

Hill AFB's Focus on Sustainable Choices in Environmental Restoration

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BUILDING A BETTER WORLD



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Goals

E2S2 – Provide an opportunity to share ideas on how to improve energy, environmental and sustainability management

My Presentation – Give you the roadmap of the steps taken by Hill AFB Restoration Program to enable more sustainable solutions for remediation systems



Presentation Outline

- Sustainability Drivers
- Overview Hill AFB
- Two Approaches
- Results
- Lessons Learned



Sustainability Drivers



Environmental
stewardship

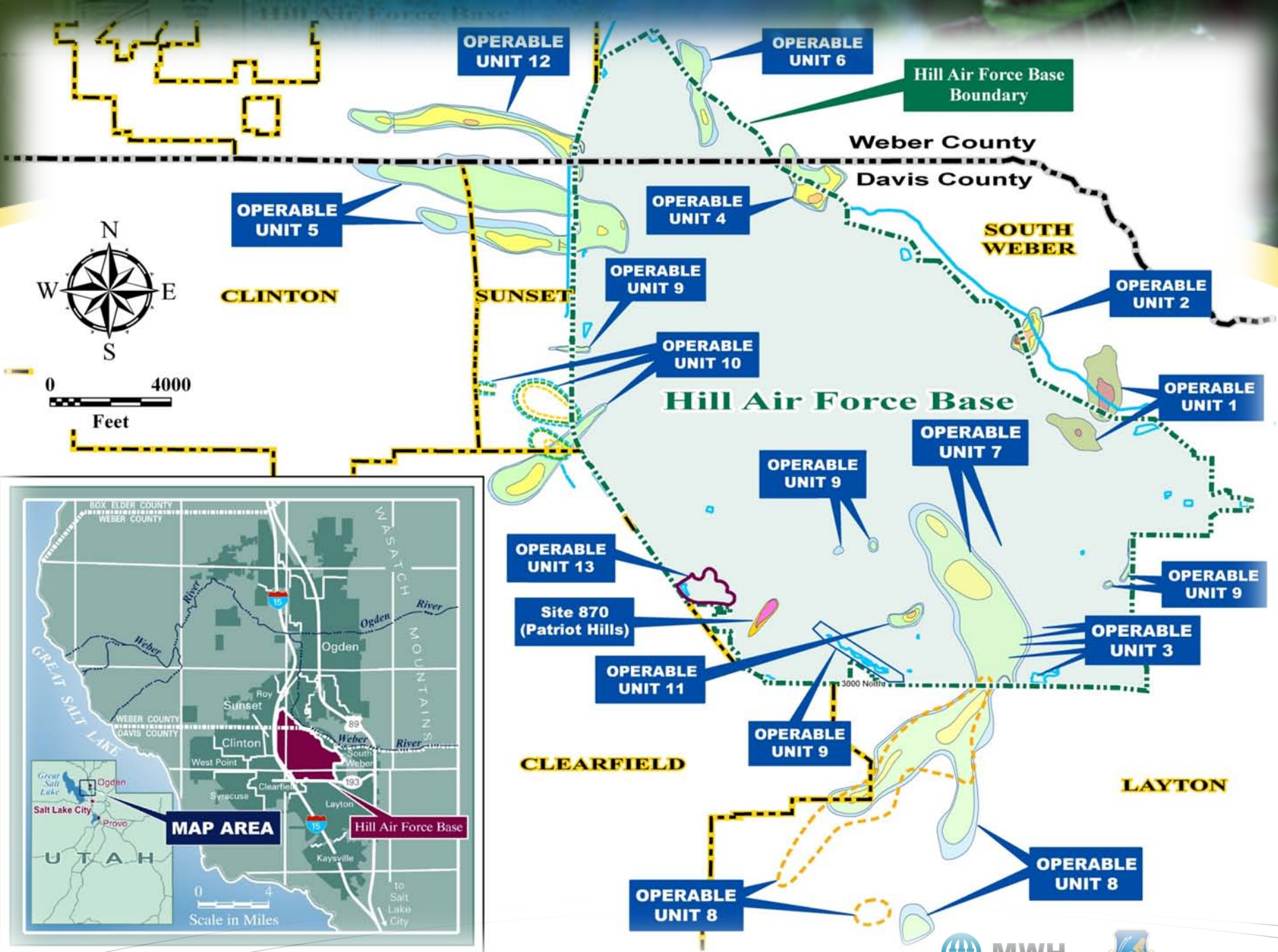


Fiscal
responsibility



Formal drivers

- Executive Orders
- AF Infrastructure Energy Strategic Plan
- US EPA – Green Remediation
- DoD Memorandum of 10 August 2009 – specific to GR



Approaches

Two Approaches for Identifying Energy, Carbon, Water,
and Labor Savings



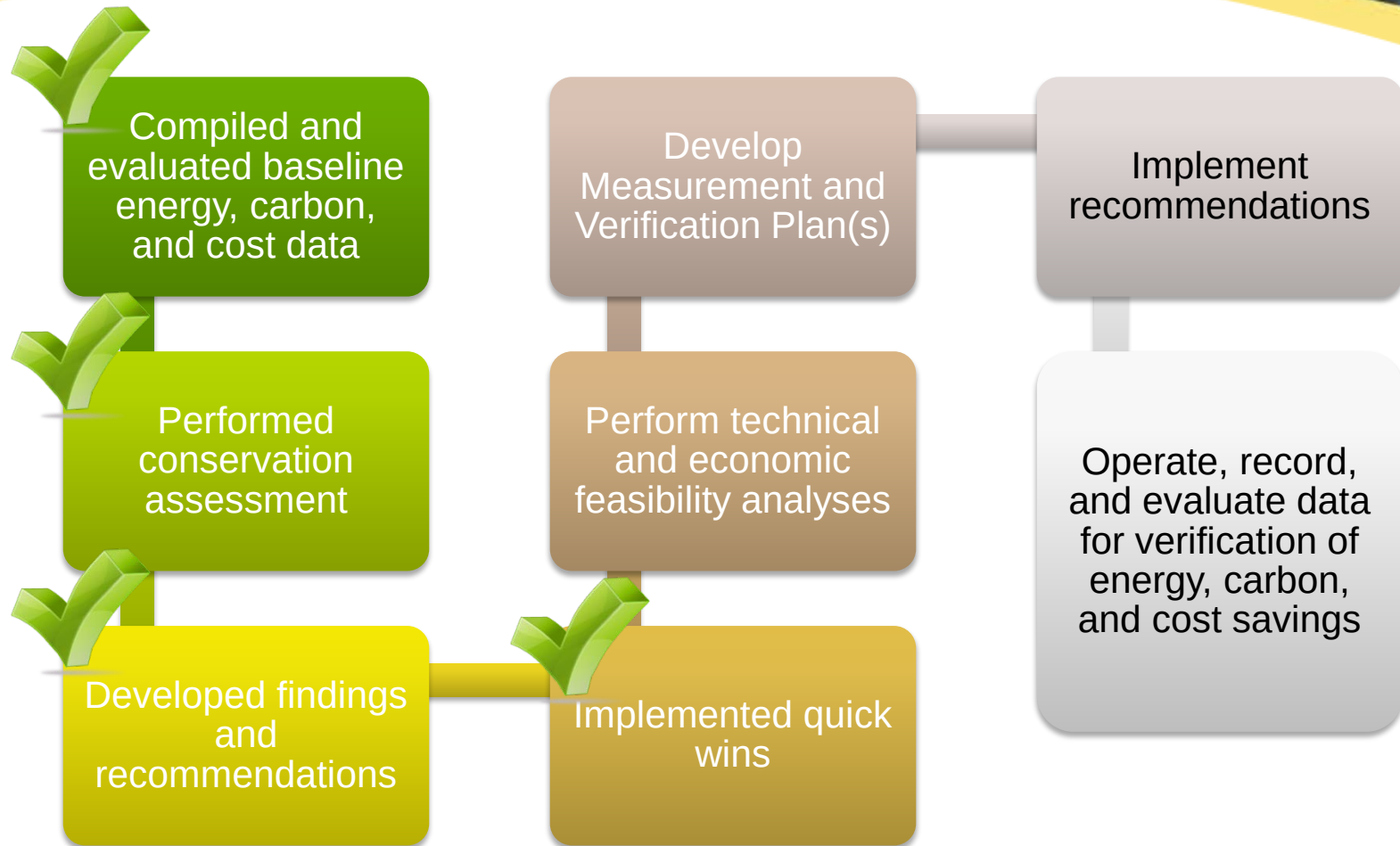
Each Approach Had Different Incentives



Projects Identified by the Conservation Assessment

Primary Incentive: Energy, Carbon and Water Use Reductions

Conservation Assessment Approach



Conservation Assessment Recommendations

35 site-specific, **3** basewide

Estimated Savings

395,000 kWh/yr (35%)

358,000 lb CO₂/yr (29%)

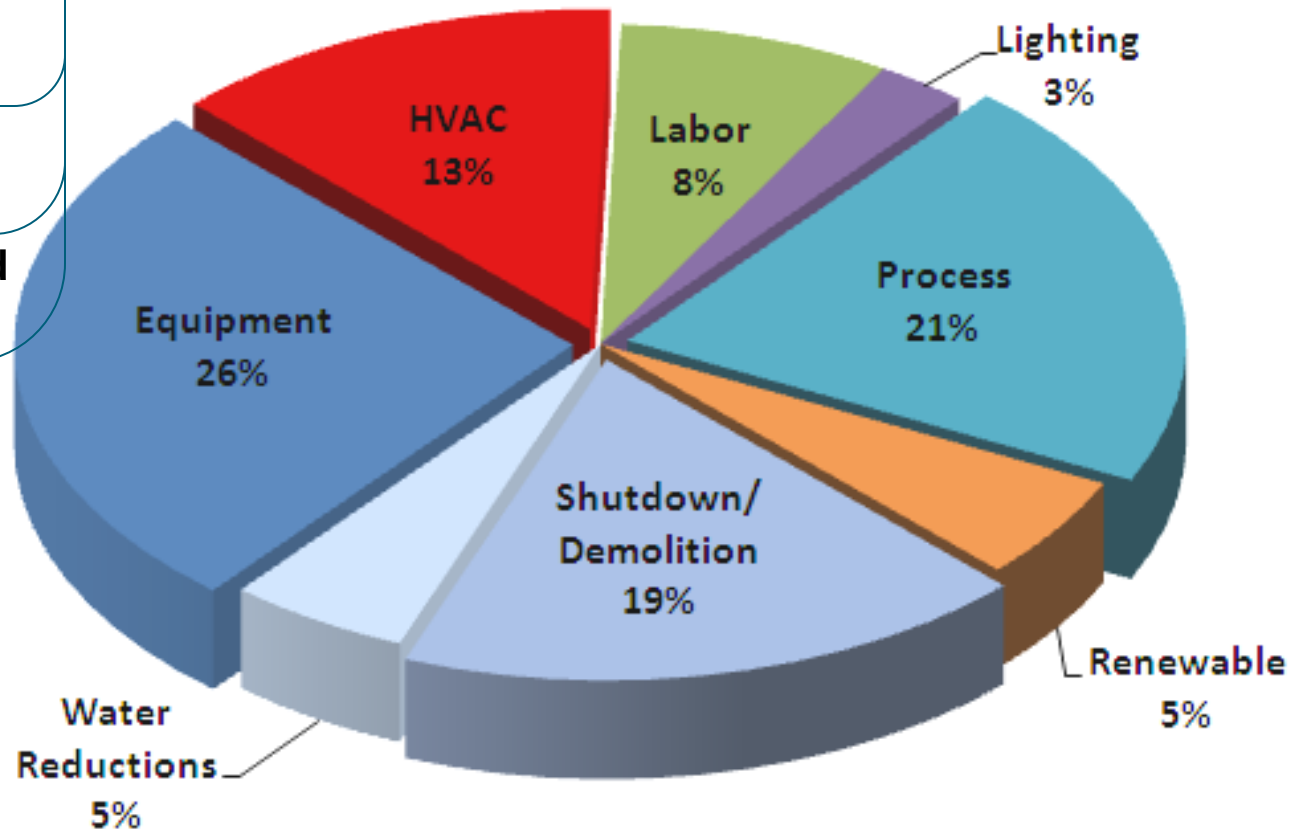
\$268,500 (17%)

Estimated Investment

\$652,000

Estimated Payback Period

2.4 years



Next Steps

- ✓ Implemented “quick-win” recommendations
 - Quick payback period
 - Relatively small investment
 - Not complicated
- ✓ Proceeded with feasibility study and robust cost/benefit analysis of 8 additional engineering-intensive recommendations

Example of Cost-Benefit Analysis

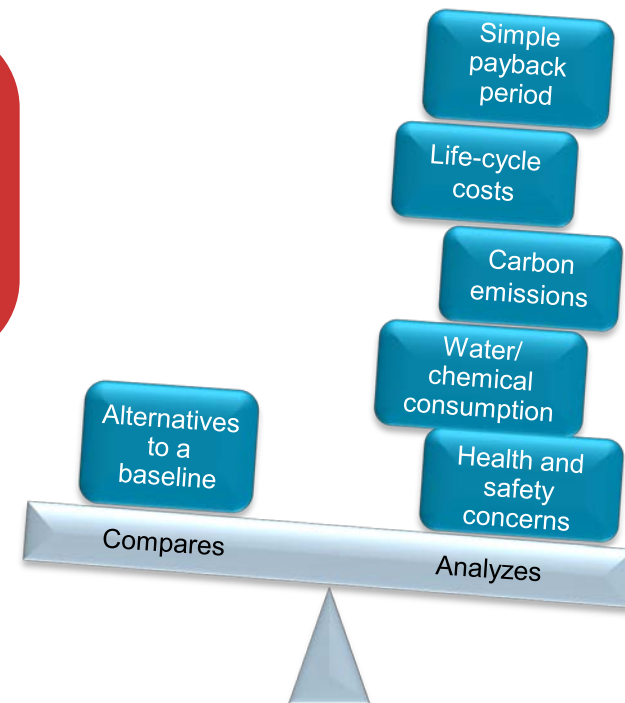
Cost/Benefit Analysis for **Photovoltaic (PV) Solar Arrays at Six Meter Buildings and Central Facilities Building (CFB) Using On-Base Electricity Rates (Rate Schedule 9) (1-7)**

Date of Evaluation **12/16/2010**

Operable Unit **1**

System **Groundwater Containment System (GCS)**

Parameter	Baseline	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Equipment/Method/Procedure	Grid Power	900 W PV Array at 4 Small Meter Buildings	1.4 kW PV Array at 2 Large Meter Buildings	9.9 kW PV Array at CFB	PV Array at All Buildings
Non-recurring Costs					
Field Labor (\$)	\$ -	\$ 4,070	\$ 2,030	\$ 3,050	\$ 9,150
Engineering/Design Labor (\$)	\$ -	\$ 5,410	\$ 5,410	\$ 5,410	\$ 5,410
Administration (\$)	\$ -	\$ 2,350	\$ 2,350	\$ 2,350	\$ 2,350
Total Labor Cost (\$)	\$ -	\$ 11,830	\$ 9,790	\$ 10,810	\$ 16,910
Mileage (\$)	\$ -	\$ 410	\$ 230	\$ 290	\$ 470
Total Other Direct Costs (\$)	\$ -	\$ 410	\$ 230	\$ 290	\$ 470
Installation Subcontractor for Alternative (\$)	\$ -	\$ 26,980	\$ 18,590	\$ 58,390	\$ 103,960
Total Subcontractor Costs (\$)	\$ -	\$ 26,980	\$ 18,590	\$ 58,390	\$ 103,960
Subtotal	\$ -	\$ 39,220	\$ 28,610	\$ 69,490	\$ 121,340
Recurring Costs					
kWhr Required For System Operation (kWhr/yr) ^(a)	233,928	233,928	233,928	233,928	233,928
kWhr Produced by Alternative Oct - Apr (kWhr/yr) ^(b)	-	2,516	1,956	6,850	11,322
kWhr Produced by Alternative May - Sept (kWhr/yr) ^(b)	-	2,520	1,960	6,860	11,340
kWhr Required from Grid Oct-Apr (kWhr/yr)	176,580	174,064	174,624	169,730	165,258
kWhr Required from Grid May-Sept (kWhr/yr)	57,348	54,828	55,388	50,488	46,008
Average Peak Load Savings by Alternative Oct-Apr (kW) ^{(b)(c)}	-	2.9	2.2	7.8	12.8
Average Peak Load Savings by Alternative May-Sept (kW) ^{(b)(c)}	-	2.7	2.1	7.4	12.3
Cost per year savings using PV array (\$/yr)	\$ -	\$ 470	\$ 380	\$ 1,390	\$ 2,240
Cost per year from Grid Rate Schedule (\$/yr)	\$ 6,050	\$ 5,580	\$ 5,670	\$ 4,660	\$ 3,810
Subtotal	\$ 6,050	\$ 5,580	\$ 5,670	\$ 4,660	\$ 3,810
Replacement Costs					
Life Cycle	25	25	25	25	25
Replacement Costs (\$) ^(d)	\$ -	\$ 11,070	\$ 8,300	\$ 26,730	\$ 46,100
Subtotal	\$ -	\$ 11,070	\$ 8,300	\$ 26,730	\$ 46,100
Simple Payback Period (yrs)	N/A	107	97	69	75
Anticipated Life-Cycle Costs (20 year)	\$ 121,000	\$ 178,720	\$ 170,360	\$ 185,990	\$ 216,590
Anticipated Life-Cycle Cost Savings (20 year)	N/A	\$ (57,720)	\$ (49,360)	\$ (64,990)	\$ (95,590)

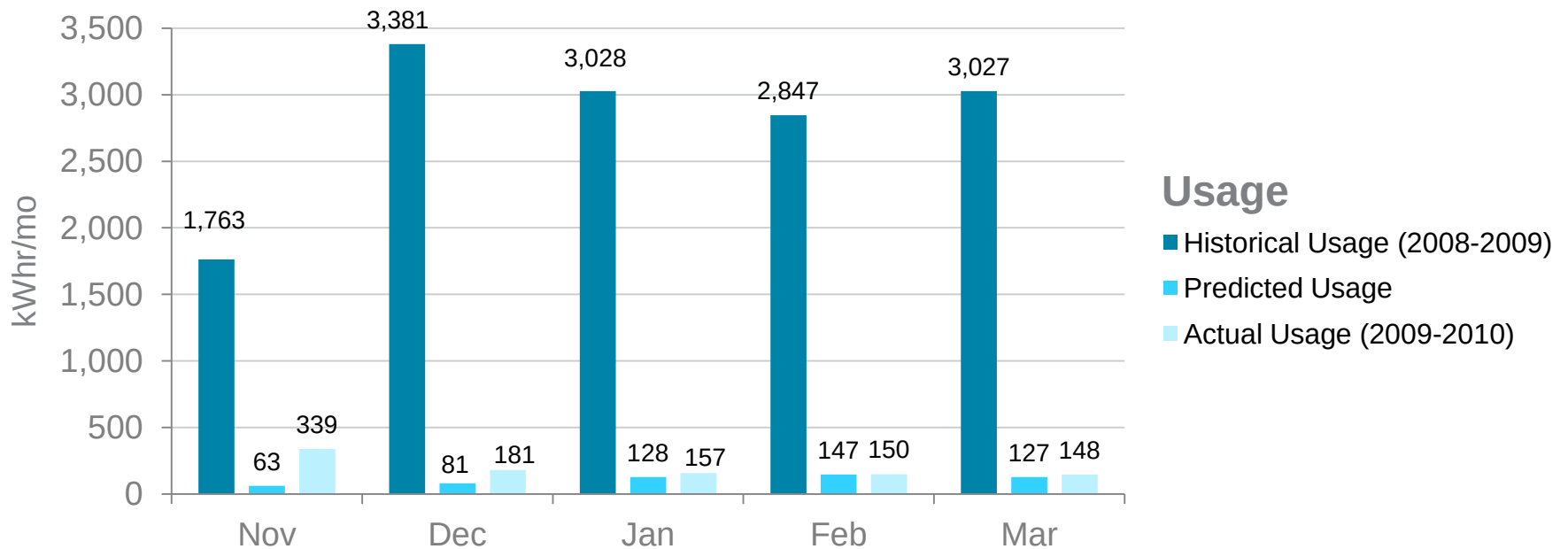


Selected Projects from Cost/Benefit Analyses

4 of the 8 projects got green light for implementation

- Inactivate HVAC at system process building and installed heat trace on piping
- Maximize use of off-peak electricity rates for extraction wells at two on-Base OUs instead of pumping 24/7
- Inactivate air stripper and route extracted groundwater directly to sanitary sewer
- Replace existing landscaping with xeriscaping at two off-Base sites located in residential neighborhoods

Example of Measurement & Verification Approach

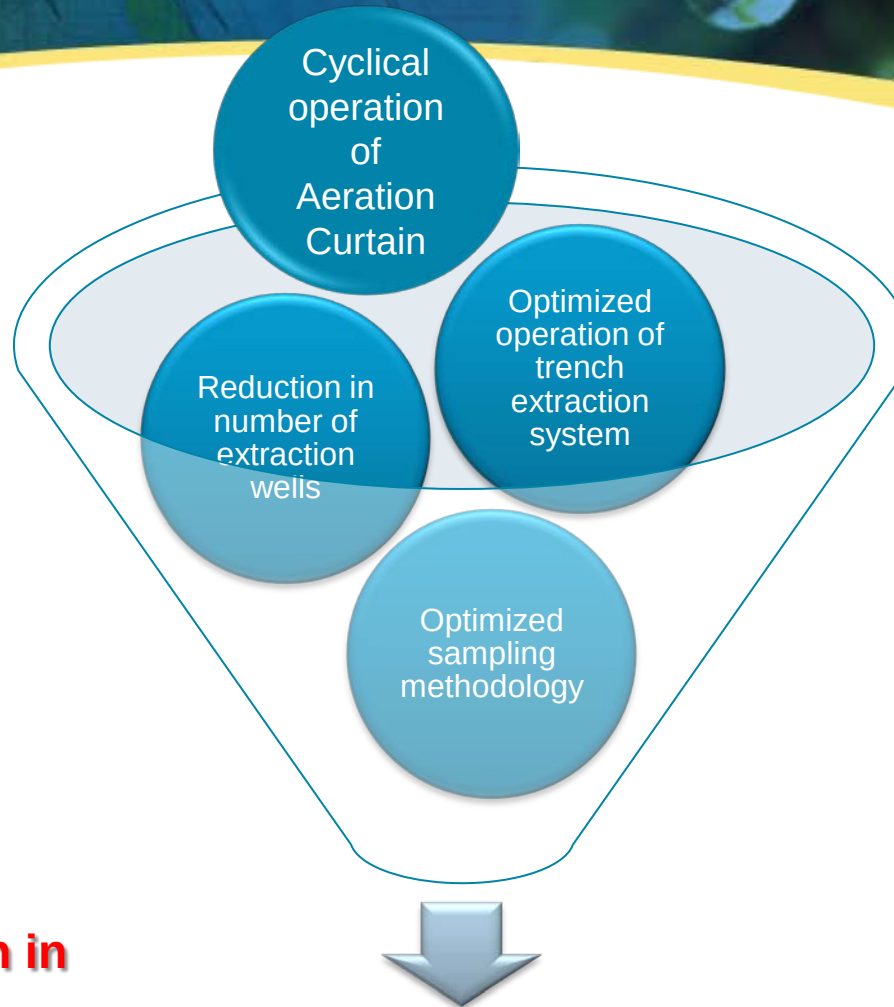




Projects Identified by O&M Contractors

Primary Incentive: Labor Savings

Recommendations Identified by O&M Contractors



Implementation plan in place for each recommendation to ensure no deterioration in system performance

Labor Savings to O&M Contractor

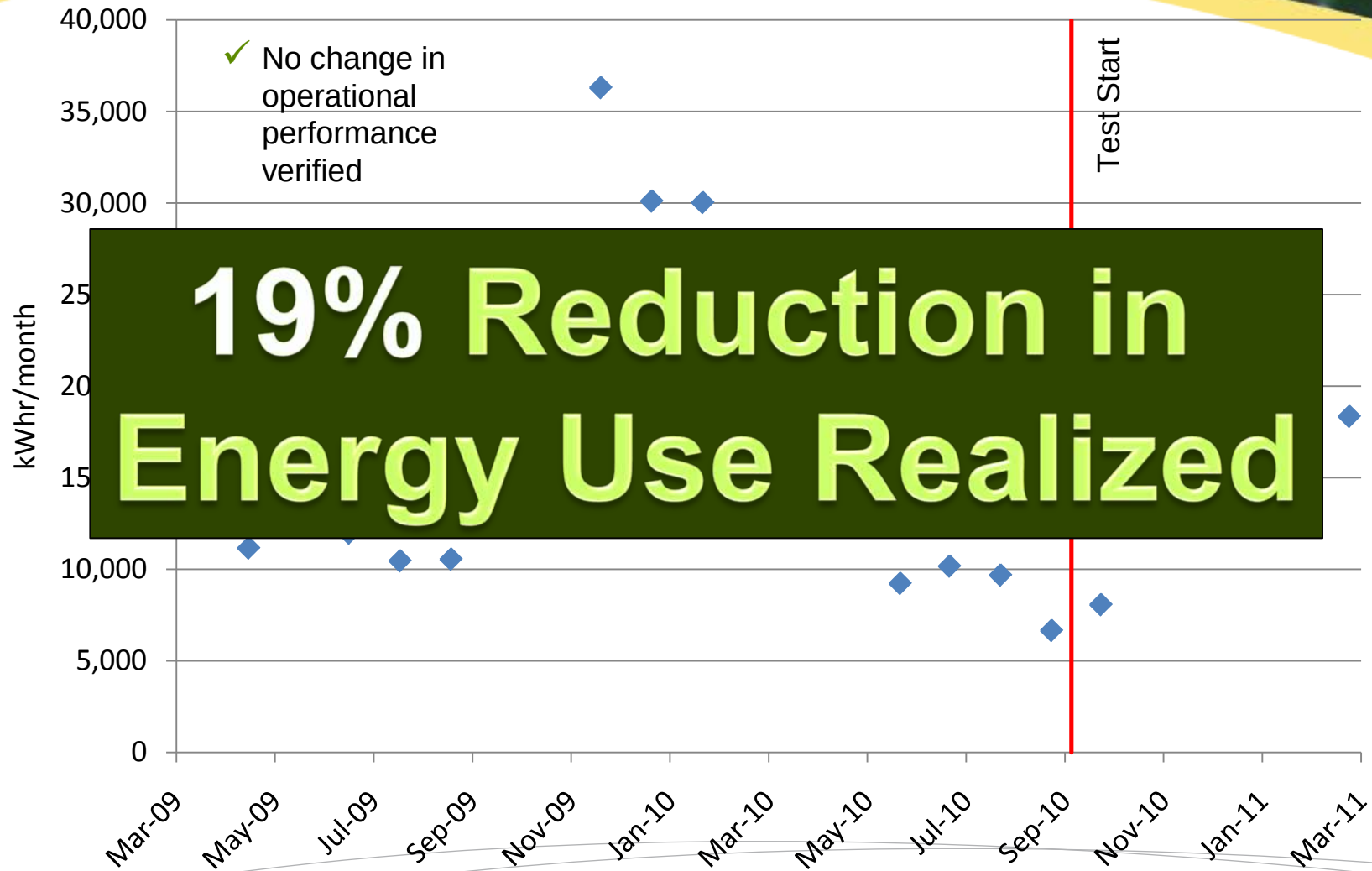


Results for Implemented Projects and Predicted Results for Planned Projects

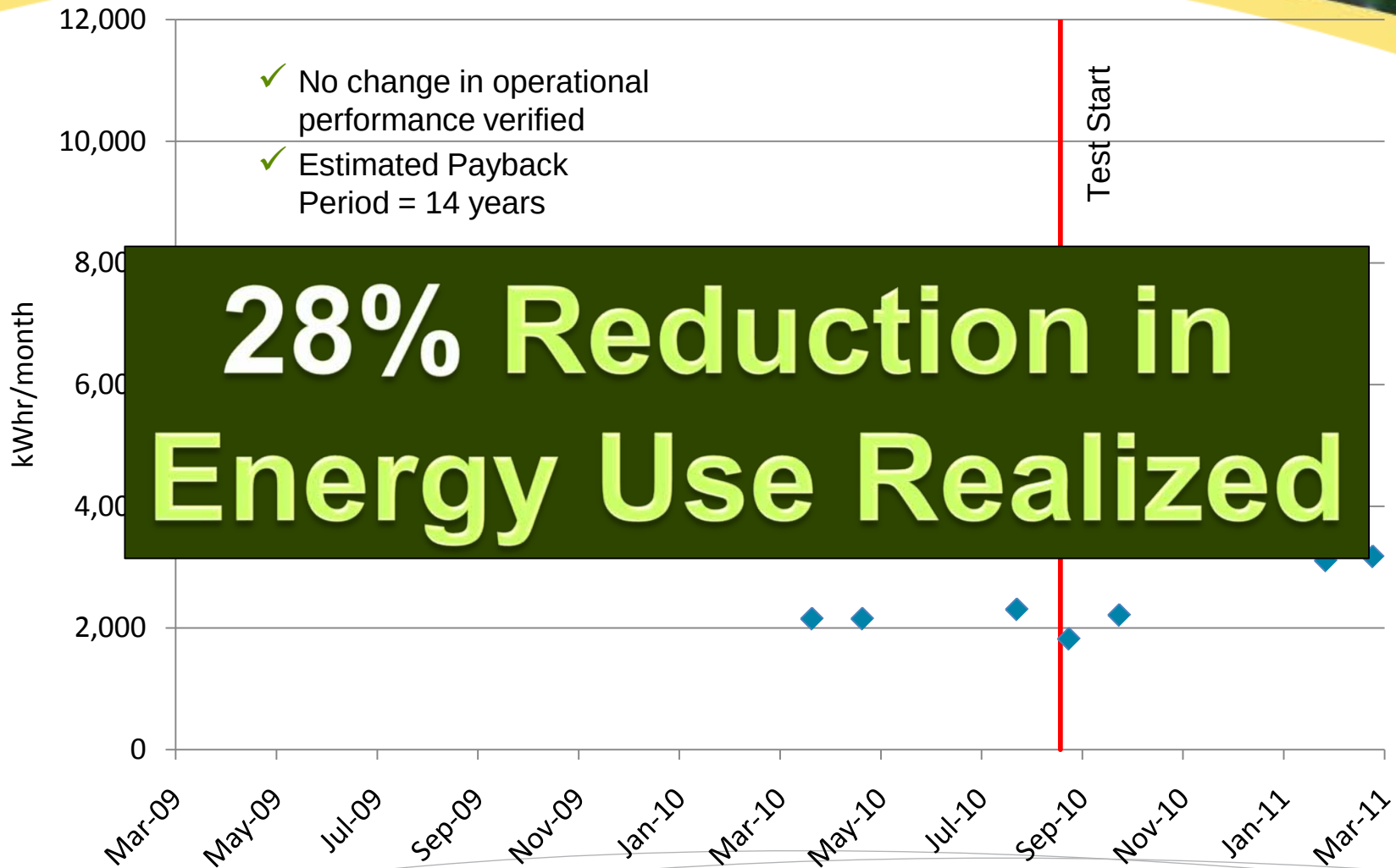
Cyclical Operation of Aeration Curtain

- Alternated aeration operations among 3 modules on 24-hour increments instead of all modules 24/7
- Test performed with existing blower therefore no electricity savings realized during 3-month test
- Implemented recommended modifications in March 2011
- Projected:
 - 35 to 45% electricity savings
 - Payback period = 7 years

Operation of Reduced Number of Extraction Trenches



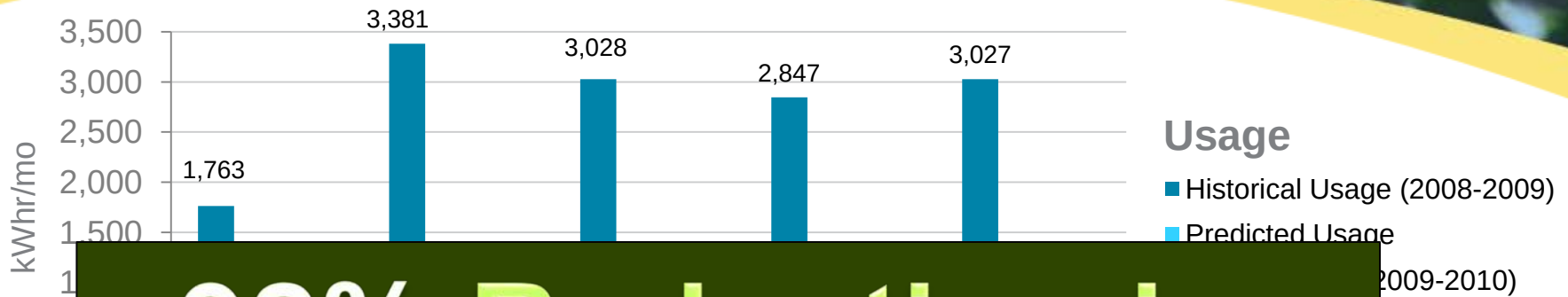
Operation of Reduced Number of Extraction Wells



Implemented Passive Sampling Basewide

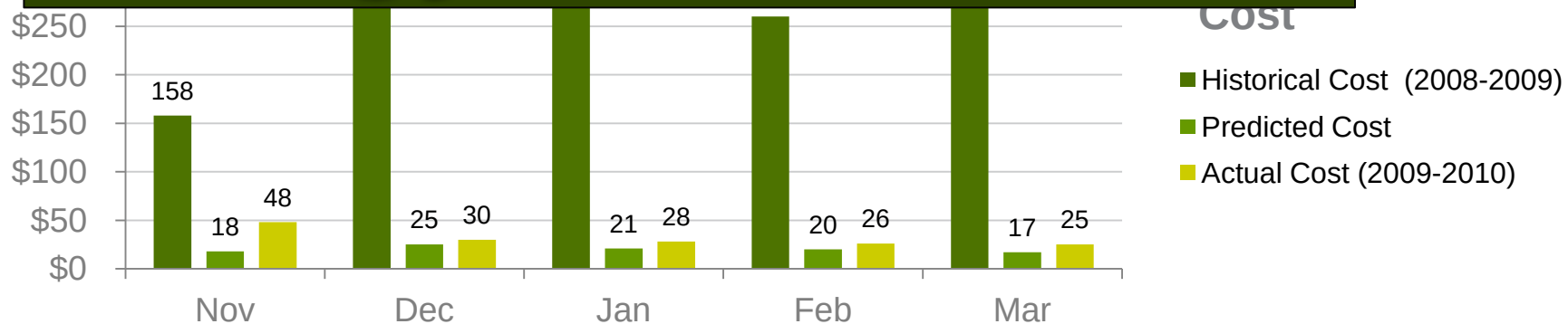
- Changing standard purge and low-flow sampling to passive methodology (Hydrasleeve)
- Projected:
 - 58% CO₂ emission reduction
 - 61% labor and equipment savings
 - 99.8% reduction in water use/extraction/treatment
 - \$5.4M over 20 years

HVAC Decommissioning



Payback period < 10 years

Energy Use Realized



Summary of Planned Projects

**Combined estimated payback
for planned projects = 3.7 years**

**Estimated Water Savings =
945,000 gallons/year**

STATUS

- Waiting on funding approval
- Implementation anticipated in Spring/Summer 2011

Total Savings from Implementation



Energy Reductions – 200,000 kWh/year (16%)



CO₂ Emission Reductions – 220,000 lbs/year (17%)



Water Reductions – 1,000,000 gal/year



Investment – \$530,000



Program Savings – \$430,000/year (11%)



Overall Payback Period – 1.2 years

Lessons Learned

- ✓ Implement quick wins
- ✓ Labor savings outweighed energy savings
- ✓ M&V plans critical to understanding true effect of project
- ✓ Technology insertion may make more sense than system optimization
- ✓ Design systems with future operations in mind – retrofitting costly
- ✓ Contract incentives to identify and share in energy saving ideas
- ✓ Longer-duration contracts
- ✓ Ability to bundle energy-saving projects
- ✓ Methodology transferrable

Discussion

A small, realistic-looking globe of the Earth is positioned in the center of the frame, resting on a bed of vibrant green grass. The globe shows the continents of North and South America, surrounded by blue oceans and white clouds. The grass blades are long and pointed, with some showing signs of being cut or broken. The lighting is bright, suggesting a sunny day, and the overall composition is centered and balanced.

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