



# Santa Susana Field Laboratory

January 22, 2011  
Public Meeting

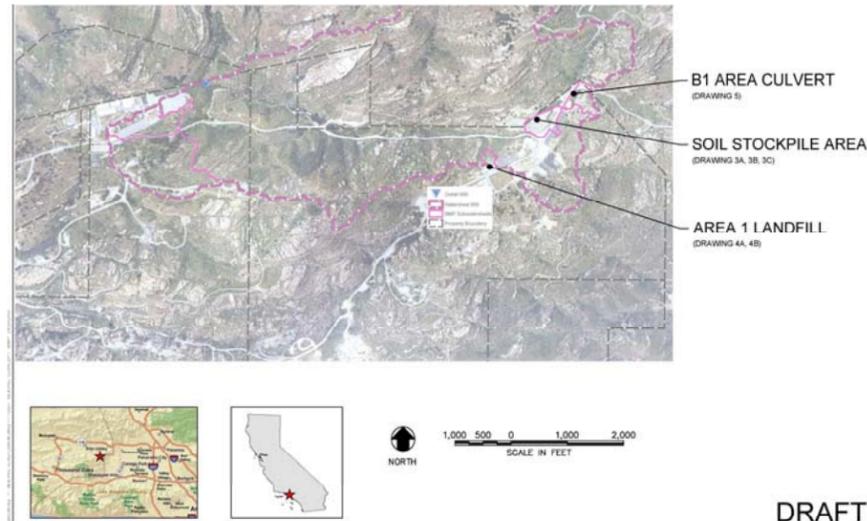
Update of Outfall 008/009 ISRA and BMP  
Activities

Stormwater Expert Panel

## Background

The Stormwater Expert Panel has identified three planned treatment BMPs on Boeing Company property within the NPDES Outfall 009 watershed of the SSFL:

- Soil Stockpile Area;
- Area 1 Landfill; and
- B1 Culvert Inlet.

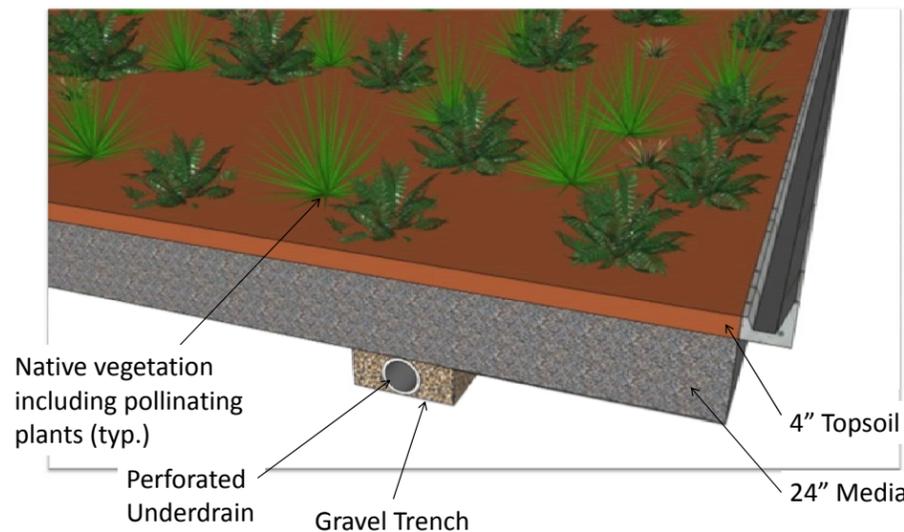


### General BMP Selection and Design Guidelines :

1. Site and select BMPs to treat runoff where pollutant concentration data and/or source knowledge indicate that they are needed to protect water quality;
2. Locate grading boundaries outside planned ISRA areas and jurisdictional drainages, to the extent feasible;
3. Minimize impacts to existing oak trees;
4. Drain ponded areas within 72 hours;
5. Minimize required maintenance;
6. Minimize geotechnical impacts of ponded water adjacent to road embankments;
7. Consider the condition of existing infrastructure (e.g., culverts);
8. Size water quality features based on the one year, 24 hour design event or 90% volume capture target, to the extent feasible; and
9. Minimize earthwork to the extent feasible, to minimize permitting delays.

## BMP Techniques

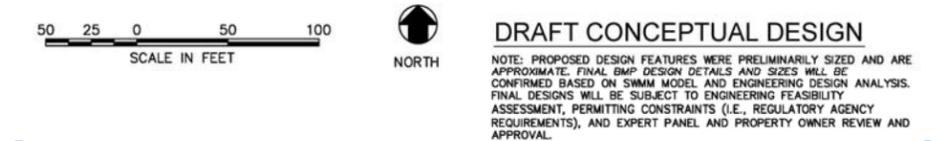
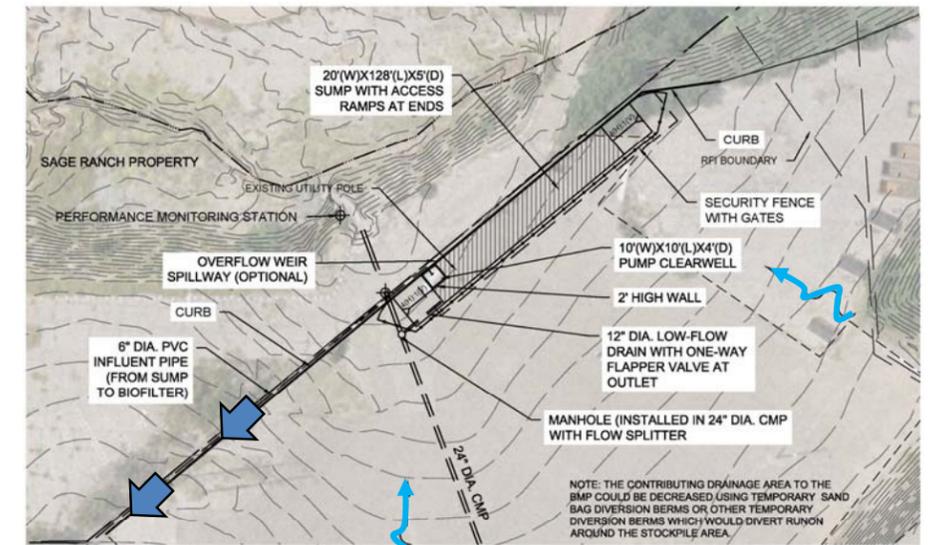
**Biofilter:** The typical SSFL biofilter will be designed with a 4 inch thick layer of topsoil, underlain by a 24 inch thick treatment media layer, underlain by a gravel collection system. The media will consist of a mixture of fine filter sand, granular activated carbon (GAC) and zeolite as recommended by the Stormwater Expert Panel. The gravel collection system will include perforated laterals that will be controlled by an outlet structure designed to meet the required contact time of the treatment media (minimum of 10 to 40 minutes as recommended by the Stormwater Expert Panel).



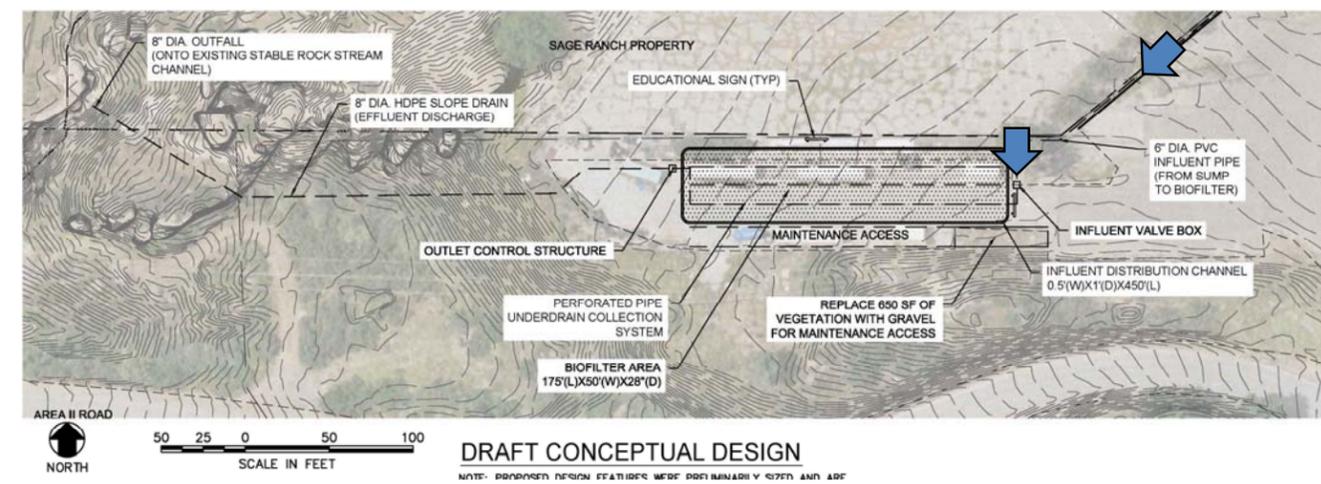
The biofilter will include **flowering, pollinating plants** that are native to the region and are attractive to pollinators, with input from WRA (Megan Stromberg) and The Pollinators non-profit group.

The stockpile biofilter sites, where appropriate, will include **educational signage** for the visiting public, including descriptive information visible to viewers from the adjacent Sage Ranch property.

## Example BMP: Soil Stockpile Area



View West of Stockpile Biofilter Area      View North of Stockpile Sump Area



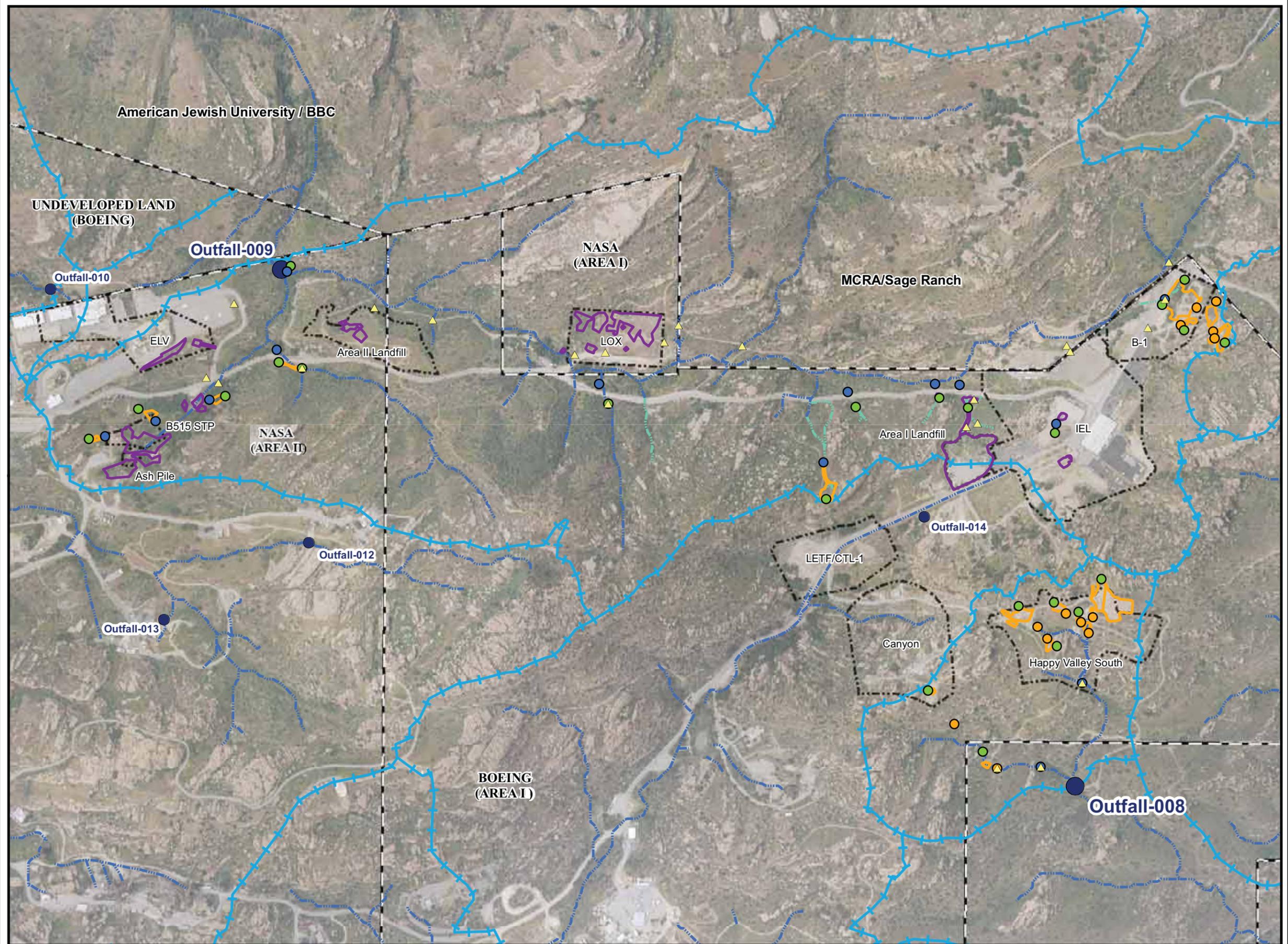
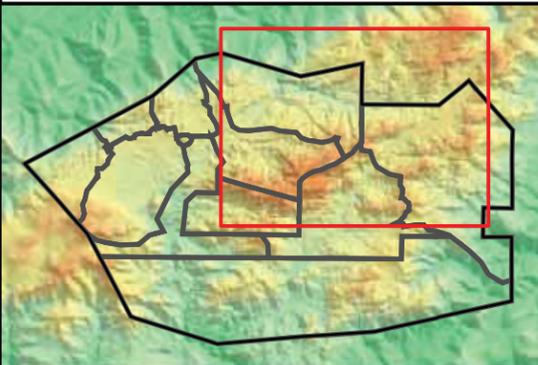
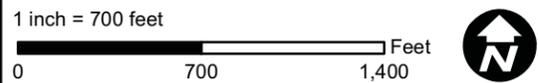
# Outfalls 008 and 009 BMP and ISRA Monitoring

- Base Map Legend**
- Administrative Area Boundary
  - RFI Site Boundary
  - NPDES Outfall
  - Drainage
  - Non Jurisdictional Surface Water Pathway
  - Surface Water Divide

- Figure Legend**
- Proposed Primary Downgradient Performance Monitoring Sample Location
  - Proposed Upgradient Performance Monitoring Sample Location
  - Proposed Secondary Downgradient Performance Monitoring Sample Location
  - Proposed BMP Sample Location
  - ISRA Excavation Boundary
  - Post-2010 ISRA Area Boundary

**Note:**  
 1. Aerial imagery from 2010 Sage Consulting.  
 2. Topographic contours from 2010 Sage Consulting.

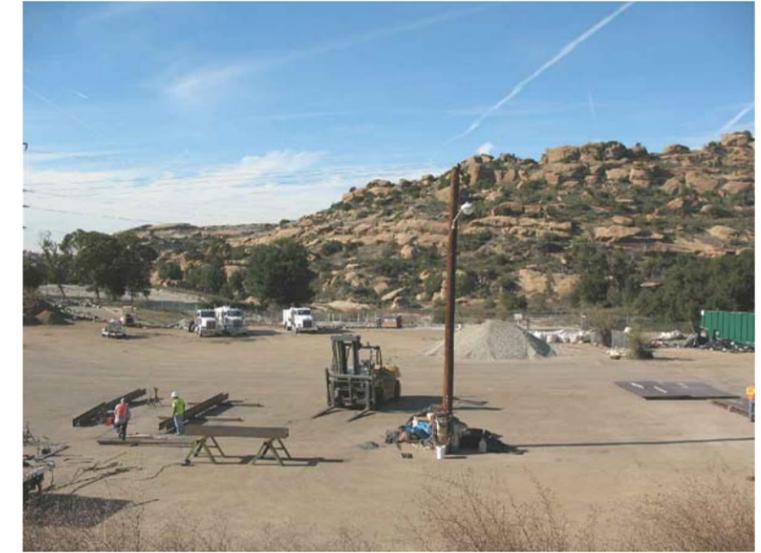
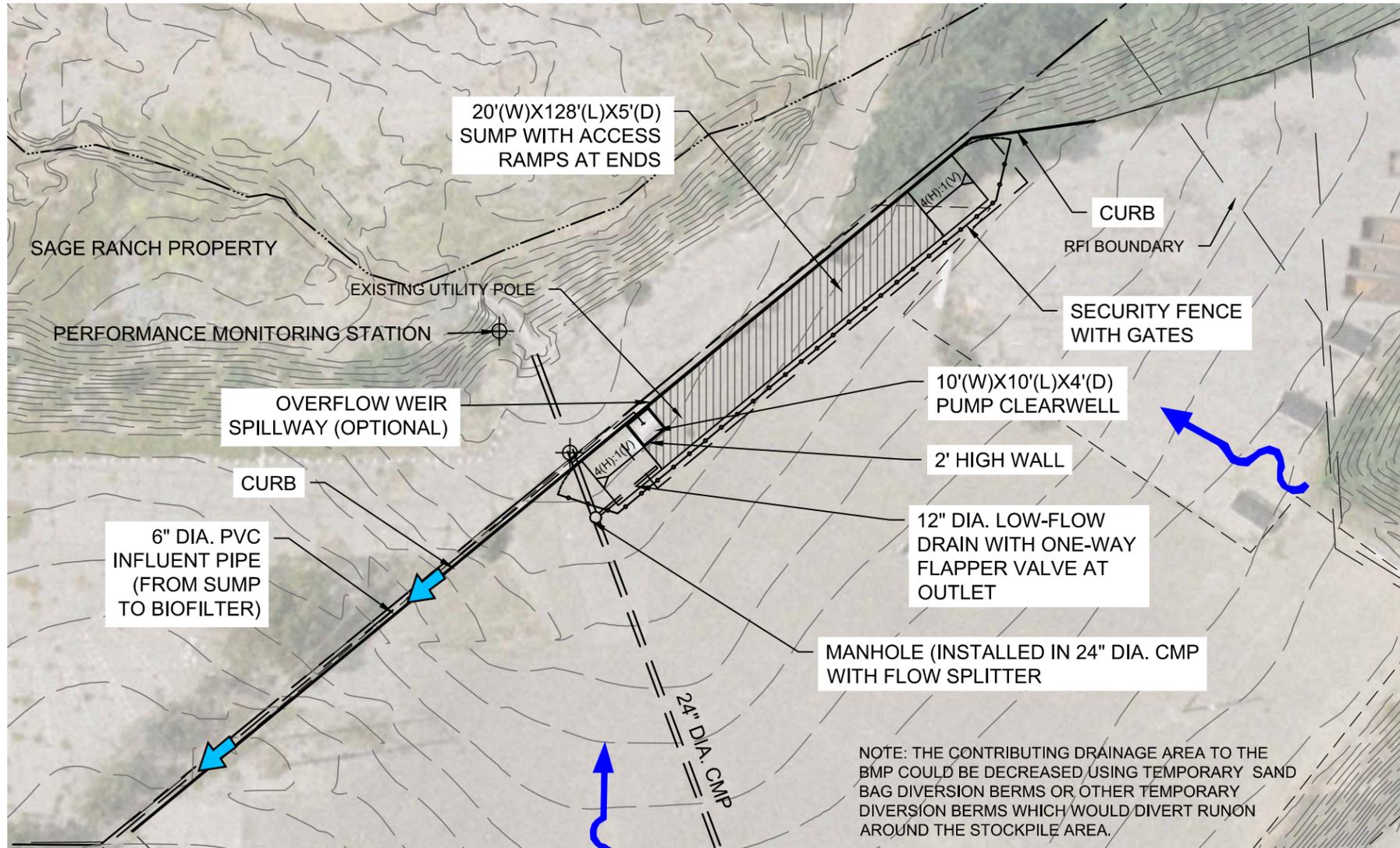
Document: ISRA\_Plots\_PerfMon\_008and009.mxd Date: Dec 17, 2010



SANTA SUSANA FIELD LABORATORY

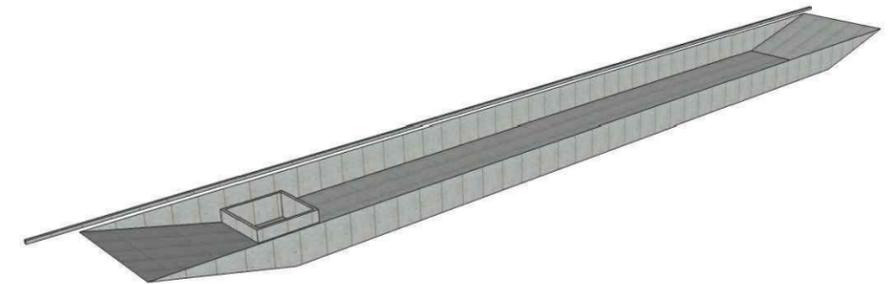
FIGURE 1





STOCKPILE AREA VIEWED FROM THE SOUTH IN A NORTHERLY DIRECTION

**SITE PHOTO**



OBLIQUE VIEW OF 3D SKETCH OF PROPOSED SUMP IN STOCKPILE AREA

**OBLIQUE VIEW**

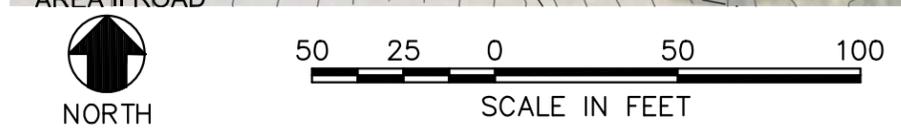
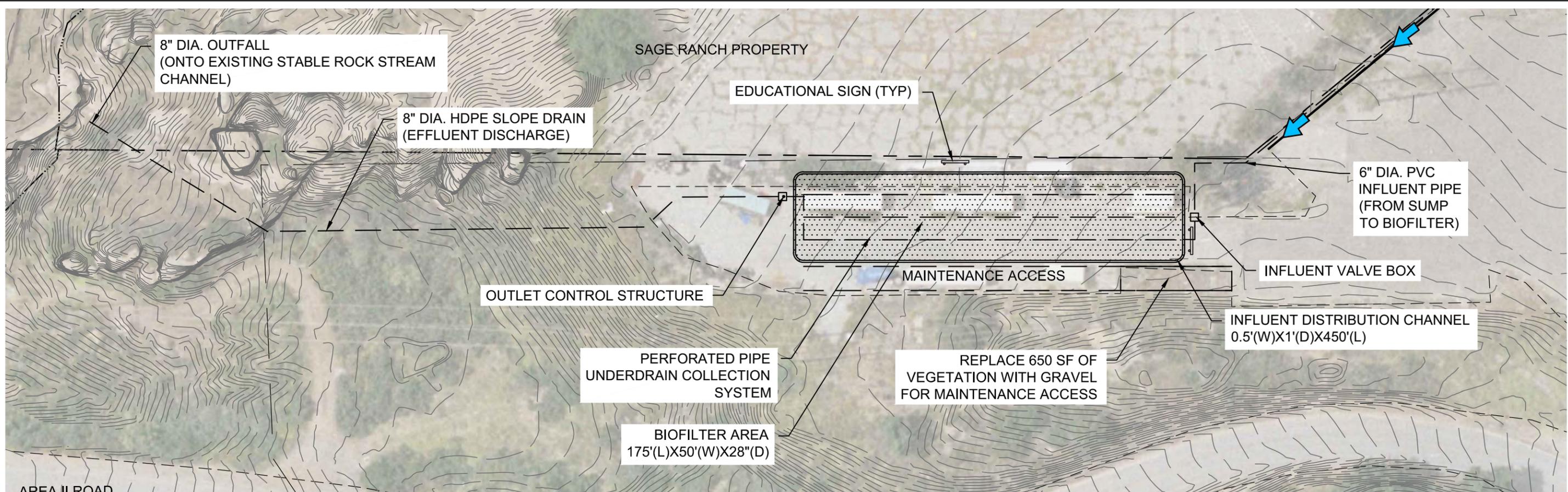


**DRAFT CONCEPTUAL DESIGN**

NOTE: PROPOSED DESIGN FEATURES WERE PRELIMINARILY SIZED AND ARE APPROXIMATE. FINAL BMP DESIGN DETAILS AND SIZES WILL BE CONFIRMED BASED ON SWMM MODEL AND ENGINEERING DESIGN ANALYSIS. FINAL DESIGNS WILL BE SUBJECT TO ENGINEERING FEASIBILITY ASSESSMENT, PERMITTING CONSTRAINTS (I.E., REGULATORY AGENCY REQUIREMENTS), AND EXPERT PANEL AND PROPERTY OWNER REVIEW AND APPROVAL.

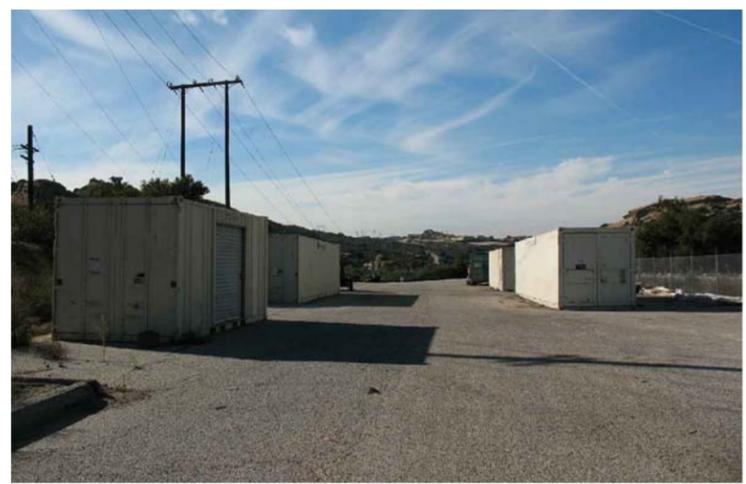
T:\PROJECTS\SB0363Q - BOEING\CAD\SB0636Q--1007 BOEING CONCEPT BMP DESIGNS

TITLE: <b>SOIL STOCKPILE AREA SUMP AREA</b>	924 ANACAPA STREET, SUITE 4A SANTA BARBARA, CA 93101 PHONE: 805.897.3800	SANTA SUSANA FIELD LABORATORY VENTURA COUNTY, CALIFORNIA	PROJECT: <b>STORMWATER TREATMENT BMP CONCEPT DESIGNS BOEING SSFL WATERSHED 009</b>	DESIGNED BY: DHB	REVIEWED BY: JH	DATE: JAN 2011	DRAWING: <b>3A</b>
				DRAWN BY: DHB	APPROVED BY: BS	PROJ. NO.: SB0363Q	



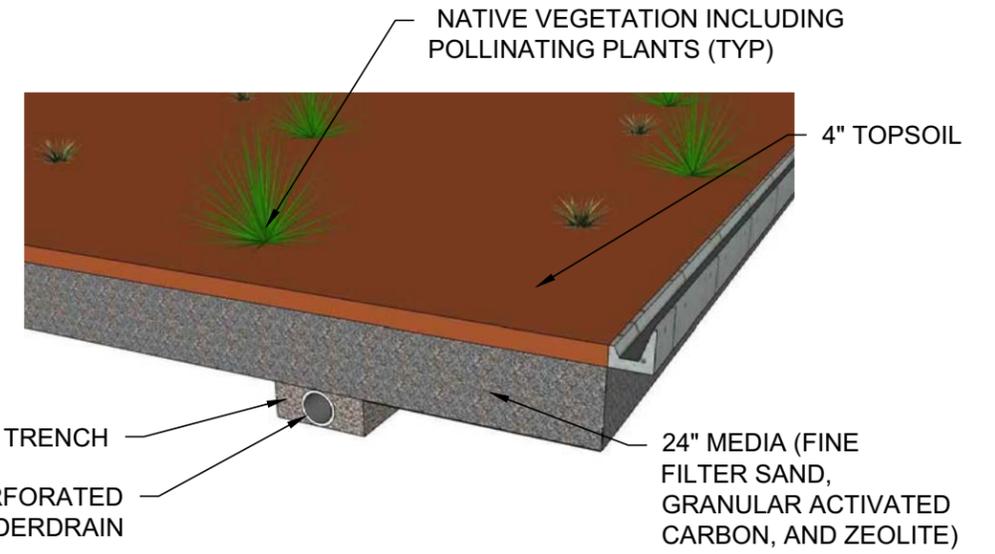
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PAVED AREA OF FUTURE TREATMENT CELL VIEWED FROM THE EAST IN A WESTERLY DIRECTION

### SITE PHOTO



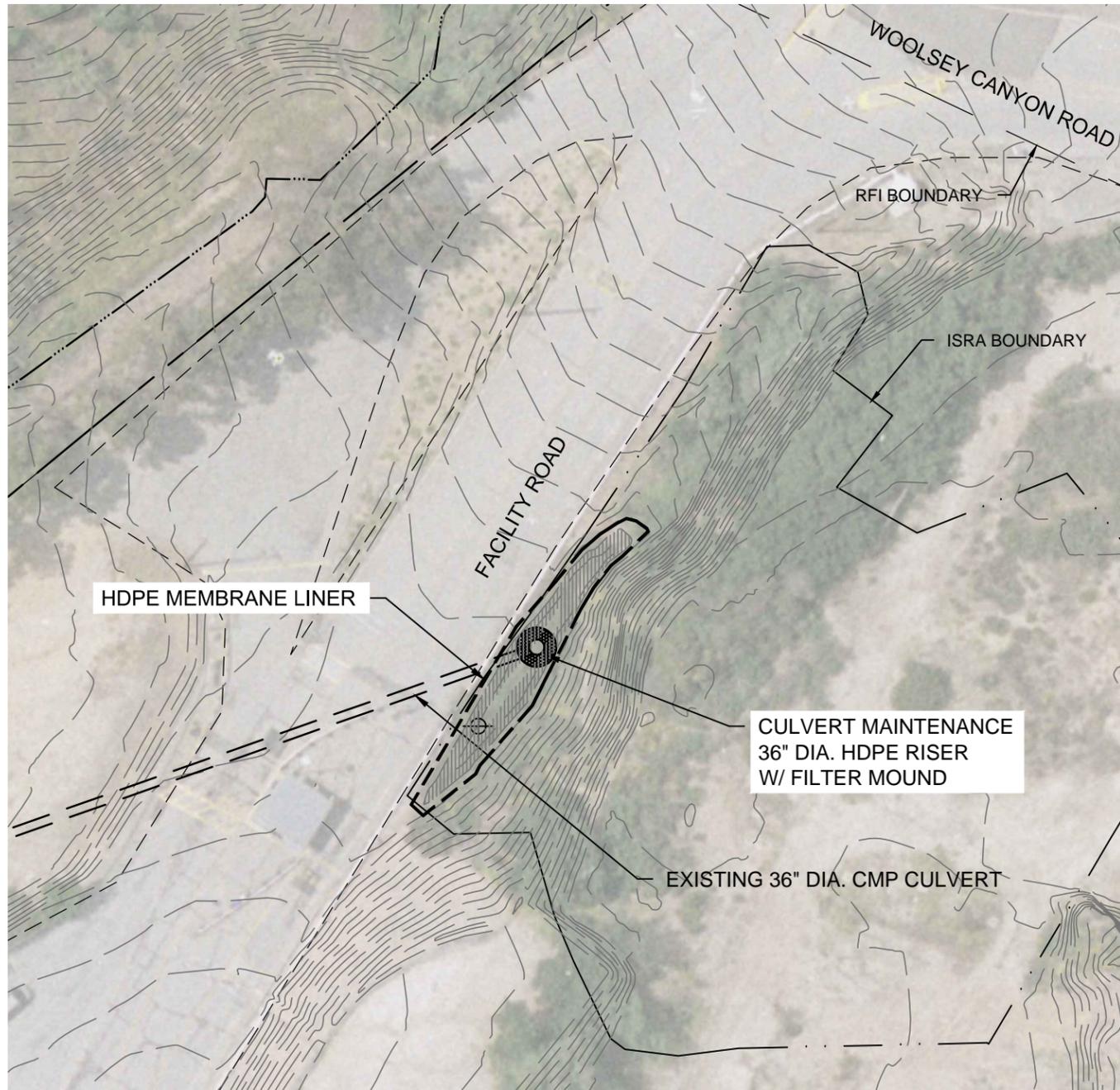
OBLIQUE VIEW OF 3D SKETCH OF PROPOSED TREATMENT CELL

### OBLIQUE VIEW

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TITLE: <b>SOIL STOCKPILE AREA          BIOFILTER</b>	924 ANACAPA STREET, SUITE 4A SANTA BARBARA, CA 93101 PHONE: 805.897.3800	SANTA SUSANA FIELD LABORATORY VENTURA COUNTY, CALIFORNIA	PROJECT: <b>STORMWATER TREATMENT BMP CONCEPT DESIGNS          BOEING SSFL WATERSHED 009</b>	DESIGNED BY: DHB	REVIEWED BY: JH	DATE: JAN 2011	DRAWING: <b>3B</b>
			DRAWN BY: DHB	APPROVED BY: BS	PROJ. NO.: SB0363Q		

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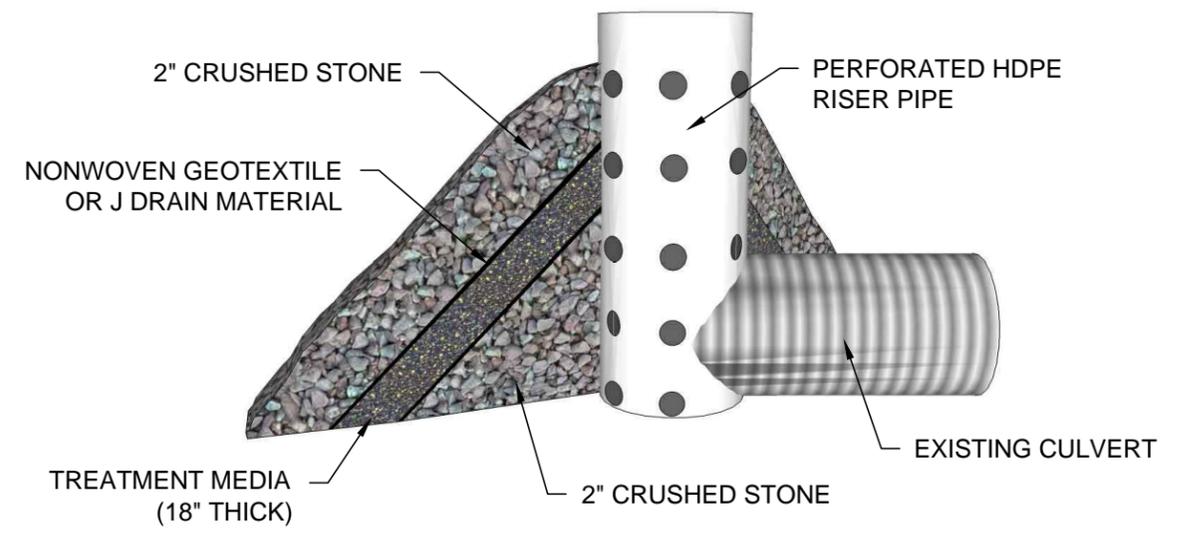


EXISTING CULVERT INLET



AREA OF B1 CULVERT INLET FROM THE NORTH IN A SOUTHERLY DIRECTION

**SITE PHOTO**



OBLIQUE VIEW OF 3D SKETCH OF FILTER MOUND

**OBLIQUE VIEW**



**DRAFT CONCEPTUAL DESIGN**

NOTE: PROPOSED DESIGN FEATURES WERE PRELIMINARILY SIZED AND ARE APPROXIMATE. FINAL BMP DESIGN DETAILS AND SIZES WILL BE CONFIRMED BASED ON SWMM MODEL AND ENGINEERING DESIGN ANALYSIS. FINAL DESIGNS WILL BE SUBJECT TO ENGINEERING FEASIBILITY ASSESSMENT, PERMITTING CONSTRAINTS (I.E., REGULATORY AGENCY REQUIREMENTS), AND EXPERT PANEL AND PROPERTY OWNER REVIEW AND APPROVAL.

TITLE: **B1 AREA CULVERT INLET**

**Geosyntec** consultants  
 924 ANACAPA STREET, SUITE 4A  
 SANTA BARBARA, CA 93101  
 PHONE: 805.897.3800

**BOEING** SANTA SUSANA FIELD LABORATORY VENTURA COUNTY, CALIFORNIA

PROJECT: **STORMWATER TREATMENT BMP CONCEPT DESIGNS BOEING SSFL WATERSHED 009**

DESIGNED BY: DHB	REVIEWED BY: JH	DATE: JAN 2011
DRAWN BY: DHB	APPROVED BY: BS	PROJ. NO.: SB0363Q

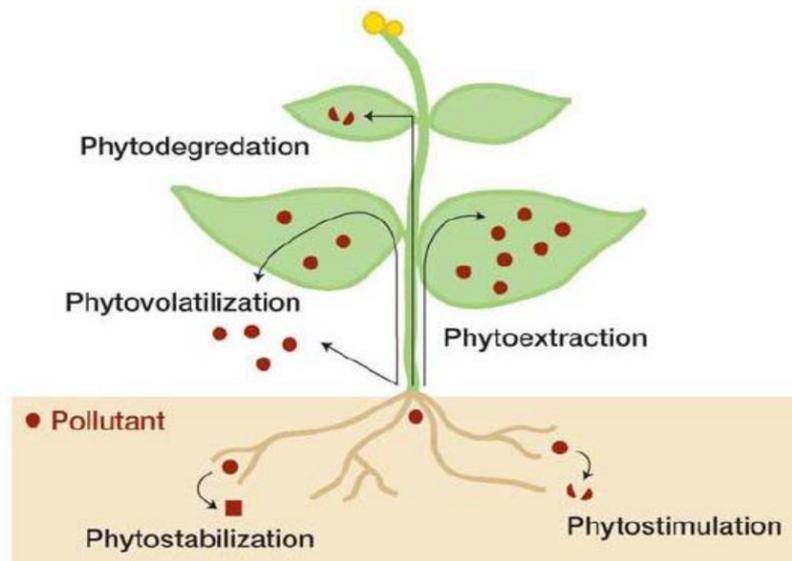
DRAWING: **5**

## Background

**Phytoremediation:** is the use of plants to remediate and/or contain contaminants in soil, groundwater, surface water, and sediments. More recently, the term “phytotechnologies” has been introduced instead of “phytoremediation” since this remedial approach covers a number of technologies (chemical, plant and microbial processes) and applications.

**Processes:**

- Phytostabilization:
- Rhizodegradation
- Phytodegradation
- Phytoaccumulation / Phytoextraction
- Phytovolatilization
- Phytohydraulics / Evapotranspiration



**Considerations that Control Effectiveness:** Topography, depth to groundwater, degree of shading, soil saturation, pH, depth of contamination, rooting depth, electrical conductivity, ability of plants to uptake contaminant(s), and the ability of plants to facilitate degrade and/or sequester contaminant(s) are factors that affect phytoremediation potential.

## SSFL Pilot Study

**Two Phytoremediation Treatability Studies:**

**1. Laboratory Study:** Edenspace Systems Corporation will conduct an in-laboratory phytoremediation study using metal-impacted soil taken from the SSFL. The results of the laboratory-scale study will not only be utilized to assess the potential of phytoremediation at SSFL, but also will become part of an on-going global National Institute of Health-funded study of retiring mercury from the global biogeochemical cycle through phytostabilization as insoluble mercury compounds within the plant tissue (mainly roots).



Rabbit foot grass  
(*Polypogon monspeliensis*)



Annual ryegrass  
(*Lolium multiflorum*)

**2. Field Study:** Parallel to the NIH-funded study, a field biologist at the SSFL will survey vegetation growing at or near known metal-impacted areas of the SSFL. This survey will facilitate the potential selection of native plants that may be candidates for phytoremediation. Plants at these areas will be harvested and analyzed for their metals content. If they show concentrations in plant tissue well above soil metal concentrations, these plants could have potential for phytoremediation purposes, and will be considered for inclusion in a follow-on SSFL-specific study that will use metal-impacted soils to compare known mercury hyperaccumulating plants with native plants from SSFL to look at phytoremediation effectiveness for a wider range of metals.

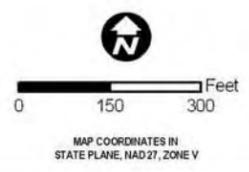
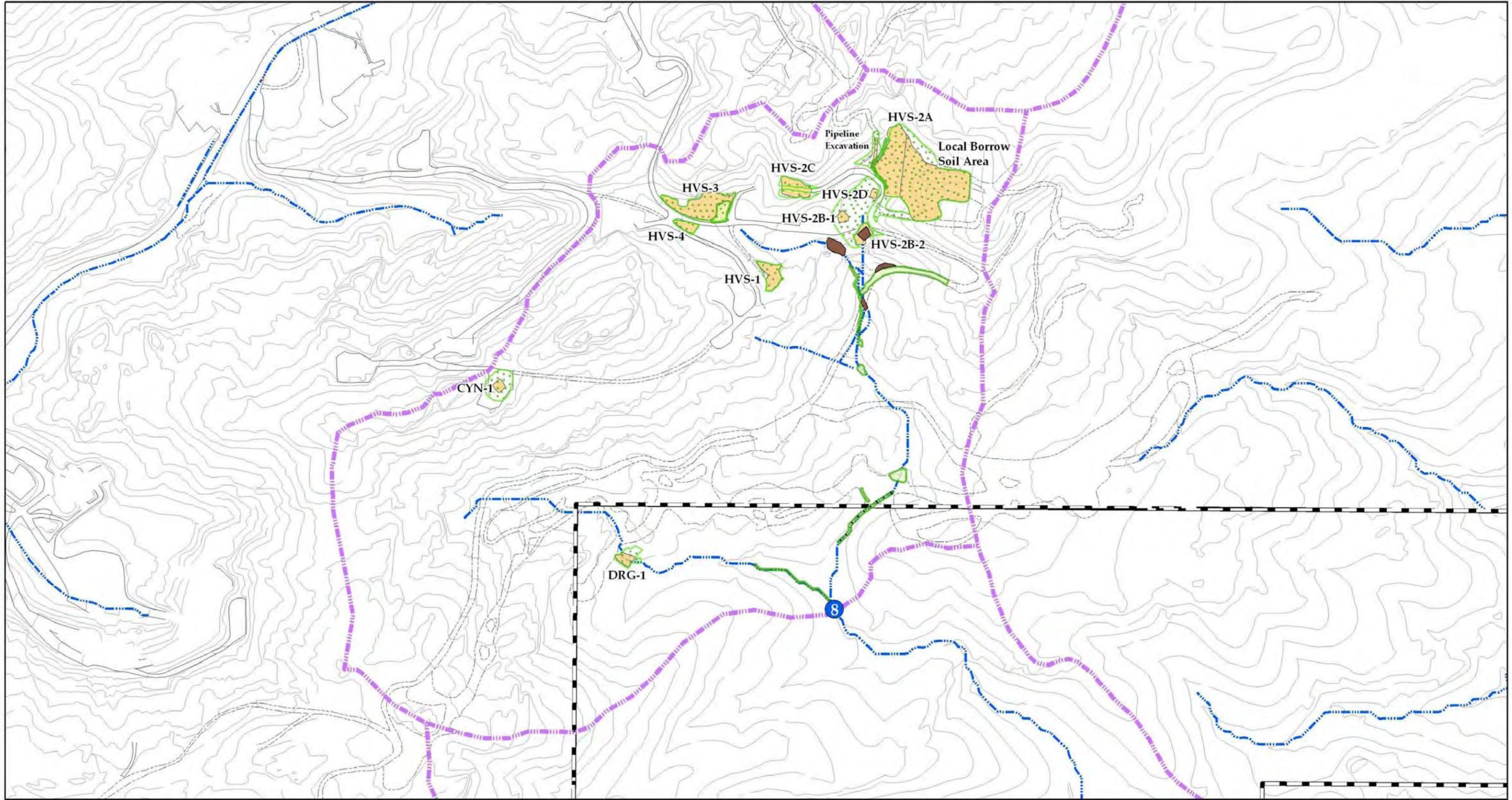
## Mercury Phytoremediation

**Mercury Phytoremediation** is being pilot tested as a remedial alternative at the **Area 1 Landfill (A1LF)** Interim Source Removal Area (ISRA) at the SSFL in combination with stormwater treatment.



Area 1 Landfill planting recommendations to come from phytoremediation treatability study.

Recent research has focused on the use of phytostabilization of mercury within plants (i.e., mainly within plant roots). Phytostabilization is the use of plants to immobilize/sequester contaminants in plants, soil, sediments, and groundwater through the absorption and accumulation into the roots, the adsorption onto the roots, or the precipitation or immobilization within the root zone. Results from the NIH-funded study should be available by March 2011. If these results are promising, a more site-specific and comprehensive SSFL pilot study will be initiated.



● NPDES Outfalls (RWQCB Primary Oversight Authority)

--- Natural Drainage  
 --- Surface Water Divide

**Erosion Control BMPs in Place**

■ Planting Area (As-Built 2010)  
 ■ Mulefat Wattle  
 ■ ISRA Excavation, 2009 (Wattles Installed)  
 ■ Hydroseed  
 ■ Rock Crib

**Base Map Legend**

SSFL Property Boundary  
 Administrative Area Boundary  
 Ground Elevation Contours  
 A/C Curbing  
 Dirt Road

**Outfall 008 Existing BMPs**

Date: September 17, 2010  
 File: \\Upas\inetapp1\del\rskd.ed\ne.gis\Material\GISFiles\ISRA\_Projects\ISRA\_MXD\BMP\CompliancePlanSep2010\Fig1-5\_Outfall\_BMPsisting.mxd



FIGURE 1-5



# Santa Susana Field Laboratory

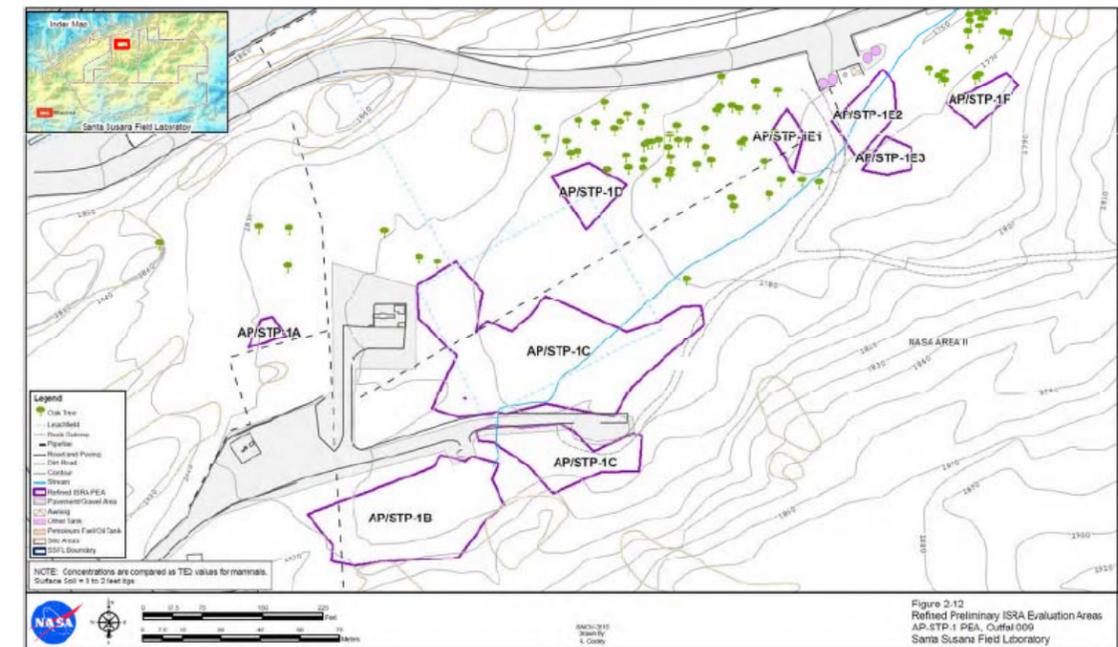
## NASA 2010 ISRA Activities

Outfall 008/009 Storm Water Management Tour  
January 22, 2011



## Brief Background

- 2010 ISRA work began with delineation of previous sampling results for ISRA constituents of concern (COCs)
- Performed work consistent with Ventura County oak tree protection regulations





## Recent ISRA Activities

- Approved 2010 Work Plan Addendum included ISRA for Ash Pile/Sewage Treatment Plant, Liquid Oxygen Plant (LOX), and Area II Landfill
- Nine planned excavations in Ash Pile/Sewage Treatment Plant area
  - Three areas completed in 2010; Remaining six scheduled for 2011
  - Approximately 78 yd<sup>3</sup> of soils removed from AP/STP-1F
  - Approximately 172 yd<sup>3</sup> of soils removed from AP/STP-1D
  - Approximately 33 yd<sup>3</sup> of soils removed from AP/STP-1A
- Excavations targeted upper two feet of soil
  - Under oaks, limited initial depth to one foot
- Approved for disposal as non-hazardous soil
  - Disposed at Waste Management, Lancaster, CA



## Recent ISRA Activities

### AP/STP-1F



- Excavation area was entirely under oak trees
- Three oaks within excavation area



- Soils were loosened with hand tools
- Soils removed by vacuum truck, wheelbarrow, and conveyor belt



## Recent ISRA Activities

### AP/STP-1D



- One oak along excavation boundary
- Only hand tools used under drip line
- Small excavator used beyond drip line



- Soils under drip line were removed by wheelbarrow and conveyor belt
- All heavy equipment stayed beyond drip line

5



## Recent ISRA Activities

### AP/STP-1A



- Soils were loosened with hand tools

- Soils were removed from the excavation area by wheelbarrow and conveyor belt



6



## Recent ISRA Activities

- AP/STP-1A  
Confirmation samples below ISRA cleanup goals (dioxins 3.0 pg/g and lead 34 mg/kg)
- AP/STP-1D  
Two additional removals completed to target dioxin results above goals
- AP/STP-1F  
One additional removal completed to target dioxin result above goals



## Future ISRA Activities

- Additional excavations for AP/STP, LOX, Area II Landfill, ELV
- Final delineation and waste characterization sampling completed
- Work anticipated to begin in April 2011

