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AE Master Plans: A Tool for Ensuring Explosives Safety Compliance

2010 DDESB Seminar
13 July 2010

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Abstract

Today's planners and explosives safety managers often lack a detailed, comprehensive plan for planned construction of explosives facilities. Installation master plans rarely identify specific building placement or recommended magazine designs. When a military construction project (MILCON) or other construction opportunity arises, a new facility site may be chosen that meets explosives safety criteria but hinders future development. One solution is to develop an Ammunition and Explosives (AE) Master Plan, which identifies a specific approach to long-term improvements to explosives facilities. A comprehensive AE Master Plan includes final alternatives for recapitalization, phasing, construction cost estimates, environmental and explosives safety issues, and a preliminary site plan.

This paper will discuss:

- Example explosives safety issues that relate to AE Master Plans;
- Why an AE Master Plan is useful (i.e., advantages of using an AE Master Plan to guide planning/development);
- How to develop an AE Master Plan, including the magazine selection process and the magazine siting process; and
- Typical costs/schedules for an AE Master Plan.

Report Documentation Page

Form Approved
OMB No. 0704-0188

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1. REPORT DATE JUL 2010	2. REPORT TYPE N/A	3. DATES COVERED -			
4. TITLE AND SUBTITLE AE Master Plans: A Tool for Ensuring Explosives Safety Compliance		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Eastern Research Group, Inc. 14555 Avion Parkway, Ste 200 Chantilly, VA 20151		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM002313. Department of Defense Explosives Safety Board Seminar (34th) held in Portland, Oregon on 13-15 July 2010, The original document contains color images.					
14. ABSTRACT Todays planners and explosives safety managers often lack a detailed, comprehensive plan for planned construction of explosives facilities. Installation master plans rarely identify specific building placement or recommended magazine designs. When a military construction project (MILCON) or other construction opportunity arises, a new facility site may be chosen that meets explosives safety criteria but hinders future development. One solution is to develop an Ammunition and Explosives (AE) Master Plan, which identifies a specific approach to long-term improvements to explosives facilities. A comprehensive AE Master Plan includes final alternatives for recapitalization, phasing, construction cost estimates, environmental and explosives safety issues, and a preliminary site plan.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 23	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Example Issues

Most planners and explosives safety managers can identify facilities at their installations that don't meet current explosives safety criteria and/or current mission needs. The majority of these issues can be grouped into three general categories: encroachment, poor configuration, and poor condition. Examples of these issues include:

- An inhabited facility (e.g., office building) was constructed just outside existing explosives arcs. As a result, explosives limits cannot be increased and/or new explosives buildings cannot be built (encroachment).
- A new housing development was constructed in a previously undeveloped area adjacent to the installation fence line. The development is located in or near existing explosives arcs (encroachment).
- A new magazine was constructed such that there is not sufficient space for a second new magazine (due to quantity distance (QD) issues). The original planned location considered the need for future development (i.e., a second magazine). However, the construction site was abruptly changed during the RFP development because of cost concerns related to the terrain at the preferred site (poor configuration of buildings).
- An installation has old magazines with 8-foot wide access doors. The magazines cannot be used to store large, modern AE items such as missiles or torpedoes because they will not fit through the doors (see Figure 1). Also, because the floor is not flush to the ground, or due to the small size of the magazine, a forklift cannot drive into the magazines. Ordnance personnel are forced to break down palletized materials and hand-carry them into the magazine (poor configuration).
- An installation has a complex of old earth-covered magazines. The magazines were constructed in the 1940s and require frequent maintenance due to water intrusion, cracking/crumbling concrete, and corrosion of grounding systems (see Figure 1) (poor condition).



Figure 1. Photos of Magazines with Condition and Configuration Issues

Why an AE Master Plan is Useful

The AE Master Plan should include final alternatives for recapitalization, phasing, construction cost estimates, environmental and explosives safety issues, and a preliminary site plan. An AE Master Plan provides the following advantages:

- Resolves siting issues such as the examples listed above.
- Eliminates waivers.
- Eliminates storage compatibility issues.
- Identifies/documents current and future storage requirements.
- Identifies optimal mix of magazine types to meet storage requirements.
- Identifies candidate sites for planned magazines based on existing and planned physical constraints.
- Identifies additional expansion sites for future (undetermined) storage requirements.
- Provides a tool that planners and explosives safety managers can utilize to prevent incompatible development within *existing and planned* explosives safety arcs (many Encroachment Action Plans only consider existing arcs).
- Considers the impacts of phasing on explosives safety arcs and storage capacity.

- Reduces site improvement costs by identifying potential issues (e.g., archeological site, soil contamination) and minimizing those issues through the site selection process.
- Maximizes explosives limits (consistent with mission requirements) at existing/planned magazines, thus reducing construction costs by reducing the number of required magazines.
- Provides “shovel ready”/“off the shelf” projects for when funding opportunities arise.
- Provides information and graphics (i.e., site maps) that improve the visibility of planned projects during briefings.

How an AE Master Plan is Developed

An AE Master Plan is typically developed through a series of briefings and workshops designed to maximize input from all applicable stakeholders (see Figure 2). Although the mix of stakeholders may vary between installations, typical participants include planning, environmental, safety, security, mission/operations, and command staff.

The AE Master Planning process has four phases: kickoff/interviews, concept development, concept analysis, and reporting.

The first phase includes a kickoff meeting and data gathering. A workshop is held to conduct a series of stakeholder interviews, which help to establish goals/expectations and identify key issues. This phase also typically includes field verification.

During concept development, the planning team conducts workshops to present preliminary plans to the stakeholders and obtain their feedback. A charette is held during which stakeholders provide additional input to the alternatives; this input is incorporated during the charette so that stakeholders can see the result of their feedback. During the concept development phase, development alternatives are refined and narrowed. Typically, a preferred plan and an alternative plan are identified at the end of the concept development phase. These plans are illustrated via site maps that include current and planned explosives arcs. The planning team prepares these site maps in the format preferred by the installation (e.g., AutoCAD, GIS).

The concept analysis phase includes construction cost estimation, phasing, analysis of environmental and safety considerations, identification of advantages and disadvantages, and other detailed planning. This phase may overlap somewhat with the concept development phase (i.e., the preferred plan and alternative plan may not be identified until the preliminary concept analysis is complete). The concept analysis phase typically concludes with a briefing in which the planning team presents results, conclusions, and recommendations.

The reporting phase is the final step in the process. During this phase, the planning team generates a draft report for stakeholder comment and review. Stakeholder comments are then incorporated into a final report.

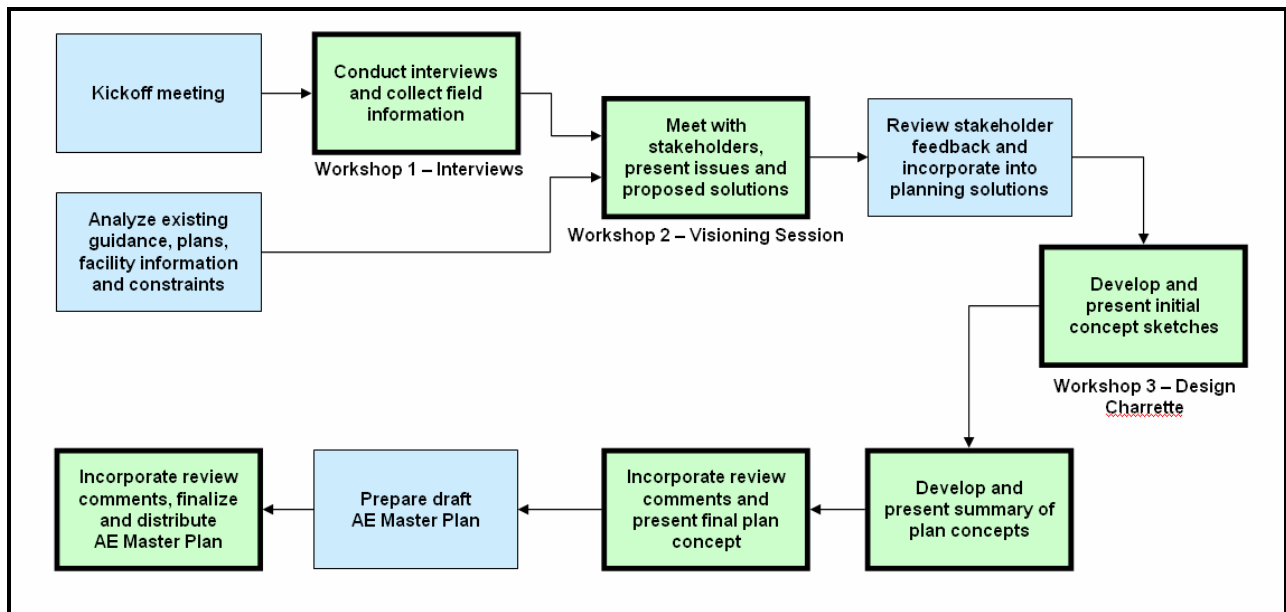


Figure 2. Example Process Flow for Development of an AE Master Plan

Typical Cost and Schedule

The cost and length of time to develop an AE Master Plan can range from \$50k to \$150k and 6 to 12 months, and varies from one installation to another. Variables that may impact cost and/or schedule include:

- Quality of existing data (e.g., is the current load plan up to date, is the mapping data up to date?).
- Whether updates to facility condition assessments are required.
- Whether updates to facility planning documents (e.g., basic facility requirements) are included as part of the effort.
- Number of facilities in the explosives storage/operating areas.
- Number of existing waivers/exemptions that require consideration.
- Degree of anticipated future expansion (i.e., is this primarily a recapitalization effort or is extensive expansion planned/required?).
- Number of meetings/workshops desired and number of additional revisions to the report required.

Conclusion

This paper summarizes the benefits of having an AE Master Plan, the typical process used to develop an AE Master Plan, and the typical cost and duration to develop an AE Master Plan.

AE Master Plans are a valuable resource to planners and explosives safety managers because they provide a documented, installation command-approved plan for short-term and long-term development in AE areas. Having an AE Master Plan also heightens awareness of issues with facility conditions (i.e., older magazines) and by doing so improves the likelihood of attracting funding for maintenance and/or replacement.

To learn more about AE Master Plans, please contact one of the ERG contacts listed at the top of this document.

Ammunition and Explosives Master Plans

A tool for ensuring explosives safety compliance

Ward R. Libby, P.E.

Do you have...

- Magazines in poor condition?



Do you have...

- Magazines that modern AE won't fit into?



Do you have...

- Magazines that don't permit forklift access?



Do you have...

- Storage compatibility issues?
- Waivers?

*An AE Master Plan
will establish a plan to
correct these issues*



An AE Master Plan...

- Identifies what new magazines are required for current and future needs (and where to put them)
- Identifies near-term and long-term phases (out to 20 or 30 years)
- Is similar to a Master Plan but more detailed

An AE Master Plan may include...

- Requirements analyses
- Review of existing siting constraints / exposures
- Facilities condition assessments
- Site plans (current and proposed arcs)
- Project phasing (scopes and costs)
- Development alternatives (facility types / sites)
- “Surplus sites” (for future requirements)

Typical Recommendations

- Optimal mix of magazine types
- Advantages/disadvantages of alternatives
- Corrective action for siting issues
- Real estate to preserve (encroachment)

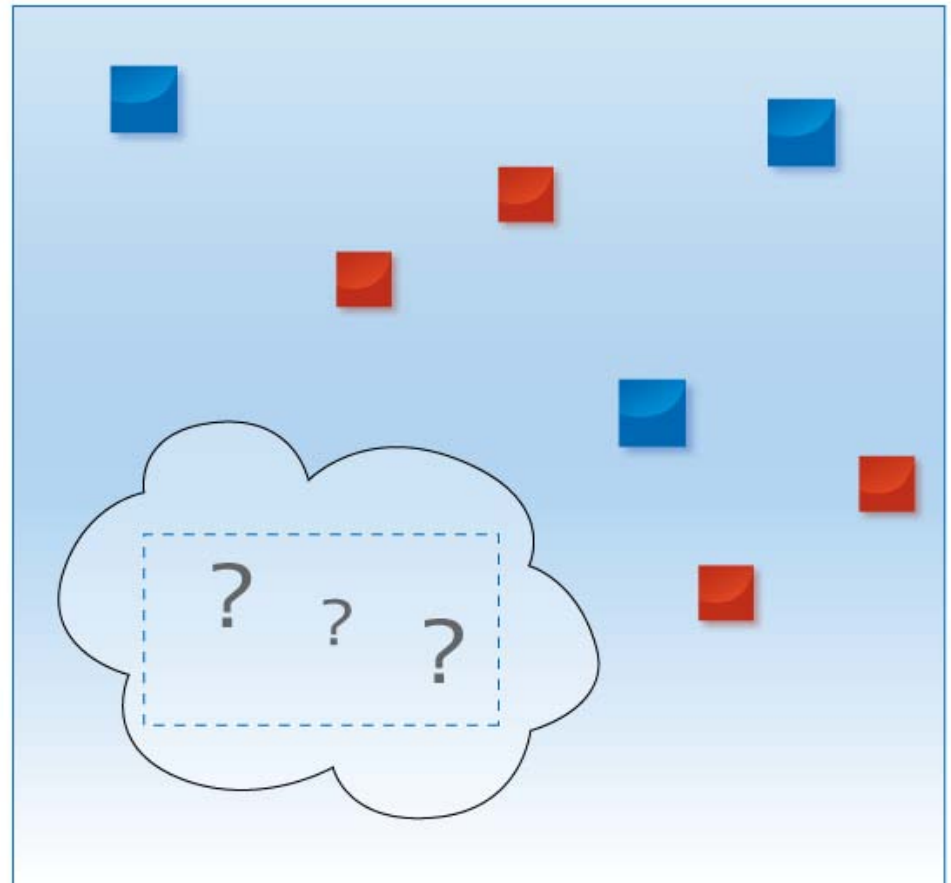
Does Your Master Plan Address AE?

Installation Master Plan, DoD Installation X

Legend

- Planned Construction
- Planned Demolition
- Fenceline for Explosives Area
- Installation Boundary
- ⤵ Explosives Safety Arcs *

* We don't know much about this area so we're going to assume it will stay the same.



Why have an AE Master Plan?

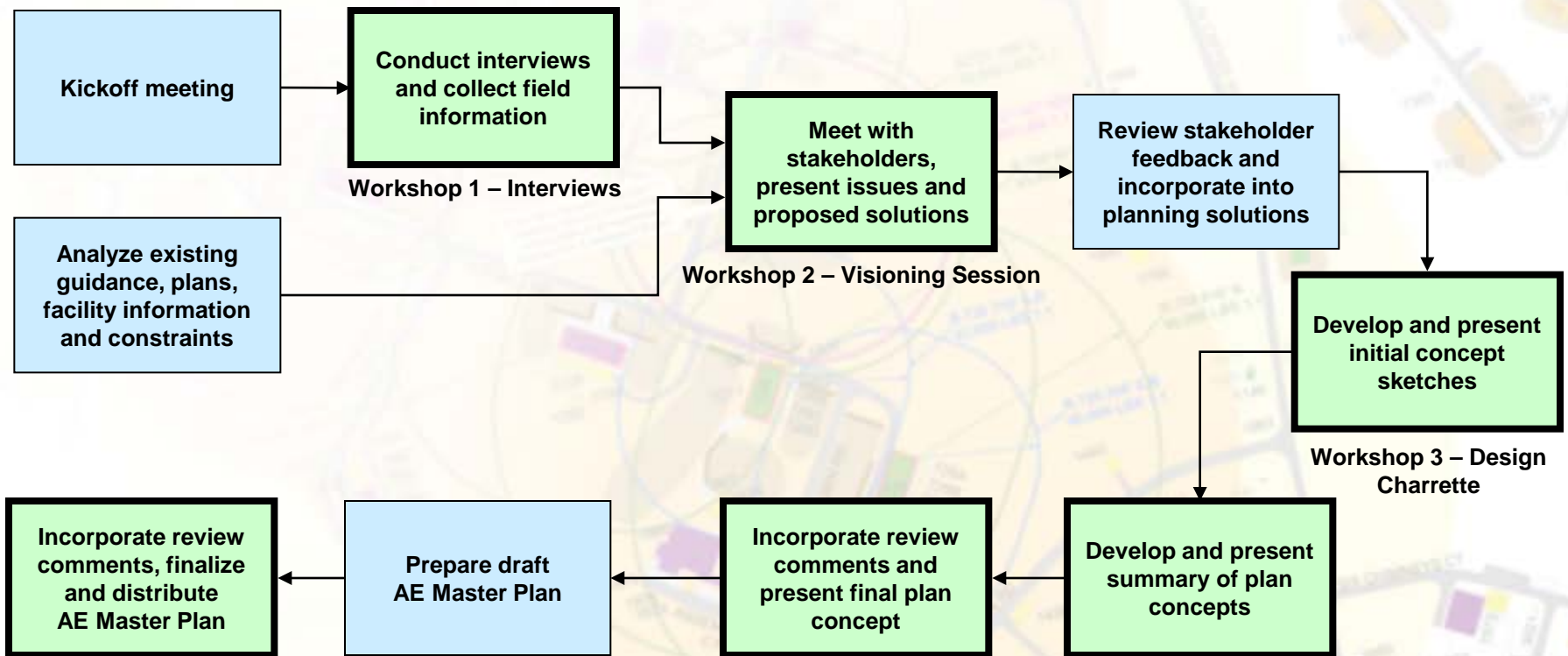
- Cost avoidance
 - Reduce site improvement costs
 - Reduce number of magazines
- Maximize utilization of real estate
- Maximize limits / storage capacity
- Preserve real estate
- Identify “shovel ready” / “on the shelf” projects for when funding opportunities arise
- Improve visibility of planned projects
- Plan in place for current and future mission requirements
- Feeds/guides MILCON planning process



Case Study: Naval Station Norfolk

Process Flow

Project Duration: 7 months
(May take more or less time depending on project)

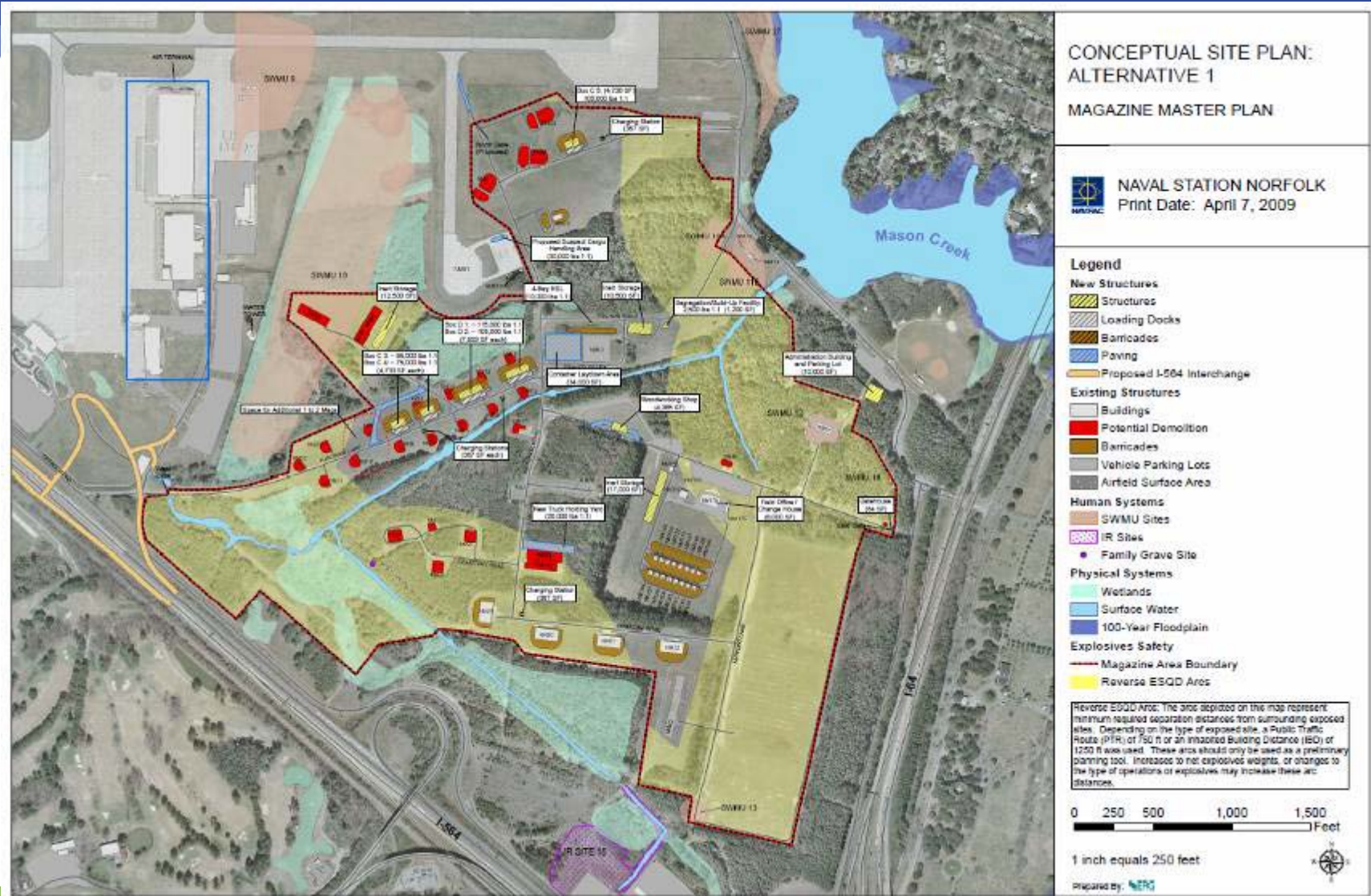


Green boxes indicate stakeholder involvement

Concept Plan Overview

Functional Requirement	Proposed Action
High explosive magazines	Replace with box type magazines
Ordnance operations	Renovate existing facility or construct new facility
Academic instruction	Construct new facility
Segregation/Build-up	Renovate existing facility or construct new facility
Forklift charging	Install 4 new stations
Woodworking	Construct a new shop with an adjacent covered area
Inert storehouses	Construct 2 to 3 new storehouses
Gate/Sentry	Construct new shelter
Suspect cargo area	Install paved areas
De-containerizing area	
Container laydown area	
Truck holding yard	

Preferred Concept Plan



Phasing Approach

Option 1 Preliminary Cost Estimate Summary			
Facility Name	Size (SF)	Phase 1 (\$FY13)	Phase 2 (\$FY14)
Ordnance Operations	10,344	\$1,578	
Segregation	1,200	\$670	
Woodworking Shop	4,365	\$890	
Forklift Recharging Station (1)	368	\$80	
Forklift Recharging Station (2)	368	\$80	
Forklift Recharging Station (3)	368	\$80	
Forklift Recharging Station (4)	368		\$90
Type C Earth-Covered Magazine (1)	4,738	\$2,500	
Type C Earth-Covered Magazine (2)	4,738		\$2,600
Type D Earth-Covered Magazine (1)	7,993	\$7,000	
Type D Earth-Covered Magazine (2)	7,993		\$7,200
Inert Storehouse (1)	17,000		\$3,570
Inert Storehouse (2)	12,500	\$2,200	
Inert Storehouse (3)	10,500		\$2,400
Guard Shack	64	\$34	
Container Laydown Area	34,000	\$99	
Truck Holding Yard	20,000	\$200	
Demolition (Phase 1)	32,896	\$3,200	
Demolition (Phase 2)	36,530		\$3,750
	Total:	\$18,611	\$19,610

(Note: Costs presented in this table are not real. They have been changed from what was presented in the study)

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- Concepts / Alternatives
- Explosives Safety
- Environmental
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