulder (eastern side).	Floodplain	1,000	No change
I28. Repair Vince Drainage, Building 565	NVZR100167	2014	Administrative	Regrade the NW exit area of Building 565 as required to prevent water from accumulating.	ERP, Floodplain	3,000	No change

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Other Infrastructure Improvement Projects (continued)							
I29. Construct CENTCOM Parking Lot	NVZR100152	2014	Community Commercial	Construct a new 190,000-ft ² parking lot for Buildings 1045 and 1047 CENTOM personnel. Lot to be located north of Building 1045, south of Royal Tern Avenue, and east of Avocet Street.	SWMU 61, Floodplain	25,149	+190,000
I30. Construct Bike Paths/Lanes	NVZR100032	2015	Housing, Open Space, Administrative, Outdoor Recreation	Construct paved surfaces (1-mile path, 4 feet wide) along various primary routes to encourage bicycle usage and provide separation from vehicle traffic.	Floodplain	21,120	+21,120
I31. Repair Water Distribution System	NVZR090056	2015	Open Space, Community, Administrative	Repair/replace 16- to 20-inch water main from the Dale Mabry gate, along the northern boundary to near MacDill Gate. Repair water line near Building 153.	Airfield	15,675	No change
I32. Replace Cable 16	No project number assigned	2016	Administrative	Install and test copper cable infrastructure from Building P-40 (DCO) to Buildings 143, 149, 151, and 153.	Floodplain	894	No change
I33. Construct SATCOM Parking Lot, Building 1750	NVZR070098	2016	Administrative	Extend the parking area of Building 1750 to add 10 additional parking spaces.	Floodplain	2,952	+2,952
Total Square Feet						1,091,609	+628,050

Note: * = Denotes projects that include demolition of facilities.

Key:

ACM = asbestos-containing material
 AST = aboveground storage tank
 ATCOLS = Air Traffic Control and Landing Systems
 CENTCOM = U.S. Central Command
 CRB = constant run booster
 CZ = clear zone
 DCO = Data Collection Office
 DFSP = Defense Fuel Supply Point
 DISA = Defense Information Systems Agency
 EFH = essential fish habitat

ERP = Environmental Restoration Program
 FAMCAMP = family campground
 ft² = square feet
 FY = fiscal year
 GaRDS = gamma-ray detection system
 HEMP = high-altitude electromagnetic pulse
 HQ = headquarters
 ITN = Installation Transportation Network
 JCSE = Joint Communications Squad Element

MSA = Munitions Storage Area
 POV = privately operated vehicle
 QD = quantity-distance
 RV = recreational vehicle
 SATCOM = satellite communications
 SOCOM = U.S. Special Operations Command
 SWMU = Solid Waste Management Unit
 F&I = furnish and install

Table A-4. Proposed Natural Infrastructure Management Projects

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Selected Natural Infrastructure Management Project							
N11. Storm Water Drainage Improvement	NVZR080772, NVZR050269, NVZR100178, NVZR090053, NVZR040097, NVZR110027, NVZR090123, NVZR040198, NVZR090105, NVZR090097	2012 – 2016	Airfield, Housing, Industrial, Open Space	Remove excess sediment and vegetation and restore grades to storm water drainage ditches. Four ditches have sediment contaminated with VOCs, PAHs, and metals. Three of these ditches are adjacent or in near proximity to the airfield. Replace two storm water drainage pipes under Bayshore Boulevard near the pedestrian bridge across from the old military housing area (south of Youth Center). Dredge installation drainage ditches within the tank farm area. The north ditch is approximately 1,600 feet long; the south drainage is approximately 700 feet long. Repair/replace existing storm water drainage culverts at various locations (e.g., Marina Bay Drive, Southshore Avenue, North Golf Course Street, and Golf Course Avenue). Clean out the concrete culvert just north of the Waste Water Treatment Plant near Building 717. Clean, evaluate, and repair the joints of box culvert K-9 on the eastern end of Taxiway K to facilitate proper storm water drainage. Repair damaged reinforced concrete pipe and headwall (2,000 ft ²) near Bayshore Boulevard and CENTCOM Avenue. Repair headwall in the southern side of Taxiway G, west of the entry to Taxiway X (2,000 ft ²).	Airfield, ERP, Wetlands, Floodplain, Bald eagle nests, EFH, QD	184,156	No change
Other Natural Infrastructure Management Project							
N12. Airfield Tree Violations, MacDill	NVZR060078	2016	Airfield/Open Space	Remove trees within 1,000 feet of the centerline of the runway.	Wetlands, Floodplain	372,618	No change
Total Square Feet						556,774	No change

Key:

CENTCOM = U.S. Central Command
 EFH = essential fish habitat
 ERP = Environmental Restoration Program
 ft² = square feet

PAH = polynuclear aromatic hydrocarbons
 VOC = volatile organic compound
 QD = quantity distance

Table A-5. Proposed Strategic Sustainability Performance Project

Project Identification Number and Title	Installation Project Number	FY	Land Use	Description	Potential Constraints	Project Area (ft ²)	Change in Impervious Surface (ft ²)
Selected Strategic Sustainability Performance Project							
S1. Install Jogging Path Lighting	NVZR100079	2013	Open Space	Install solar-powered lights along Southshore Road from the intersection with North Golf Course Street (west) for a distance of 1.5 miles.	QD, Floodplain, Bald eagle nest, EFH	7,920	No change
Total Square Feet						7,920	No change

Key:

EFH = essential fish habitat

ft² = square feet

QD = quantity-distance

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APPENDIX B

**INTERAGENCY AND INTERGOVERNMENTAL COORDINATION
FOR ENVIRONMENTAL PLANNING (IICEP), NATIVE AMERICAN TRIBAL
CONSULTATION, AND PUBLIC INVOLVEMENT CORRESPONDENCE**



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR MOBILITY COMMAND

MEMORANDUM FOR DISTRIBUTION

FROM: HQ AMC/A7P

507 Symington Drive
Scott AFB IL 62225-5022

SUBJECT: Environmental Assessment of Installation Development at MacDill Air Force Base (AFB), Florida

1. Headquarters Air Mobility Command, on behalf of the 6th Air Mobility Wing at MacDill AFB, Florida, has initiated an Environmental Assessment of Installation Development (IDEA) addressing selected projects from those programmed and reasonably foreseeable installation development projects identified for the next 5 fiscal years (FYs), FY2012 to FY2017. MacDill AFB seeks to improve its understanding of the potential environmental consequences associated with the continuing process of installation development by evaluating selected projects in a single Environmental Assessment. The projects analyzed in this IDEA fall under five categories: demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects.

2. In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and solicit comments on the attached Draft Environmental Assessment for this Proposed Action. Also enclosed is a copy of the distribution list of other Federal, state, and local agencies to be contacted regarding this Proposed Action. If you feel there are any additional individuals who should review and comment on the proposal, please feel free to include them in your distribution of this letter and the attached materials.

3. Please provide any comments or information within 45 days of receipt of this correspondence to HQ AMC/A7PI, 507 Symington Drive, Scott AFB, Illinois, 62225-5022.

4. If your staff has any questions, our point of contact is Ms. Jean Reynolds, HQ AMC/A7PI, (618) 229-0843, or email to jean.reynolds-02@us.af.mil.

BRIAN C. MURPHY, Colonel, USAF
Chief, Programs Division
Directorate of Installations & Mission Support

Attachment:
Draft Environmental Assessment

DISTRIBUTION:
See Attached

AMC - GLOBAL REACH FOR AMERICA



**DEPARTMENT OF THE AIR FORCE
6TH AIR MOBILITY WING (AMC)
MACDILL AIR FORCE BASE, FLORIDA**

OCT 24 2012

MEMORANDUM FOR DIVISION OF HISTORIC RESOURCES

ATTN: MR. ROBERT F. BENDUS
R.A. GRAY BUILDING
500 SOUTH BRONOUGH STREET
TALLAHASSEE, FL 32399-0250

FROM: 6 CES/CL

7621 Hillsborough Loop Drive
MacDill AFB 33621-5207

SUBJECT: Request for Concurrence on a No Adverse Effect Determination for the Installation Development Plan, MacDill Air Force Base (AFB)

1. In accordance with the provisions of 36 CFR 800.4(d)(1), MacDill AFB determines that the actions proposed in its Installation Development Plan (IDP) will have no adverse effects to historic properties, and requests Florida State Historic Preservation Office (SHPO) concurrence.

2. The documentation required to support this finding, as specified in 36 CFR 800.11(d), are contained in Atch 1, an assessment prepared to evaluate the environmental (including historical properties) consequences associated with implementation of a five year development plan at the base. It describes all of the projects planned for implementation from 2012 to 2017, with the base itself as the area of potential effect.

3. As noted in Atch 1, MacDill completed several historic property surveys which evaluated the significance of facilities constructed on the base through 1965. The only architectural resources currently determined eligible for the National Register are the World War II era facilities associated with the original development of the base. As noted in the documentation, the IDP projects will not affect these resources.

4. None of the proposed IDP projects are located within the boundaries of the five identified archaeological sites on MacDill AFB; consequently no adverse impacts to archaeological resources are expected through their implementation. It is unlikely that the IDP projects would result in the inadvertent discovery of archaeological resources. However, if such occurs, appropriate response procedures in the MacDill Integrated Cultural Resources Management Plan would be engaged in concert with your office. The need for further archaeological inventory at the base was discounted in 1988, after documented coordination with the SHPO (Atch 2).

5. MacDill AFB will continue to accomplish individual Section 106 consultation for any future projects, whether described in the IDP or otherwise, that involve architectural or archaeological resources considered potential eligible for the National Register. Our point of contact for this

UNRIVALED GLOBAL REACH FOR AMERICA...ALWAYS!

action is Mr. Jason Kirkpatrick at (813) 828-0459. We look forward to your response and to further coordination with the Florida SHPO in regard to MacDill's cultural resources.



ROBERT B. HUGHES, GS-14
Director, 6th Civil Engineer Squadron

Attachments

1. IDP EA (36 CFR 800.11(d) documentation)
2. SHPO Letter Dated 21 April 1988

4 • The Tampa Tribune • TBO.com • 813-259-7900 • Tuesday, August 21, 2012 • TBO.com/tbo

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Legal announcements**LEGAL NOTICES**

NOTICE
On August 14, 2012, an application was tendered for filing with the FCC to assign the license of FM translator station W288AU, Zolfo Springs, FL, from Reach Communications, Inc. to Acme Media, LLC. W288AU rebroadcasts station WWSB, Cypress Quarters, FL at 107.7 MHz on output channel 298 and operates with a transmitter output power of 5.194 kW from Highway 27, 5.6 km south of Zolfo Springs, FL. 813/2012

LEGAL NOTICES

PUBLIC NOTICE, United States Attorney

Notice of Availability

Draft Environmental Assessment (EA) of Installation Development at

MacDill Air Force Base (AFB), Florida

The lead contractor Air Mobility Command, in coordination with MacDill AFB, has completed a Draft EA that evaluates the potential effects of Installation Development at MacDill AFB, Florida.

The analysis contained in detail the potential environmental effects of the Proposed Action and alternative. The results, as listed in the EA, show that the Proposed Action would not have a adverse impact on the environment, including that a Finding of No Significant Impact (FONSI) or Finding of No Potential for Significant Impact (FONSI) would be appropriate. An Environmental Impact Statement should not be necessary to implement the Proposed Action.

Copies of the Draft EA showing the analysis are available for review at the following libraries:

Tampa/Hillsborough County Public Library

996 North Ashley Drive

Tampa, Florida 33605

University of Tampa Mott Library

401 West Kennedy Boulevard

Tampa, Florida 33605

Written comments on the Draft EA are invited and will be accepted for 45 days from the publication of this action.

Comments for consideration by the USAF on this document should be provided for writing to:

6 AMW Public Affairs

329 Hanger Lane Drive, Suite 14

MacDill AFB, FL 33633-0881

Phone: (813) 438-2315

813/2012

LEGAL NOTICES

NOTICE

On August 14, 2012, an application was tendered for filing with the FCC to assign the license of FM translator station W288AM (Arcadia, FL, from Reach Communications, Inc. to Acme Media, LLC. W288AM rebroadcasts station WWSB, Cypress Quarters, FL at 104.5 MHz on output channel 293 and operates with a transmitter output power of 5.098 kW from 1159 NW Livingston St., Arcadia, FL. 813/2012

LEGAL NOTICES

PUBLIC NOTICE, United States Attorney

Notice of Availability

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6 AMW Public Affairs

329 Hanger Lane Drive, Suite 14

MacDill AFB, FL 33633-0881

Phone: (813) 438-2315

813/2012

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DEPARTMENT OF THE AIR FORCE
6TH AIR MOBILITY WING (AMC)
MACDILL AIR FORCE BASE, FLORIDA

AUG 07 2012

MEMORANDUM FOR US FISH AND WILDLIFE SERVICE
NORTH FLORIDA ECOLOGICAL SERVICES FIELD OFFICE
ATTN: MR. DAVE HANKLA
7915 BAYMEADOWS WAY, STE 200
JACKSONVILLE FL 32256

FROM: 6 CES/CL
7621 Hillsborough Loop Dr
MacDill AFB FL 33621

SUBJECT: Environmental Assessment of Installation Development

1. The 6th Air Mobility Wing at MacDill AFB, Florida, has initiated an Environmental Assessment of Installation Development (IDEA) addressing selected projects from those programmed and reasonably foreseeable installation development projects identified for the next five fiscal years (FYs), FY12-17. The projects analyzed in this IDEA fall under five categories: demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance.
2. In accordance with Section 7 of the Endangered Species Act, MacDill AFB is requesting concurrence for a *no adverse effect determination* for the proposed implementation of the selected installation development projects at MacDill AFB in Hillsborough County, Florida.
3. It has been determined that four federally protected species have the potential to use portions of MacDill AFB, including the federally endangered Florida manatee (*Trichechus manatus latirostris*), least tern (*Sterna antillarum*), wood stork (*Mycteria americana*), and the federally threatened piping plover (*Charadrius melodus*).
4. All four of these species have been observed on MacDill AFB in recent years; however, none of the proposed projects would occur within habitat areas utilized by these species. The Florida manatee is known to occur along the southern shoreline, particularly within the deep water areas such as Raccoon Creek and the dredged marina channel and basin. The least tern and piping plover both predominantly occur along the sandy areas of the eastern and southern shoreline. These areas are identified in Figure 3-2 in the attached IDEA as areas where concentrations of avian species are known to occur. The wood stork, like many other wading bird species observed on the installation, also frequently occur within the ditches or wetlands throughout the base, particularly the southern portion.
5. No projects are proposed to occur in areas where the Florida manatee has the potential to occur. Furthermore, none of the projects described in the IDEA would directly affect habitat areas utilized by federally protected species. There are no known nesting colonies on MacDill, so none of the proposed projects would disturb nesting bird colonies. A few projects would

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occur in areas adjacent to habitat utilized by federally protected bird species; particularly the wood stork. However, avian species are highly mobile and typically move away from any type of construction or disturbance, relocating to another area of suitable, similar habitat somewhere else on the base. Given these circumstances, MacDill AFB has determined that activities associated with projects described in the IDEA would have *no adverse effect* on the Florida manatee, least tern, wood stork, and piping plover.

6. We are requesting concurrence from the U.S. Fish and Wildlife Service (USFWS) that the proposed projects listed in Tables 2-1, 2-2, 2-3, 2-4, and 2-5 of the attached IDEA would have *no adverse effect* on the Florida manatee, least tern, wood stork, or piping plover.

7. We also request your concurrence with our determination and your review of, and any comments on, the attached Draft Environmental Assessment for this Proposed Action. We have enclosed a copy of the distribution list for the other Federal, state, and local agencies we intend to contact regarding the projects analyzed in the IDEA. If you feel there are any additional individuals that should review and comment on the proposal, please feel free to include them in your distribution of this letter and the attached materials.

8. Please provide any comments or information within 45 days of the receipt of this correspondence to:

6 CES/DD
7621 Hillsborough Loop Dr
MacDill AFB, FL 33621

9. If your staff has any questions, our point-of-contact is Mr. Jason Kirkpatrick, 6 CES/CEVN, (813) 828-0459, or email to jason.kirkpatrick.2.ctr@us.af.mil.



ROBERT B. HUGHES, GS-14
Director, 6th Civil Engineer Squadron

Attachment:
Environmental Assessment



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIRMOBILITY COMMAND

Interagency and Intergovernmental Coordination for Environmental Planning Distribution List

Florida State Clearing House
Ms. Lauren P. Milligan
3900 Commonwealth Boulevard MS 47
Tallahassee, Florida 32399-3000

NOAA Fisheries Service
Southeastern Regional Office
Mr. Mark Sramek
263 13th Avenue South
St. Petersburg, Florida 33701-5505

Florida Division of Historical Resources
Compliance Review Section
Attn: Laura Kammerer, Deputy SHPO
or Attn: Scott Edwards, Historic Preservationist
500 South Bronough Street
Tallahassee, Florida 32399-0250

U.S. Army Corps of Engineers
Jacksonville District
Mr. Charles Schnepel
10117 Princess Palm Avenue, Suite 120
Tampa, Florida, 33610-8300

U.S. Fish and Wildlife Service
Mr. Dave Hankla
7915 Baymeadows Way, Suite 200
Jacksonville, FL 32256-7517

AMC—GLOBAL REACH FOR AMERICA



DEPARTMENT OF THE AIR FORCE
6TH AIR MOBILITY WING (AMC)
MACDILL AIR FORCE BASE, FLORIDA

MAY 24 2012

MEMORANDUM FOR MICCOSUKEE BUSINESS COMMUNITY
ATTN: MR FRED DAYHOFF
P.O. BOX 440021 – TAMiami STATION
MIAMI FL 33144

FROM: 6 AMW/CC
8208 Hangar Loop Dr, Ste 1
MacDill AFB FL 33621

SUBJECT: Environmental Assessment of Installation Development (IDEA)

1. MacDill AFB and the Headquarters Air Mobility Command (HQ AMC) are preparing an Environmental Assessment of Installation Development (IDEA). The IDEA evaluates MacDill-approved community plans for installation development and resource management for fiscal years 2012-2017. These projects provide for development of the installation to accommodate future mission and facility requirements. They consider development constraints, opportunities, and land-use relationships. The projects analyzed in this IDEA fall under four categories: demolition, construction, infrastructure improvement, and natural infrastructure management

2. In furtherance of Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, MacDill is providing you this IDEA to update you on potential projects occurring on the base. I request your participation by reviewing the attached Draft IDEA and providing comments. I understand that a written comment from the Miccosukee Tribe is not likely to occur however, your input on this action is important to us. Please provide any comments or information regarding the action no later than 60 days of the receipt of this correspondence, when the public comment period has ended and preparation on the Final EA will commence.

3. My point of contact for this analysis is Ms. Jean Reynolds, HQ AMC/A7PI, (618) 229-0843, or email jean.reynolds@us.af.mil. Issues concerning other tribal matters should be referred to the MacDill AFB Cultural Resources Manager, Mr. Jason Kirkpatrick, 6 CES/CEVN, (813) 828-0459, or email jason.kirkpatrick.2.ctr@us.af.mil. Thank you for your support of this effort.


LENNY J. RICHOUX, Colonel, USAF
Commander

Attachment:
Draft Environmental Assessment

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DEPARTMENT OF THE AIR FORCE
6TH AIR MOBILITY WING (AMC)
MACDILL AIR FORCE BASE, FLORIDA

MAY 24 2012

MEMORANDUM FOR AH-TAH-THI-KI-MUSEUM
ATTN: MR RICK TRNKA
HC61 BOX 21A
CLEWISTON FL 33440

FROM: 6 AMW/CC
8208 Hangar Loop Dr, Ste 1
MacDill AFB FL 33621

SUBJECT: Environmental Assessment of Installation Development (IDEA)

1. MacDill AFB and the Headquarters Air Mobility Command (HQ AMC) are preparing an Environmental Assessment of Installation Development (IDEA). The IDEA evaluates MacDill-approved community plans for installation development and resource management for fiscal years 2012-2017. These projects provide for development of the installation to accommodate future mission and facility requirements. They consider development constraints, opportunities, and land-use relationships. The projects analyzed in this IDEA fall under four categories: demolition, construction, infrastructure improvement, and natural infrastructure management.
2. In furtherance of Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, MacDill is providing you this IDEA to update you on potential projects occurring on the base. I request your participation by reviewing the attached Draft IDEA and providing comments. Please provide any comments or information regarding the action no later than 60 days of the receipt of this correspondence, when the public comment period has ended and preparation on the Final EA will commence.
3. My point of contact for this analysis is Ms. Jean Reynolds, HQ AMC/A7PI, (618) 229-0843, or email jean.reynolds@us.af.mil. Issues concerning other tribal matters should be referred to the MacDill AFB Cultural Resources Manager, Mr. Jason Kirkpatrick, 6 CES/CEVN, (813) 828-0459, or email jason.kirkpatrick.2.ctr@us.af.mil. Thank you for your support of this effort.

LENNY J. RICHOUX, Colonel, USAF
Commander

Attachment:
Draft Environmental Assessment

UNRIVALED GLOBAL REACH FOR AMERICA...ALWAYS!



United States Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

7915 BAYMEADOWS WAY, SUITE 200
JACKSONVILLE, FLORIDA 32256-7517

(S) REPLY REFER TO:

FWS Log Nos. 41910-2013-I-0031

December 17, 2012

Mr. Robert Moore, Deputy Director
6 CES/DD
Department of the Air Force
7621 Hillsborough Loop Drive
MacDill Air Force Base, Florida 33621-5207
(Attn: Jason Kirkpatrick)

cc M 9 JAN 13
DD ROM 9 JAN 13
CEE _____
CEV _____
received
7 JAN 13

Re: Review of Installation Draft Environmental Assessment (IDEA): Installation Development, MacDill Air Force Base (MacDill AFB), Hillsborough County, Florida

Dear Mr. Moore:

Our office has reviewed subject DEA, dated August 2012 and accompanying letter dated August 7, 2012. The document provides an analysis of installation development projects proposed to occur over the next five fiscal years (2012 – 2017), and an assessment of the degree of effects those actions may have on the general environment within and adjacent to the installation. The general category of actions include demolition, new construction, physical infrastructure improvements, natural infrastructure improvements (natural, historic, environmental, and socioeconomic resources), and strategic sustainability performance actions (environment, energy, and economics). We provide the following comments in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*), and National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*).

Endangered Species Act

MacDill AFB completed an updated endangered species population survey in 2005. Species identified within the terrestrial and aquatic boundaries of the facility include the threatened loggerhead (*Caretta caretta*) and endangered green (*Chelonia mydas*) sea turtles, endangered wood stork (*Mycteria americana*) and threatened piping plover (*Charadrius melodus*), and endangered West Indian (Florida) manatee (*Trichechus manatus latirostris*). The threatened roseate tern (*Sterna dougallii*) was also listed, but a review of historic and current literature does not include any credible sighting records of migrating individuals within Hillsborough County. The endangered Bachman's warbler (*Vermivora bachmanii*) was last observed in the United States in 1962, with no credible sightings since that time. The least tern (*Sternula antillarum*) is not Federally listed in Florida, while the threatened eastern indigo snake (EIS) (*Drymarchon corais couperi*) may occur within the installation boundaries, but has not been observed there. The gopher tortoise (*Gopherus polyphemus*) has recently been added to the current list of Federal candidate species for listing. Consideration of protective measures for candidate species is encouraged but not required under the ESA.

MacDill AFB has determined that the proposed activities associated with the projects described in the IDEA would have no adverse effects on the manatee, least tern, wood stork, and piping plover. The document also states that in the event one or more project-specific reviews reveal actions having potential adverse effects not previously considered or identified, to those or any other federally listed species found to occur on the base, MacDill AFB would engage in formal or informal section 7 consultation with this office.

Based on a review of the IDEA, we concur with the initial determinations of effect for the manatee, wood stork, and piping plover. MacDill AFB did not make a determination on the eastern indigo snake. It is our view that the proposed projects have a greater chance of impacting this species, if present, than the other species for which a determination was provided. We therefore recommend that MacDill AFB consider potential impacts to the EIS in its final installation environmental assessment. We also recommend consideration be given to protecting the gopher tortoise to the maximum possible extent consistent with your mission and Integrated Natural Resource Management Plan (INRMP). We further advise you check with our office periodically for updates on the listing status of this species, as well as any other Federal protection and conservation measures that may be implemented in lieu of a species' listing.

Although this does not represent a biological opinion as described in section 7 of the Act, it does fulfill the requirements of the Act, and no further action is required. Changes to the proposed projects or potential adverse effects not initially considered, however, may increase the risk of adverse effects to a level at which take is reasonably certain to occur. MacDill AFB under such circumstances should consider seeking the assistance of this office to ascertain if additional section 7 consultation is needed.

National Environmental Policy Act

The IDEA proposes to protect and conserve all other natural resources, including Federal Trust Resources such as migratory birds and state-listed species and species of special concern, as part of the planning and implementation of projects identified in the IDEA. The degree to which such measures will be undertaken will be consistent with the base's mission and INRMP. We support this approach to the five-year development horizon for actions intended to ensure that the installation can sustain its current and future national security operations, and mission-readiness status. It is our view that by doing so, and maintaining close coordination with Federal and state natural resource agencies during this period, we would expect no significant direct, indirect, or cumulative impacts to natural resources resulting from the proposed actions.

We appreciate the opportunity to review and comment on the DEA. If you have any questions regarding this response, please contact Mr. John Milio of my staff at the address on the letterhead, by e-mail at john_milio@fws.gov, or by calling 904-731-3098.

Sincerely,

for David L. Hankla
Field Supervisor

From: [RIDER, ANDREW W CTR Contractor AMC 6 CES/CEVW](#)
To: [Rose, Jennifer A](#)
Subject: FW: Draft Environmental Assessment of Installation Development at MacDill AFB, Florida
Date: Thursday, September 13, 2012 8:18:41 AM

Response from NOAA NMFS.

//Signed//
Andy Rider, P.E., Contractor
IAP Worldwide Services
6 CES/CEV
Comm: 813-828-2718
DSN: 968-2718

Please visit CEV's internal website for information:
<https://els.af.mil/cs/eDASH/AMC/macdill/default.aspx>

"Commit to Serve, Commit to Conserve"

----- Original Message -----

From: Mark Sramek [<mailto:mark.sramek@noaa.gov>]
Sent: Thursday, September 13, 2012 8:16 AM
To: jean.reynolds-02@us.af.mil
Cc: RIDER, ANDREW W CTR Contractor AMC 6 CES/CEVW; KIRKPATRICK, JASON W CTR Contractor AMC 6 CES/CEVN
Subject: Draft Environmental Assessment of Installation Development at MacDill AFB, Florida

NOAA's National Marine Fisheries Service, Southeast Region, Habitat Conservation Division, has reviewed the subject Department of Defense, U. S. Air Force Draft Environmental Assessment (EA) of Installation Development at MacDill Air Force Base, Florida, dated August 2012. The Proposed Action is to implement a range of selected projects, such as demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovations, utilities upgrades, community living upgrades, infrastructure improvement, recreational upgrades, natural infrastructure management, and other environmental project among those proposed to be completed or implemented between Fiscal Years 2012 through 2017. From our review of the EA, we anticipate any adverse effects that might occur on marine and anadromous fishery resources would be minimal from the proposed activities and facility improvements identified in the EA.



Florida Department of Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Rick Smith
Governor
Jonnie Carroll
Lt. Governor
Gregory E. Vining
Secretary

October 12, 2012

Ms. Jean Reynolds
Department of the Air Force
HQ AMC/A7PI
507 Symington Drive
Scott AFB, IL 62225-5022

RE: Department of the Air Force - Draft Environmental Assessment of Installation
Development at MacDill Air Force Base - Hillsborough County, Florida.
SAI # FL201208226342C

Dear Ms. Reynolds:

The Florida State Clearinghouse has coordinated a review of the Draft Environmental Assessment (EA) under the following authorities: Presidential Executive Order 12372; § 403.061(42), *Florida Statutes*; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Department of State (DOS) has reviewed Sections 3.7 and 4.3.7 of the Draft EA and advises that these cultural resource sections do not accurately reflect the agency's past and current comments or adequately address cultural resources. Since archaeological sites may be present, DOS requests that the proposed project areas be subjected to a professional reconnaissance survey with judgmental testing to locate and assess any cultural resources present in the property. The resultant survey report must conform to the specifications set forth in Chapter 1A-46, *Florida Administrative Code*, and be forwarded to the DOS Division of Historical Resources to complete the state review process. If significant finds are located, the report data and conclusions will assist the DOS in determining measures that must be taken to avoid, minimize or mitigate adverse impacts to archaeological sites and historical properties. In addition, the DOS recommends that the buildings scheduled for demolition be subjected to a professional historical and architectural resource survey to assess the significance of historic buildings and structures present. Please refer to the enclosed DOS letter for further information.

The Southwest Florida Water Management District (SWFWMD) notes that there are several projects proposed in the Draft EA located on sites with existing stormwater or Environmental Resource Permits. For permitted sites, a formal or short form permit

OPTIONAL FORM NO. 10
5010-108-01

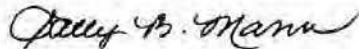
Ms. Jean Reynolds
October 12, 2012
Page 2 of 2

modification will be needed to remain in compliance with the state's regulatory requirements. Since Tampa Bay does not meet state water quality standards for dissolved oxygen or chlorophyll *a* concentration guidelines related to nutrient loads, net improvement of stormwater quality will be required. Although wetland mitigation is not required for impacts to upland-cut ditches, construction plans should include details regarding the total acreage of surface waters within project boundaries and quantify the proposed impacts of culvert installation or structure removal within these waterbodies. Best management practices for erosion and turbidity control during demolition and construction activities should be depicted on site plans during the permitting process. Please refer to the enclosed SWFWMD memorandum for additional detailed comments and recommendations.

Based on the information contained in the Draft EA and enclosed agency comments, the state has determined that, at this stage, the proposed federal activities are consistent with the Florida Coastal Management Program (FCMP). To ensure the project's continued consistency with the FCMP, the concerns identified by our reviewing agencies must be addressed prior to project implementation. The state's continued concurrence will be based on the activities' compliance with FCMP authorities, including federal and state monitoring of the activities to ensure their continued conformance, and the adequate resolution of issues identified during this and subsequent regulatory reviews. The state's final concurrence of the project's consistency with the FCMP will be determined during the environmental permitting process, in accordance with Section 373.428, *Florida Statutes*.

Thank you for the opportunity to review this proposal. Should you have any questions regarding this letter, please contact Ms. Lauren P. Milligan at (850) 245-2170.

Yours sincerely,



Sally B. Mann, Director
Office of Intergovernmental Programs

SBM/rb
Enclosures

cc: Scott Edwards, DOS
Rand Frahm, SWFWMD
Charles Kovach, DEP, Southwest District



Florida

Department of Environmental Protection

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Project Information	
Project:	FL201208226342C
Comments Due:	10/01/2012
Letter Due:	10/21/2012
Description:	DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT OF INSTALLATION DEVELOPMENT AT MACDILL AIR FORCE BASE - HILLSBOROUGH COUNTY, FLORIDA
Keywords:	USAF - DEA, INSTALLATION DEVELOPMENT AT MACDILL AFB - HILLSBOROUGH CO.
CFDA #:	12.200
Agency Comments:	
ENVIRONMENTAL PROTECTION - FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION	
The DEP Southwest District Office notes that the U.S. Air Force should coordinate with the Southwest Florida Water Management District to ensure compliance with the state's environmental resource permitting requirements.	
STATE - FLORIDA DEPARTMENT OF STATE	
The DOS has reviewed Sections 3.7 and 4.3.7 of the Draft EA and advises that these cultural resource sections do not accurately reflect the agency's past and current comments or adequately address cultural resources. Since archaeological sites may be present, DOS requests that the proposed project areas be subjected to a professional reconnaissance survey with judgmental testing to locate and assess any cultural resources present in the property. The resultant survey report must conform to the specifications set forth in Chapter 1A-46, F.A.C., and be forwarded to the DOS Division of Historical Resources to complete the state review process. If significant finds are located, the report data and conclusions will assist the DOS in determining measures that must be taken to avoid, minimize or mitigate adverse impacts to archaeological sites and historical properties. In addition, the DOS recommends that the buildings scheduled for demolition be subjected to a professional historical and architectural resource survey to assess the significance of historic buildings and structures present.	
SOUTHWEST FLORIDA WMD - SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT	
The SWFWMD notes that there are several projects proposed in the Draft EA located on sites with existing stormwater or environmental resource permits. For permitted sites, a formal or short form permit modification will be needed to remain in compliance with the state's regulatory requirements. Since Tampa Bay does not meet state water quality standards for dissolved oxygen or chlorophyll a concentration guidelines related to nutrient loads, net improvement of stormwater quality will be required. Although wetland mitigation is not required for impacts to upland-cut ditches, construction plans should include details regarding the total acreage of surface waters within project boundaries and quantify the proposed impacts of culvert installation or structure removal within these waterbodies. Best management practices for erosion and turbidity control during all demolition and construction activities should also be depicted on site plans during the permitting process. Please refer to the enclosed SWFWMD memorandum for further detailed comments and recommendations.	
FISH and WILDLIFE COMMISSION - FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION	
FWC staff has reviewed the document and indicates that no comments or recommendations are needed from the FWC at this time.	
TRANSPORTATION - FLORIDA DEPARTMENT OF TRANSPORTATION	
FDOT, District 7 has no comments.	
TAMPA BAY RPC - TAMPA BAY REGIONAL PLANNING COUNCIL	
No Comments	
HILLSBOROUGH - HILLSBOROUGH COUNTY	
No Comments	



FLORIDA DEPARTMENT of STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Ms. Lauren P. Milligan
Environmental Manager
Florida State Clearinghouse
Florida Department of Environmental Protection
3900 Commonwealth Boulevard, Mail Station 47
Tallahassee, Florida 32399-3000

RECEIVED
SEP 04 2012
F.C.M.P.

August 30, 2012

RE: DHR Project File Number: 2012-3948
SAI #: 201208226342C
U.S. Department of the Air Force
Draft Environmental Assessment of Installation Development at MacDill Air Force Base
MacDill Air Force Base, Hillsborough County

Dear Ms. Milligan:

Our office reviewed the referenced project for possible impact to historic properties listed, or eligible for listing, in the *National Register of Historic Places*, or otherwise of historical, architectural or archaeological value. The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended and 36 *CFR Part 800: Protection of Historic Properties* and the implementing state regulations.

We have reviewed the Sections 3.7 and 4.3.7 of the referenced document that deals with cultural resources and do not concur with the findings. The sections do not accurately reflect our past and current comments or adequately address cultural resources.

Since archaeological sites may be present, it is the request of this office that the proposed project areas be subjected to a professional reconnaissance survey with judgmental testing. The purpose of this survey will be to locate and assess any cultural resources that may be present in the subject property. The resultant survey report must conform to the specification set forth in Chapter 1A-46, *Florida Administrative Code*, and will need to be forwarded to *The Division of Historical Resources* in order to complete the reviewing process for this proposed project and its impacts. The results of the analysis will determine if significant cultural resources would be disturbed by this development. In addition, if significant remains are located, the data described in the report and the consultant's conclusions will assist this office in determining measures that must be taken to avoid, minimize, or mitigate adverse impacts to archaeological sites and historical properties listed, or eligible for listing in the NRHP, or otherwise significant

This office recommends that the buildings scheduled for demolition be subjected to a professional historical and architectural resource survey. The purpose of this survey will be to assess the significance of historic buildings and structures present. The resultant report should conform to the specifications set forth in Chapter 1A-46, *Florida Administrative Code*. The results of the survey are to be forwarded to this office for review and comment on the findings.



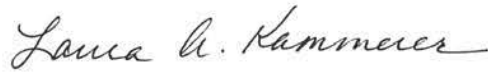
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Ms. Milligan
DHR No.:2012-3948
August 30, 2012
Page 2 of 2

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservationist, by electronic mail scott.edwards@dos.myflorida.com, or at 850.245.6333 or 800.847.7278.

Sincerely,

A handwritten signature in cursive script that reads "Laura A. Kammerer". The signature is written in dark ink and is positioned above the printed name and title.

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance



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Southwest Florida Water Management District

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170 Century Boulevard
Bartow, Florida 33830-7700
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Sarasota Service Office
6750 Fruitville Road
Sarasota, Florida 34240-9711
(941) 377-3722 or
1-800-320-3503 (FL only)

Tampa Service Office
7601 U.S. 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or
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Vacant
Polk
Blake C. Quillory
Executive Director

October 2, 2012

Ms. Lauren Milligan
Florida State Clearinghouse
Office of Intergovernmental Programs
Department of Environmental Protection
3900 Commonwealth Blvd. MS 47
Tallahassee, Florida 32399-3000

Subject: DEPARTMENT OF THE AIR FORCE - DRAFT ENVIRONMENTAL ASSESSMENT OF
INSTALLATION DEVELOPMENT AR MACDILL AIR FORCE BASE - HILLSBOROUGH
COUNTY, FLORIDA

SAIH#: FL201208226342C

Dear Ms. Milligan:

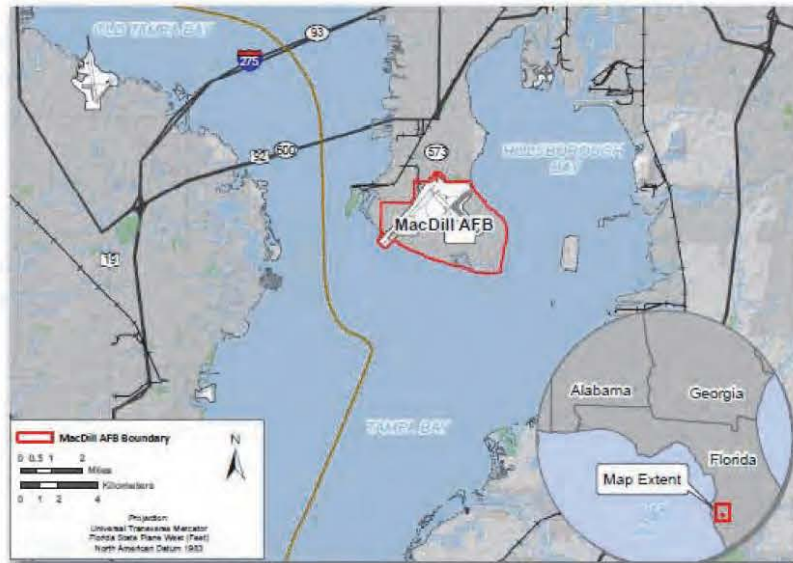
The staff of the Southwest Florida Water Management District (District) has conducted a consistency evaluation for the project referenced above. Consistency findings are divided into four categories and are based solely on the information provided in the subject application.

FINDING	CATEGORY
	Consistent/No Comment
X	Consistent/Comments Attached
	Inconsistent/Comments Attached
	Consistency Cannot be Determined Without an Environmental Assessment Report/Comments Attached

This review does not constitute permit approval under Chapter 373, Florida Statutes, or any rules promulgated thereunder, nor does it stand in lieu of normal permitting procedures in accordance with Florida Statutes and District rules. If I can be of further assistance, please contact me in the District's Planning Department at extension 4423.

Sincerely,

Jason M. Mickel
Senior Planner

**Location Map****Summary**

Project Name / Number MacDill AFB IDEA Review 2012	SAI#: FL201208226342C
Location Various Sites as indicated through the report	
County Hillsborough	Review Period 8/22/2012 to 10/1/2012

Abstract:

MacDill AFB uses numerous 6 AMW-approved development plans to project installation development requirements. These plans propose demolition, construction, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects intended to ensure that the installation can sustain its current and future national security operations and mission-readiness status. These projects include installation development projects contained in the MacDill AFB Installation Development Plan, Base Comprehensive Asset Management Plan, and the community of all other existing Wing-approved development and resource plans. MacDill AFB seeks to improve its



understanding of the potential environmental consequences associated with the continuing installation development process by evaluating in a single environmental assessment (EA) selected projects from those projects proposed in the 6 AMW-approved community of plans for installation development, called the Installation Development EA (IDEA). The Proposed Action is to implement a range of selected projects, such as demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, community living upgrades, infrastructure improvement, recreational upgrades, natural infrastructure management, and other environmental projects that would be among those proposed to be completed or implemented during the next 5 years (from Fiscal Year [FY] 2012 to FY 2017). The IDEA uses a fenceline-to-fenceline approach, capturing and addressing in some form identified projects within the installation boundary that have been proposed by host and tenant agencies in accordance with Interservice Support Agreements. The intent of the IDEA is to address the Proposed Action of implementing installation development actions for continuing development on MacDill AFB to ensure that future mission and facility requirements are met. The scope of the IDEA includes a detailed analysis of the selected projects, an evaluation of alternatives to selected projects in various categories, and an analysis of the cumulative effects on the natural and man-made environment of all other identified projects from the installation development and resource management plans.

Through the IDEA, MacDill AFB provides a constraints-based environmental impact analysis of installation development actions for projects selected from those projected over the next 5 FYs and thus help to identify environmental concerns that could exist throughout the installation and those unique to specific areas of the installation. The analysis draws from the knowledge gained from extensive recent evaluations for similar types of projects to determine the direct, indirect, and cumulative effects of projects that would be completed as part of the installation's development.

The IDEA has been prepared to evaluate the Proposed Action and alternatives, including the No Action Alternative. Resources that were considered in the impacts analysis are noise, land use, air quality, geological resources, water resources, biological resources, cultural resources, socioeconomic resources and environmental justice, infrastructure, hazardous materials and waste management, and safety.

Written comments and inquiries regarding this document should be directed to the 6 AMW Public Affairs, 8209 Hangar Loop Drive, Suite 14, MacDill AFB, FL 33621-5502. Telephone calls can be directed to 813-828-2215. Anyone wishing to provide comments on this document should contact the 6 AMW Public Affairs Office within 45 days from the publication of the Notice of Availability.

General Permitting Comments:

MacDill AFB has a long history of permitting through both the Southwest Florida Water Management District (SWFWMD) and the Florida Department of Environmental Protection (FDEP). During the review of the *Environmental Assessment of Installation Development at MacDill Air Force Base, Florida (August 2012)* report by District staff it was noted there are several projects projected to occur between Fiscal Year (FY) 2012 and FY2017 are located on sites with existing MSSW or ERP permits. For permitted sites a formal or short form permit modification will be needed to remain in compliance with the permit associated with the site. Please note there may have been some rule changes associated with permitting since some of the buildings and sites were constructed so modifications to the sites may require bringing the site into compliance with the permitting rules as they are currently defined.

General Engineering Comments (as provided by David Kramer PE):

According to the Florida Department of Environmental Protection (DEP), Tampa Bay does not meet the State's dissolved oxygen standards or chlorophyll concentration guidelines with nutrients being the cause. Since the Tampa Bay Estuary Program has pursued the Reasonable Assurance approach, Tampa Bay is designated as a Category 4b water body (impaired, but no TMDL required) rather than a Category 5 (impaired, needing TMDL), based on Integrated Reporting Classification of water bodies. According to DEP's determination that Tampa Bay does not currently meet water quality standards, net improvement is required. The applicant shall provide the greater of the presumptive treatment volume or the net improvement volume to meet minimum water quality requirements.

Tampa Bay is an infinite, tidal receiving water body. Any discharges directly to Tampa Bay do not require water quantity attenuation. Past practice has also been not to formally require water quantity attenuation on the majority of the Air Force Base property since the property is a peninsula surrounded by Tampa Bay on the south, east and west. Any increase in discharge rate and volume would likely only cause local impacts to Air Force Base property. There are exceptions on the northern property boundary, where attenuation would be required and discharges from the base have the potential to impact off-site property.

Additionally, the 100-year floodplain mapped on-site is mostly associated with a coastal flood surge. Past practice has been not to require floodplain compensation on the majority of the Air Force Base property since the property is a peninsula surrounded by Tampa Bay on the south, east and west. Furthermore, any impacts to flood features associated with a 100-year, 24-hour rainfall event would likely only cause local impacts to Air Force Base property. There are exceptions on the northern property boundary, where floodplain compensation (100-year, 24-hour rainfall event) would be required, where impacts have the potential to adversely affect off-site property.

Environmental Comments (as provided by Chastity Collins):

Throughout MacDill Air Force Base (AFB) there is a series of surface water ditches that are connected to Tampa Bay. Several of the projects proposed have the potential to impact these systems. While wetland mitigation is not required to offset impacts to drainage ditches constructed in uplands, construction plans and the application should include details regarding the acreage of the surface water located within the project boundaries and quantify the surface water impacts due to installation of culverts or the removal of structures from within the limits of these water bodies. In most cases, the top of bank (TOB) for these drainage ditches should be labeled as the SWFWMD Surface Water Line.

As noted in the MacDill AFB IDEA report there are approximately 1,195 acres of wetlands located within the boundaries of the base. Wetlands and surface water systems may have been delineated through an earlier permit; however, if they have not or the wetland line has expired a formal delineation or information wetland determination will be required. Review of the District's File of Record or review of the permitting layer within the District's ArcMap can help determine if a site may have a binding wetland line associated with it.

Demolition Projects (2.1.3):

An Environmental Resource Permit (ERP) is required for all site preparation work, whether it is linked to construction of a structure or just the removal of an existing structure. During permitting of these sites it is important to show details concerning the best management practices (BMPs) for the erosion control measures for the site. If the site has a surface water body located within its boundaries, floating



turbidity barriers are required to prevent the shoaling of water bodies outside of the project area. The projects specifically listed for review through this report do not appear to be within the vicinity of wetlands; however, special attention should be paid to the proposed staging areas to reduce wetland impacts, direct or secondary.

Construction Projects (2.1.4):

An Environmental Resource Permit (ERP) is required for construction work proposed on MacDill AFB; however, the type of permit required will depend upon the final design configuration. Of the six (6) construction projects detailed for review through this report, most are located on sites with existing buildings which will be removed as part of the construction or are additions to an existing building. Permitting on these sites all appear to be routine as they relate to the District requirements.

Project C3. Construct EOD Bunker Barricade may require additional efforts due to the wetlands within the vicinity. The existing entrance road to the EOD crosses the proposed project location for Project Site #24 of the ERP Conceptual Permit No. 49014123.063 Depending on the timeframe for these two projects there may be some additional wetland impacts related to the construction access.

Project C5. Construct Outdoor Recreation Facility is located near wetlands. During permitting a wetland delineation will be required since there isn't an existing binding wetland line for this site. A formal wetland determination maybe applied for prior to submitting the permit application for the building site. All wetland impacts will need to be assessed utilizing the Uniform Mitigation Assessment Method (UMAM) and wetland impacts will need to be offset either through onsite wetland mitigation or utilizing excess functional gain credits if available from other permitted sites.

Infrastructure Improvement Projects (2.1.5):

An Environmental Resource Permit (ERP) is required for construction work proposed on MacDill AFB; however, the type of permit required will depend upon the final design configuration. Sites with existing ERPs will require a modification to these permits accounting for the changes to the site and to meet the rule requirements.

Project I4. Construct Medical Clinic Sidewalks appears to meet the requirements of a District exemption as defined by Rule 40D-4.051(13)(a), F.A.C.: "Sidewalks adjacent to roadways that have a width of six feet or less and do not obstruct or impound surface waters."

Project I5. Replace Sludge Digester Tanks may have permitting conducted through FDEP per the Operating Agreement between SWFWMD and FDEP. Please contact DEP prior to submittal to determine if the SWFWMD or DEP should process this request.

Project I6. Construct DISA Parking Lot is located with several wetlands in close vicinity and may require additional permitting efforts if the proposed project area is extended beyond the cleared area, as shown in Figure 2-18.

Natural Infrastructure Management Projects (2.1.6):

Project NI1. Storm Water Drainage Improvements appears to meet the requirements for a maintenance exemption through the District. It is advised to set up a meeting with District staff prior to submitting the exemption request though to clearly define the limits of the work to prevent any issues that may arise during the review of the request.



Strategic Sustainability Performance Projects (2.1.7):

Project S1. Install Jogging Path Lighting appears to be in the vicinity of several wetlands; however, the installation of the lighting and electrical supply to these lights will most likely result in de minimis or temporary wetland impacts. These impacts will not require wetland mitigation to offset the impacts but it is advised to conduct an onsite inspection of the proposed locations prior to submitting the permit application to avoid wetland impacts.

Comments provided by the Surface Water Improvement and Management (SWIM) section:

The District, in cooperation with MacDill Air Force Base (AFB), completed two phases of restoration work in the 1990's and is in the process of implementing a third phase. One of the stipulations of the cooperative agreements was that the AFB would maintain the systems. These systems should be considered environmental constraints in evaluation of proposed projects at the AFB. These conservation areas are not completely represented in the draft Environmental Assessment report. Figure 2-22 has a category for "Wetland" which includes some of the conservation areas but there were upland restoration efforts included in this series of projects as well. Restoration efforts outside of the "Wetland" areas are not included in any of the existing categories on Figure 2-22. All of the restored areas should be shown as conservation lands on Figure 2-22.

Phase 3 of the District/AFB Restoration project includes natural system restoration within and adjacent to the Golf Course. Open channel intertidal connections are under construction and include marsh areas with littoral plantings in new channels but are also included in or adjacent to some existing channels. Section 2.1.6-Natural Infrastructure Management Projects identifies and discusses alternate ways to maintain drainage ditches. Removal of ditch vegetation and sediments by excavation, herbicide or by using geotextile or geoweb are applications discussed in the Environmental Assessment. These actions are counter to the practices proposed for the MacDill AFB Phase 3 Restoration project areas. Although none of the draft NI-1 projects conflict with the restoration or conservation areas, it is recommended that these areas be catalogued or identified so that Stormwater Drainage Improvements, now and in the future, do not occur without additional evaluation. Figures 5-1 and 5-3 are maps representing environmental constraints, which should also be updated to include District/AFB restoration efforts or conservation lands.



FLORIDA DEPARTMENT of STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Mr. Robert B. Hughes
Department of the Air Force
6 CES/CL
7621 Hillsborough Loop Drive
MacDill Air Force Base, Florida 33621-5207

February 6, 2013

RE: DHR Project File Number: 2012-3844-C
Additional Information for the Draft Environmental Assessment of Installation Development Plan for Facilities Proposed for Demolition, Renovations, and/or Additions
MacDill Air Force Base, Hillsborough County

Dear Mr. Hughes:

In response to our December 3, 2012 comments this office has reviewed the additional information on the referenced project for possible impact to historic properties listed, or eligible for listing, on the *National Register of Historic Places (NRHP)*. The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966 (NHPA)*, as amended, *36 CFR Part 800: Protection of Historic Properties* and the *National Environmental Policy Act of 1969 (NEPA)*, as amended.

The Installation Development Plan (IDP) consists of demolition, construction, infrastructure improvement and natural infrastructure management projects at MacDill Air Force Base. A total of fifty-six facilities will either be demolished, renovated or have an addition.

We note that Buildings 13, 27, 40, 46, 47, 60, 65, 82, 83, 85, 312, 373, 377, 378, 595, 821, 826, 827, 1069, 1101, 1132 and 1205 were previously evaluated by our office. It was the opinion of this office that the buildings do not appear to meet the criteria for listing on the *National Register*. We also concur that Buildings 108, 178, 295, 506A, 506E, 543, 1070, 1052, 1079, 1081, 1083, 1084, and 1144 do not appear to meet the criteria for listing on the *National Register*.

In addition, we have reviewed the submitted report "A Brief Evaluation of Cold War Facilities Proposed for Demolition, Renovations, and/or Addition under the Installation Development Plan" dated December 2012. The report evaluated Buildings 89, 119, 175, 189, 500, 510, 694, 848, 861, 863, 886, 1051, 1053, 1061, 1062, 1066, 1075, 1107, 1135, and 1161. We concur with your determination that the buildings do not appear to meet the criteria for listing on the *National Register*.

Finally, we note that Building 299 is not scheduled for demolition, renovation or addition and Building 540 has been reviewed by this office and mitigated.



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Mr. Hughes
DHR No. 2012-3844-C
February 6, 2013
Page 2 of 2

We note that none of the construction projects associated with the Draft EA are located in the area of potential effect of the documented archaeological sites. In the event of inadvertent discovery of archaeological materials, procedures outlined in Standard Operating Procedure 4 in the MacDill AFB ICRMP would be followed. No adverse effects on NRHP-eligible architectural resources would be expected from the selected projects under the NHPA and no significant impacts would be expected under NEPA. This office concurs with these findings.

We appreciate the sincere cooperation United State Air Force and your office have demonstrated. This office would also like to thank Jason Kirkpatrick on his consultation with our office and compliment him on the thoroughness of the materials sent.

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservationist, by electronic mail scott.edwards@dos.myflorida.com, or at 850.245.6333 or 800.847.7278.

Sincerely,

Timothy A. Parsons, DSHPO for

Robert F. Bendus, Director
Division of Historical Resources
and State Historic Preservation Officer

PC: Jason Kirkpatrick, MacDill AFB
Jean Reynolds, USAF

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APPENDIX C

**LIST OF FACILITIES ON MACDILL AFB AT OR APPROACHING 50 YEARS OLD
BY 2017 WITH NRHP ELIGIBILITY EVALUATIONS, SHPO CONCURRENCE, AND
ACHP PROGRAM COMMENTS**

Table C-1. List of Facilities on MacDill AFB 50 Years Old by 2017

Building Number	Structure Name	Construction Date	SHPO Concurrence
1	Hangar 1	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1993 HABS I
2	Hangar 2	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1993 HABS I
3	AASE/Base Operations	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1993 HABS III
4	Hangar 4	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1993 HABS III
5	NOAA	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1993 HABS
6	Joint Intelligence Center	1953	Not eligible for NRHP
6 T1	Joint Intelligence Center For	1953	Not eligible for NRHP
7	Def Mapping	1953	Not eligible for NRHP
8	Fire Station	1952	Not eligible for NRHP
8 S1	Fire Station - Shed	1952	Not eligible for NRHP
9	NOAA	1960	Not eligible for NRHP
9 S1	NOAA – Shed	1960	Not eligible for NRHP
11	Storage-CEMAS Warehouse	1941	NRHP Eligible as part of MacDill Field Historic District
12	CE Maintenance Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS I
13	USAF Communications System Maintenance	1954	Not eligible for NRHP
23	Gas Meter Facility	1940	Not eligible for NRHP
25	Photo Lab	1959	Not eligible for NRHP
26	Fire Station	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1994 HABS I
26 S1	Fire Station - Shed	1941	Not eligible for NRHP
26 S2	Fire Station - Shed	1941	Not eligible for NRHP
27	Airmans Attic/NAVTRANS	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS II

Building Number	Structure Name	Construction Date	SHPO Concurrence
28	6 SYS	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS II
29	Maintenance Shop-CE	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS II
29 S1	Maintenance Shop-CE - Shed	1941	Not eligible for NRHP
29 S2	Maintenance Shop-CE - Shed	1941	Not eligible for NRHP
29 S3	Maintenance Shop-CE - Shed	1941	Not eligible for NRHP
29 S5	Maintenance Shop-CE - Shed	1941	Not eligible for NRHP
29 S6	Maintenance Shop-CE - Shed	1941	Not eligible for NRHP
30	CE Administration	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1994 HABS I
31	Lock Smith Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
32	CE Maintenance Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
32 S1	CE Maintenance Shop - Shed	1941	Not eligible for NRHP
32 S2	CE Maintenance Shop - Shed	1941	Not eligible for NRHP
32 S3	CE Maintenance Shop - Shed	1941	Not eligible for NRHP
33	CE Maintenance Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
34	CE Pav/Grd Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
35	CE Maintenance Shop	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS II
36	Thrift Shop/CE	1953	Not eligible for NRHP
36 S1	Thrift Shop/CE - Shed	1953	Not eligible for NRHP
36 S2	Thrift Shop/CE - Shed	1953	Not eligible for NRHP
37	Water Tank Storage	1941	NRHP Eligible
37 WT	Water Tower		NRHP Eligible

Building Number	Structure Name	Construction Date	SHPO Concurrence
40	Telephone Communications Center	1951	Not eligible for NRHP. Facility 40 was constructed after that historic district's period of significance and does not share the functional theme of the district
40 S1	Telecommunications Center - Shed	1951	Not eligible for NRHP
40 S2	Telecommunications Center - Shed	1951	Not eligible for NRHP
41	Theater	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1994 HABS I
41 A	Theater	1941	NRHP Eligible as part of MacDill Field Historic District and individually, 1994 HABS I
42	Precision Measurement Equipment Laboratory	1942	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS II
45	Vehicle Fuel Storage	1942	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
46	Joint Combat Aquatic Training Center	1949	Not eligible for NRHP
47	Amn Bathhouse @ Shopette	1949	Not eligible for NRHP
48	Mobility, Base/Xpl	1967	See note #2.
49	Warehouse, Base-Room Base Supply	1953	Not eligible for NRHP
50	Utility Vault	1959	Not eligible for NRHP
52	TMA/BATO/AWACS	1954	Not eligible for NRHP
53	Operations Group	1954	Not eligible for NRHP
54	LG/Command Post/LSS	1954	Not eligible for NRHP
54 S1	LG/Command Post/LSS - Shed	1954	Not eligible for NRHP
55	JICS	1954	Not eligible for NRHP
57	AFCS Maintenance Facility	1951	Not eligible for NRHP
57 S1	AFCS Maintenance Facility - Shed	1951	Not eligible for NRHP
58	Utility Vault	1951	Not eligible for NRHP
60	6 SYS, Outdoor Recreation Program	1953	Not eligible for NRHP
60 P1	6 SYS, Outdoor Recreation Program	1953	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
64	Wastewater Treatment Building	1953	Not eligible for NRHP
65	MWR Offices	1959	Not eligible for NRHP
66	Wastewater Treatment Building	1953	Not eligible for NRHP
68	Storage Facility	1941	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
74	MWR Storage/Administration	1960	Not eligible for NRHP
75	Hydra Fuel Building	1954	Not eligible for NRHP
75 S1	Hydra Fuel Building - Shed	1954	Not eligible for NRHP
79	JCSE Survey Shop	1959	Not eligible for NRHP
79 S1	JCSE Survey Shop - Shed	1959	Not eligible for NRHP
79 S2	JCSE Survey Shop - Shed	1959	Not eligible for NRHP
82	Psychiatric Hospital (Originally Use Operations For AC & W Squadron)	1954	Not eligible for NRHP
83	Warehouse: Hospital Storage	1958	Not eligible for NRHP
85	Electric Panels	1954	Not eligible for NRHP
90	Education Center	1956	Not eligible for NRHP
92	LG Fuels	1957	Not eligible for NRHP
111	Storage Facility	1940	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
180	AASE Hazardous Storage	1953	Not eligible for NRHP
191	Electric Power Station Building	1966	See note #2.
200	SOCOM	1955	Not eligible for NRHP
250	Dormitory (120 Room)	1954	Not eligible for NRHP
251	Amn Dorm	1967	See note #2.
254	Amn Dorm	1967	See note #2.
258	Demo/Consol - Bldg 53 For ALS & FTAC	1967	See note #2.
297	6 MXS Survival Equip And 6 MSS	1943	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
347	Engineer Administration	1944	NRHP Eligible as part of SOQ Historic District, 1994 HABS III
369	Maintenance Shop-CE	1963	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
372	Dorm, Vaq	1959	Not eligible for NRHP
373	Mission Support Facility1	1959	Not eligible for NRHP
375	Dorm	1967	See note #2.
376	Dorm	1960	Not eligible for NRHP
376 P1	Dorm	1960	Not eligible for NRHP
377	Dorm	1960	Not eligible for NRHP
378	Dorm	1960	Not eligible for NRHP
379	Dorm	1960	Not eligible for NRHP
397	Officers Club	1941	Exempt from Section 106 Review
397 S1	Officers Club - Shed	1941	Exempt from Section 106 Review
401	Housing (Loop)	1941	NRHP Eligible as part of SOQ Historic District and individually, 1994 HABS I
402	Housing (Loop)	1941	NRHP Eligible as part of SOQ Historic District and individually, 1994 HABS I
403	Housing (Loop)	1941	NRHP Eligible as part of SOQ Historic District, 1994 HABS I
404	Housing (Loop)	1941	NRHP Eligible as part of SOQ Historic District and individually, 1994 HABS I
405	Housing (Loop)	1941	NRHP Eligible as part of SOQ Historic District and individually, 1994 HABS I
499	NCO Club	1959	Not eligible for NRHP
500	Auto Maintenance Shop	1967	Not eligible for NRHP
500 S1	Auto Maintenance Shop - Shed	1967	See note #2.
524	AGE Maintenance	1952	Not eligible for NRHP
551	Storage MS/LG	1959	Not eligible for NRHP
551 S1	Storage MS/LG - Shed	1959	Not eligible for NRHP
552	Storage Facility	1945	NRHP Eligible as part of MacDill Field Historic District, 1994 HABS III
552 S1	Age Maintenance - Shed	1942	Not eligible for NRHP
554	AGE Facility	1948	Not eligible for NRHP
595	Utility Vault (Originally Use Cable House)	1959	Not eligible for NRHP
600	Water Pump Station	1956	Not eligible for NRHP
665	Outdoor Recreation Program Facility, B665	1964	Not eligible for NRHP
665 S1	Maintenance Facility - Shed	1964	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
665 S2	Maintenance Facility - Cover	1964	Not eligible for NRHP
665 S3	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 S4	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 S5	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 S6	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 S7	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 S8	Maintenance Facility - Shed	1964	Not eligible for NRHP
665 T1	Maintenance Facility - Trailer	1964	Not eligible for NRHP
694	Electric Power Station	1966	Not eligible for NRHP
700	Explosive Ordnance Disposal	1959	Not eligible for NRHP
700 S1	Explosive Ordnance Disposal - Shed	1959	Not eligible for NRHP
700 S2	Explosive Ordnance Disposal - Shed	1959	Not eligible for NRHP
740	CE Maintenance Shop	1950	Not eligible for NRHP
740 P1	CE Maintenance Shop - Pavilion	1950	Not eligible for NRHP
740 S1	CE Maintenance Shop - Shed	1950	Not eligible for NRHP
740 S2	CE Maintenance Shop - Shed	1950	Not eligible for NRHP
740 S3	CE Maintenance Shop - Shed	1950	Not eligible for NRHP
769	GRE Facility	1950	Not eligible for NRHP
805	Communications Transmitter Receiver	1961	Not eligible for NRHP
805 S1	Communications Transmitter Receiver - Shed	1961	Not eligible for NRHP
809	Ammo Igloo	1942	Not eligible for NRHP
810	Ammo Igloo	1942	Not eligible for NRHP
811	Ammo Igloo	1942	Not eligible for NRHP
812	Ammo Igloo	1942	Not eligible for NRHP
813	Ammo Igloo	1942	Not eligible for NRHP
814	Ammo Igloo	1942	Not eligible for NRHP
815	Ammo Igloo	1942	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
817	Segregated Ammo	1942	Not eligible for NRHP
818	Ammo Igloo	1942	Not eligible for NRHP
819	Ammo Igloo	1942	Not eligible for NRHP
820	Ammo Igloo	1942	Not eligible for NRHP
821	Communications Maintenance (Original Use Ordnance Warehouse And Office)	1946	Not eligible for NRHP
821 S1	Communications Maintenance - Shed	1946	Not eligible for NRHP
824	Dog Kennel	1955	Not eligible for NRHP
825	Admin Munitions	1957	Not eligible for NRHP
825 S1	Admin Munitions - Shed	1957	Not eligible for NRHP
826	6 LSS/LGLOP	1965	Not eligible for NRHP
827	6 LSS/LGLOP	1965	Not eligible for NRHP
828	Aircraft Maintenance/Ctk	1964	Not eligible for NRHP
829	AWACS AGE Maintenance	1965	Not eligible for NRHP
830	Ammo Igloo1	1952	Not eligible for NRHP
831	Ammo Igloo1	1956	Not eligible for NRHP
832	Ammo Igloo1	1952	Not eligible for NRHP
833	Ammo Igloo1	1955	Not eligible for NRHP
834	Ammo Igloo1	1952	Not eligible for NRHP
835	Ammo Igloo1	1955	Not eligible for NRHP
836	Ammo Igloo1	1952	Not eligible for NRHP
837	Ammo Igloo1	1955	Not eligible for NRHP
838	Ammo Igloo1	1956	Not eligible for NRHP
839	Munitions Shop	1965	Not eligible for NRHP
840	Ammo Igloo1	1956	Not eligible for NRHP
843	Surveillance Shop	1956	Not eligible for NRHP
845	Inert Ammo Storage	1956	Not eligible for NRHP
846	Inert Ammo Storage	1956	Not eligible for NRHP
849	Ammo Igloo1	1955	Not eligible for NRHP
864	Entomology Chemical Storage	1943	Not eligible for NRHP
864 A	Entomology Chemical Storage	1943	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
864 HT	Entomology Chemical Storage	1943	Not eligible for NRHP
864 S1	Entomology Chemical Storage	1943	Not eligible for NRHP
865	Entomology-BE Maintenance Shop	1943	Not eligible for NRHP
865 T1	Entomology-BE Maintenance Shop	1943	Not eligible for NRHP
865 T2	Entomology-BE Maintenance Shop	1943	Not eligible for NRHP
865 T3	Entomology-BE Maintenance Shop	1943	Not eligible for NRHP
865 T4	Entomology-BE Maintenance Shop	1943	Not eligible for NRHP
866	Base Engineering Complex	1993	See note #2.
1064	Maintenance Shop-CE	1943	Not eligible for NRHP
1064 S1	Maintenance Shop-CE - Shed	1943	Not eligible for NRHP
1067	Liquid Oxygen Storage-LGS	1959	Not eligible for NRHP
1069	1 LRS/Ola FMSE Administration Office	1943	Not eligible for NRHP
1101	Liquid Fuels Lab	1959	Not eligible for NRHP
1102	DRMO Warehouse/Off	1944	Not eligible for NRHP
1105	CENTCOM/SOCCENT	1959	Not eligible for NRHP
1105 S1	CENTCOM/SOCCENT - Shed	1959	Not eligible for NRHP
1106	Wastewater Treatment Building	1960	Not eligible for NRHP
1110	DRMO Office	1963	Not eligible for NRHP
1119	Hazardous Storage-Base	1955	Not eligible for NRHP
1121 P1	Lab, Liquid Fuel A - Pavilion	1955	Not eligible for NRHP
1121 S1	Lab, Liquid Fuel A - Shed	1955	Not eligible for NRHP
1121 S2	Lab, Liquid Fuel A - Shed	1955	Not eligible for NRHP
1121 S4	Lab, Liquid Fuel A - Shed	1955	Not eligible for NRHP
1122	Fuel Plant Off	1952	Not eligible for NRHP
1124	Water Pump Station	1952	Not eligible for NRHP

Building Number	Structure Name	Construction Date	SHPO Concurrence
1132	Maintenance Facility (Original Use Power Energy Building)	1954	Not eligible for NRHP
1133	Communications Transmitter	1953	Not eligible for NRHP
1135	Electric Power Station	1966	Not eligible for NRHP
1137	6 AGS/LGGS	1966	See note #2.
1137 S1	6 AGS/LGGS - Shed	1966	Not eligible for NRHP
1138	6 CS Public Address Equipment	1960	Not eligible for NRHP
1141 A	Water Tank	1952	See note #2.
1182 S1	Lab, Liquid Fuel A - Shed	1955	Not eligible for NRHP
1205	CE Wastewater/Treatment	1962	Not eligible for NRHP
3105 A	CENTCOM/SOCCENT	1959	See note #2.
3105 B	CENTCOM/SOCCENT	1959	See note #2.
3105 C	CENTCOM/SOCCENT	1959	See note #2.
3105 D	CENTCOM/SOCCENT	1959	See note #2.

Sources: MAFB 2011c; MAFB 2012b

Notes:

1. According to the 2006 *Program Comment for World War II and Cold War Era (1939-1974) Ammunition Storage Facilities*, the USAF will complete an historic context and document representative examples of the storage facilities at three installations; these products will serve as mitigation for any future actions affecting ammunition storage facilities within the USAF inventory as a whole. No further evaluation is required.
2. All unevaluated buildings are considered to be eligible for listing on the National Register of Historic Places (NRHP) until a determination has been made.
3. Shading identifies buildings proposed for demolition as part of implementing the selected projects.

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APPENDIX D

AIR EMISSIONS CALCULATIONS

Summary	Summarizes total emissions by calendar year for other 2012 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2012 projects to regional emissions.

Air Emissions for Other 2012 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	10.814	1.349	4.500	0.873	0.709	0.688	1,250.654
Fugitive Dust	-	-	-	-	40.116	4.012	-
Haul Truck On-Road	6.662	4.817	19.577	0.525	7.923	2.060	1,686.730
Commuter	0.496	0.494	4.462	0.006	0.047	0.030	591.668
TOTAL	17.973	6.660	28.539	1.404	48.795	6.789	3,529.053

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	3,200.851	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00142%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000059%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2012 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2012 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
17.973	6.660	28.539	1.404	48.795	6.789	
0.010%	0.005%	0.004%	0.001%	0.063%	0.033%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction		Area Disturbed	
12.) C8. Construct Visitor's Quarters Phase I and II		225,000 ft ²	
13.) C9. Construct Storage Facility		61,734 ft ²	
14.) C10. Construct Fitness Assessment Cell Running Track		276,469 ft ²	
Demolition Activities			
17.) D5. Demolish Building 1135		694 ft ²	
18.) D6. Demolish Building 540 and 543		190,284 ft ²	
19.) D7. Demolish Building 1144		192 ft ²	
20.) D8. Demolish Building 595		96 ft ²	
21.) D9. Demolish Building 826 and 827		6,112 ft ²	
25.) C8. Construct Visitor's Quarters Phase I and II - Demo		69,802 ft ²	
Paving Activities			
C8. Parking for Visitor's Quarters Phase I and II		80,000 ft ²	Assumed 80,000 SF for parking area
27.) I7. Construct SOCCOM Garage		204,000 ft ²	
28.) I8. Repair FAMCAMP Electrical Distribution System		0 ft ²	
29.) I9. Install HEMP Shelter Generator Fuel Tank, Building 541		36 ft ²	
30.) I10. F&I WWTP Effluent Pumping Station		500 ft ²	
31.) I11. Gravity Sewer Installation and Repair		33,240 ft ²	
Total Building Construction Area:	563,203 ft ²		All Building Construction Projects
	12.93 acres		
Total Demolition Area:	267,180 ft ²		All Demolition Projects
	6.13 acres		
Total Pavement Area:	317,776 ft ²		
	7.30 acres		
Total Disturbed Area:	1,148,159 ft ²		All 2012 Projects
	26.36 acres		
Construction Duration:	12 months		
Annual Construction Activity:	240 days		Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	3	124.924	7.731	47.130	10.348	7.637	7.407	14824.579
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			61.163					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	1,148,159	26.36	6	(from "Grading" worksheet)
Paving:	317,776	7.30	35	
Demolition:	267,180	6.13	307	
Building Construction:	563,203	12.93	240	
Architectural Coating	563,203	12.93	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	749.54	46.39	282.78	62.09	45.82	44.44	88,947
Paving	1,587.86	91.20	650.25	137.40	97.16	94.25	196,838
Demolition	9,764.93	578.85	3,863.22	793.56	590.42	572.71	1,136,844
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	1,230.73	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	21,628.92	2,698.32	8,999.30	1,745.99	1,418.56	1,376.00	2,501,308

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	21,628.92	2,698.32	8,999.30	1,745.99	1,418.56	1,376.00	2,501,308
Total Project Emissions (tons)	10.814	1.349	4.500	0.873	0.709	0.688	1,250.654

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	7.30 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	19.06 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	36.767	18.384	3.677	1.838
General Construction Activities	43.464	21.732	4.346	2.173
Total	80.231	40.116	8.023	4.012

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 26.36 acres/yr (from Combustion Worksheet)
Qty Equipment: 8.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	26.36	3.29
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	26.36	12.89
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	13.18	13.29
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	13.18	5.45
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	26.36	9.24
TOTAL								44.17

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 44.17
Qty Equipment: 8.00
Grading days/yr: 5.52

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	39,582 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	118,747 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	250,312 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	11,769 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	187,734 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	11,769 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	30996 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	13324.885	9634.917	39154.661	1049.591	15846.363	4120.464	3373460.876
tons	6.662	4.817	19.577	0.525	7.923	2.060	1686.730

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 150 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	991.592	987.107	8923.777	11.637	93.937	59.164	1183336.936
tons	0.496	0.494	4.462	0.006	0.047	0.030	591.668

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I1 to regional emissions.

Air Emissions for Project I1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.771	0.378	2.103	0.378	0.342	0.332	541.024
Fugitive Dust	-	-	-	-	2.435	0.244	-
Haul Truck On-Road	0.535	0.387	1.572	0.042	0.636	0.165	135.467
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	5.389	0.847	4.419	0.421	3.421	0.746	775.102

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	703.018	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00031%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000013%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I1

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.389	0.847	4.419	0.421	3.421	0.746	
0.003%	0.001%	0.001%	0.0003%	0.004%	0.004%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) I1. CENTCOM Parking Garage Site Preparation; Construct CENTCOM Parking Garage		89,397 ft ²	Assume 15% (FY12) and 75% (FY 13) area disturbed for construction
2.) I1. Pavement		1,650 ft ²	
Total Construction Area:		89,397 ft ²	
		2.05 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		1,650 ft ²	
		0.04 acres	
Total Disturbed Area:		25,650 ft ²	Garage footprint is 160,000 SF; 15% cosntructed FY2012.
		0.59 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	25,650	0.59	1	(from "Grading" worksheet)
Paving:	1,650	0.04	1	
Demolition:	0	0.00	0	
Building Construction:	89,397	2.05	240	
Architectural Coating:		0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	45.37	2.61	18.58	3.93	2.78	2.69	5,624
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	9,542.12	756.34	4,206.04	755.30	684.29	663.76	1,082,048

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,542.12	756.34	4,206.04	755.30	684.29	663.76	1,082,048
Total Project Emissions (tons)	4.771	0.378	2.103	0.378	0.342	0.332	541.024

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.04 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	2.05 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.191	0.095	0.019	0.010
General Construction Activities	4.679	2.340	0.468	0.234
Total	4.870	2.435	0.487	0.244

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.59 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.59	0.07
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.59	0.29
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.29	0.30
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.29	0.12
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.59	0.21
TOTAL								0.99

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.99
Qty Equipment: 3.00
Grading days/yr: 0.33

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	39,732 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	61 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	9,933 cubic yards	Construction area multiplied by 3 feet (parking garage).
Amount of Paving Materials =	61 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	2489 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1070.164	773.811	3144.635	84.296	1272.672	330.928	270933.318
tons	0.535	0.387	1.572	0.042	0.636	0.165	135.467

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I1b
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I1b to regional emissions.

Air Emissions for Project I1b

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.019	0.392	2.204	0.399	0.357	0.347	571.615
Fugitive Dust	-	-	-	-	5.673	0.567	-
Haul Truck On-Road	0.148	0.107	0.435	0.012	0.176	0.046	37.518
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
2012+ Busing Workers	0.201	0.145	0.590	0.016	0.239	0.062	50.790
TOTAL	5.450	0.727	3.972	0.427	6.453	1.027	758.535

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	687.991	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00030%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000013%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I1b is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I1b

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
5.450	0.727	3.972	0.427	6.453	1.027
0.003%	0.001%	0.001%	0.0003%	0.008%	0.005%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) I1. Construct Stormwater Retention Ponds for Parking Areas.		12,500 ft ²	Assume large stormwater retention area of 100 ft. by 100 ft. and smaller area of 50 ft. by 50 ft.
2.) I1. Pavement for 330 vehicle surface parking lot		92,400 ft ²	Assumed each space and manuever area is approx. 8 ft. by 35 ft.
			Assume 100% of construction conducted in FY12.
Total Construction Area:		12,500 ft ² 0.29 acres	
Total Demolition Area:		0 ft ² 0.00 acres	
Total Pavement Area:		92,400 ft ² 2.12 acres	
Total Disturbed Area:		116,400 ft ² 2.67 acres	Garage footprint is 160,000 SF; 15% cosntructed FY2012.
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days
Grading:	116,400	2.67	2
Paving:	92,400	2.12	11
Demolition:	0	0.00	0
Building Construction:	12,500	0.29	240
Architectural Coating:		0.00	0

(from "Grading" worksheet)

(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	83.28	5.15	31.42	6.90	5.09	4.94	9,883
Paving	499.04	28.66	204.36	43.18	30.54	29.62	61,864
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	10,037.44	784.97	4,407.54	798.01	714.60	693.16	1,143,229

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	10,037.44	784.97	4,407.54	798.01	714.60	693.16	1,143,229
Total Project Emissions (tons)	5.019	0.392	2.204	0.399	0.357	0.347	571.615

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	2.12 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.29 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	10.691	5.345	1.069	0.535
General Construction Activities	0.654	0.327	0.065	0.033
Total	11.345	5.673	1.135	0.567

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 2.67 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	2.67	0.33
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	2.67	1.31
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	1.34	1.35
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	1.34	0.55
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	2.67	0.94
TOTAL								4.48

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 4.48
Qty Equipment: 3.00
Grading days/yr: 1.49

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	5,556 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	3,422 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	1,389 cubic yards	Construction area multiplied by 3 feet (parking garage).
Amount of Paving Materials =	3,422 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	689 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	296.388	214.311	870.925	23.346	352.474	91.652	75036.586
tons	0.148	0.107	0.435	0.012	0.176	0.046	37.518

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Busing Worker Emissions

Emissions from busing workers from new parking area to other areas on the base are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Buses are classified as Heavy Duty Diesel Vehicles and emission factors for scenario year 2010 are used.

Assume 50 people per bus trip.

The average roundtrip distance for a base worker = 3.5 miles Based on estimated distance from NI1b lot and NI1 garage.
 Number of working days/yr = 250 days
 Number of workers (daily) = 1600 people

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	401.235	290.123	1179.012	31.605	477.160	124.074	101580.551
tons	0.201	0.145	0.590	0.016	0.239	0.062	50.790

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project NI1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project NI1 to regional emissions.

Air Emissions for Project NI1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	0.723	0.072	-
Haul Truck On-Road	0.022	0.016	0.065	0.002	0.026	0.007	5.567
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.076	0.050	0.370	0.004	0.753	0.082	47.483

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	43.067	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project NI1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project NI1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.076	0.050	0.370	0.004	0.753	0.082
0.00004%	0.00004%	0.00005%	0.000002%	0.001%	0.0004%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) NI1. Storm Water Drainage Improvements		27,623 ft ²	Assume 15% for FY12 and 21.25% for FY13 - FY 16 area disturbed for construction Total area is 184,156 SF.
Total Construction Area:		0 ft ² 0.00 acres	
Total Demolition Area:		0 ft ² 0.00 acres	
Total Pavement Area:		0 ft ² 0.00 acres	
Total Disturbed Area:		27,623 ft ² 0.63 acres	Line 1
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	27,623	0.63	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.63 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	1.446	0.723	0.145	0.072
Total	1.446	0.723	0.145	0.072

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.63 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.63	0.08
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.63	0.31
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.32	0.32
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.32	0.13
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.63	0.22
TOTAL								1.06

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.06
Qty Equipment: 3.00
Grading days/yr: 0.35

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	2,046 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	102 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	43.981	31.802	129.238	3.464	52.304	13.600	11134.760
tons	0.022	0.016	0.065	0.002	0.026	0.007	5.567

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for other 2013 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2013 projects to regional emissions.

Air Emissions for Other 2013 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.710	1.015	2.474	0.455	0.400	0.388	651.694
Fugitive Dust	-	-	-	-	20.687	2.069	-
Haul Truck On-Road	4.456	3.222	13.095	0.351	5.300	1.378	1,128.227
Commuter	0.496	0.494	4.462	0.006	0.047	0.030	591.668
TOTAL	10.663	4.731	20.031	0.812	26.434	3.864	2,371.590

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	2,151.032	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00095%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000040%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2013 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2013 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
10.663	4.731	20.031	0.812	26.434	3.864	
0.006%	0.003%	0.003%	0.000%	0.034%	0.019%	

Regional Emissions
Emissions
% of Regional

Combustion EmissionsCombustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

Building Construction Activities		Area Disturbed
1.) C12. Construct JCSE Paint Facility		5,500 ft ²
2.) C13. Construct CE Storage Area, Building 293		400 ft ²
3.) C14. Construct Dorm Area Recreational Courts		21,800 ft ²
4.) C15. Construct Obstacle Course		57,600 ft ²
5.) C16. Construct Recreational Pavilion Dorm Area		1,200 ft ²
6.) C17. Construct AGE Canopies, Building 552		21,000 ft ²
7.) C18. Construct Medical Group Storage Facility		4,500 ft ²
8.) C19. Construct SFS Training Pad		2,500 ft ²
9.) C20. Education Center Addition		4,000 ft ³
11.) C22. NOAA AOC		161,051 ft ²
12.) C23. Postal Service Center		10,000 ft ²
13.) C24. Construct Skeet Range Facility		2,000 ft ²
14.) C25. Renovate and Add to Surf's Edge Club, Building 499		4,400 ft ²
15.) C26. Construct EOD Addition, Building 108		1,620 ft ²
16.) C27. Construct Covered Parking Shelter		2,500 ft ²
17.) C28. Construct BOWST Building 295 Addition		1,296 ft ²
25.) I15. SOF Acquisition Center (Phase II) (SOCOM Parking Garage)		204,000 ft ²
Demolition Activities		
18.) D10. Demolish Building 821		4,121 ft ²
19.) D11. Demolish Buildings 1101 and 1161		17,093 ft ²
20.) D12. Demolish Building 189		5,600 ft ²
Paving Activities		
C21. Miscellaneous MSA Upgrades - Paving		9,312 ft ²
C22. NOAA AOC - Aircraft Apron		40,500 ft ²
28.) I18. Install Vehicle Entry Gate and Concrete Pavement Roadway, Building 105		5,004 ft ²
I20. Widen Road to Accommodate Rapidscan GaRDS System; Port Tampa Gate Improvements		6,690 ft ²
I23. Construct Building 372 Service Delivery Road		15,419 ft ⁵
Infrastructure Construction Activities		
22.) I12. Repair Secondary Electrical Distribution		15,789 ft ²
23.) I13. Replace Cables 25/1180-1079.		4,800 ft ²
24.) I14. Install Fiber Optic Connectivity between ITN 49 and ITN 1750 (SATCOM)		1,000 ft ²
26.) I16. Repair SOCCOM SE Gate Entrance		1,000 ft ²
27.) I17. Install Fire Hydrants, MSA		25,200 ft ²
29.) I19. Repair DFSP Fire Hydrant System; Repair DFSP Overhead Electrical Distribution		3,250 ft ²
31.) I21. New Constant Run Booster and Automated Chlorine Feed		400 ft ³
32.) I22. Direct Bury Communication Infrastructure		36,800 ft ⁴

Assume sf is 50% for FY13 and 50% FY15

Total Building Construction Area:	505,367 ft ² 11.60 acres	All Building Construction Projects
Total Demolition Area:	26,814 ft ² 0.62 acres	All Demolition Projects
Total Pavement Area:	76,925 ft ² 1.77 acres	
Total Disturbed Area:	697,345 ft ² 16.01 acres	All 2013 Projects
Construction Duration:	12 months	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0
Emission factors are taken from the NONROAD model and were provided to e2M by Larry Landman of the Air Quality and Modeling Center
(Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.
Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Reqd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
	2	83.282	5.154	31.420	6.899	5.091	4.938	9883.053
Grading Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Paving Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Demolition Equipment	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Building Construction	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Air Compressor for Architectural Coating			57.938					
Architectural Coating**								

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**En Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	697,345	16.01	6	(from "Grading" worksheet)
Paving:	76,925	1.77	9	
Demolition:	26,814	0.62	31	
Building Construction:	505,367	11.60	240	
Architectural Coating	505,367	11.60	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	499.69	30.92	188.52	41.39	30.55	29.63	59,298
Paving	408.31	23.45	167.21	35.33	24.98	24.24	50,616
Demolition	986.03	58.45	390.10	80.13	59.62	57.83	114,795
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	1,166.22	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	11,420.63	2,030.20	4,948.88	909.80	800.31	776.30	1,303,387

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	11,420.63	2,030.20	4,948.88	909.80	800.31	776.30	1,303,387
Total Project Emissions (tons)	5.710	1.015	2.474	0.455	0.400	0.388	651.694

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	1.77 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	14.24 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	8.900	4.450	0.890	0.445
General Construction Activities	32.474	16.237	3.247	1.624
Total	41.374	20.687	4.137	2.069

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 16.01 acres/yr (from Combustion Worksheet)
Qty Equipment: 5.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	16.01	2.00
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	16.01	7.83
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	8.00	8.07
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	8.00	3.31
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	16.01	5.61
TOTAL								26.82

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 26.82
Qty Equipment: 5.00
Grading days/yr: 5.36

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	3,972 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	11,917 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	224,608 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	2,849 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	168,456 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	2,849 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	20733 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	8912.806	6444.644	26189.937	702.055	10599.383	2756.114	2256454.935
tons	4.456	3.222	13.095	0.351	5.300	1.378	1128.227

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 150 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	991.592	987.107	8923.777	11.637	93.937	59.164	1183336.936
tons	0.496	0.494	4.462	0.006	0.047	0.030	591.668

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C1 to regional emissions.

Air Emissions for Project C1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.052	0.523	2.217	0.401	0.360	0.349	574.113
Fugitive Dust	-	-	-	-	3.801	0.380	-
Haul Truck On-Road	0.278	0.201	0.818	0.022	0.331	0.086	70.490
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	5.413	0.807	3.779	0.424	4.500	0.820	743.214

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	674.096	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00030%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000012%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C1

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.413	0.807	3.779	0.424	4.500	0.820	
0.0031%	0.0006%	0.0005%	0.0003%	0.0058%	0.0039%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C1. Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Joint Combat Aquatic Training (JCAT) Center*		24,211 ft ²	Assume 50% area disturbed for FY13 and FY 14 construction
2.) C1. Pavement		52,301 ft ²	
3) C1. Demolition (pool, bathhouse)		5,403 ft ²	
Total Construction Area:		24,211 ft ²	
		0.56 acres	
Total Demolition Area:		5,403 ft ²	
		0.12 acres	
Total Pavement Area:		52,301 ft ²	
		1.20 acres	
Total Disturbed Area:		81,915 ft ²	
		1.88 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			12.681					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	81,915	1.88	2	(from "Grading" worksheet)
Paving:	52,301	1.20	6	
Demolition:	5,403	0.12	7	
Building Construction:	24,211	0.56	240	
Architectural Coating:	24,211	0.56	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	83.28	5.15	31.42	6.90	5.09	4.94	9,883
Paving	272.20	15.63	111.47	23.55	16.66	16.16	33,744
Demolition	222.65	13.20	88.09	18.09	13.46	13.06	25,922
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	261.09	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	10,104.74	1,046.23	4,434.04	801.49	720.37	698.76	1,148,227

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	10,104.74	1,046.23	4,434.04	801.49	720.37	698.76	1,148,227
Total Project Emissions (tons)	5.052	0.523	2.217	0.401	0.360	0.349	574.113

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	1.20 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.68 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	6.051	3.026	0.605	0.303
General Construction Activities	1.550	0.775	0.155	0.078
Total	7.601	3.801	0.760	0.380

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 1.88 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	1.88	0.24
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	1.88	0.92
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.94	0.95
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.94	0.39
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	1.88	0.66
TOTAL								3.15

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 3.15
Qty Equipment: 3.00
Grading days/yr: 1.05

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	800 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	2,401 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	10,760 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	1,937 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	8,070 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	1,937 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	1295 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	556.857	402.650	1636.303	43.863	662.232	172.197	140979.495
tons	0.278	0.201	0.818	0.022	0.331	0.086	70.490

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C2
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C2 to regional emissions.

Air Emissions for Project C2

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	6.289	0.615	2.712	0.504	0.435	0.422	722.114
Fugitive Dust	-	-	-	-	18.395	1.840	-
Haul Truck On-Road	0.738	0.534	2.170	0.058	0.878	0.228	186.957
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	7.110	1.231	5.626	0.563	19.716	2.495	1,007.683

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	913.968	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00040%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000017%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C2 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C2

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
7.110	1.231	5.626	0.563	19.716	2.495	
0.0040%	0.0009%	0.0008%	0.0003%	0.0255%	0.0120%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) C2. Construct Logistics Readiness Complex*		32,132 ft ²
2.) C2. Pavement		261,746 ft ²
3.) C2. Demolition Buildings 119, 175, 178, 500, and 510		41,059 ft ²
4.) C2. Site Improvements (SW Retention Pond, Green Space)		51,096 ft ²
Total Construction Area:		32,132 ft ² 0.74 acres
Total Demolition Area:		41,059 ft ² 0.94 acres
Total Pavement Area:		261,746 ft ² 6.01 acres
Total Disturbed Area:		386,033 ft ² 8.86 acres
Construction Duration:		12 months
Annual Construction Activity:		240 days
Assume 4 weeks per month, 5 days per week.		

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			14.609					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	386,033	8.86	5	(from "Grading" worksheet)
Paving:	261,746	6.01	29	
Demolition:	41,059	0.94	48	
Building Construction:	32,132	0.74	240	
Architectural Coating:	32,132	0.74	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	208.21	12.88	78.55	17.25	12.73	12.35	24,708
Paving	1,315.65	75.57	538.77	113.85	80.51	78.09	163,095
Demolition	1,526.76	90.50	604.02	124.07	92.31	89.54	177,748
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	299.65	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	12,577.22	1,229.76	5,424.41	1,008.11	870.70	844.58	1,444,228

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	12,577.22	1,229.76	5,424.41	1,008.11	870.70	844.58	1,444,228
Total Project Emissions (tons)	6.289	0.615	2.712	0.504	0.435	0.422	722.114

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	6.01 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	2.85 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	30.285	15.142	3.028	1.514
General Construction Activities	6.505	3.253	0.651	0.325
Total	36.790	18.395	3.679	1.840

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 8.86 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	8.86	1.11
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	8.86	4.33
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	4.43	4.47
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	4.43	1.83
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	8.86	3.11
TOTAL								14.85

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 14.85
Qty Equipment: 3.00
Grading days/yr: 4.95

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	6,083 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	18,248 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	14,281 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	9,694 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	10,711 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	9,694 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	3436 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1476.932	1067.935	4339.907	116.337	1756.413	456.713	373914.784
tons	0.738	0.534	2.170	0.058	0.878	0.228	186.957

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C2a
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C2a to regional emissions.

Air Emissions for Project C2a

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	6.675	0.638	2.865	0.536	0.459	0.445	767.170
Fugitive Dust	-	-	-	-	18.918	1.892	-
Haul Truck On-Road	0.866	0.626	2.544	0.068	1.030	0.268	219.205
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	7.624	1.346	6.153	0.605	20.415	2.609	1,084.987

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	984.083	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00044%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000018%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C2a is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C2a

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
7.624	1.346	6.153	0.605	20.415	2.609	
0.0043%	0.0010%	0.0008%	0.0004%	0.0264%	0.0125%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C2. Construct Logistics Readiness Complex*		32,132 ft ²	
2.) C2. Pavement		261,746 ft ²	
3.) C2. Demolition Buildings 119, 175, 178, 500, and 510, 3500		61,059 ft ²	Assumed 20,000 SF for Bldg. 3500
4.) C2. Site Improvements (SW Retention Pond, Green Space)		51,096 ft ²	
Total Construction Area:		32,132 ft ²	
		0.74 acres	
Total Demolition Area:		61,059 ft ²	
		1.40 acres	
Total Pavement Area:		261,746 ft ²	
		6.01 acres	
Total Disturbed Area:		406,033 ft ²	
		9.32 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e2M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			14.609					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	406,033	9.32	6	(from "Grading" worksheet)
Paving:	261,746	6.01	29	
Demolition:	61,059	1.40	71	
Building Construction:	32,132	0.74	240	
Architectural Coating:	32,132	0.74	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	249.85	15.46	94.26	20.70	15.27	14.81	29,649
Paving	1,315.65	75.57	538.77	113.85	80.51	78.09	163,095
Demolition	2,258.34	133.87	893.45	183.53	136.55	132.45	262,918
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	299.65	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	13,350.43	1,275.70	5,729.54	1,071.02	917.48	889.96	1,534,340

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	13,350.43	1,275.70	5,729.54	1,071.02	917.48	889.96	1,534,340
Total Project Emissions (tons)	6.675	0.638	2.865	0.536	0.459	0.445	767.170

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	6.01 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	3.31 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	30.285	15.142	3.028	1.514
General Construction Activities	7.552	3.776	0.755	0.378
Total	37.837	18.918	3.784	1.892

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 9.32 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	9.32	1.17
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	9.32	4.56
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	4.66	4.70
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	4.66	1.93
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	9.32	3.27
TOTAL								15.62

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 15.62
Qty Equipment: 3.00
Grading days/yr: 5.21

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	9,046 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	27,137 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	14,281 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	9,694 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	10,711 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	9,694 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	4028 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1731.684	1252.141	5088.486	136.403	2059.372	535.490	438410.372
tons	0.866	0.626	2.544	0.068	1.030	0.268	219.205

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C3
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C3 to regional emissions.

Air Emissions for Project C3

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.784	0.407	2.109	0.378	0.344	0.334	541.810
Fugitive Dust	-	-	-	-	0.028	0.003	-
Haul Truck On-Road	0.009	0.007	0.027	0.001	0.011	0.003	2.286
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	4.876	0.496	2.880	0.380	0.391	0.344	642.707

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	582.935	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00026%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000011%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C3 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C3

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
4.876	0.496	2.880	0.380	0.391	0.344	
0.0027%	0.0004%	0.0004%	0.0002%	0.0005%	0.0017%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) C3. Construct EOD Bunker Barricades		1,080 ft ²
Total Construction Area:		1,080 ft ²
		0.02 acres
Total Demolition Area:		0 ft ²
		0.00 acres
Total Pavement Area:		ft ²
		0.00 acres
Total Disturbed Area:		1,080 ft ²
		0.02 acres
Construction Duration:	12 months	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			2.678					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days
Grading:	1,080	0.02	1
Paving:	0	0.00	0
Demolition:	0	0.00	0
Building Construction:	1,080	0.02	240
Architectural Coating:	1,080	0.02	20

(from "Grading" worksheet)

(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	61.03	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	9,568.24	814.76	4,218.77	756.40	687.70	667.07	1,083,620

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,568.24	814.76	4,218.77	756.40	687.70	667.07	1,083,620
Total Project Emissions (tons)	4.784	0.407	2.109	0.378	0.344	0.334	541.810

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.02 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.057	0.028	0.006	0.003
Total	0.057	0.028	0.006	0.003

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.02 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.02	0.00
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.02	0.01
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.01	0.01
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.01	0.01
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.02	0.01
TOTAL								0.04

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.04
Qty Equipment: 3.00
Grading days/yr: 0.01

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	480 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	0 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	360 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	0 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	42 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	18.056	13.056	53.056	1.422	21.472	5.583	4571.125
tons	0.009	0.007	0.027	0.001	0.011	0.003	2.286

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

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lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C4
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C4 to regional emissions.

Air Emissions for Project C4

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.521	0.662	2.400	0.438	0.388	0.377	627.600
Fugitive Dust	-	-	-	-	3.246	0.325	-
Haul Truck On-Road	0.959	0.693	2.818	0.076	1.141	0.297	242.809
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	6.562	1.438	5.962	0.515	4.783	1.003	969.020

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	878.901	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00039%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000016%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C4 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C4

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
6.562	1.438	5.962	0.515	4.783	1.003	
0.0037%	0.0011%	0.0008%	0.0003%	0.0062%	0.0048%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C4. Construct Joint Special Operations University (JSOU)*	85,000 ft ²	3 story Bldg at 28,333 sf per floor	
2.) C4. Demolition Buildings 506A and 506E	39,027 ft ²		
Total Construction Area:	85,000 ft ²		
	1.95 acres		
Total Demolition Area:	39,027 ft ²		
	0.90 acres		
Total Pavement Area:	ft ²		
	0.00 acres		
Total Disturbed Area:	124,027 ft ²		
	2.85 acres		
Construction Duration:	12 months		
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.	

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			23.761					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days
Grading:	124,027	2.85	2
Paving:	0	0.00	0
Demolition:	39,027	0.90	45
Building Construction:	85,000	1.95	240
Architectural Coating:	85,000	1.95	20

(from "Grading" worksheet)

(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	83.28	5.15	31.42	6.90	5.09	4.94	9,883
Paving	-	-	-	-	-	-	0
Demolition	1,431.34	84.85	566.27	116.32	86.54	83.95	166,638
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	482.69	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	11,041.22	1,323.84	4,800.75	876.16	776.79	753.49	1,255,200

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	11,041.22	1,323.84	4,800.75	876.16	776.79	753.49	1,255,200
Total Project Emissions (tons)	5.521	0.662	2.400	0.438	0.388	0.377	627.600

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	2.85 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	6.492	3.246	0.649	0.325
Total	6.492	3.246	0.649	0.325

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 2.85 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	2.85	0.36
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	2.85	1.39
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	1.42	1.44
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	1.42	0.59
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	2.85	1.00
TOTAL								4.77

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 4.77
Qty Equipment: 3.00
Grading days/yr: 1.59

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	5,782 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	17,345 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	37,778 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	0 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	28,333 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	0 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	4462 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1918.150	1386.970	5636.409	151.091	2281.123	593.151	485617.917
tons	0.959	0.693	2.818	0.076	1.141	0.297	242.809

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project D1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks conducting debris removal from the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project D1 to regional emissions.

Air Emissions for Project D1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.196	0.012	0.077	0.016	0.012	0.011	22.838
Fugitive Dust	-	-	-	-	0.233	0.023	-
Haul Truck On-Road	0.014	0.010	0.042	0.001	0.017	0.004	3.581
Commuter	0.040	0.039	0.357	0.000	0.004	0.002	47.333
TOTAL	0.250	0.061	0.476	0.018	0.265	0.041	73.752

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	66.893	metric tons	
State of Florida's CO ₂ emissions =	227,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00003%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project D1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project D1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.250	0.061	0.476	0.018	0.265	0.041
0.00014%	0.00005%	0.00006%	0.00001%	0.00034%	0.00020%

Regional Emissions
Project Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) D1. Demolish Buildings 65, 82, 83, 85, and 1205		8,885 ft ²	Demolition is limited to building footprint
			Assume 50% area disturbed for FY13 and FY 14 construction
	Total Construction Area:	0 ft ²	
		0.00 acres	
	Total Demolition Area:	8,885 ft ²	
		0.20 acres	
	Total Pavement Area:	0 ft ²	
		0.00 acres	
	Total Disturbed Area:	8,885 ft ²	
		0.20 acres	
	Construction Duration:	12 months	
	Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	8,885	0.20	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	8,885	0.20	11	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	349.88	20.74	138.42	28.43	21.16	20.52	40,734
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	391.52	23.32	154.13	31.88	23.70	22.99	45,675

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	391.52	23.32	154.13	31.88	23.70	22.99	45,675
Total Project Emissions (tons)	0.196	0.012	0.077	0.016	0.012	0.011	22.838

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.20 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.465	0.233	0.047	0.023
Total	0.465	0.233	0.047	0.023

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.20 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.20	0.03
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.20	0.10
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.10	0.10
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.10	0.04
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.20	0.07
TOTAL								0.34

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.34
Qty Equipment: 3.00
Grading days/yr: 0.11

Haul Truck Emissions

Emissions from debris removal are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Debris Removal Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the disposal area is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Debris =	1,316 cubic yards	Square footage of building footprints to be demolished multiplied by 4 feet per floor
Number of trucks required =	66 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	28.292	20.457	83.134	2.229	33.645	8.749	7162.638
tons	0.014	0.010	0.042	0.001	0.017	0.004	3.581

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 12 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	79.327	78.969	713.902	0.931	7.515	4.733	94666.955
tons	0.040	0.039	0.357	0.000	0.004	0.002	47.333

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions by calendar year for Project D2
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks conducting debris removal from the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project D2 to regional emissions.

Air Emissions for Project D2

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.069	0.004	0.027	0.006	0.004	0.004	8.025
Fugitive Dust	-	-	-	-	0.064	0.006	-
Haul Truck On-Road	0.004	0.003	0.011	0.000	0.005	0.001	0.980
Commuter	0.040	0.039	0.357	0.000	0.004	0.002	47.333
TOTAL	0.112	0.046	0.395	0.006	0.076	0.014	56.339

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	51.099	metric tons	
State of Florida's CO ₂ emissions =	227,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project D2 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project D2

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.112	0.046	0.395	0.006	0.076	0.014
0.00006%	0.00003%	0.00005%	0.000004%	0.00010%	0.00007%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) D2. Demolish Building 1107		2,431 ft ²	Demolition is limited to building footprint
Total Construction Area:	0 ft ² 0.00 acres		
Total Demolition Area:	2,431 ft ² 0.06 acres	Line 1	
Total Pavement Area:	0 ft ² 0.00 acres		
Total Disturbed Area:	2,431 ft ² 0.06 acres	Line 1	
Construction Duration:	12 months		
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.	

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	2,431	0.06	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	2,431	0.06	3	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	95.42	5.66	37.75	7.75	5.77	5.60	11,109
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	137.06	8.23	53.46	11.20	8.32	8.07	16,051

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	137.06	8.23	53.46	11.20	8.32	8.07	16,051
Total Project Emissions (tons)	0.069	0.004	0.027	0.006	0.004	0.004	8.025

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.06 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.127	0.064	0.013	0.006
Total	0.127	0.064	0.013	0.006

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.06 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.06	0.01
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.06	0.03
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.03	0.03
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.03	0.01
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.06	0.02
TOTAL								0.09

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.09
Qty Equipment: 3.00
Grading days/yr: 0.03

Haul Truck Emissions

Emissions from debris removal are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Debris Removal Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the disposal area is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Debris =	360 cubic yards	Square footage of building footprints to be demolished multiplied by 4 feet per floor
Number of trucks required =	18 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	7.741	5.598	22.747	0.610	9.206	2.394	1959.860
tons	0.004	0.003	0.011	0.000	0.005	0.001	0.980

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 12 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	79.327	78.969	713.902	0.931	7.515	4.733	94666.955
tons	0.040	0.039	0.357	0.000	0.004	0.002	47.333

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions by calendar year for Project I1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I1 to regional emissions.

Air Emissions for Project I1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.815	0.381	2.120	0.381	0.345	0.334	546.307
Fugitive Dust	-	-	-	-	13.799	1.380	-
Haul Truck On-Road	1.377	0.995	4.045	0.108	1.637	0.426	348.523
Commuter	0.066	0.066	0.595	0.001	0.006	0.004	78.889
TOTAL	6.257	1.442	6.760	0.491	15.787	2.144	973.719

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	883.163	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00039%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000016%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I1

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
6.257	1.442	6.760	0.491	15.787	2.144	
0.004%	0.001%	0.001%	0.0003%	0.020%	0.010%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) I1. CENTCOM Parking Garage Site Preparation; Construct CENTCOM Parking Garage		506,584 ft ²	Assume 15% (FY12) and 75% (FY 13) area disturbed for construction
2.) I1. Pavement		9,350 ft ²	
Total Construction Area:		506,584 ft ²	
		11.63 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		9,350 ft ²	
		0.21 acres	
Total Disturbed Area:		145,350 ft ²	Garage footprint is 160,000 SF, four story structure; 85% constructed FY2013.
		3.34 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	145,350	3.34	2	(from "Grading" worksheet)
Paving:	9,350	0.21	2	
Demolition:	0	0.00	0	
Building Construction:	506,584	11.63	240	
Architectural Coating	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	83.28	5.15	31.42	6.90	5.09	4.94	9,883
Paving	90.73	5.21	37.16	7.85	5.55	5.39	11,248
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	9,629.13	761.52	4,240.33	762.67	689.61	668.93	1,092,614

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,629.13	761.52	4,240.33	762.67	689.61	668.93	1,092,614
Total Project Emissions (tons)	4.815	0.381	2.120	0.381	0.345	0.334	546.307

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.21 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	11.63 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	1.082	0.541	0.108	0.054
General Construction Activities	26.515	13.258	2.652	1.326
Total	27.597	13.799	2.760	1.380

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 3.34 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	3.34	0.42
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	3.34	1.63
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	1.67	1.68
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	1.67	0.69
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	3.34	1.17
TOTAL								5.59

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 5.59
Qty Equipment: 3.00
Grading days/yr: 1.86

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	71,111 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	346 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	56,287 cubic yards	Construction area multiplied by 3 feet (parking garage).
Amount of Paving Materials =	346 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	6405 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	2753.274	1990.829	8090.391	216.873	3274.279	851.397	697046.457
tons	1.377	0.995	4.045	0.108	1.637	0.426	348.523

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I2
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I2 to regional emissions.

Air Emissions for Project I2

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.112	0.006	0.045	0.010	0.007	0.007	13.719
Fugitive Dust	-	-	-	-	2.083	0.208	-
Haul Truck On-Road	0.029	0.021	0.084	0.002	0.034	0.009	7.256
Commuter	0.066	0.066	0.595	0.001	0.006	0.004	78.889
TOTAL	0.206	0.093	0.724	0.013	2.130	0.228	99.864

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	90.576	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00004%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000002%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I2 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I2

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.206	0.093	0.724	0.013	2.130	0.228
0.00012%	0.00007%	0.00010%	0.00001%	0.00275%	0.00109%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) I2. Straighten Marina Bay Drive		36,000 ft ²
Total Construction Area:	0 ft ²	
	0.00 acres	
Total Demolition Area:	0 ft ²	
	0.00 acres	
Total Pavement Area:	36,000 ft ²	
	0.83 acres	
Total Disturbed Area:	36,000 ft ²	
	0.83 acres	
Construction Duration:	12 month	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	36,000	0.83	1	(from "Grading" worksheet)
Paving:	36,000	0.83	4	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	181.47	10.42	74.31	15.70	11.10	10.77	22,496
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	223.11	13.00	90.02	19.15	13.65	13.24	27,437

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	223.11	13.00	90.02	19.15	13.65	13.24	27,437
Total Project Emissions (tons)	0.112	0.006	0.045	0.010	0.007	0.007	13.719

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.83 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.00 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	4.165	2.083	0.417	0.208
General Construction Activities	0.000	0.000	0.000	0.000
Total	4.165	2.083	0.417	0.208

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.83 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.83	0.10
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.83	0.40
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.41	0.42
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.41	0.17
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.83	0.29
TOTAL								1.38

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.38
Qty Equipment: 3.00
Grading days/yr: 0.46

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	0 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	1,333 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	0 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	1,333 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	133 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	57.319	41.446	168.430	4.515	68.166	17.725	14511.507
tons	0.029	0.021	0.084	0.002	0.034	0.009	7.256

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I3
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I3 to regional emissions.

Air Emissions for Project I3

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.180	0.010	0.073	0.015	0.011	0.011	22.155
Fugitive Dust	-	-	-	-	3.471	0.347	-
Haul Truck On-Road	0.048	0.035	0.140	0.004	0.057	0.015	12.093
Commuter	0.066	0.066	0.595	0.001	0.006	0.004	78.889
TOTAL	0.29	0.11	0.81	0.02	3.55	0.38	113.14

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	102.615	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00005%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000002%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I3 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I3

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.293	0.111	0.808	0.020	3.545	0.376
0.00017%	0.00008%	0.00011%	0.00001%	0.00459%	0.00181%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) I3. Construct Dining Facility Parking Lot		60,000 ft ²
Total Construction Area:	0 ft ²	
	0.00 acres	
Total Demolition Area:	0 ft ²	
	0.00 acres	
Total Pavement Area:	60,000 ft ²	
	1.38 acres	
Total Disturbed Area:	60,000 ft ²	
	1.38 acres	
Construction Duration:	12 month	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	60,000	1.38	1	(from "Grading" worksheet)
Paving:	60,000	1.38	7	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	317.57	18.24	130.05	27.48	19.43	18.85	39,368
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	359.21	20.82	145.76	30.93	21.98	21.32	44,309

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	359.21	20.82	145.76	30.93	21.98	21.32	44,309
Total Project Emissions (tons)	0.180	0.010	0.073	0.015	0.011	0.011	22.155

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency	0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	1.38 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.00 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	6.942	3.471	0.694	0.347
General Construction Activities	0.000	0.000	0.000	0.000
Total	6.942	3.471	0.694	0.347

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 1.38 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	1.38	0.17
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	1.38	0.67
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.69	0.69
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.69	0.28
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	1.38	0.48
TOTAL								2.31

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 2.31
Qty Equipment: 3.00
Grading days/yr: 0.77

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	0 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	2,222 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	0 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	2,222 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	222 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	95.532	69.077	280.717	7.525	113.610	29.541	24185.845
tons	0.048	0.035	0.140	0.004	0.057	0.015	12.093

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I4
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I4 to regional emissions.

Air Emissions for Project I4

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.044	0.003	0.017	0.004	0.003	0.003	5.283
Fugitive Dust	-	-	-	-	0.182	0.018	-
Haul Truck On-Road	0.003	0.002	0.007	0.000	0.003	0.001	0.635
Commuter	0.066	0.066	0.595	0.001	0.006	0.004	78.889
TOTAL	0.11	0.07	0.62	0.00	0.19	0.03	84.81

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	76.920	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00003%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I4 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I4

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.112	0.070	0.619	0.005	0.194	0.026
0.000063%	0.000052%	0.000084%	0.000003%	0.000251%	0.000123%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) I4. Construct Medical Clinic Sidewalks		3,150 ft ²
Total Construction Area:	0 ft ²	
	0.00 acres	
Total Demolition Area:	0 ft ²	
	0.00 acres	
Total Pavement Area:	3,150 ft ²	
	0.07 acres	
Total Disturbed Area:	3,150 ft ²	
	0.07 acres	
Construction Duration:	12 month	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	3,150	0.07	1	(from "Grading" worksheet)
Paving:	3,150	0.07	1	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	45.37	2.61	18.58	3.93	2.78	2.69	5,624
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	87.01	5.18	34.29	7.38	5.32	5.16	10,565

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	87.01	5.18	34.29	7.38	5.32	5.16	10,565
Total Project Emissions (tons)	0.044	0.003	0.017	0.004	0.003	0.003	5.283

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.07 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.00 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.364	0.182	0.036	0.018
General Construction Activities	0.000	0.000	0.000	0.000
Total	0.364	0.182	0.036	0.018

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.07 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.07	0.01
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.07	0.04
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.04	0.04
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.04	0.01
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.07	0.03
TOTAL								0.12

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.12
Qty Equipment: 3.00
Grading days/yr: 0.04

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	0 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	117 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	0 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	117 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	12 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	5.015	3.627	14.738	0.395	5.965	1.551	1269.757
tons	0.003	0.002	0.007	0.000	0.003	0.001	0.635

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
Number of construction days = 240 days
Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project I5
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I5 to regional emissions.

Air Emissions for Project I5

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.848	0.431	2.135	0.383	0.348	0.337	549.216
Fugitive Dust	-	-	-	-	0.086	0.009	-
Haul Truck On-Road	0.018	0.013	0.054	0.001	0.022	0.006	4.656
Commuter	0.066	0.066	0.595	0.001	0.006	0.004	78.889
TOTAL	4.932	0.510	2.784	0.386	0.462	0.356	632.761

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	573.914	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00025%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000011%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I5 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I5

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
4.932	0.510	2.784	0.386	0.462	0.356	
0.002782%	0.000376%	0.000376%	0.000234%	0.000598%	0.001708%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) I5. Replace Sludge Digester Tanks		3,300 ft ²	
	Total Construction Area:	3,300 ft ²	Construct new tanks
		0.08 acres	
	Total Demolition Area:	3,300 ft ²	Remove old tanks
		0.08 acres	
	Total Pavement Area:	ft ²	
		0.00 acres	
	Total Disturbed Area:	3,300 ft ²	
		0.08 acres	
	Construction Duration:	12 month	
	Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			4.682					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	3,300	0.08	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	3,300	0.08	4	
Building Construction:	3,300	0.08	240	
Architectural Coating:	3,300	0.08	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	127.23	7.54	50.34	10.34	7.69	7.46	14,812
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	101.10	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	9,695.47	862.37	4,269.11	766.74	695.40	674.53	1,098,432

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,695.47	862.37	4,269.11	766.74	695.40	674.53	1,098,432
Total Project Emissions (tons)	4.848	0.431	2.135	0.383	0.348	0.337	549.216

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.08 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.173	0.086	0.017	0.009
Total	0.173	0.086	0.017	0.009

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.08 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.08	0.01
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.08	0.04
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.04	0.04
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.04	0.02
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.08	0.03
TOTAL								0.13

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.13
Qty Equipment: 3.00
Grading days/yr: 0.04

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	122 cubic yards	Demolition area multiplied by 1 foot for tanks.
Amount of fill material =	0 cubic yards	
Amount of Excavation Materials for New Buildings =	1,467 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	0 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	122 cubic yards	Construction area multiplied by 1 foot for tanks.
Amount of Paving Materials =	0 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	86 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	36.780	26.595	108.076	2.897	43.740	11.373	9311.551
tons	0.018	0.013	0.054	0.001	0.022	0.006	4.656

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
Number of construction days = 240 days
Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project NI1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project NI1 to regional emissions.

Air Emissions for Project NI1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	1.024	0.102	-
Haul Truck On-Road	0.031	0.023	0.092	0.002	0.037	0.010	7.887
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.085	0.057	0.397	0.005	1.066	0.115	49.803

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	45.171	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project NI1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project NI1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.085	0.057	0.397	0.005	1.066	0.115
0.00005%	0.00004%	0.00005%	0.000003%	0.001%	0.001%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) NI1. Storm Water Drainage Improvements		39,133 ft ²	Assume 15% for FY12 and 21.25 for FY13 - FY 16 area disturbed for construction
Total Construction Area:		0 ft ²	
		0.00 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		0 ft ²	
		0.00 acres	
Total Disturbed Area:		39,133 ft ²	Line 1
		0.90 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	39,133	0.90	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.90 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	2.048	1.024	0.205	0.102
Total	2.048	1.024	0.205	0.102

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.90 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.90	0.11
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.90	0.44
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.45	0.45
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.45	0.19
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.90	0.32
TOTAL								1.51

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.51
Qty Equipment: 3.00
Grading days/yr: 0.50

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	2,899 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	145 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	62.308	45.053	183.088	4.908	74.098	19.267	15774.412
tons	0.031	0.023	0.092	0.002	0.037	0.010	7.887

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project S1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project S1 to regional emissions.

Air Emissions for Project S1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	0.207	0.021	-
Haul Truck On-Road	0.006	0.005	0.019	0.000	0.007	0.002	1.596
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.060	0.039	0.324	0.003	0.219	0.026	43.512

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	39.465	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project S1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project S1

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
0.060	0.039	0.324	0.003	0.219	0.026	
0.000034%	0.000029%	0.000044%	0.000002%	0.000283%	0.000124%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) S1. Install Jogging Path Lighting		7,920 ft ²	
	Total Construction Area:	0 ft ²	
		0.00 acres	
	Total Demolition Area:	0 ft ²	
		0.00 acres	
	Total Pavement Area:	0 ft ²	
		0.00 acres	
	Total Disturbed Area:	7,920 ft ²	Line 1
		0.18 acres	
	Construction Duration:	12 month	
	Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e2M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	7,920	0.18	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.18 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.415	0.207	0.041	0.021
Total	0.415	0.207	0.041	0.021

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.18 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.18	0.02
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.18	0.09
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.09	0.09
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.09	0.04
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.18	0.06
TOTAL								0.30

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.30
Qty Equipment: 3.00
Grading days/yr: 0.10

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	587 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	29 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	12.610	9.118	37.055	0.993	14.996	3.899	3192.532
tons	0.006	0.005	0.019	0.000	0.007	0.002	1.596

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for other 2014 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2014 projects to regional emissions.

Air Emissions for Other 2014 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	7.532	0.946	3.202	0.605	0.510	0.495	866.054
Fugitive Dust	-	-	-	-	21.954	2.195	-
Haul Truck On-Road	2.948	2.132	8.663	0.232	3.506	0.912	746.347
Commuter	0.496	0.494	4.462	0.006	0.047	0.030	591.668
TOTAL	10.976	3.571	16.327	0.843	26.017	3.632	2,204.070

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	1,999.091	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00088%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000037%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2014 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2014 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
10.976	3.571	16.327	0.843	26.017	3.632	
0.006%	0.003%	0.002%	0.001%	0.034%	0.017%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

Building Construction Activities		Area Disturbed
C11. Florida ARNG Special Operations Detachment - Storage		8,000 ft ²
1.)	C29. Joint Operations and Logistics Mobility Facility	97,000 ft ²
2.)	C30. Coalition Village	77,400 ft ²
3.)	C31. Mission Support Facility	62,601 ft ²
Demolition Activities		
4.)	C29. Joint Operations and Logistics Mobility Facility - Demo	82,042 ft ²
5.)	C31. Mission Support Facility - Demo	32,602 ft ²
Pavement Activities		
C11. Florida ARNG Special Operations Detachment - Paving		23,400 ft ²
12.)	I29. Construct CENTCOM Parking Lot	190,000 ft ²
Infrastructure Construction Activities		
8.)	I25. Repair Lift Station	1,500 ft ²
9.)	I26. Install new Lift Station and Force Main	2,000 ft ²
10.)	I27. Reestablish Drainage Taxiway G	1,000 ft ²
11.)	I28. Repair Vince Drainage, Building 565	3,000 ft ²
Total Building Construction Area:		245,001 ft ²
		5.62 acres
Total Demolition Area:		114,644 ft ²
		2.63 acres
Total Pavement Area:		213,400 ft ²
		4.90 acres
Total Disturbed Area:		580,545 ft ²
		13.33 acres
Construction Duration:		12 months
Annual Construction Activity:		240 days
		Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			40.341					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	580,545	13.33	6	(from "Grading" worksheet)
Paving:	213,400	4.90	24	
Demolition:	114,644	2.63	132	
Building Construction:	245,001	5.62	240	
Architectural Coating	245,001	5.62	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	249.85	15.46	94.26	20.70	15.27	14.81	29,649
Paving	1,088.81	62.54	445.88	94.22	66.63	64.63	134,975
Demolition	4,198.60	248.89	1,661.06	341.20	253.86	246.25	488,806
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	814.27	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	15,063.86	1,892.32	6,404.26	1,209.06	1,020.92	990.29	1,732,108

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	15,063.86	1,892.32	6,404.26	1,209.06	1,020.92	990.29	1,732,108
Total Project Emissions (tons)	7.532	0.946	3.202	0.605	0.510	0.495	866.054

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	4.90 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	8.43 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	24.691	12.345	2.469	1.235
General Construction Activities	19.217	9.608	1.922	0.961
Total	43.908	21.954	4.391	2.195

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 13.33 acres/yr (from Combustion Worksheet)
Qty Equipment: 4.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	13.33	1.67
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	13.33	6.52
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	6.66	6.72
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	6.66	2.76
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	13.33	4.67
TOTAL								22.33

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 22.33
Qty Equipment: 4.00
Grading days/yr: 5.58

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	16,984 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	50,953 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	108,889 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	7,904 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	81,667 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	7,904 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	13715 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	5896.019	4263.275	17325.224	464.425	7011.727	1823.230	1492694.958
tons	2.948	2.132	8.663	0.232	3.506	0.912	746.347

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 150 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SCAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	991.592	987.107	8923.777	11.637	93.937	59.164	1183336.936
tons	0.496	0.494	4.462	0.006	0.047	0.030	591.668

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C1 to regional emissions.

Air Emissions for Project C1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.052	0.523	2.217	0.401	0.360	0.349	574.113
Fugitive Dust	-	-	-	-	3.801	0.380	-
Haul Truck On-Road	0.278	0.201	0.818	0.022	0.331	0.086	70.490
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	5.413	0.807	3.779	0.424	4.500	0.820	743.214

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	674.096	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00030%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000012%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C1

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.413	0.807	3.779	0.424	4.500	0.820	
0.003%	0.001%	0.001%	0.0003%	0.006%	0.004%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C1. Upgrade Fitness Center Soccer Field, Add to and Alter Physical Fitness Center, Joint Combat Aquatic Training (JCAT) Center*		24,211 ft ²	Assume 50% area disturbed for FY13 and FY 14 construction
2.) C1. Pavement		52,301 ft ²	
3.) C1. Demolition (pool and bathhouse		5,403 ft ²	
Total Construction Area:		24,211 ft ²	
		0.56 acres	
Total Demolition Area:		5,403 ft ²	
		0.12 acres	
Total Pavement Area:		52,301 ft ²	
		1.20 acres	
Total Disturbed Area:		81,915 ft ²	
		1.88 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			12.681					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days
Grading:	81,915	1.88	2
Paving:	52,301	1.20	6
Demolition:	5,403	0.12	7
Building Construction:	24,211	0.56	240
Architectural Coating:	24,211	0.56	20

(from "Grading" worksheet)

(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	83.28	5.15	31.42	6.90	5.09	4.94	9,883
Paving	272.20	15.63	111.47	23.55	16.66	16.16	33,744
Demolition	222.65	13.20	88.09	18.09	13.46	13.06	25,922
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	261.09	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	10,104.74	1,046.23	4,434.04	801.49	720.37	698.76	1,148,227

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	10,104.74	1,046.23	4,434.04	801.49	720.37	698.76	1,148,227
Total Project Emissions (tons)	5.052	0.523	2.217	0.401	0.360	0.349	574.113

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	1.20 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.68 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	6.051	3.026	0.605	0.303
General Construction Activities	1.550	0.775	0.155	0.078
Total	7.601	3.801	0.760	0.380

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 1.88 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	1.88	0.24
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	1.88	0.92
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.94	0.95
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.94	0.39
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	1.88	0.66
TOTAL								3.15

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 3.15
Qty Equipment: 3.00
Grading days/yr: 1.05

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	800 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	2,401 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	10,760 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	1,937 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	8,070 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	1,937 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	1295 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	556.857	402.650	1636.303	43.863	662.232	172.197	140979.495
tons	0.278	0.201	0.818	0.022	0.331	0.086	70.490

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C5
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C5 to regional emissions.

Air Emissions for Project C5

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.202	0.488	2.276	0.413	0.369	0.358	590.980
Fugitive Dust	-	-	-	-	2.199	0.220	-
Haul Truck On-Road	0.223	0.162	0.656	0.018	0.266	0.069	56.560
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	5.508	0.732	3.676	0.431	2.841	0.652	746.151

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	676.759	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00030%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000012%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C5 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C5

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.508	0.732	3.676	0.431	2.841	0.652	
0.003%	0.001%	0.0005%	0.0003%	0.004%	0.003%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C5. Construct Outdoor Recreation Maintenance Facility		10,250 ft ²	Assume 50% area disturbed for FY14 and FY15 construction
2.) C5. Pavements		25,000 ft ²	
3.) C5. Demolition Buildings 13, 60, and 694		18,500 ft ²	
Total Construction Area:		10,250 ft ²	
		0.24 acres	
Total Demolition Area:		18,500 ft ²	
		0.42 acres	
Total Pavement Area:		25,000 ft ²	
		0.57 acres	
Total Disturbed Area:		53,750 ft ²	
		1.23 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			8.251					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	53,750	1.23	1	(from "Grading" worksheet)
Paving:	25,000	0.57	3	
Demolition:	18,500	0.42	22	
Building Construction:	10,250	0.24	240	
Architectural Coating:	10,250	0.24	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	136.10	7.82	55.74	11.78	8.33	8.08	16,872
Demolition	699.77	41.48	276.84	56.87	42.31	41.04	81,468
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	172.49	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	10,404.11	975.52	4,551.35	825.04	738.34	716.19	1,181,959

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	10,404.11	975.52	4,551.35	825.04	738.34	716.19	1,181,959
Total Project Emissions (tons)	5.202	0.488	2.276	0.413	0.369	0.358	590.980

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.57 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.66 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	2.893	1.446	0.289	0.145
General Construction Activities	1.505	0.752	0.150	0.075
Total	4.397	2.199	0.440	0.220

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 1.23 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	1.23	0.15
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	1.23	0.60
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.62	0.62
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.62	0.26
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	1.23	0.43
TOTAL								2.07

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 2.07
Qty Equipment: 3.00
Grading days/yr: 0.69

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	2,741 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	8,222 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	4,556 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	926 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	3,417 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	926 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	1039 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	446.811	323.079	1312.938	35.195	531.362	138.168	113119.215
tons	0.223	0.162	0.656	0.018	0.266	0.069	56.560

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C6
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C6 to regional emissions.

Air Emissions for Project C6

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	6.373	0.605	2.740	0.509	0.440	0.427	728.549
Fugitive Dust	-	-	-	-	7.893	0.789	-
Haul Truck On-Road	0.768	0.556	2.258	0.061	0.914	0.238	194.516
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	7.22	1.24	5.74	0.57	9.25	1.46	1,021.68

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	926.660	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00041%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000017%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C4 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C6

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
7.224	1.242	5.742	0.570	9.255	1.459	
0.004%	0.001%	0.001%	0.0003%	0.012%	0.007%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C6. Alert Facility, Fuels Mobility Support Equipment Facility		25,525 ft ²	Assume 50% area disturbed for FY14 and FY15 construction
2.) C6. Pavement		90,000 ft ²	
3.) C6. Demolition		72,137 ft ²	
4.) C6. Construct Fuel Storage Area		5,000 ft ²	
Total Construction Area:		30,525 ft ²	
		0.70 acres	
Total Demolition Area:		72,137 ft ²	
		1.66 acres	
Total Pavement Area:		90,000 ft ²	
		2.07 acres	
Total Disturbed Area:		192,662 ft ²	
		4.42 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			13.021					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	192,662	4.42	3	(from "Grading" worksheet)
Paving:	90,000	2.07	10	
Demolition:	72,137	1.66	83	
Building Construction:	30,525	0.70	240	
Architectural Coating:	25,525	0.59	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	124.92	7.73	47.13	10.35	7.64	7.41	14,825
Paving	453.67	26.06	185.78	39.26	27.76	26.93	56,240
Demolition	2,640.03	156.50	1,044.45	214.55	159.62	154.84	307,355
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	267.88	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	12,745.22	1,209.32	5,480.43	1,017.10	880.18	853.77	1,457,098

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	12,745.22	1,209.32	5,480.43	1,017.10	880.18	853.77	1,457,098
Total Project Emissions (tons)	6.373	0.605	2.740	0.509	0.440	0.427	728.549

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	2.07 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	2.36 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	10.413	5.207	1.041	0.521
General Construction Activities	5.373	2.687	0.537	0.269
Total	15.787	7.893	1.579	0.789

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 4.42 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	4.42	0.55
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	4.42	2.16
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	2.21	2.23
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	2.21	0.91
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	4.42	1.55
TOTAL								7.41

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 7.41
Qty Equipment: 3.00
Grading days/yr: 2.47

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	10,687 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	32,061 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	13,567 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	3,333 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	8,508 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	3,333 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	3574 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1536.640	1111.109	4515.358	121.040	1827.420	475.176	389031.139
tons	0.768	0.556	2.258	0.061	0.914	0.238	194.516

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project D1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks conducting debris removal from the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project D1 to regional emissions.

Air Emissions for Project D1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.196	0.012	0.077	0.016	0.012	0.011	22.838
Fugitive Dust	-	-	-	-	0.233	0.023	-
Haul Truck On-Road	0.014	0.010	0.042	0.001	0.017	0.004	3.581
Commuter	0.040	0.039	0.357	0.000	0.004	0.002	47.333
TOTAL	0.250	0.061	0.476	0.018	0.265	0.041	73.752

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	66.893	metric tons	
State of Florida's CO ₂ emissions =	227,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00003%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project D1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project D1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.250	0.061	0.476	0.018	0.265	0.041
0.0001%	0.0000%	0.0001%	0.00001%	0.00034%	0.00020%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) D1. Demolish Buildings 65, 82, 83, 85, and 1205		8,885 ft ²	Demolition is limited to building footprint
			Assume 50% area disturbed for FY13 and FY 14 construction
	Total Construction Area:	0 ft ²	
		0.00 acres	
	Total Demolition Area:	8,885 ft ²	
		0.20 acres	
	Total Pavement Area:	0 ft ²	
		0.00 acres	
	Total Disturbed Area:	8,885 ft ²	
		0.20 acres	
	Construction Duration:	12 months	
	Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	8,885	0.20	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	8,885	0.20	11	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	349.88	20.74	138.42	28.43	21.16	20.52	40,734
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	391.52	23.32	154.13	31.88	23.70	22.99	45,675

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	391.52	23.32	154.13	31.88	23.70	22.99	45,675
Total Project Emissions (tons)	0.196	0.012	0.077	0.016	0.012	0.011	22.838

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.20 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.465	0.233	0.047	0.023
Total	0.465	0.233	0.047	0.023

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.20 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.20	0.03
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.20	0.10
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.10	0.10
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.10	0.04
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.20	0.07
TOTAL								0.34

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.34
Qty Equipment: 3.00
Grading days/yr: 0.11

Haul Truck Emissions

Emissions from debris removal are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Debris Removal Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the disposal area is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Debris =	1,316 cubic yards	Square footage of building footprints to be demolished multiplied by 4 feet per floor
Number of trucks required =	66 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	28.292	20.457	83.134	2.229	33.645	8.749	7162.638
tons	0.014	0.010	0.042	0.001	0.017	0.004	3.581

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 12 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	79.327	78.969	713.902	0.931	7.515	4.733	94666.955
tons	0.040	0.039	0.357	0.000	0.004	0.002	47.333

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions by calendar year for Project D3
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks conducting debris removal from the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project D3 to regional emissions.

Air Emissions for Project D3

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.243	0.014	0.096	0.020	0.015	0.014	28.392
Fugitive Dust	-	-	-	-	0.307	0.031	-
Haul Truck On-Road	0.019	0.014	0.055	0.001	0.022	0.006	4.731
Commuter	0.040	0.039	0.357	0.000	0.004	0.002	47.333
TOTAL	0.302	0.067	0.508	0.022	0.348	0.053	80.457

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	72.974	metric tons	
State of Florida's CO ₂ emissions =	227,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00003%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project D3 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project D3

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.302	0.067	0.508	0.022	0.348	0.053
0.00017%	0.00005%	0.00007%	0.00001%	0.00045%	0.00026%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) D3. Demolish Building 40		11,737 ft ²	Demolition is limited to building footprint
Total Construction Area:		0 ft ²	
		0.00 acres	
Total Demolition Area:		11,737 ft ²	Line 1
		0.27 acres	
Total Pavement Area:		0 ft ²	
		0.00 acres	
Total Disturbed Area:		11,737 ft ²	Line 1
		0.27 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	11,737	0.27	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	11,737	0.27	14	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	445.31	26.40	176.17	36.19	26.92	26.12	51,843
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	486.95	28.97	191.88	39.64	29.47	28.59	56,785

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	486.95	28.97	191.88	39.64	29.47	28.59	56,785
Total Project Emissions (tons)	0.243	0.014	0.096	0.020	0.015	0.014	28.392

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.27 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	0.614	0.307	0.061	0.031
Total	0.614	0.307	0.061	0.031

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

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0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.27 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.27	0.03
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.27	0.13
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.13	0.14
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.13	0.06
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.27	0.09
TOTAL								0.45

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.45
Qty Equipment: 3.00
Grading days/yr: 0.15

Haul Truck Emissions

Emissions from debris removal are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Debris Removal Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the disposal area is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Debris =	1,739 cubic yards	Square footage of building footprints to be demolished multiplied by 4 feet per floor
Number of trucks required =	87 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	37.375	27.025	109.826	2.944	44.448	11.558	9462.309
tons	0.019	0.014	0.055	0.001	0.022	0.006	4.731

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 12 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	79.327	78.969	713.902	0.931	7.515	4.733	94666.955
tons	0.040	0.039	0.357	0.000	0.004	0.002	47.333

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Summary	Summarizes total emissions by calendar year for Project I6
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill and excavation materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate Air Quality Control Region Tier report for 2008, to be used to compare Project I6 to regional emissions.

Air Emissions for Project I6

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.07	0.00	0.03	0.01	0.00	0.00	8.09
Fugitive Dust	-	-	-	-	1.04	0.10	-
Haul Truck On-Road	0.01	0.01	0.04	0.00	0.02	0.00	3.63
Commuter	0.07	0.07	0.59	0.00	0.01	0.00	78.89
TOTAL	0.15	0.08	0.66	0.01	1.07	0.12	90.61

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	82.185	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00004%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000002%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project I6 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project I6

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.147	0.080	0.663	0.008	1.069	0.116
0.000083%	0.000059%	0.000090%	0.000005%	0.001382%	0.000559%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed
1.) I6. Construct DISA Parking Lot, Building 805		18,000 ft ²
Total Construction Area:	0 ft ²	
	0.00 acres	
Total Demolition Area:	0 ft ²	
	0.00 acres	
Total Pavement Area:	18,000 ft ²	
	0.41 acres	
Total Disturbed Area:	18,000 ft ²	
	0.41 acres	
Construction Duration:	12 month	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	18,000	0.41	1	(from "Grading" worksheet)
Paving:	18,000	0.41	2	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	90.73	5.21	37.16	7.85	5.55	5.39	11,248
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	132.38	7.79	52.87	11.30	8.10	7.85	16,189

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	132.38	7.79	52.87	11.30	8.10	7.85	16,189
Total Project Emissions (tons)	0.066	0.004	0.026	0.006	0.004	0.004	8.095

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.41 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.00 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	2.083	1.041	0.208	0.104
General Construction Activities	0.000	0.000	0.000	0.000
Total	2.083	1.041	0.208	0.104

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.41 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.41	0.05
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.41	0.20
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.21	0.21
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.21	0.09
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.41	0.14
TOTAL								0.69

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.69
Qty Equipment: 3.00
Grading days/yr: 0.23

Haul Truck Emissions

Emissions from hauling fill and excavation material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	0 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	667 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	0 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	667 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	67 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	28.660	20.723	84.215	2.257	34.083	8.862	7255.754
tons	0.014	0.010	0.042	0.001	0.017	0.004	3.628

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 20 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	132.212	131.614	1189.837	1.552	12.525	7.889	157778.258
tons	0.066	0.066	0.595	0.001	0.006	0.004	78.889

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project NI1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project NI1 to regional emissions.

Air Emissions for Project NI1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	1.024	0.102	-
Haul Truck On-Road	0.031	0.023	0.092	0.002	0.037	0.010	7.887
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.085	0.057	0.397	0.005	1.066	0.115	49.803

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	45.171	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project NI1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project NI1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.085	0.057	0.397	0.005	1.066	0.115
0.00005%	0.00004%	0.00005%	0.000003%	0.001%	0.001%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) NI1. Storm Water Drainage Improvements		39,133 ft ²	Assume 15% for FY12 and 21.25 for FY13 - FY 16 area disturbed for construction
Total Construction Area:		0 ft ²	
		0.00 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		0 ft ²	
		0.00 acres	
Total Disturbed Area:		39,133 ft ²	Line 1
		0.90 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	39,133	0.90	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.90 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	2.048	1.024	0.205	0.102
Total	2.048	1.024	0.205	0.102

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.90 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.90	0.11
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.90	0.44
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.45	0.45
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.45	0.19
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.90	0.32
TOTAL								1.51

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.51
Qty Equipment: 3.00
Grading days/yr: 0.50

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	2,899 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	145 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	62.308	45.053	183.088	4.908	74.098	19.267	15774.412
tons	0.031	0.023	0.092	0.002	0.037	0.010	7.887

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for other 2015 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2015 projects to regional emissions.

Air Emissions for Other 2015 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	6.777	0.843	2.909	0.545	0.465	0.451	780.819
Fugitive Dust	-	-	-	-	27.562	2.756	-
Haul Truck On-Road	2.140	1.548	6.289	0.169	2.545	0.662	541.844
Commuter	0.496	0.494	4.462	0.006	0.047	0.030	591.668
TOTAL	9.413	2.884	13.660	0.719	30.620	3.899	1,914.331

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	1,736.298	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00077%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000032%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2015 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2015 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
9.413	2.884	13.660	0.719	30.620	3.899	
0.005%	0.002%	0.002%	0.000%	0.040%	0.019%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction Activities		Area Disturbed	
1.) C32. Construct FAMCAMP Annex		15,000 ft ²	
2.) C33. Dormitory (120-Room)		36,753 ft ²	
3.) C34. Fuels Management Facility		8,611 ft ²	
4.) C35. Base Civil Engineering Complex		86,725 ft ²	
5.) C36. Construct Wing Headquarters		33,182 ft ²	
Demolition Activities			
6.) C33. Dormitory (120-Room) - Demo		50,700 ft ²	
7.) C34. Fuels Management Facility - Demo		3,520 ft ²	
Pavement Activities			
C32. Construct FAMCAMP Annex - RV Pads/Parking Pads		12,360 ft ²	
9.) C33. Dormitory (120-Room) - Pavement		21,613 ft ²	
10.) C35. Base Civil Engineering Complex - Pavement		234,703 ft ²	
11.) C36. Construct Wing Headquarters - Pavement		72,000 ft ²	
13.) I30. Construct Bike Paths/Lanes		21,120 ft ²	
Infrastructure Construction Activities			
12.) I19. Repair DFSP Fire Hydrant System; Repair DFSP Overhead Electrical Distribution		3,250 ft ²	Assume sf is 50% of total for FY13 and 50% of total for FY15.
14.) I31. Repair Water Distribution System		15,675 ft ²	
Total Building Construction Area:		180,271 ft ²	All Building Construction Projects
		4.14 acres	
Total Demolition Area:		54,220 ft ²	All Demolition Projects
		1.24 acres	
Total Pavement Area:		361,796 ft ²	
		8.31 acres	
Total Disturbed Area:		615,212 ft ²	All 2015 Projects
		14.12 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			34.604					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	615,212	14.12	5	(from "Grading" worksheet)
Paving:	361,796	8.31	40	
Demolition:	54,220	1.24	63	
Building Construction:	180,271	4.14	240	
Architectural Coating	180,271	4.14	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	208.21	12.88	78.55	17.25	12.73	12.35	24,708
Paving	1,814.69	104.23	743.14	157.03	111.04	107.71	224,958
Demolition	2,003.88	118.79	792.78	162.85	121.16	117.53	233,294
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	699.53	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	13,553.37	1,686.59	5,817.53	1,090.07	930.09	902.19	1,561,638

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	13,553.37	1,686.59	5,817.53	1,090.07	930.09	902.19	1,561,638
Total Project Emissions (tons)	6.777	0.843	2.909	0.545	0.465	0.451	780.819

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	8.31 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	5.82 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	41.861	20.930	4.186	2.093
General Construction Activities	13.264	6.632	1.326	0.663
Total	55.125	27.562	5.512	2.756

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 14.12 acres/yr (from Combustion Worksheet)
Qty Equipment: 5.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day)	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	14.12	1.77
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	14.12	6.90
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	7.06	7.12
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	7.06	2.92
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	14.12	4.95
TOTAL								23.67

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 23.67
Qty Equipment: 5.00
Grading days/yr: 4.73

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	8,033 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	24,098 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	80,120 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	13,400 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	60,090 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	13,400 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	9957 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	4280.475	3095.112	12578.010	337.170	5090.472	1323.654	1083687.722
tons	2.140	1.548	6.289	0.169	2.545	0.662	541.844

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
Number of construction days = 240 days
Number of construction workers (daily) = 150 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SCAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	991.592	987.107	8923.777	11.637	93.937	59.164	1183336.936
tons	0.496	0.494	4.462	0.006	0.047	0.030	591.668

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C5
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C5 to regional emissions.

Air Emissions for Project C5

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	5.202	0.488	2.276	0.413	0.369	0.358	590.980
Fugitive Dust	-	-	-	-	2.199	0.220	-
Haul Truck On-Road	0.223	0.162	0.656	0.018	0.266	0.069	56.560
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	5.508	0.732	3.676	0.431	2.841	0.652	746.151

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	676.759	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00030%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000012%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C5 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C5

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.508	0.732	3.676	0.431	2.841	0.652	
0.003%	0.001%	0.0005%	0.0003%	0.004%	0.003%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C5. Construct Outdoor Recreation Maintenance Facility		10,250 ft ²	Assume 50% area disturbed for FY14 and FY15 construction
2.) C5. Pavements		25,000 ft ²	
3.) C5. Demolition Buildings 13, 60, and 694		18,500 ft ²	
Total Construction Area:		10,250 ft ²	
		0.24 acres	
Total Demolition Area:		18,500 ft ²	
		0.42 acres	
Total Pavement Area:		25,000 ft ²	
		0.57 acres	
Total Disturbed Area:		53,750 ft ²	
		1.23 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			8.251					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	53,750	1.23	1	(from "Grading" worksheet)
Paving:	25,000	0.57	3	
Demolition:	18,500	0.42	22	
Building Construction:	10,250	0.24	240	
Architectural Coating:	10,250	0.24	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	136.10	7.82	55.74	11.78	8.33	8.08	16,872
Demolition	699.77	41.48	276.84	56.87	42.31	41.04	81,468
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	172.49	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	10,404.11	975.52	4,551.35	825.04	738.34	716.19	1,181,959

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	10,404.11	975.52	4,551.35	825.04	738.34	716.19	1,181,959
Total Project Emissions (tons)	5.202	0.488	2.276	0.413	0.369	0.358	590.980

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.57 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.66 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	2.893	1.446	0.289	0.145
General Construction Activities	1.505	0.752	0.150	0.075
Total	4.397	2.199	0.440	0.220

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 1.23 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	1.23	0.15
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	1.23	0.60
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.62	0.62
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.62	0.26
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	1.23	0.43
TOTAL								2.07

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 2.07
Qty Equipment: 3.00
Grading days/yr: 0.69

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	2,741 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	8,222 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	4,556 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	926 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	3,417 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	926 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	1039 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	446.811	323.079	1312.938	35.195	531.362	138.168	113119.215
tons	0.223	0.162	0.656	0.018	0.266	0.069	56.560

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project C6
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill materials to the job site.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project C6 to regional emissions.

Air Emissions for Project C6

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	6.373	0.605	2.740	0.509	0.440	0.427	728.549
Fugitive Dust	-	-	-	-	7.893	0.789	-
Haul Truck On-Road	0.768	0.556	2.258	0.061	0.914	0.238	194.516
Commuter	0.083	0.082	0.744	0.001	0.008	0.005	98.611
TOTAL	7.224	1.242	5.742	0.570	9.255	1.459	1,021.676

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	926.660	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00041%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000017%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project C6 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project C6

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
7.224	1.242	5.742	0.570	9.255	1.459	
0.004%	0.001%	0.001%	0.0003%	0.012%	0.007%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) C6. Alert Facility, Fuels Mobility Support Equipment Facility		25,525 ft ²	Assume 50% area disturbed for FY14 and FY15 construction
2.) C6. Pavement		90,000 ft ²	
3.) C6. Demolition		72,137 ft ²	
4.) C6. Construct Fuel Storage Area		5,000 ft ²	
Total Construction Area:		30,525 ft ²	
		0.70 acres	
Total Demolition Area:		72,137 ft ²	
		1.66 acres	
Total Pavement Area:		90,000 ft ²	
		2.07 acres	
Total Disturbed Area:		192,662 ft ²	
		4.42 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			13.021					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	192,662	4.42	3	(from "Grading" worksheet)
Paving:	90,000	2.07	10	
Demolition:	72,137	1.66	83	
Building Construction:	30,525	0.70	240	
Architectural Coating:	25,525	0.59	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	124.92	7.73	47.13	10.35	7.64	7.41	14,825
Paving	453.67	26.06	185.78	39.26	27.76	26.93	56,240
Demolition	2,640.03	156.50	1,044.45	214.55	159.62	154.84	307,355
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	267.88	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	12,745.22	1,209.32	5,480.43	1,017.10	880.18	853.77	1,457,098

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	12,745.22	1,209.32	5,480.43	1,017.10	880.18	853.77	1,457,098
Total Project Emissions (tons)	6.373	0.605	2.740	0.509	0.440	0.427	728.549

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	2.07 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	2.36 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	10.413	5.207	1.041	0.521
General Construction Activities	5.373	2.687	0.537	0.269
Total	15.787	7.893	1.579	0.789

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 4.42 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	4.42	0.55
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	4.42	2.16
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	2.21	2.23
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	2.21	0.91
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	4.42	1.55
TOTAL								7.41

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 7.41
Qty Equipment: 3.00
Grading days/yr: 2.47

Haul Truck Emissions

Emissions from hauling fill and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill and Excavation Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	10,687 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	32,061 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	13,567 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	3,333 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	8,508 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	3,333 cubic yards	Paving area multiplied 1 foot.

Number of trucks required =	3574 heavy duty diesel haul truck trips
Miles per trip =	30 miles

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	1536.640	1111.109	4515.358	121.040	1827.420	475.176	389031.139
tons	0.768	0.556	2.258	0.061	0.914	0.238	194.516

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 25 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	165.265	164.518	1487.296	1.939	15.656	9.861	197222.823
tons	0.083	0.082	0.744	0.001	0.008	0.005	98.611

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project NI1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project NI1 to regional emissions.

Air Emissions for Project NI1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	1.024	0.102	-
Haul Truck On-Road	0.031	0.023	0.092	0.002	0.037	0.010	7.887
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.085	0.057	0.397	0.005	1.066	0.115	49.803

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	45.171	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project NI1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project NI1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.085	0.057	0.397	0.005	1.066	0.115
0.00005%	0.00004%	0.00005%	0.000003%	0.001%	0.001%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) NI1. Storm Water Drainage Improvements		39,133 ft ²	Assume 15% for FY12 and 21.25 for FY13 - FY 16 area disturbed for construction
Total Construction Area:		0 ft ²	
		0.00 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		0 ft ²	
		0.00 acres	
Total Disturbed Area:		39,133 ft ²	Line 1
		0.90 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	39,133	0.90	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.90 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	2.048	1.024	0.205	0.102
Total	2.048	1.024	0.205	0.102

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.90 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.90	0.11
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.90	0.44
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.45	0.45
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.45	0.19
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.90	0.32
TOTAL								1.51

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.51
Qty Equipment: 3.00
Grading days/yr: 0.50

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	2,899 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	145 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	62.308	45.053	183.088	4.908	74.098	19.267	15774.412
tons	0.031	0.023	0.092	0.002	0.037	0.010	7.887

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
Number of construction days = 240 days
Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for other 2016 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2016 projects to regional emissions.

Air Emissions for Other 2016 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.807	0.479	2.119	0.380	0.345	0.335	544.622
Fugitive Dust	-	-	-	-	0.654	0.065	-
Haul Truck On-Road	0.121	0.088	0.356	0.010	0.144	0.037	30.651
Commuter	0.248	0.247	2.231	0.003	0.023	0.015	295.834
TOTAL	5.176	0.813	4.705	0.393	1.167	0.453	871.107

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	790.094	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00035%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000015%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2016 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2016 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.176	0.813	4.705	0.393	1.167	0.453	
0.003%	0.001%	0.001%	0.000%	0.002%	0.002%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction		Area Disturbed	
1.)	C37. Construct Fuel Containment System, Building 105	3,750 ft ²	
2.)	C38. DFT - Construct Pavilion, Building 49	300 ft ²	
3.)	C39. Munitions Administration Facility	5,000 ft ²	
4.)	C40. U.S. Water Operations Building	5,000 ft ²	
Pavement Activities			
	C40. U.S. Water Operations Building _ Pavement	1,600 ft ²	
7.)	I33. Construct SATCOM Parking Lot, Building 1750	2,952 ft ²	
Infrastructure Construction Activities			
6.)	I32. Replace Cable 16	894 ft ²	
			Assume FY16 even though programmed FY17
Total Building Construction Area:		14,050 ft ²	All Building Construction Projects
		0.32 acres	
Total Demolition Area:		ft ²	All Demolition Projects
		0.00 acres	
Total Pavement Area:		4,552 ft ²	
		0.10 acres	
Total Disturbed Area:		19,496 ft ²	All 2016 Projects
		0.45 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			9.660					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	19,496	0.45	1	(from "Grading" worksheet)
Paving:	4,552	0.10	1	
Demolition:	0	0.00	0	
Building Construction:	14,050	0.32	240	
Architectural Coating	14,050	0.32	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	45.37	2.61	18.58	3.93	2.78	2.69	5,624
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	200.67	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	9,613.61	957.01	4,237.35	760.32	690.48	669.76	1,089,244

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,613.61	957.01	4,237.35	760.32	690.48	669.76	1,089,244
Total Project Emissions (tons)	4.807	0.479	2.119	0.380	0.345	0.335	544.622

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.10 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.34 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.527	0.263	0.053	0.026
General Construction Activities	0.782	0.391	0.078	0.039
Total	1.309	0.654	0.131	0.065

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.45 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.45	0.06
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.45	0.22
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.22	0.23
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.22	0.09
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.45	0.16
TOTAL								0.75

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 0.75
Qty Equipment: 3.00
Grading days/yr: 0.25

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.
 Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	6,244 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	169 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	4,683 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	169 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	563 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	242.137	175.084	711.511	19.073	287.957	74.876	61301.847
tons	0.121	0.088	0.356	0.010	0.144	0.037	30.651

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 75 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SCAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	495.796	493.554	4461.889	5.818	46.969	29.582	591668.468
tons	0.248	0.247	2.231	0.003	0.023	0.015	295.834

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for Project NI1
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling fill material and excavation waste.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare Project NI1 to regional emissions.

Air Emissions for Project NI1

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	0.021	0.001	0.008	0.002	0.001	0.001	2.471
Fugitive Dust	-	-	-	-	1.024	0.102	-
Haul Truck On-Road	0.031	0.023	0.092	0.002	0.037	0.010	7.887
Commuter	0.033	0.033	0.297	0.000	0.003	0.002	39.445
TOTAL	0.085	0.057	0.397	0.005	1.066	0.115	49.803

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	45.171	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00002%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000001%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because Project NI1 is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from Project NI1

Point and Area Sources Combined					
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
177,306	135,700	740,058	164,464	77,315	20,815
0.085	0.057	0.397	0.005	1.066	0.115
0.00005%	0.00004%	0.00005%	0.000003%	0.001%	0.001%

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction and Demolition Activities		Area Disturbed	
1.) NI1. Storm Water Drainage Improvements		39,133 ft ²	Assume 15% for FY12 and 21.25 for FY13 - FY 16 area disturbed for construction
Total Construction Area:		0 ft ²	
		0.00 acres	
Total Demolition Area:		0 ft ²	
		0.00 acres	
Total Pavement Area:		0 ft ²	
		0.00 acres	
Total Disturbed Area:		39,133 ft ²	Line 1
		0.90 acres	
Construction Duration:		12 month	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			0.000					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	39,133	0.90	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	0	0.00	0	
Architectural Coating:	0	0.00	0	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	-	-	-	-	-	-	0
Architectural Coatings	-	-	-	-	-	-	0
Total Emissions (lbs):	41.64	2.58	15.71	3.45	2.55	2.47	4,942

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Total Project Emissions (tons)	0.021	0.001	0.008	0.002	0.001	0.001	2.471

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.90 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	2.048	1.024	0.205	0.102
Total	2.048	1.024	0.205	0.102

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.90 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.90	0.11
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.90	0.44
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.45	0.45
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.45	0.19
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.90	0.32
TOTAL								1.51

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.51
Qty Equipment: 3.00
Grading days/yr: 0.50

Haul Truck Emissions

Emissions from hauling fill material and excavation waste are estimated in this spreadsheet.
Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Fill Materials Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of Fill Material and Excavation Waste =	2,899 cubic yards	Square footage of disturbed area multiplied by the depth of disturbance, which is assumed to be 2 feet.
Number of trucks required =	145 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	62.308	45.053	183.088	4.908	74.098	19.267	15774.412
tons	0.031	0.023	0.092	0.002	0.037	0.010	7.887

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 10 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	66.106	65.807	594.918	0.776	6.262	3.944	78889.129
tons	0.033	0.033	0.297	0.000	0.003	0.002	39.445

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Summary	Summarizes total emissions by calendar year for other 2016 projects
Combustion	Estimates emissions from non-road equipment exhaust.
Fugitive	Estimates particulate emissions from construction and demolition activities including earthmoving, vehicle traffic, and windblown dust.
Grading	Estimates the number of days of site preparation, to be used for estimating heavy equipment exhaust and earthmoving dust emissions.
Haul Truck On-Road	Estimates emissions from haul trucks hauling demolition debris, construction materials, fill materials, and excavation materials.
Construction Commuter	Estimates emissions for construction workers commuting to the site.
AQCR Tier Report	Summarizes total emissions for the West Central Florida Intrastate (WCFI) Air Quality Control Region Tier report for 2008, to be used to compare other 2016 projects to regional emissions.

Air Emissions for Other 2016 Projects

	NO _x (ton)	VOC (ton)	CO (ton)	SO ₂ (ton)	PM ₁₀ (ton)	PM _{2.5} (ton)	CO ₂ (ton)
Combustion	4.784	0.522	2.109	0.378	0.344	0.334	541.810
Fugitive Dust	-	-	-	-	0.785	0.079	-
Haul Truck On-Road	0.251	0.181	0.737	0.020	0.298	0.078	63.488
Commuter	0.099	0.099	0.892	0.001	0.009	0.006	118.334
TOTAL	5.134	0.802	3.739	0.399	1.437	0.496	723.631

Note: Total PM_{10/2.5} fugitive dust emissions are assuming USEPA 50% control efficiencies.

CO ₂ emissions converted to metric tons =	656.334	metric tons	
State of Florida's CO ₂ emissions =	226,000,000	metric tons	(U.S. DOE/EIA 2011)
Percent of Florida's CO ₂ emissions =	0.00029%		
United States' CO ₂ emissions =	5,425,600,000	metric tons	(U.S. DOE/EIA 2011)
Percent of USA's CO ₂ emissions =	0.000012%		

Source: U.S. Department of Energy, Energy Information Administration (U.S. DOE/EIA). 2011. *Table 1. State Emissions by Year (Million Metric Tons of Carbon Dioxide)*. Available online <http://www.eia.gov/environment/emissions/state/state_emissions.cfm>. Data released October 2011. Data accessed 23 March 2012.

Since future year budgets were not readily available, actual 2008 air emissions inventories for the counties were used as an approximation of the regional inventory. Because the other 2016 projects is several orders of magnitude below significance, the conclusion would be the same, regardless of whether future year budget data set were used.

West Central Florida Intrastate Air Quality Control Region

Year	Point and Area Sources Combined					
	NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)
2008	177,306	135,700	740,058	164,464	77,315	20,815

Source: USEPA National Emissions Inventory (NEI) (<http://neibrowser.epa.gov/eis-public-web/home.html>). Site visited on 23 March 2012.

Air Emissions from other 2016 projects

Point and Area Sources Combined						
NO _x (tpy)	VOC (tpy)	CO (tpy)	SO ₂ (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	
177,306	135,700	740,058	164,464	77,315	20,815	
5.134	0.802	3.739	0.399	1.437	0.496	
0.003%	0.001%	0.001%	0.000%	0.002%	0.002%	

Regional Emissions
Emissions
% of Regional

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction		Area Disturbed	
1.)	C37. Construct Fuel Containment System, Building 105	3,750 ft ²	
2.)	C38. DFT - Construct Pavilion, Building 49	300 ft ²	
3.)	C39. Munitions Administration Facility	5,000 ft ²	
4.)	C40. U.S. Water Operations Building	5,000 ft ²	
5.)	C41. Construct Security Forces Boat Dock	10,000 ft ²	
Pavement Activities			
6.)	C40. U.S. Water Operations Building _ Pavement	1,600 ft ²	
7.)	C41. Pavement	7,500 ft ²	
8.)	I33. Construct SATCOM Parking Lot, Building 1750	2,952 ft ²	
Infrastructure Construction Activities			
9.)	I32. Replace Cable 16	894 ft ²	
Natural Infrastructure Construction Activities			
10.)	NI2. Airfield Tree Violations, MacDill	372,618 ft ²	
Total Building Construction Area:		24,050 ft ²	All Building Construction Projects
		0.55 acres	
Total Demolition Area:		ft ²	All Demolition Projects
		0.00 acres	
Total Pavement Area:		12,052 ft ²	
		0.28 acres	
Total Disturbed Area:		409,614 ft ²	All 2016 Projects
		9.40 acres	
Construction Duration:		12 months	
Annual Construction Activity:		240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req'd. ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			12.639					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	409,614	9.40	6	(from "Grading" worksheet)
Paving:	12,052	0.28	2	
Demolition:	0	0.00	0	
Building Construction:	24,050	0.55	240	
Architectural Coating	24,050	0.55	20	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	249.85	15.46	94.26	20.70	15.27	14.81	29,649
Paving	90.73	5.21	37.16	7.85	5.55	5.39	11,248
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	260.25	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	9,867.18	1,032.07	4,334.48	781.49	705.98	684.80	1,119,575

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,867.18	1,032.07	4,334.48	781.49	705.98	684.80	1,119,575
Total Project Emissions (tons)	4.934	0.516	2.167	0.391	0.353	0.342	559.788

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
Construction and Demolition Activities	0.19	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42	ton PM ₁₀ /acre-month	MRI 1996; EPA 2001; EPA 2006

PM_{2.5} Emissions

PM _{2.5} Multiplier	0.10	(10% of PM ₁₀ emissions assumed to be PM _{2.5})	EPA 2001; EPA 2006

Control Efficiency

0.50	(assume 50% control efficiency for PM ₁₀ and PM _{2.5} emissions)	EPA 2001; EPA 2006

Project Assumptions

New Roadway Construction (0.42 ton PM₁₀/acre-month)

Duration of Construction Project	12 months
Area	0.00 acres

General Construction and Demolition Activities (0.19 ton PM₁₀/acre-month)

Duration of Project	12 months
Area	0.69 acres

	Project Emissions (tons/year)			
	PM ₁₀ uncontrolled	PM ₁₀ controlled	PM _{2.5} uncontrolled	PM _{2.5} controlled
New Roadway Construction	0.000	0.000	0.000	0.000
General Construction Activities	1.570	0.785	0.157	0.079
Total	1.570	0.785	0.157	0.079

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM₁₀/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM₁₀/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM₁₀/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM₁₀/acre-month) and 75% of the average emission factor (0.11 ton PM₁₀/acre-month). The 0.19 ton PM₁₀/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM₁₀/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particulate (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District as well as the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM₁₀/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM₁₀/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM₁₀/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM_{2.5} Multiplier

0.10

PM_{2.5} emissions are estimated by applying a particle size multiplier of 0.10 to PM₁₀ emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM₁₀ and PM_{2.5}

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM₁₀ and PM_{2.5} in PM nonattainment areas (EPA 2006). Wetting controls will be applied during project construction.

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

Grading Schedule

Estimate of time required to grade a specified area.

Input Parameters

Construction area: 0.69 acres/yr (from Combustion Worksheet)
Qty Equipment: 3.00 (calculated based on 3 pieces of equipment for every 10 acres)

Assumptions.

Terrain is mostly flat.

An average of 6" soil is excavated from one half of the site and backfilled to the other half of the site; no soil is hauled off-site or borrowed.

200 hp bulldozers are used for site clearing.

300 hp bulldozers are used for stripping, excavation, and backfill.

Vibratory drum rollers are used for compacting.

Stripping, Excavation, Backfill and Compaction require an average of two passes each.

Excavation and Backfill are assumed to involve only half of the site.

Calculation of days required for one piece of equipment to grade the specified area.

Reference: Means Heavy Construction Cost Data, 19th Ed., R. S. Means, 2005.

Means Line No.	Operation	Description	Output	Units	Acres per equip-day	equip-days per acre	Acres/yr (project- specific)	Equip-days per year
2230 200 0550	Site Clearing	Dozer & rake, medium brush	8	acre/day	8	0.13	0.69	0.09
2230 500 0300	Stripping	Topsoil & stockpiling, adverse soil	1,650	cu. yd/day	2.05	0.49	0.69	0.34
2315 432 5220	Excavation	Bulk, open site, common earth, 150' haul	800	cu. yd/day	0.99	1.01	0.34	0.35
2315 120 5220	Backfill	Structural, common earth, 150' haul	1,950	cu. yd/day	2.42	0.41	0.34	0.14
2315 310 5020	Compaction	Vibrating roller, 6 " lifts, 3 passes	2,300	cu. yd/day	2.85	0.35	0.69	0.24
TOTAL								1.15

Calculation of days required for the indicated pieces of equipment to grade the designated acreage.

(Equip)(day)/yr: 1.15
Qty Equipment: 3.00
Grading days/yr: 0.38

Haul Truck Emissions

Emissions from hauling construction supplies, demolition debris, fill, and excavated material are estimated in this spreadsheet.

Emission Estimation Method: United States Air Force (USAF) Institute for Environment, Safety and Occupational Health Risk Analysis (IERA) Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations (Revised December 2003).

Assumptions:

Haul trucks carry 20 cubic yards of material per trip.

The average distance from the project site to the materials source is 15 miles; therefore, a haul truck will travel 30 miles round trip.

Estimated number of trips required by haul trucks = total amount of material/20 cubic yards per truck

Amount of demolition debris =	0 cubic yards	Demolition area multiplied by 4 feet per floor. All buildings assumed to be one floor.
Amount of fill material =	0 cubic yards	Demolition area multiplied by depth of building foundations which are assumed to be 12 feet.
Amount of Excavation Materials for New Buildings =	13,333 cubic yards	Construction area multiplied by depth of disturbance which is assumed to be 12 feet.
Amount of Excavation Material for Paving =	0 cubic yards	Paving area multiplied by depth of disturbance which is assumed to be 1 foot.
Amount of Building Materials =	10,000 cubic yards	Construction area multiplied by 9 feet.
Amount of Paving Materials =	0 cubic yards	Paving area multiplied 1 foot.
Number of trucks required =	1167 heavy duty diesel haul truck trips	
Miles per trip =	30 miles	

Heavy Duty Diesel Vehicle (HDDV) Average Emission Factors (grams/mile)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
HDDV	6.5	4.7	19.1	0.512	7.73	2.01	1645.605

Notes:

Emission factors for all pollutants except CO₂ are from USAF IERA 2003.

Emission factors for PM, PM₁₀, SO_x are from HDDV in Table 4-50 (USAF IERA 2003).

Emission factors for VOC, CO, and NO_x are from Tables 4-41 through 4-43 for the 2010 calendar year, 2000 model year (USAF IERA 2003).

Diesel fuel produces 22.384 pounds of CO₂ per gallon.

It is assumed that the average HDDV has a fuel economy of 6.17 miles per gallon, Table 4-51 (USAF IERA 2003)

CO₂ emission factor = 22.384 lbs CO₂/gallon diesel * gallon diesel/6.17 miles * 453.6 g/lb

HDDV Haul Truck Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	501.543	362.654	1473.765	39.506	596.451	155.093	126975.689
tons	0.251	0.181	0.737	0.020	0.298	0.078	63.488

Example Calculation: NO_x emissions (lbs) = 30 miles per trip * 369 trips * NO_x emission factor (g/mile) * lb/453.6 g

Construction Commuter Emissions

Emissions from construction workers commuting to the job site are estimated in this spreadsheet.

Emission Estimation Method: Emission factors from the South Coast Air Quality Management District (SCAQMD) EMFAC 2007 (v 2.3) Model (on-road) were used. These emission factors are available online at <http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>.

Assumptions:

Passenger vehicle emission factors for scenario year 2010 are used.

The average roundtrip commute for a construction worker = 30 miles
 Number of construction days = 240 days
 Number of construction workers (daily) = 30 people

Passenger Vehicle Emission Factors for Year 2010 (lbs/mile)

NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
0.00091814	0.00091399	0.00826276	0.00001077	0.00008698	0.00005478	1.09568235

Source: South Coast Air Quality Management District. EMFAC 2007 (ver 2.3) On-Road Emissions Factors. Last updated April 24, 2008. Available online: <<http://www.aqmd.gov/ceqa/handbook/onroad/onroad.html>>. Accessed 27 May 2009.

Notes:

The SMAQMD 2007 reference lists emission factors for reactive organic gas (ROG). For purposes of this worksheet ROG = VOC.

Construction Commuter Emissions

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
lbs	198.318	197.421	1784.755	2.327	18.787	11.833	236667.387
tons	0.099	0.099	0.892	0.001	0.009	0.006	118.334

Example Calculation: NO_x emissions (lbs) = 60 miles/day * NO_x emission factor (lb/mile) * number of construction days * number of workers

West Central Florida Intrastate (WCFI) Air Quality Control Region

			All Emission Sources					
Row #	State	County	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC
1	FL	Citrus County	36,883	36,819	10,692	5,212	85,669	6,972
2	FL	Hardee County	9,060	1,403	1,557	360	36	1,348
3	FL	Hernando County	32,957	8,115	4,002	808	2,128	5,845
4	FL	Hillsborough County	200,158	56,348	17,543	4,313	19,078	35,779
5	FL	Levy County	14,560	1,329	2,227	420	21	2,930
6	FL	Manatee County	60,057	11,873	4,998	1,422	8,965	11,816
7	FL	Pasco County	67,110	13,317	9,559	1,609	17,468	12,365
8	FL	Pinellas County	159,218	22,970	7,442	1,725	7,723	28,646
9	FL	Polk County	135,926	21,860	16,127	4,149	23,327	26,108
10	FL	Sumter County	24,129	3,273	3,168	799	50	3,890
Grand Total			740,058	177,306	77,315	20,815	164,464	135,700

SOURCE:

<http://neibrowser.epa.gov/eis-public-web/home.html>

USEPA National Emissions Inventory (NEI)

Emissions in tons per year for 2008

Combustion Emissions

Combustion Emissions of VOC, NO_x, SO₂, CO, PM_{2.5}, PM₁₀, and CO₂ due to Construction and Demolition

General Construction**Area Disturbed**

1.) C42. SOCOM Utility Plant

30,000 ft²

Total Building Construction Area:	30,000 ft ²	All Building Construction Projects
	0.69 acres	
Total Demolition Area:	0 ft ²	All Demolition Projects
	0.00 acres	
Total Pavement Area:	0 ft ²	
	0.00 acres	
Total Disturbed Area:	30,000 ft ²	All 2017 Projects
	0.69 acres	
Construction Duration:	12 months	
Annual Construction Activity:	240 days	Assume 4 weeks per month, 5 days per week.

Emission Factors Used for Construction Equipment

References: Guide to Air Quality Assessment, SMAQMD, 2004; and U.S. EPA NONROAD Emissions Model, Version 2005.0.0

Emission factors are taken from the NONROAD model and were provided to e²M by Larry Landman of the Air Quality and Modeling Center (Landman.Larry@epamail.epa.gov) on 12/14/07. Factors provided are for the weighted average US fleet for CY2007.

Assumptions regarding the type and number of equipment are from SMAQMD Table 3-1 unless otherwise noted.

Grading

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Bulldozer	1	13.60	0.96	5.50	1.02	0.89	0.87	1456.90
Motor Grader	1	9.69	0.73	3.20	0.80	0.66	0.64	1141.65
Water Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	3	41.64	2.58	15.71	3.45	2.55	2.47	4941.53

Paving

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Paver	1	3.83	0.37	2.06	0.28	0.35	0.34	401.93
Roller	1	4.82	0.44	2.51	0.37	0.43	0.42	536.07
Truck	2	36.71	1.79	14.01	3.27	1.99	1.93	4685.95
Total per 10 acres of activity	4	45.37	2.61	18.58	3.93	2.78	2.69	5623.96

Demolition

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Loader	1	13.45	0.99	5.58	0.95	0.93	0.90	1360.10
Haul Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Total per 10 acres of activity	2	31.81	1.89	12.58	2.58	1.92	1.87	3703.07

Building Construction

Equipment ^d	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c (lb/day)	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Stationary								
Generator Set	1	2.38	0.32	1.18	0.15	0.23	0.22	213.06
Industrial Saw	1	2.62	0.32	1.97	0.20	0.32	0.31	291.92
Welder	1	1.12	0.38	1.50	0.08	0.23	0.22	112.39
Mobile (non-road)								
Truck	1	18.36	0.89	7.00	1.64	1.00	0.97	2342.98
Forklift	1	5.34	0.56	3.33	0.40	0.55	0.54	572.24
Crane	1	9.57	0.66	2.39	0.65	0.50	0.49	931.93
Total per 10 acres of activity	6	39.40	3.13	17.38	3.12	2.83	2.74	4464.51

Note: Footnotes for tables are on following page

Architectural Coatings

Equipment	No. Req ^d . ^a per 10 acres	NO _x (lb/day)	VOC ^b (lb/day)	CO (lb/day)	SO ₂ ^c	PM ₁₀ (lb/day)	PM _{2.5} (lb/day)	CO ₂ (lb/day)
Air Compressor	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77
Total per 10 acres of activity	1	3.57	0.37	1.57	0.25	0.31	0.30	359.77

- a) The SMAQMD 2004 guidance suggests a default equipment fleet for each activity, assuming 10 acres of that activity, (e.g., 10 acres of grading, 10 acres of paving, etc.). The default equipment fleet is increased for each 10 acre increment in the size of the construction project. That is, a 26 acre project would round to 30 acres and the fleet size would be three times the default fleet for a 10 acre project.
- b) The SMAQMD 2004 reference lists emission factors for reactive organic gas (ROG). For the purposes of this worksheet ROG = VOC. The NONROAD model contains emissions factors for total HC and for VOC. The factors used here are the VOC factors.
- c) The NONROAD emission factors assume that the average fuel burned in nonroad trucks is 1100 ppm sulfur. Trucks that would be used for the Proposed Actions will all be fueled by highway grade diesel fuel which cannot exceed 500 ppm sulfur. These estimates therefore over-estimate SO₂ emissions by more than a factor of two.
- d) Typical equipment fleet for building construction was not itemized in SMAQMD 2004 guidance. The equipment list above was assumed based on SMAQMD 1994 guidance.

PROJECT-SPECIFIC EMISSION FACTOR SUMMARY

Source	Equipment Multiplier*	Project-Specific Emission Factors (lb/day)						
		NO _x	VOC	CO	SO ₂ **	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	1	41.641	2.577	15.710	3.449	2.546	2.469	4941.526
Paving Equipment	1	45.367	2.606	18.578	3.926	2.776	2.693	5623.957
Demolition Equipment	1	31.808	1.886	12.584	2.585	1.923	1.865	3703.074
Building Construction	1	39.396	3.130	17.382	3.116	2.829	2.744	4464.512
Air Compressor for Architectural Coating	1	3.574	0.373	1.565	0.251	0.309	0.300	359.773
Architectural Coating**			14.116					

*The equipment multiplier is an integer that represents units of 10 acres for purposes of estimating the number of equipment required for the project.

**Emission factor is from the evaporation of solvents during painting, per "Air Quality Thresholds of Significance", SMAQMD, 1994

Example: SMAQMD Emission Factor for Grading Equipment NO_x = (Total Grading NO_x per 10 acre)*(Equipment Multiplier)

Summary of Input Parameters

	Total Area (ft ²)	Total Area (acres)	Total Days	
Grading:	30,000	0.69	1	(from "Grading" worksheet)
Paving:	0	0.00	0	
Demolition:	0	0.00	0	
Building Construction:	30,000	0.69	240	(per SMAQMD "Air Quality of Thresholds of Significance", 1994)
Architectural Coating	30,000	0.69	20	

NOTE: The 'Total Days' estimate for paving is calculated by dividing the total number of acres by 0.21 acres/day, which is a factor derived from the 2005 MEANS Heavy Construction Cost Data, 19th Edition, for 'Asphaltic Concrete Pavement, Lots and Driveways - 6" stone base', which provides an estimate of square feet paved per day. There is also an estimate for 'Plain Cement Concrete Pavement', however the estimate for asphalt is used because it is more conservative. The 'Total Days' estimate for demolition is calculated by dividing the total number of acres by 0.02 acres/day, which is a factor also derived from the 2005 MEANS reference. This is calculated by averaging the demolition estimates from 'Building Demolition - Small Buildings, Concrete', assuming a height of 30 feet for a two-story building; from 'Building Footings and Foundations Demolition - 6" Thick, Plain Concrete'; and from 'Demolish, Remove Pavement and Curb - Concrete to 6" thick, rod reinforced'. Paving is double-weighted since projects typically involve more paving demolition. The 'Total Days' estimate for building construction is assumed to be 230 days, unless project-specific data is known.

Total Project Emissions by Activity (lbs)

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Grading Equipment	41.64	2.58	15.71	3.45	2.55	2.47	4,942
Paving	-	-	-	-	-	-	0
Demolition	-	-	-	-	-	-	0
Building Construction	9,455.12	751.15	4,171.75	747.92	678.97	658.60	1,071,483
Architectural Coatings	71.48	289.79	31.31	5.02	6.19	6.00	7,195
Total Emissions (lbs):	9,568.24	1,043.52	4,218.77	756.40	687.70	667.07	1,083,620

Results: Total Project Annual Emission Rates

	NO _x	VOC	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂
Total Project Emissions (lbs)	9,568.24	1,043.52	4,218.77	756.40	687.70	667.07	1,083,620
Total Project Emissions (tons)	4.784	0.522	2.109	0.378	0.344	0.334	541.810

APPENDIX E

COASTAL CONSISTENCY DETERMINATION

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION

Introduction

This document provides the State of Florida with the U.S. Air Force's Consistency Determination under the Coastal Zone Management Act (CZMA) Section 307 and 15 C.F.R. § 930 sub-part C. The information in this Consistency Determination is provided pursuant to 15 C.F.R. § 930.39 and § 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, and its implementing regulations at 15 C.F.R. § 930.

This Federal consistency determination addresses selected installation development projects at MacDill Air Force Base (AFB), Florida from fiscal year 2012 to 2017.

Proposed Federal Agency Action

The purpose of the Proposed Action is to complete selected construction, demolition, infrastructure improvement, natural infrastructure management, and strategic sustainability performance projects identified as necessary to ensure that future mission and facility requirements are met.

The need for the Proposed Action is to meet current and future mission requirements and national security objectives associated with MacDill AFB. This involves meeting ongoing mission requirements that necessitate repairing and upgrading installation utilities, pavements, and facilities; improving the efficiency and effectiveness of forces with the capability to expand; replacing older, substandard facilities with new buildings; and providing reliable utilities, quality housing, and an efficient transportation system to support MacDill AFB.

Federal Review

Statutes addressed as part of the Florida Coastal Management Program (CMP) consistency review and considered in the analysis of the Proposed Action are discussed in **Table 1**.

Based on the information and analysis provided in **Table 1**, MacDill AFB finds that the Proposed Action for installation development is consistent with the applicable enforceable policies and mechanisms of Florida's CMP.

Pursuant to 15 C.F.R. § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document to concur with, or object to, this Consistency Determination, or to request an extension in writing under 15 C.F.R. § 930.41(b). Florida's concurrence will be presumed if MacDill AFB does not receive its response by the 60th day from receipt of this determination.

Table 1. Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161, F.S. <i>Beach and Shore Preservation</i>	The Proposed Action would not affect beach and shore management, specifically as it pertains to: • The Coastal Construction Permit Program. • The Coastal Construction Control Line (CCCL) Permit Program. • The Coastal Zone Protection Program.	Authorizes the Bureau of Beaches and Coastal Systems within DEP to regulate construction on or seaward of the states' beaches.
Chapter 163, F.S. <i>Intergovernmental Programs: Growth Policy, County and Municipal Planning: Land Development Regulation</i>	The Proposed Action would not affect local government comprehensive plans.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186, F.S. <i>State and Regional Planning</i>	State and regional agencies will be provided the opportunity to review the Installation Development Environmental Assessment (IDEA). Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding state plans for water use, land development, and transportation.	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252, F.S. <i>Emergency Management</i>	The Proposed Action would not have significant adverse effects on the ability of the state to manage and respond to natural and manmade disasters.	Directs the state to reduce the vulnerability of its people and property to natural and manmade disasters; prepare for, respond to, and reduce the impacts of disasters; and decrease the time and resources needed from disasters.
Chapter 253, F.S. <i>State Lands</i>	The Proposed Action would occur on Federal property; therefore, the selected projects would not have an effect on state-owned lands.	Provides the framework for conservation and protection of natural and cultural resources of state-owned lands.
Chapter 258, F.S. <i>State Parks and Preserves</i>	The Proposed Action would not have an effect on state parks, recreational areas, or preserves.	Addresses administration and management of state parks, preserves, and recreation areas.

Statute	Consistency	Scope
Chapter 259, F.S. <i>Land Acquisition for Conservation or Recreation</i>	The Proposed Action would not have an effect on publicly owned lands for tourism or outdoor recreation.	Authorizes acquisition of environmentally endangered lands and outdoor recreation lands.
Chapter 260, F.S. <i>Florida Greenways and Trails Act</i>	The Proposed Action would not include the acquisition of land and would not affect the Greenways and Trails Program.	Authorizes acquisition of land to create a recreational trails system and to facilitate management of the system.
Chapter 267, F.S. <i>Historical Resources</i>	The Proposed Action would not have an effect on archaeological sites listed or eligible for listing in the National Register of Historic Places (NHRP), Native American sacred sites, or any adverse effects on NRHP-eligible architectural resources.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288, F.S. <i>Commercial Development and Capital Improvements</i>	The Proposed Action would not have significant adverse effects on Florida industries or economic diversification efforts.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334, F.S. <i>Transportation Administration</i>	Minor, short-term, effects are anticipated on the transportation network at and around MacDill AFB from construction vehicles, which would compose a small percentage of the total existing traffic. No long-term, permanent affects or alteration to the transportation network would occur.	Addresses the transportation administration policies of the state.
Chapter 339, F.S. <i>Transportation Finance and Planning</i>	The Proposed Action would not affect the finance and planning needs of the state's transportation system.	Addresses the state's transportation systems finance and planning needs.

Statute	Consistency	Scope
Chapter 373, F.S. <i>Water Resources</i>	The Proposed Action would not result in a significant effect on water resources. The selected projects would increase the potential for impact from the increased rate and volume of storm water runoff due to an increase in impervious surfaces, but this would be managed through implementation of environmental protection measures and by following the installation's Storm Water Pollution Prevention Plan. Storm water drainage improvements would reduce localized flooding. All applicable permits would be coordinated in accordance with the Florida Administrative Code and the National Pollutant Discharge Elimination System. All potential impacts on water resources from implementing the Proposed Action are further addressed in Section 4 of the IDEA. Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the water resources of the state.	Addresses conservation and preservation of water resources, water quality, and environmental quality.
Chapter 375, F.S. <i>Outdoor Recreation and Conservation Lands</i>	The Proposed Action would not opportunities for outdoor recreation on state lands.	Addresses the development of a comprehensive multipurpose outdoor recreation plan.
Chapter 376, F.S. <i>Pollutant Discharge Prevention and Removal</i>	The Proposed Action would involve storage tanks, asbestos, and lead-based paints, but would be managed through implementation of the installation's Spill Prevention, Control, and Countermeasures (SPCC) Plan, Hazardous Waste Management Plan, Asbestos Management and Operations Plan, and the Lead-Based Paint Management Plan.	Regulates the transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.
Chapter 377, F.S. <i>Energy Resources</i>	Newly constructed buildings would tie into existing utility lines. Therefore, the Proposed Action would not affect energy resource production, including oil and gas, or the transportation of oil and gas.	Addresses the regulation, planning and development of oil and gas resources of the state.
Chapter 379, F.S. <i>Fish and Wildlife Conservation</i>	The Proposed Action would not result in permanent significant disturbances to native habitat and would have no affect on threatened or endangered species.	Addresses the management of the wildlife resources of the state.

Statute	Consistency	Scope
Chapter 380, F.S. <i>Land and Water Management</i>	The Proposed Action would not affect development of state lands with regional (i.e., more than one county) impacts. The Proposed Action would not include changes to coastal infrastructure such as capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing or construction.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381, F.S. <i>Public Health: General Provisions</i>	The Proposed Action would not affect the state's policy concerning the public health system.	Establishes public policy concerning the state's public health system.
Chapter 388, F.S. <i>Mosquito Control</i>	The Proposed Action would not affect mosquito control efforts.	Addresses mosquito control efforts in the state.
Chapter 403, F.S. <i>Environmental Control</i>	The conservation of environmentally sensitive living resources; protection of groundwater and surface water quality and quantity; protection of potable water supply; protection of air quality; minimization of adverse hydrogeologic impacts; protection of floodplains and wetlands are addressed in review of the Proposed Action. Where impacts on these resources can be identified, possible minimization and mitigation measures are suggested.	Establishes public policy concerning environmental control in the state.
Chapter 553, F.S. <i>Building and Construction Standards</i>	The Proposed Action would comply with the state's construction standards. The Proposed Action would have no affect on building construction standards.	Addresses building construction standards for a unified Florida Building Code.
Chapter 582, F.S. <i>Soil and Water Conservation</i>	Soil disturbance would occur during construction, but would be controlled through best management practices and by following guidelines in the installation's Storm Water Pollution Prevention Plan and Section 438 of the Energy Independence and Security Act.	Provides for the control and prevention of soil erosion.
Chapter 597, F.S. <i>Aquaculture</i>	The Proposed Action would have no affect on aquaculture.	Establishes public policy to enhance the growth of aquaculture.

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