Development of a Design Storm and Engineered Natural Treatment Systems at Boeing's Santa Susana Field Lab, Canoga Park (NPDES No. CA0001309)

An Overview, Status and Next Steps to be Taken by the Expert Panel

Professor Michael K. Stenstrom, PhD, UCLA

April 3rd, 2008

Expert Panel Members

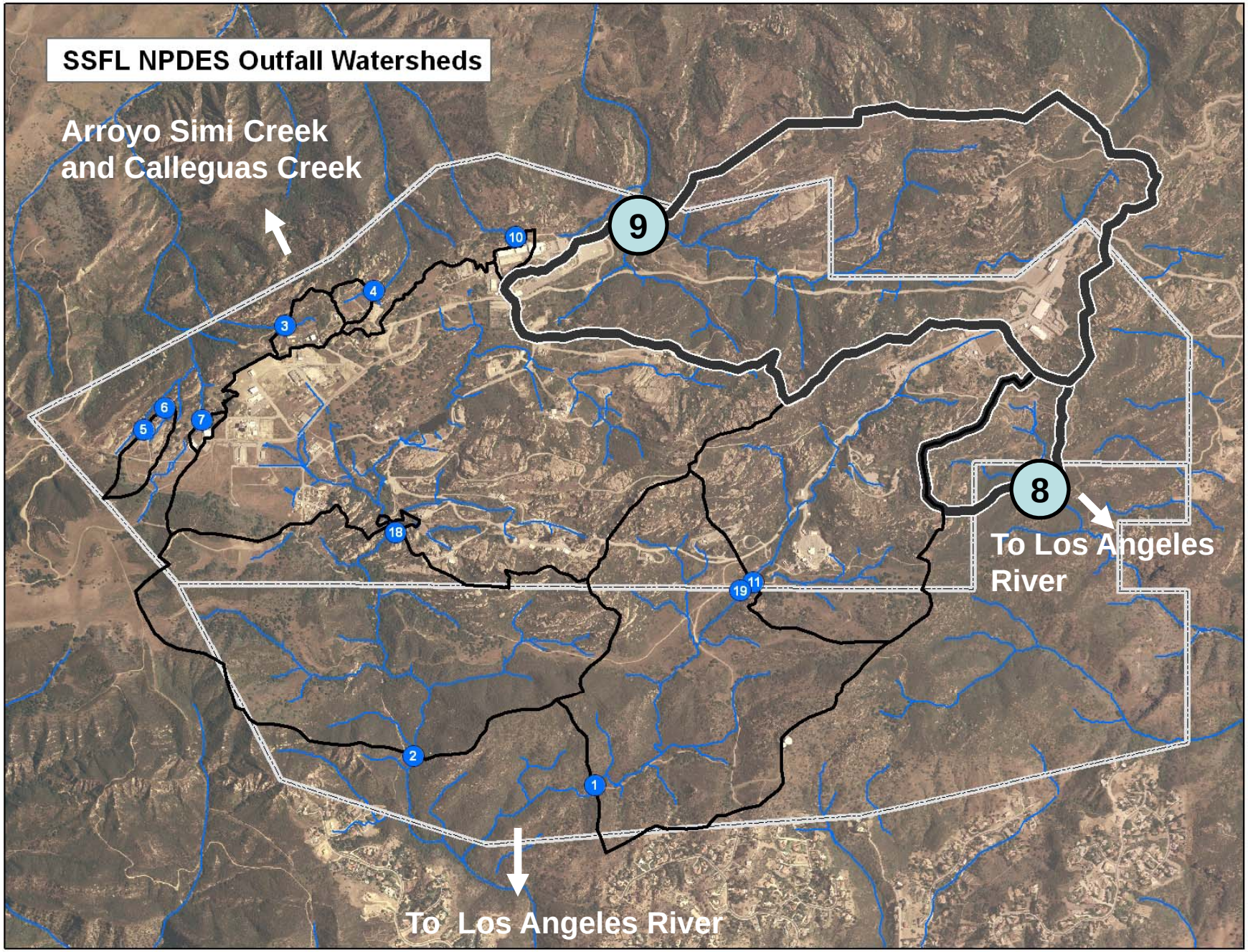
- Dr. Robert Gearheart, P.E.
- Dr. Richard Horner
- Jonathan Jones, P.E.
- Dr. Michael Josselyn
- Dr. Robert Pitt, P.E.
- Dr. Michael Stenstrom, P.E.

Agenda

- Independent Expert Panel
  - Scope of work/Schedule
  - Progress on ENTS (Controls) selection
  - Progress toward design storm recommendation
  - Monitoring summary
  - Panel future efforts and schedule

Expert Panel's Scope of Work

- For outfalls 008 and 009 review site data and recommend natural BMPs capable of providing the required treatment to meet the final effluent limits.
- Recommend to the Board a site-wide design storm
- Public Involvement


SSFL NPDES Outfall Watersheds
Arroyo Simi Creek
and Calleguas Creek
9
10
4
3
6
5
7
18
8
To Los Angeles
River
19
11
2
1
To Los Angeles River

Expert Panel
Work Plan Schedule

Tasks	Proposed Date
Design Storm Recommendation	**Preliminary draft submitted to Board staff**
ENTS Conceptual Designs Complete	May 15, 2008
ENTS Final Designs Complete	July 15, 2008
ENTS Permitting	August 15, 2008
ENTS Construction	October 31, 2008
Final Permit Limits Become Effective	June 10, 2009

Independent Expert Panel
Public Involvement

- Public participation meetings
- Periodic reports to RWQCB on project status
- Periodic progress reports posted on the Internet

http://www.boeing.com/aboutus/environment/santa_susana/ents/index.html

- Public field trips organized

Expert Panel Public Meetings

Proposed Scope	Proposed Date
Panel introduction	**Completed January 22nd**
Progress on design storm and ENTS selection & conceptual design	**Completed March 17th**
Recommended design storm and conceptual ENTS designs	April 17, 2008
Progress on ENTS implementation	September, 2008
Initial ENTS Performance Monitoring Results	Summer 2009

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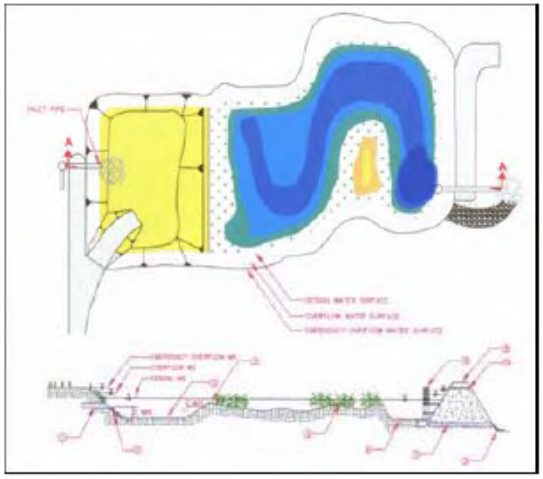
Proposed Approach – ENTS

Vegetated Dry Detention Basin

Goleta, Santa Barbara County

Conceptual Wetlands Design



Vegetated Swale

Turnpike Bio-Swale, Santa Barbara County

008 and 009 Watersheds Guiding Principles

- Panel recommends that ENTS infiltrate and/or evapotranspirate runoff to the maximum extent feasible considering site conditions and constraints such as:
  - locations of contaminated groundwater plumes,
  - sensitive habitat,
  - infiltration potential,
  - natural infiltration rates, and
  - geotechnical suitability.

008 and 009 Watersheds Guiding Principles

- Engineered Natural Treatment System (ENTS) options should focus on pollutant load as well as concentration reductions.

- ENTS Include:
  - More Regional Engineered natural treatment systems
  - Localized Treatment controls for “critical source areas”

“Treatment Train” Approach

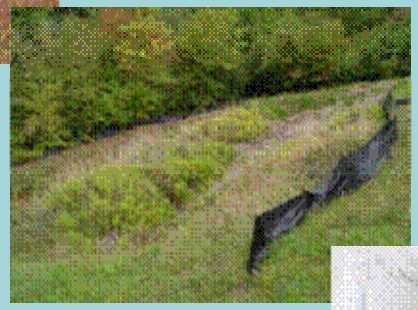
- Combine controls in series to treat runoff for multiple constituents and protect downstream controls
- Reduce peak flows to allow for optimizing treatment
- Consider “polishing” enhancements (media additions, BMP soils amendments, etc.)
- Optimize unit processes and overall system design
  - redundancy and complementary processes
- Detain and slow runoff from watershed to maximize space-limited treatment at outfall 009

“Dry” Treatment Train Approach

1: Site Controls
(reduce runoff volume)

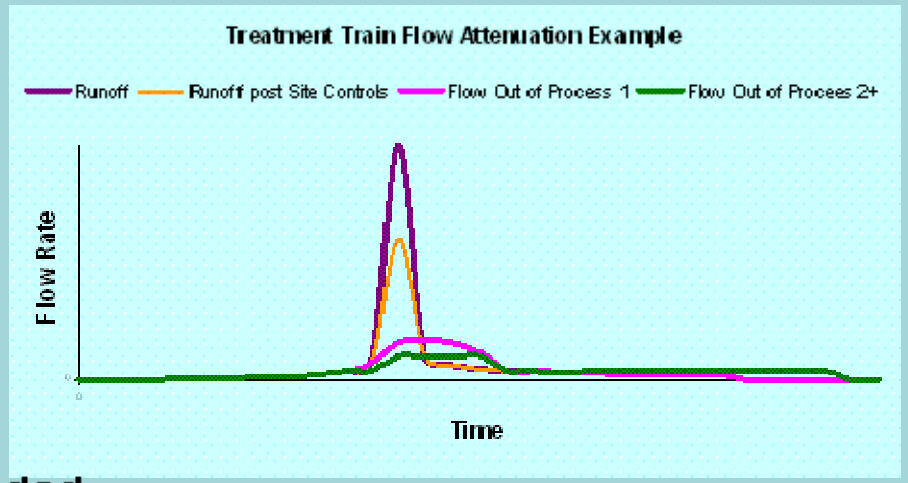
E.g., restore un-used impervious surface to natural state

2: Extended Detention



3: Bio-Filter

4: Media Filter
(If needed)



Progress on ENTS Designs for Outfall 008 and 009 Watersheds

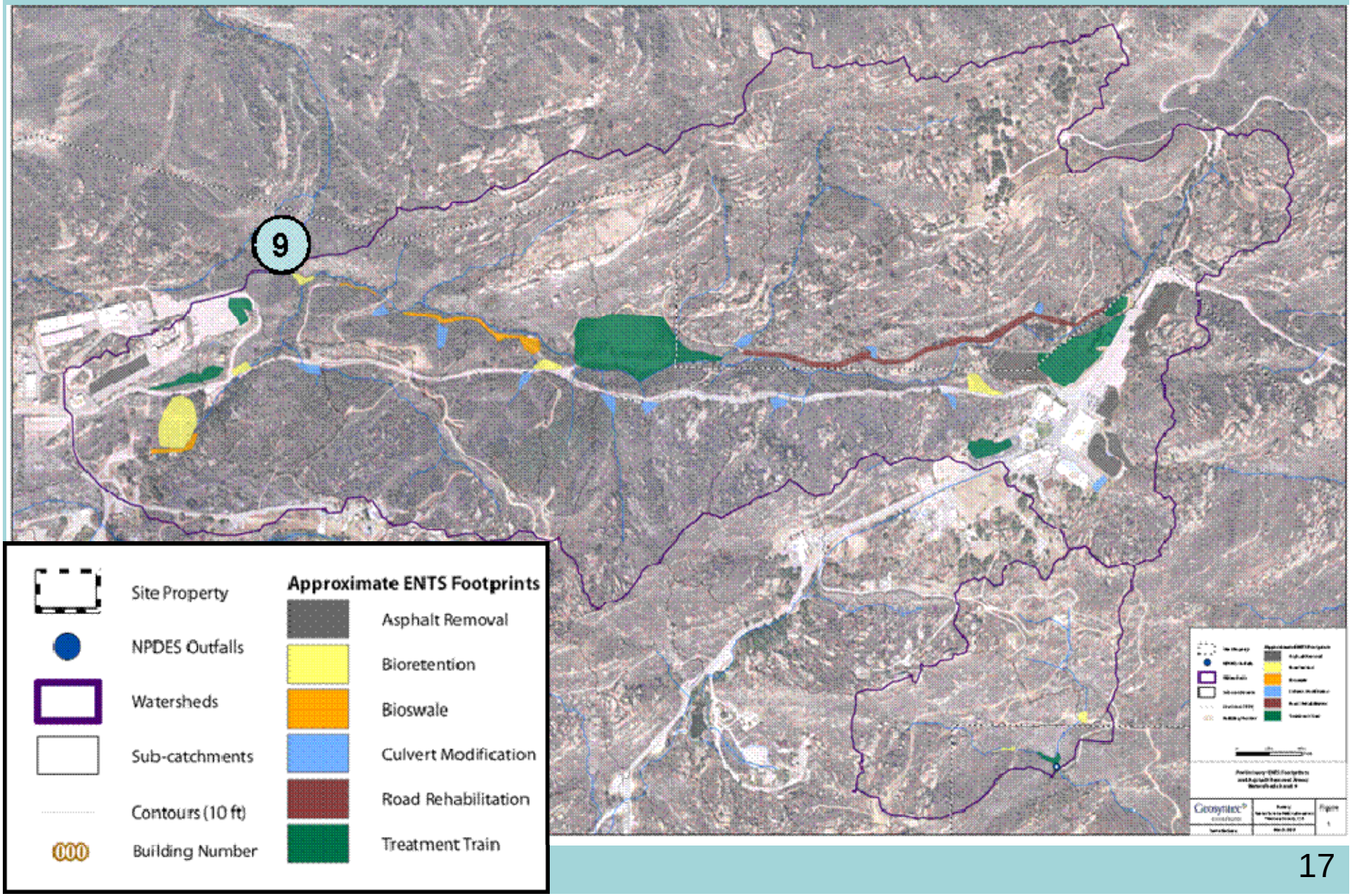
- Selected multiple potential ENTS locations throughout these watersheds
- Initially locating ENTS downstream of:
  - Developed areas
  - Areas of known historic activities or surface soil/sediment contamination
  - Large drainage areas
- Conceptual ENTS designs in progress

Progress on ENTS Designs for Outfall 008 and 009 Watersheds

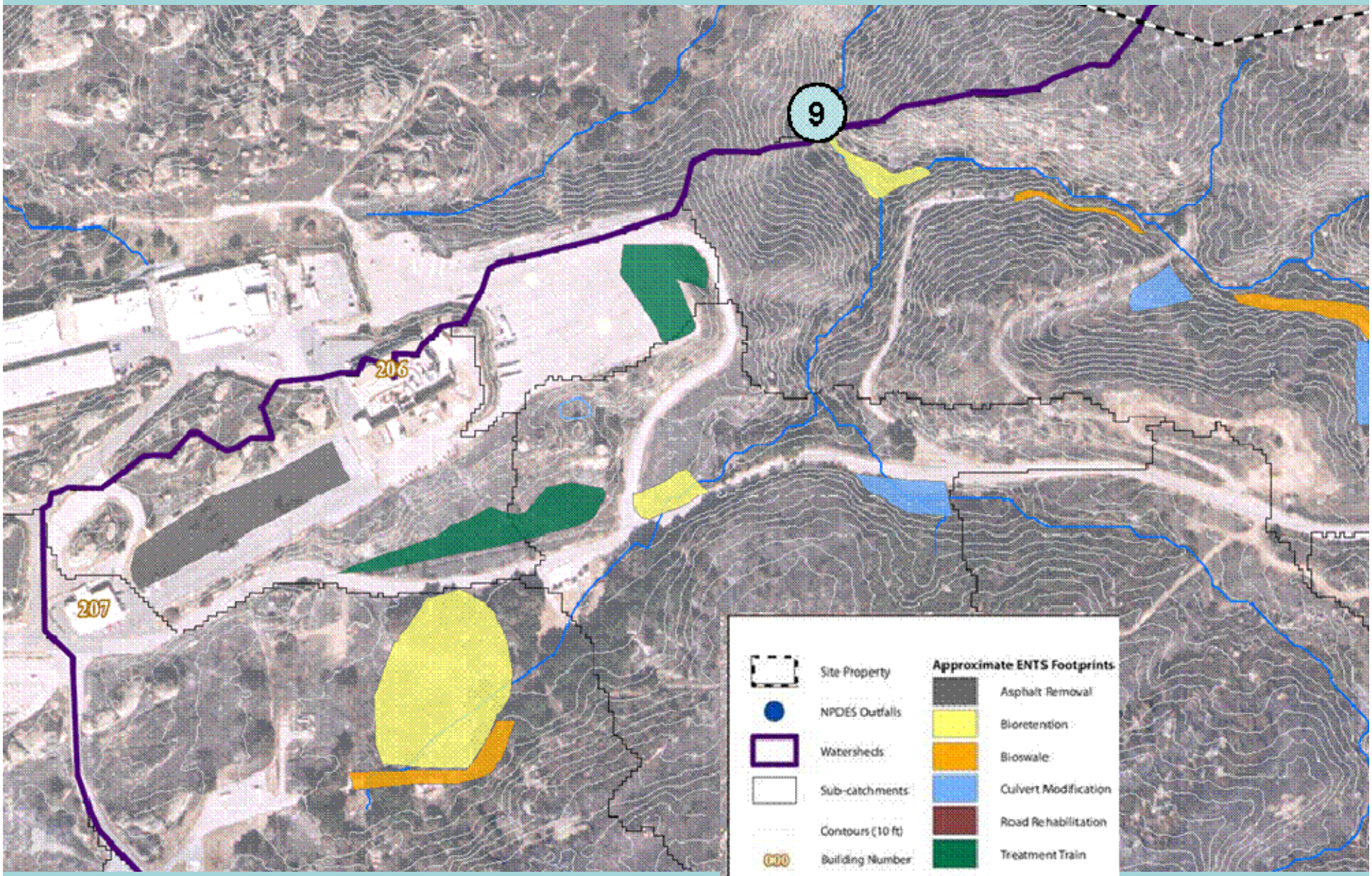
(continued)

- Considering locating additional ENTS at upstream off-site locations to address run-on
- Looking at locations for “source control” type of BMPs, for example:
  - Remove/cover treated wood and galvanized metals
  - Remove impervious areas
  - Control eroding areas
  - Outfall protection
  - Stream stability enhancements
  - Other source controls identified by the panel or by Boeing

Draft ENTS for 008 and 009 Watersheds



Draft ENTS Footprints – Western 009 Watershed

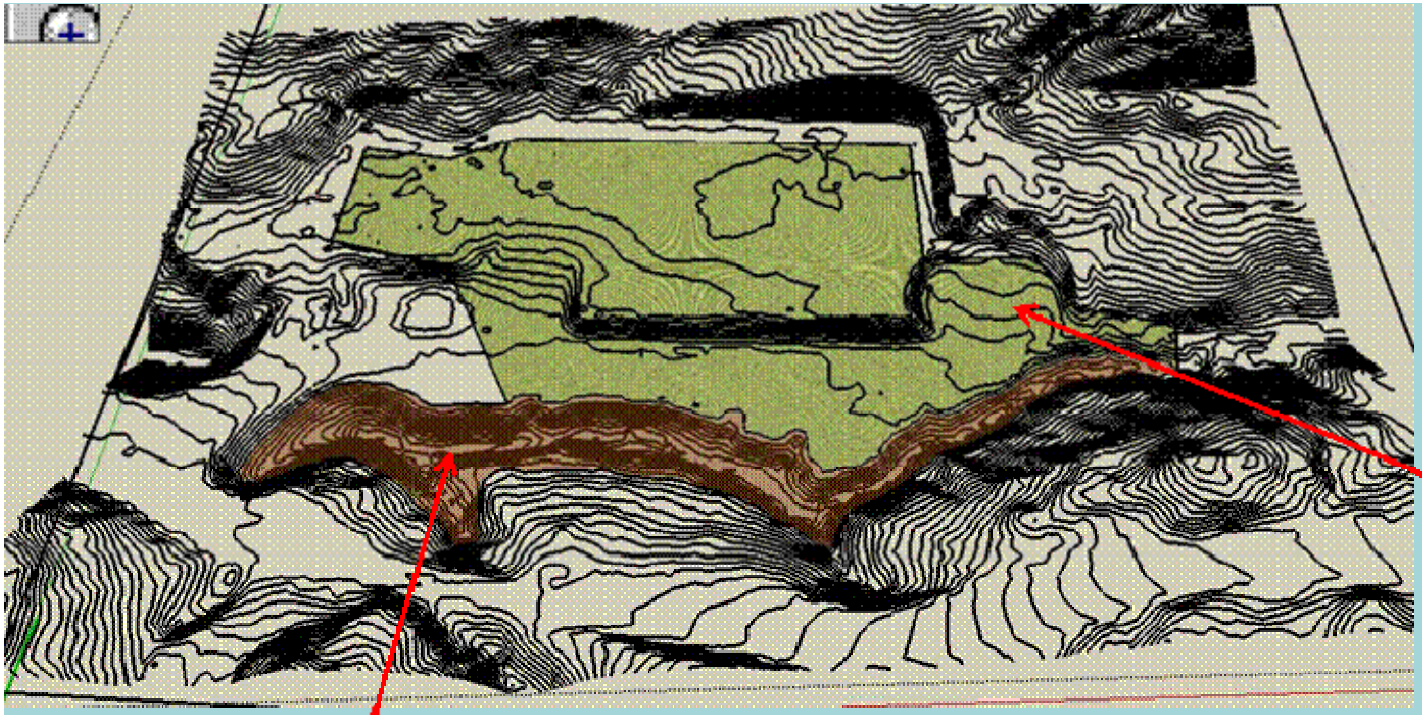


Fire Station Area

Draft ENTS Footprints – Central 009 Watershed

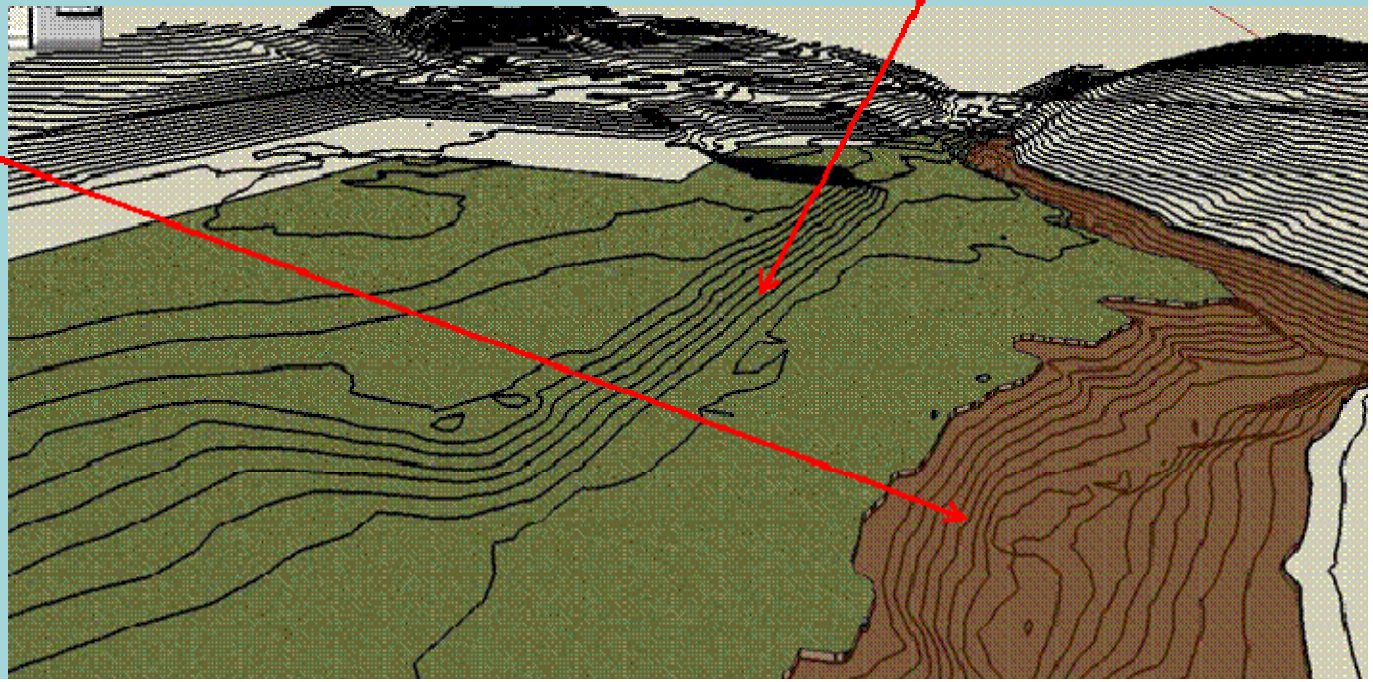
Captures runoff from large upstream tributary area

LOX Area ENTS



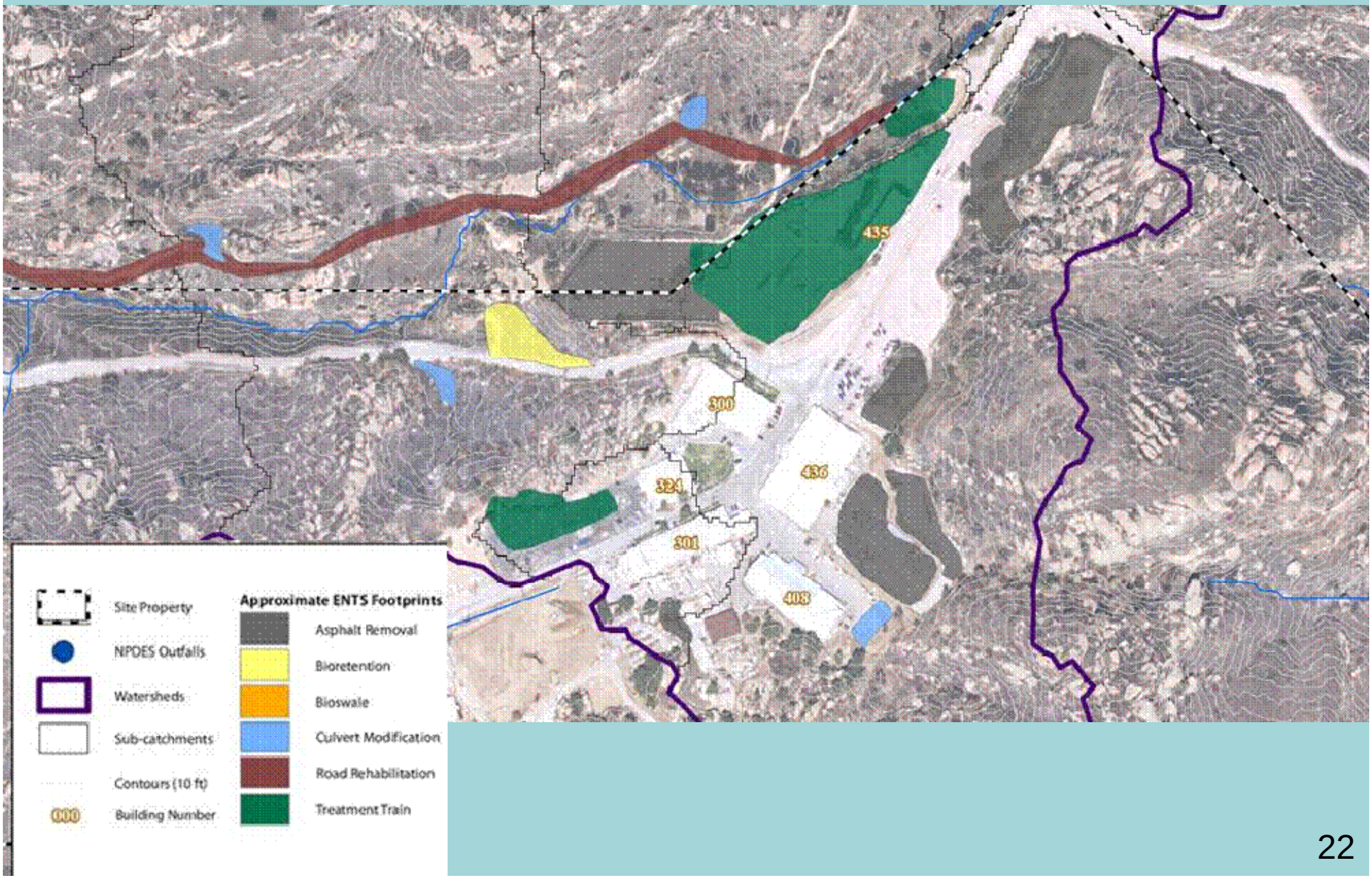
CUT

FILL



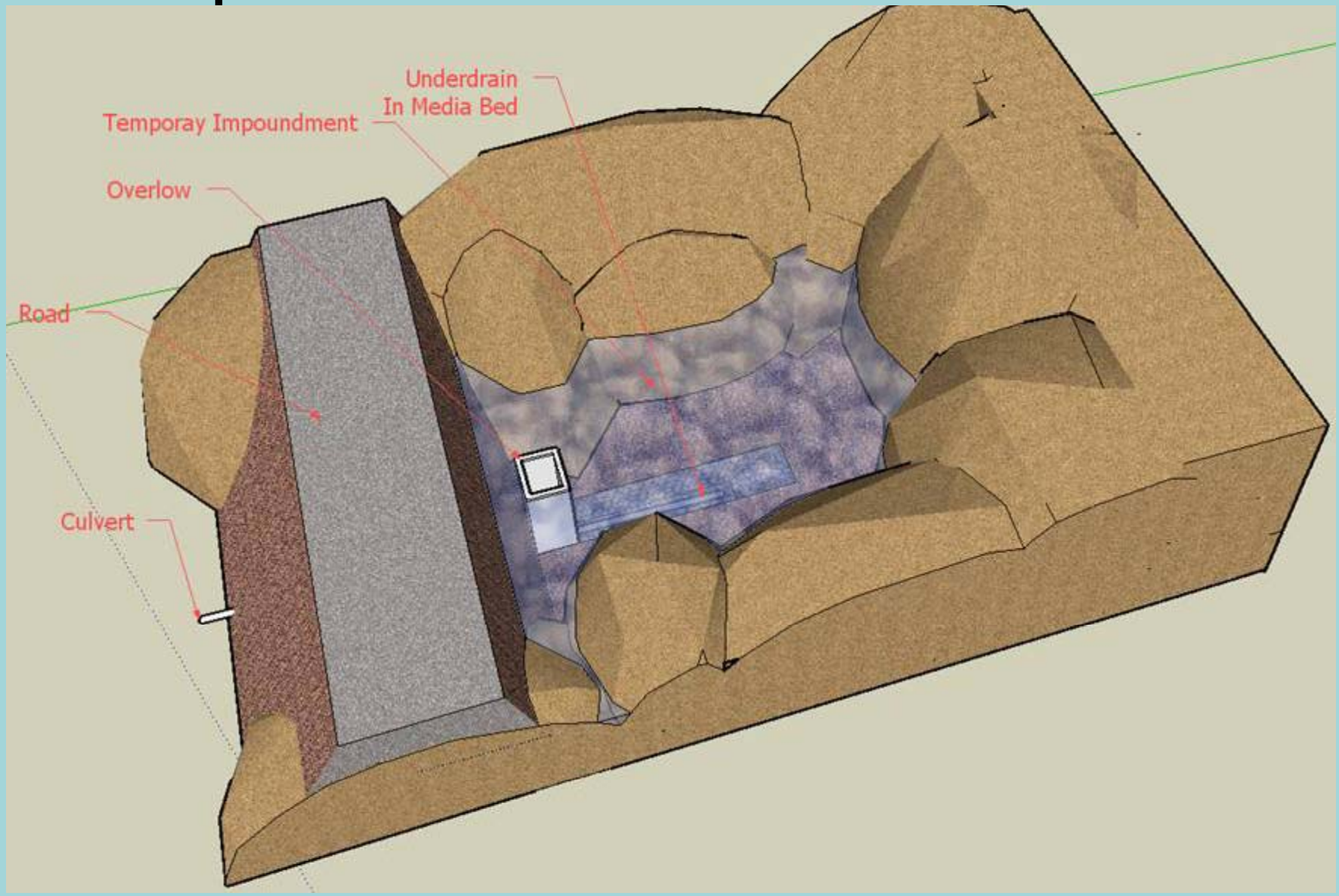
Floodplain option – Option 3

Draft ENTS Footprints – Eastern 009 Watershed

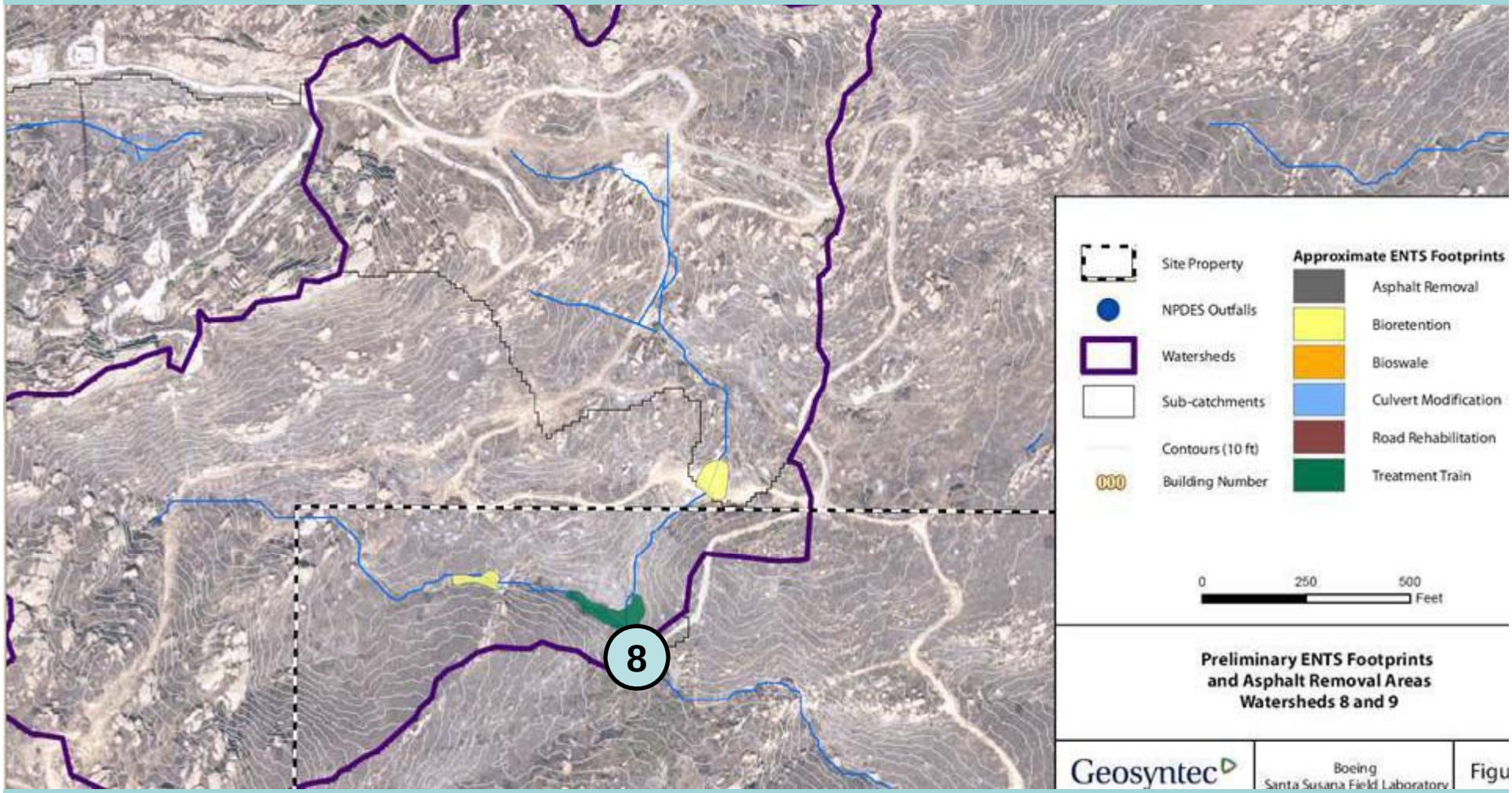


Service Road Culvert at Area 1 Landfill

Example of Culvert Modification ENTS



Draft ENTS Footprints – 008 Watershed



Agency Coordination Required for Final ENTS Approval & Implementation

- CDFG, ACOE, NASA, DTSC, RWQCB, and Ventura County
- Example - DTSC:
  - Many proposed ENTS located near cleanup areas
  - Significant coordination required with DTSC for these areas to meet ENTS implementation schedule

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Expert Panel Design Storm Schedule

Proposed Scope	Proposed Date
Introduce Panel to public	**Completed January 22nd**
Present initial progress on the design storm to Regional Board	**Completed March 6th**
Present progress on preliminary design storm to public	**Completed March 17th**
Present preliminary design storm to Regional Board	**Completed April 3rd**
Present progress on final design storm to public	April 17, 2008
Present final recommendation to Regional Board	May 1, 2008

What is a Site-Specific Design Storm?

- Storm depth or rain intensity to use for assessing compliance and therefore driving selection and design/sizing of controls:
  - e.g. natural treatment systems for 008 and 009
  - Other treatment controls for other outfalls

Expert Panel Recommended Application of Site Design Storm in Assessing Compliance

Storm Size	Effluent Limits	Results
Smaller than or Equal to the Site Design Storm	Effluent limits apply as numerical effluent limits	Enforcement action(s) by Regional Board for exceedence(s) + propose remedies
Larger than Site Design Storm	Effluent limits apply as benchmarks	Assess cause of exceedence(s) and propose potential control enhancements for Regional Board review

Progress on Site Specific Design Storm

- Have implemented evaluation methodology (i.e., long-term continuous hydrology modeling) consistent with LA Design Storm Task Force
- Developed preliminary recommendation (1 year event) to be confirmed with additional work on treatment system design for 008 and 009 watersheds

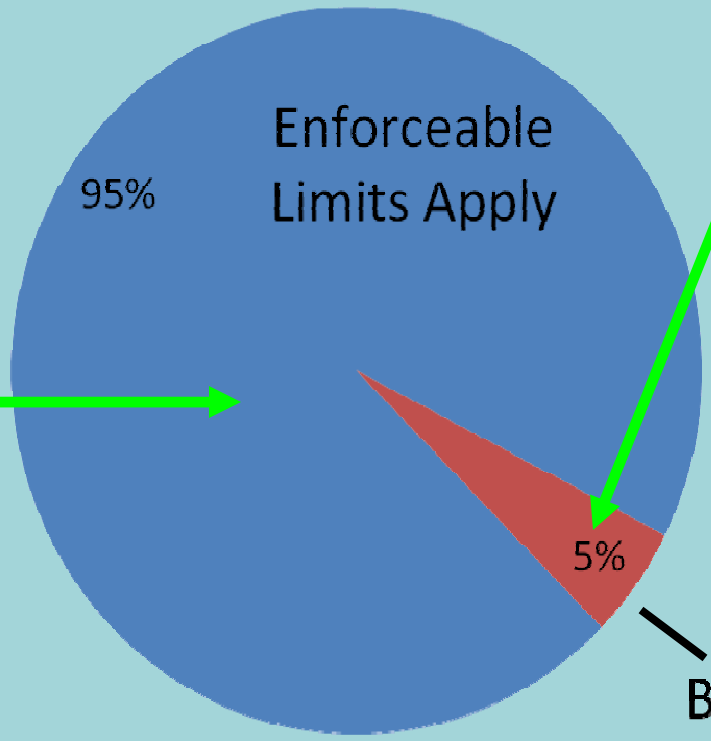
Design Storm/ENTS

The Panel's Goal is a system of Engineered Natural Treatment Systems and other Controls (e.g. Treatment Trains), and a design storm that:

- Maximize the probability of attaining numeric effluent limits
- Minimize the potential impacts to downstream residents and the environment
- Protect the natural site conditions and is feasible given the site's constraints

Percent of Storms Being Treated at SSFL Using 1-Year Design Storm

If numeric effluent limits are exceeded, Boeing will be subject to enforcement and will have to propose remedies



If numeric effluent limits are exceeded, Boeing will have to assess sources and put in more management measures if it is expected to cause significant problems

Summary of Expert Panel's Efforts

- A proposed criterion (Design Storm and application) to govern how Boeing is regulated when runoff from the site is discharged off site.

- All available opportunities for management measures are being identified. With goals of:

  – fully managing more than 90% of the runoff to the extent that the various site conditions allow

  – retaining the maximum possible amounts of contaminants in managed locations

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Existing Monitoring in 008 & 009 Watersheds

- Existing NPDES compliance monitoring for stormwater discharges at the outfalls
  - Dioxin - Every sampling event
  - Radionuclides - Every sampling event
    - Includes Gross Alpha, Gross Beta, Combined Ra-226 & 228), Tritium, Strontium-90, K-40, Cs-137, & Uranium
  - Total metals – Every sampling event
  - Toxicity – acute annually, chronic 2X/year
  - Remaining USEPA priority pollutants (including VOCs) - annually
- Sampling conducted consistent with Regional Board-approved protocols
- Analyses conducted by State-certified analytical laboratories

New Monitoring in 008 & 009 Watersheds

- New monitoring proposed by Expert Panel and the project team
  - Treatability stormwater samples already taken above outfalls
  - Additional rain gauges added in watersheds
  - Manual flow measurements taken at outfall 009
  - Stream channel conditions mapped in northern drainage
  - Confirmation of soil characterization at ENTS locations
  - ENTS monitoring plan to be developed
    - Influent & effluent composite sampling
    - Sediment, vegetation, and groundwater sampling being considered

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Panel Future Efforts

- *Final* design storm recommendation and conceptual Engineered Natural Treatment Systems designs, scheduled for April 17 public meeting for Outfall 008 and 009 Watersheds:
  - Develop complete list of ENTS locations and footprints
  - Develop conceptual ENTS designs for each location
  - Develop list of other controls to be included
- Provide an update to Regional Board at May 1st Hearing