



DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST  
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SAN DIEGO, CA 92132-5190

5090  
Ser OPAE.TM/294  
July 13, 2010

Ms. Cheryl Prowell  
California Environmental Protection Agency  
California Regional Water Quality Control Board  
Mitigation & Cleanup Unit  
9174 Sky Park Court, Suite 100  
San Diego, CA 92123-4340

Mr. Tayseer Mahmoud  
California Environmental Protection Agency  
Department of Toxic Substances Control  
Brownfields and Environmental Restoration Program  
5796 Corporate Avenue  
Cypress, CA 90630

Mr. Martin Hausladen  
U. S. Environmental Protection Agency  
Region IX, Code SFD-8-B  
75 Hawthorne Street  
San Francisco, CA 94105-3901

Subj: MEETING MINUTES FOR THE 100<sup>th</sup> FEDERAL FACILITIES  
AGREEMENT (FFA) MEETING DATED MAY 20<sup>th</sup>, 2010,  
MARINE CORPS BASE CAMP PENDLETON

Dear Ms. Prowell, Mr. Mahmoud, Mr. Hausladen:

Enclosed are the minutes to the Marine Corps Base, Camp Pendleton Federal Facilities Agreement (FFA) meeting, Number 100, held on May 20<sup>th</sup>, 2010. Should you have questions, please call me at (619) 532-1502.

Sincerely,

A handwritten signature in red ink that reads "Theresa L. Morley".

THERESA MORLEY  
Lead Remedial Project Manager  
By direction of the Commanding  
Officer

5090  
Ser OP&E.TM/  
July 13, 2010

- Enclosures:
- (1) 100<sup>th</sup> FFA Meeting Minutes
  - (2) 100<sup>th</sup> FFA Meeting Agenda
  - (3) Sign in Sheet
  - (4) Deliverables/Fieldwork Spreadsheets
  - (5) Camp Pendleton 100<sup>th</sup> FFA Meeting Recap
  - (6) Update on CERCLA UST Sites
  - (7) Presentation on MCBCP Site Approval Process
  - (8) 22/23 Area Groundwater Remedial Investigation and Feasibility Study Report Presentation
  - (9) Site 1115 Pilot Study Update
  - (10) Site 21 Pilot Study

Copy to: CG, MCB Camp Pendleton (Attn: ACOS, Environmental Security - Mr. Joe Murtaugh)

**PROJECT NOTE NO. 49**

**SUBJECT: Marine Corps Base (MCB) Camp Pendleton Federal Facilities Agreement (FFA) Meeting (No. 100)**  
**DATE HELD: 20 May 2010**

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**Attendees:**

Onsite: Theresa Morley (Naval Facilities Engineering Command, Southwest [NAVFAC SW]), Tracy Sahagun (MCB Camp Pendleton), Joseph Murtaugh (MCB Camp Pendleton), Mark Bonsavage (MCB Camp Pendleton), Geoff Buckner (NAVFAC SW), Martin Hausladen (United States Environmental Protection Agency [USEPA or EPA]), Cheryl Prowell (San Diego Regional Water Quality Control Board [RWQCB or Water Board]), Bill Mabey (Tech Law), Tayseer Mahmoud (California [Cal] EPA/Department of Toxic Substances Control [DTSC]), Kimberly Day (DTSC), Steve Griswold (Parsons), Dan Griffiths (Parsons), Josh Sacker (Parsons), Letitia Moore (USEPA)\*, John Chesnutt (USEPA)\*.

By teleconference: Kelly Dorsey (San Diego RWQCB)\*, Helen Yu (RWQCB)\*.

\* denotes part-time attendance

**Introduction and Status of Deliverables and Fieldwork**

A one-day meeting was held in San Francisco to update the FFA Team (Team) on program status. Refer to attached sign-in sheet and agenda. Following introductions, Ms. Morley provided the status of deliverables and fieldwork (refer to attached slides for full list of planned deliverables and dates).

Regarding the Explanation of Significant Differences (ESD) for Site 7, Mr. Hausladen said that USEPA needs the document within 3 weeks for signature. For 12 Area Site 13, the title of the document is being changed to reflect that quarterly groundwater monitoring will be conducted at the site and monitored natural attenuation is not the selected alternative. Regarding Site 62, there was some discussion of possible polychlorinated biphenyl (PCB) migration and potential risk to groundwater. It was agreed that the agencies would provide comments and that they would be addressed as appropriate.

With regard to Site 1D, Mr. Mahmoud asked if a Record of Decision (ROD) amendment was being considered. Ms. Morley said that first a data gap analysis would be conducted, then a focused feasibility study would follow, and then the revised Proposed Plan and ROD amendment would be submitted.

Groundwater treatment continues at Site 1D. At Sites 1117 and 1118, groundwater has been resampled, and at Site 1114, conditions are too muddy to drill, and will resume when the ground dries out.

There was some discussion about the need for a Technical Review Committee (TRC) meeting associated with the Draft 22/23 Area Groundwater Remedial Investigation/Feasibility Study (RI/FS). Ms. Morley said that a TRC meeting is periodically set up by the Base when there is a need to review a decision document. The need for the next TRC meeting will be evaluated.

### **FFA Recap**

Ms. Morley provided an overview of the history and accomplishments of the FFA Team since inception, including the number of completed projects, closed sites, Records of Decision, and a summary of active Installation Restoration (IR) sites. A brief quiz followed the presentation.

### **Sites 1116, 1117, and 1118**

Ms. Morley provided a status of each of the subject sites. Refer to the attached slides. For 14 Area Groundwater (Site 1116), Ms. Morley described the monitoring wells installed and sampled at each site. Among the sites sampled, underground storage tank (UST) sites 1491, 14112, and 14008 should move to an RI/FS or Removal Action.

Regarding Site 1117 (15/16 Area Groundwater), a discussion was provided of the monitoring wells sampled and the analytical results (attached). At Site 1523, Mr. Mabey asked about the vinyl chloride detection and whether it was indicative of other volatile organic compounds (VOCs) being present at the site. Ms. Morley said that the report was forthcoming and that questions can be raised if not adequately addressed.

For Site 1655, Ms. Morley asked if more sampling is needed to delineate the plume. Ms. Prowell said that the vinyl chloride plume is not delineated. Mr. Mahmoud said that vapor sampling will also be needed. After some discussion, Mr. Hausladen suggested that a tech memo or work plan addendum be prepared to address the additional sampling needs.

### **Site Approval Process System**

Mr. Bonsavage provided a briefing on the Site Approval Process System at Camp Pendleton, which is designed to prevent unapproved activity on IR sites (see attached



slides). Mr. Bonsavage described the Base's mission, demographics, and summary of facilities.

The various steps of the site approval process were described, including the need for work requests, appropriate reviews, and ultimately approvals for any projects that are undertaken on the Base. National Environmental Policy Act (NEPA) projects are managed by an online system called Process and Management Support Module (PAMS), and all projects are required to submit a Preliminary Environmental Data (PED) Form. Various data sources are checked, including the continuously-update Geographic Information System (GIS) system before issuing a decision memo for each planned project at the Base.

Mr. Hausladen and Ms. Moore asked several questions about how monitoring occurs at sites that have land use controls, and how are unauthorized activities caught? Ms. Morley and Mr. Bonsavage noted that the Base Resident Officer in Charge of Construction (ROICC) does periodic tours around the Base to monitor construction activities and to see if anything is out of place or if unauthorized activity is taking place.

There was also discussion about how land use controls are implemented; that is, what mechanism is used, such as the Base Master Plan. It was explained that the Environmental Operations Map is the best mechanism because it is updated quarterly. The Base Master Plan is updated much less frequently, perhaps every ten years, and is not intended to track land use controls, but rather is used for long-term planning of Base lands.

#### **Site 1115 Pilot Study Fieldwork Summary**

Mr. Griffiths presented an update describing the completion of the injection of carbon substrate at Site 1115 for the pilot study (see attached slides). Following the initial steps taken for the fieldwork, including initial well installation, and baseline sampling, Light Non-Aqueous Phase Liquid (LNAPL) recovery testing was conducted at two wells where LNAPL thicknesses have been greatest (S5/8/9/17-MW40 and -MW53). LNAPL was evacuated from both wells and the rate of LNAPL thickness recovery was measured and documented over an extended period of time at both wells. At S5/8/9/17-MW40 LNAPL recovered to approximately 27% of the pre-evacuation thickness in 172 hours of monitoring. The LNAPL recovery rate over this time period was approximately 0.05 gallons per day. The LNAPL thickness at S5/8/9/17-MW53 recovered to only 0.59 feet in 146 hours of monitoring and results at this well were inconclusive due to the slow recovery rate. The conclusion from this recovery testing is that significant product removal through active extraction is unlikely. Using fuel sorbent socks with periodic replacement is likely the most efficient means of product removal at this well.

After the LNAPL recovery testing was complete Parsons proceeded with substrate injection. Injection activities were carried out between September 21 and 26. Among the three wells used for substrate injection, the largest quantity of substrate was injected

into 1115-MW1. This was because there was “breakthrough” at the 1115-MW2 and -MW3 locations. In those two cases, the breakthrough occurred because of the proximity to man-made “conduits” such as an old boring/well and a nearby former trench excavation at the site. Once the injected substrate travels out a certain distance from each injection well, if it encounters a zone of higher permeability such as a man-made conduit, it will tend to travel along that zone to the ground surface.

A specialized tool called the “Sidewinder,” which is designed for the purpose of injecting fluid into the subsurface, was used at the site during the pilot study to test its effectiveness. In the case of this site, the tool was not effective at helping increase the flow of substrate and radius of influence due to the relatively low permeability of the soils.

Based on field observations the radius of influence of injected fluid was approximately two to three times greater than initially estimated in the work plan through porosity/volume calculations. Thus, if this technology (or any other in-situ injection technology) were to be applied in the future at Site 1115, than injection point spacing could be on the order of 25-35 feet rather than the 15 foot spacing used in the pilot application.

The first performance monitoring event was conducted in January of 2010 while the second event was conducted in April. The next event is scheduled to occur in July or August of 2010. Initial results indicate that organic carbon was successfully emplaced in the intended treatment area as indicated by high concentrations of organic carbon. Baseline weakly anaerobic geochemical conditions in the treatment area became more strongly anaerobic and were methanogenic during the April sampling round. The pH conditions in the injection area initially declined but rebounded back into the neutral range during the April event. Current conditions (as of April) are sufficiently neutral to be conducive to anaerobic reductive dechlorination. Baseline TCE and cis-1,2-DCE concentrations declined slightly (by 5-10%) as measured during the January round but this data is inclusive.

### **Site 21 Pilot Study Fieldwork Summary**

Mr. Griffiths presented an update describing the completion of the injection of carbon substrate at Site 21 for the pilot study (see attached slides). Following the initial steps taken for the fieldwork, including initial well installation, and baseline sampling, substrate was injected into two injection wells. Injection activities were carried out between December 14 and 18. RWQCB personnel were onsite on December 16 to observe the injection activities. The RWQCB visit did not yield any comments.

The extent of substrate distribution achieved during injection appeared to be as proposed based on lack of substrate at monitoring well 21W-23. Post injection performance monitoring data has not been collected to date due to high water conditions in the pond limiting access to several well locations. Results of the pilot study testing will be presented when available.

## **22/23 Area Groundwater RI/FS Update**

Mr. Griswold provided an overview of the Draft 22/23 Area Groundwater RI/FS Report, which was sent to the agencies May 14 and is being received by each agency at the time of this meeting. Refer to the attached slides. An overview was provided of the site, the presence of COCs including 1,2,3-TCP, the summary of investigations, conclusions, and the remedial alternatives developed for the feasibility study.

In summary, chlorinated solvents (also referred to as VOCs) are present in site groundwater, including detections of 1,2,3-TCP in Base well 2202, and also in Base wells 330923 and 33924 (cross gradient from the site), and in agricultural well 2200 downgradient from the site. In the 22 Area, where the highest VOC concentrations are present, there are also daughter products such as cis-1,2-DCE and vinyl chloride, which indicate that contaminant degradation is occurring in some areas. However, based on data to date, groundwater contamination may remain above MCLs for several more decades if left untreated. There is no significant risk to indoor air receptors from soil gas contaminants in the 22 Area based on data and calculations presented in the report.

Six alternatives are presented in the Draft report, including:

- Alternative 1: No Action
- Alternative 2: Land Use Controls and Long Term Monitoring
- Alternative 3: Alternate Water Supply by Installing New Base Well or Wells (including Alternative 2)
- Alternative 4: Source Area Treatment via In Situ Technologies (including Alternative 2)
- Alternative 5: Ex Situ Wellhead Treatment at Well 2202 (including Alternative 2)
- Alternative 6: Wellhead Treatment at Well 2202 and Reinjection of Treated Water (including Alternative 2)

Several comments and issues were discussed regarding the site. Mr. Hausladen said that use of the term “source area” can be confusing and that we need to make sure that the terminology is clearly explained in the document. Mr. Mabey said that it would be helpful to tie together the “blobs” of contaminant plumes that we think are actually part of the same plume. The figure showing the plumes could be redrawn to show which plumes are connected and which are thought to be from different sources.

Mr. Hausladen asked what is meant by “no significant risk” to indoor air receptors. Mr. Griswold said that significant risk is defined as a risk greater than  $1 \times 10^{-6}$  as described in the document.

There was some discussion regarding timeframes for the alternatives, and whether the 30 year timeframe is realistic. It was noted that 30 years was used in order to compare the alternatives against one another in terms of cost. There was also some discussion about sustainability of each alternative. Mr. Griswold noted that there is some

discussion of sustainability in the document, and that new guidelines are in the process of being developed by the DON. Upon receipt of agency comments (which is scheduled for 60 days), the team will discuss and incorporate comments.

**Meeting Wrap-up and Schedule for Next Meeting**

The next FFA Meeting is scheduled to be held in Pasadena, CA on August 19, 2010.

**MCB Camp Pendleton  
100<sup>th</sup> FFA Meeting Agenda**

**Hotel Rex  
San Francisco**

**May 20, 2010**

<b>0900 – 0910</b>	<b>Welcome and Introductions</b>
<b>0910 – 0930</b>	<b>Camp Pendleton FFA Recap</b>
<b>0930 – 1000</b>	<b>Project Deliverables Status</b>
<b>1000 - 1040</b>	<b>Site 1116, 1117, 1118 Update</b>
<b>1040 – 1055</b>	<b>Break</b>
<b>1055 – 1155</b>	<b>Camp Pendleton Site Approval Process System</b>
<b>1155 – 1300</b>	<b>Lunch</b>
<b>1300- 1420</b>	<b>22/23 Area Groundwater RI/FS Update</b>
<b>1420 - 1450</b>	<b>Site 1115 Pilot Study Update</b>
<b>1450 – 1505</b>	<b>Break</b>
<b>1505 – 1520</b>	<b>Site 21 Pilot Study Update</b>
<b>1520 – 1545</b>	<b>Upcoming Site 1119 Work Plan Overview</b>
<b>1545 – 1600</b>	<b>Meeting Conclusion / Action Items</b>

# PARSONS

CLIENT NAVFAC - 100th FAA Meeting  
 SUBJECT \_\_\_\_\_

JOB NO. \_\_\_\_\_ SHEET \_\_\_\_\_ OF \_\_\_\_\_  
 BY \_\_\_\_\_ DATE 5/20/10  
 CKD. \_\_\_\_\_ REVISION \_\_\_\_\_

NAME	ORGANIZATION	PHONE/E-MAIL
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# MCB CAMP PENDLETON FFA RECAP

20 May 2010  
100<sup>th</sup> FFA Meeting



## MCB CAMP PENDLETON FFA

- ❖ FFA Agreement Signed  
October 1990.
- ❖ First FFA Team Meeting Conducted  
February 1991.





# MCB CAMP PENDLETON FFA

## RFA Sites

- ❖ Total RFA Sites: 109
- ❖ RFA Sites Closed: (NFA, under UST, etc.): 62
- ❖ RFA Sites Transferred (UST or IR): 14
- ❖ Active RFA Sites: 33
  - 25 CMI Phase
  - 6 Handled Under 140
  - 1 NPDES Permit
  - 1 - STP Sites 1, 2, 3, 8 and 13

# MCB CAMP PENDLETON FFA

## IR Sites Closed, no LTM - 53 Sites

- ❖ OU 1 ROD - December 1995
  - Site 4/4A (soil)
- ❖ OU 2 ROD - September 1997
  - Sites 3, 5, 15 (part of Site 3), 19, 20, 22, 28, 31, 43, 44, 45, and 2B
- ❖ OU 3 ROD - March 1999
  - Site 10, 16 (soil), 17 (soil), 18, 24, 27 (soil), 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 1B, 1C, 1I, 2C, 2D, 2F, and 2G
- ❖ OU 4 ROD - June 2007
  - Site 1E-1
- ❖ OU 5 ROD - January 2008
  - Site 6A (soil)
- ❖ Other
  - 15 Sites



# MCB CAMP PENDLETON FFA

## Status of Active IR Sites - 21 Sites

- ❖ 22/23 Area Groundwater - RI/FS Report in Agency Review.
- ❖ Site 7 - Continue groundwater, soil vapor monitoring, and semiannual site maintenance.
- ❖ Site 11 (Not a true IR Site, RWQCB lead) - Field work completed, report in progress.
- ❖ Site 12 (Not a true IR Site, RWQCB lead) - SI Work Plan final, fieldwork May 18<sup>th</sup>.
- ❖ 12 Area Site 13 - SAP in Agency Review (Groundwater).
- ❖ Site 30 - Remediation complete, RACR in Agency Review.

# MCB CAMP PENDLETON FFA

## Status of Active IR Sites

- ❖ Site 33 - Responses to Agency Comments on Draft EE/CA and AM in Agency Review
- ❖ Site 150 - Site discovered through PA process and help of a veteran. Of the six locations identified during the discovery process only one, Location 1, had VOC levels high enough to warrant further investigation. Scope for SI being prepared.
- ❖ Site 1A - RA complete, Draft RACR being prepared. Agencies may require four quarters of groundwater monitoring.
- ❖ Site 1D - Remedial action for soil complete. Discovered groundwater contamination in grid G9. Remediation of groundwater in progress. Need data gap analysis for groundwater and FFS.

# MCB CAMP PENDLETON FFA

## Status of Active IR Sites

- ❖ Site 1H - Remedial action complete. Re-excavation of lead above RGs finally complete March 26th.
- ❖ Site 1111 - RACR final, needs NFA iROD.
- ❖ Site 1A-1 - RACR final. Upload SC documentation to NORM.
- ❖ Site 1114 - RI Work Plan final, field work to start after site dries out.
- ❖ Site 1115 - Pilot study for groundwater underway; one year of groundwater monitoring in progress.

# MCB CAMP PENDLETON FFA

## Status of Active IR Sites

- ❖ Site 1116 - Field work complete, preparing preliminary draft report.
- ❖ Site 1117 - Wells are dry, need to determine a path forward.
- ❖ Site 1118 - Field work complete, preparing preliminary draft report.
- ❖ Site 1119 - Preparing preliminary draft SAP.
- ❖ Site 62 - Draft SI Report with Agencies.
- ❖ Site 2E - Site never found.

MCB Camp Pendleton Deliverables Spreadsheet

Date: 5/20/10

Item	Document	Contractor	Status	Date Due to Agencies	Agency Comments Due By	Response Received From:		
						EPA	DTSC	RWQCB
1	Remedial Action Closure Report for OU4 Site 30 - Firing Range Soil	Battelle	Revising EcoRisk Assessment	9/22/09	11/23/09	X	X	X
2	Remedial Investigation for Site 1114 - 41 Area Arroyo Site	Shaw/Trevet	FINAL	10/19/09	12/18/09	X	X	X
3	Site Inspection for Site 1116 - CERCLA USTs in 14 Area	Shaw/Trevet	FINAL	9/11/09	1/11/10	X	X	X
4	Engineering Evaluation/Cost Analysis for Site 33 - Armory Site	SDV/Battelle	FINAL	9/12/09	1/12/10	X	X	X
5	Non Time Critical Removal Action Memorandum Site 33 - Armory Site	Battelle	Public Comment Period ends 8 June	9/12/09	1/12/10	X	X	X
6	Site 7 (Box Canyon) Annual Groundwater Monitoring Report	Trevet	FINAL	12/7/09	2/5/10	NC	X	X
7	Phase II Extraction Report for Site 7 (Box Canyon) LFG	TetraTech	Finalizing	12/21/09	2/18/10	NC	X	X
8	SAP for Groundwater Monitoring at 12 Area Site 13	SDV	Responding to Agency Comments	2/5/10	4/6/10	X	X	X
9	Community Involvement Plan Update	SDV/Barrett	Responding to Agency Comments	2/26/10	4/27/10	NC	X	X
10	Site Inspection Report for Site 62 (PCB Site in 62 Area)	SeaAlaska	With agencies	4/7/10	6/7/10		X	X
11	ESD for Site 7 (Box Canyon) Photovoltaic Panel Project	SDV	Out for signature	4/2/10	4/23/10	X	X	X
12	Remedial Action Closure Report for OU3 Site 1A - Burn Ash Site	Battelle	With agencies	4/23/10	6/22/10			
13	RI/FS for 22/23 Area Groundwater	SDV/Parsons	With agencies	5/14/10	7/13/10			
14	Remedial Action Closure Report for OU5 Site 1H - Burn Ash Site	SDV	Incorporating Navy Comments	May				
15	Remedial Action Closure Report for OU4 Site 1D for Soil - Burn Ash Site	SDV	Preparing Pre-draft					
16	NTCRA Work Plan for Site 33 - Armory Site	Battelle	Once EE/CA & AM are final					
17	RI/FS Work Plan for Site 1119 - 26 Area Groundwater	Parsons	Preparing Pre-draft					
18	Data Gap Analysis Work Plan for Site 1D - Burn Ash Site							
19	Site Inspection Report for Site 1116 - 14 Area Groundwater	Trevet						
20	Site Inspection Report for Site 1117 - 15/16 Area Groundwater	ERRG						
21	Site Inspection Report for Site 1118 - 21/26/52 Area Groundwater	SeaAlaska						
22	Annual Groundwater Monitoring Report - Site 7 Box Canyon	Trevet						

Agencies have commented

### MCB Camp Pendleton Fieldwork Spreadsheet

Date: 5/20/10

Item	Field Work	Planned Start Date	Planned Completion Date
1	Groundwater at Site 1D - Burn Ash Site	In progress	
5	Site 1117 - CERCLA USTs in 15/16 Area	September 8th	Complete
6	Site 1118 - CERCLA USTs in 21/26/52 Area	November 30th ish	Complete
8	Site 1114 - 41 Area Arroyo (PCE in well)	Started last week, drill rig stuck	Will resume once site is dry



# Update on CERCLA UST Sites (1116, 1117, 1118)

FFA Meeting  
May 20, 2010

## Site 1116 (cont.)

- UST Site 1441 was recommended for NFA under CERCLA in work plan and has been transferred back to UST program
- UST sites 14131 and 14137 were recommended for NFA under CERCLA in work plan. They were closed under the UST program.

## Site 1116 – 14 Area Groundwater

- 14125, 14127 – one temporary monitoring well installed and sampled
- 14121 – one temporary monitoring well installed and sampled. Five existing monitoring wells sampled
- 14112 - one temporary monitoring well installed and sampled. Twelve existing monitoring wells sampled
- 1491 – two temporary monitoring well installed and sampled. Nine existing monitoring wells sampled
- 140008 - two temporary monitoring well installed and sampled. Nine existing monitoring wells sampled

## Site 1116 (cont.)

Monitoring wells at 14121 destroyed after DTSC Risk Assessor concurred levels were below MCLs and no vapour intrusion risk was present

Construction of BEQ underway

## Site 1116 (cont.)

- Preliminary data indicate No Further Action should be needed at UST sites 14121, 14125 and 14127
- Preliminary data indicate UST sites 1491, 14112 and 14008 should move to RI/FS or Removal Action

## Site 1116 (cont.)

- FY11 – NFA iROD for UST Sites 1441, 14121, 14125, 14127, 14131 and 14137
- FY 11 – RI/FS or Removal Action for 1491, 14112 and 14008

## Site 1117 (15/16 Area Groundwater)

- Site 1523 – 7 wells sampled
- Site 1534 – 3 wells sampled
- Site 1536 – 6 wells sampled
- 1575 – monitoring wells are gone, 2 temporary wells are dry
- 1655 – 8 wells sampled (1 dry); 3 temporary wells sampled (5 dry)

## Site 1117 (cont.)

- Site 1523 – benzene over MCLs, Vinyl Chloride at 0.51 ug/l < MCL, recommend NFA under CERCLA?
- Site 1531 – no further investigation recommended in work plan
- Site 1534 - benzene over MCLs, recommend NFA under CERCLA?



## Site 1117 (cont.)

Site 1536 – benzene, naphthalene over MCLs

Site 1575

- no monitoring wells
- temp wells dry (required air rotary drill rig)
- main COC was diesel
- only one hit ever recorded of VOCs was 3 ug/l of TCE < MCLs (before 2005)

## Site 1117 (cont.)

- Site 1655
  - Benzene above MCLs
  - VC at 2.9 ug/l in one well
  - Passes vapour intrusion risk for ESLs in groundwater
  - Have asked for support from DTSC Risk Assessor
  - More sampling to delineate plume as part of Site Inspection?

## Site 1118 (21/26/52 Area Groundwater)

- Site 2666 – NFA – no exceedances
- Site 21565 – additional assessment recommended – one well had exceedance for TCE
- Site 520400 – under evaluation – additional samples collected in April at end of rainy season





Assistant Chief of Staff  
Environmental Security (AC/S ES),  
Brief for  
May 2010 FFA Meeting

1



## Objective



- To provide the FFA team information on the processes at Marine Corps Base Camp Pendleton that prevent unapproved activity on Installation Restoration Sites



Pacific pocket mouse  
(Perognathus longimembris pacificus)

2



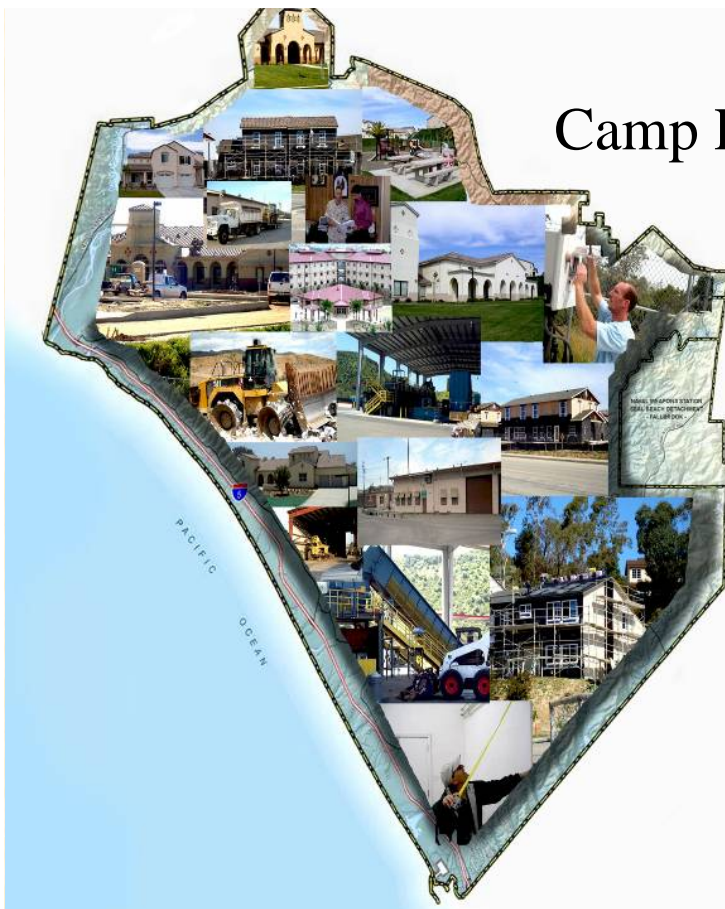
# Camp Pendleton



- **Marine Corps Base Camp Pendleton's mission is to operate a training base that promotes the combat readiness of the Operating Forces and the mission of other tenant commands by providing training opportunities, facilities, services and support responsive to the needs of Marines, Sailors and their families.**



3



# Camp Pendleton



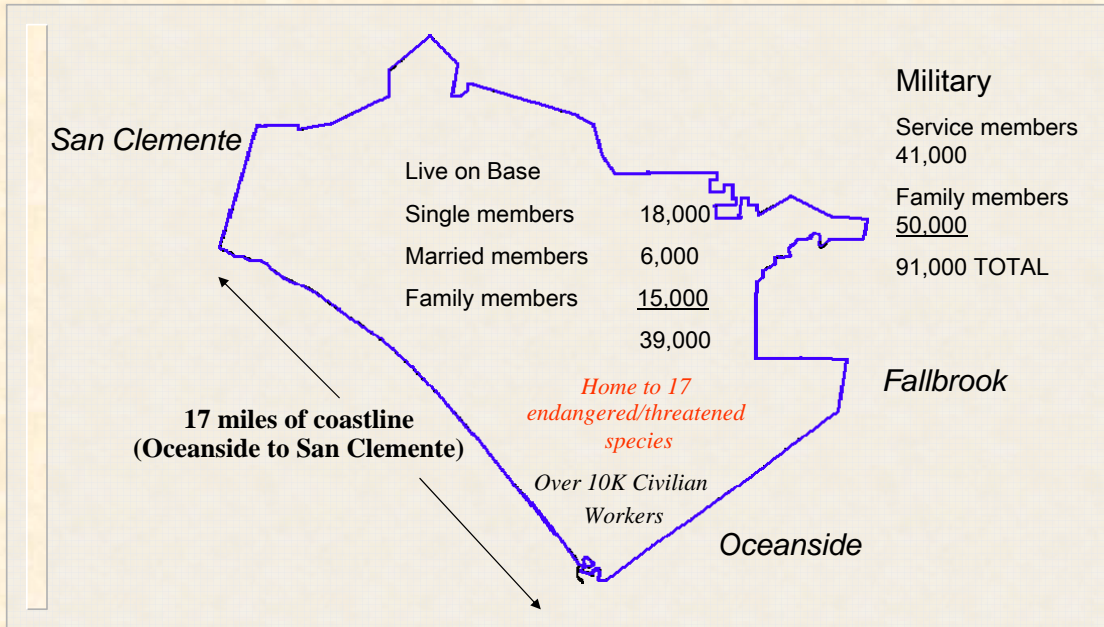
- Camp Pendleton is one of the Department of Defense's busiest installations and offers a broad spectrum of training facilities for many active and reserve Marine, Army and Navy units, as well as national, state and local agencies.
- Home to the I Marine Expeditionary Force, 1st Marine Division, 1st Marine Logistics Group and many tenant units

4

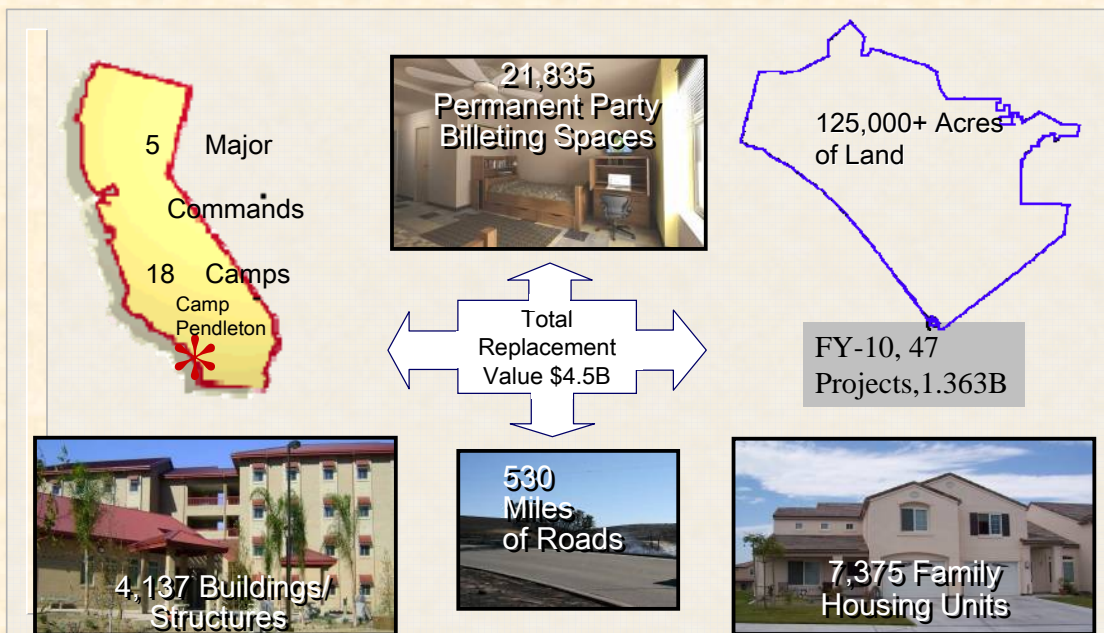




# Base Demographics



# Facilities





# Marine Corps Base Camp Pendleton



## Facilities Maintenance Department

- **Facilities Maintenance provides...**
  - **Routine and EMERGENCY maintenance**
  - **Facility and infrastructure improvement and repair**
  - **Construction/Maintenance contracting (via PWO/FSC)**
  - **Energy Conservation**
  - **Utilities maintenance, repair, and operations**
    - **High Voltage**
    - **Potable Water, Waste Water**
  - **Recycling**
  - **Refuse collection & landfill operations**

7



# Camp Pendleton Environmental Setting



- Semiarid Mediterranean climate, varied topography - coastal plains, valleys, rolling mountain foothills
- Oak woodlands, a range of chaparral and sage scrub, coastal bluff scrub, grasslands, coastal dunes, riparian communities, wetlands



8





## Natural Resources



- 17 Listed Endangered Species
- Over 800 plant species, hundreds of invertebrates, and more than 50 mammalian, 30 reptilian,
- 10 amphibian, 300 avian, and 60 fish species



9



## Environmental Security



**Environmental Security...is achieved when...the Installation's capability to support realistic military operations and training requirements is secured with minimal (acceptable) risk to either the environment or the military mission.**

10



# Site Approval



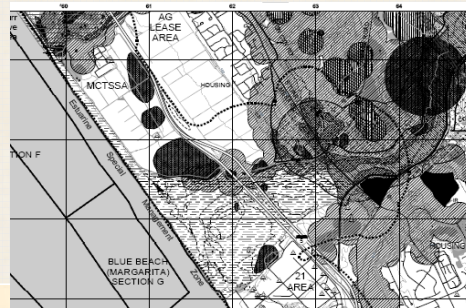
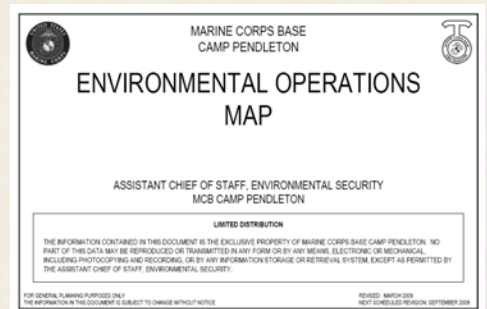
- BASE ORDER 11100.4B - STANDING OPERATING PROCEDURES FOR SITE APPROVALS
- Establishes procedures and provide guidance for obtaining site approvals
- Policy. Siting of all projects to include Milcon, M2R2, Local Authority and self-help at Marine Corps Base activities will be in conformance with the approved Master Plan. Site approval is required for all of the above projects, regardless of funding source, involving the construction, acquisition or modification Marine Corps property... Site approvals are also required for work on existing buildings or structures when that work changes the assets or condition status of the building, or structure.
- This Order is applicable to all commands, organizations, units and activities supported by Camp Pendleton.



# Proponent Approval Process



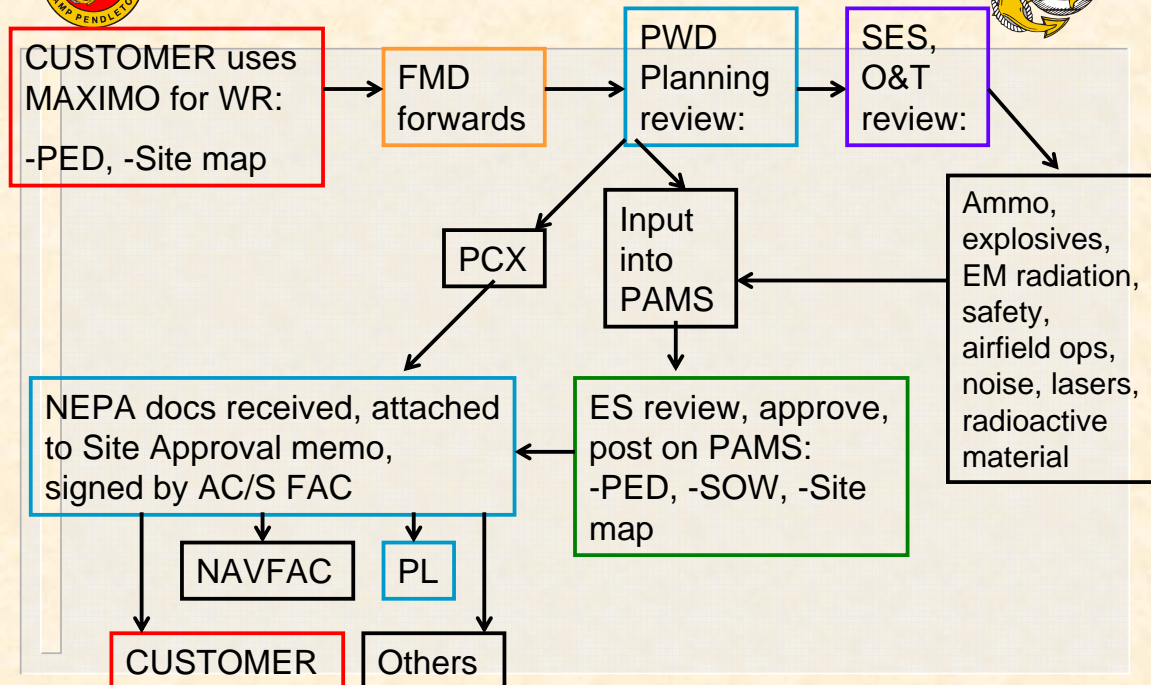
- MAXIMO, Work Request
- Review Master Plan
- Range Management Plan
- Review existing GIS information
- Environmental Operations Map
- Input PED into PAMS







# Public Works Department Site Approval Process



# Environmental Security



- Environmental Planning Division:
  - Mission: Provide environmental planning services that enable training, compliance with environmental requirements and management of natural and cultural resources.
    - Preliminary Environmental Data Form (PED)
    - Automation & Management Support Module (PAMS)
    - Geographic Information System (GIS)
    - NEPA Documentation
- RCRA Division:
  - Review PEDs
  - Provide Information on contaminated Sites
  - Coordinate with regulatory agencies

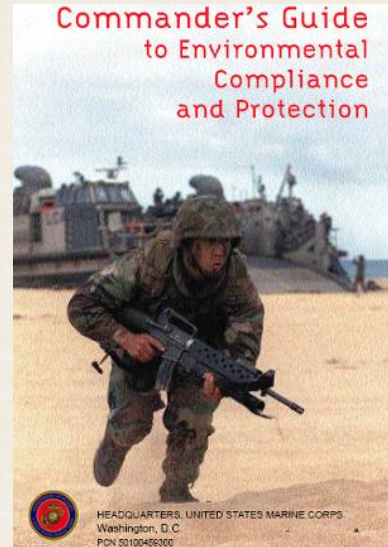




# National Environmental Policy Act (NEPA) and Implementing Guidance



- National Environmental Policy Act (NEPA)
- Marine Corps Order P5090.2A, Change 1 dated 22 JAN 08, Environmental Compliance and Protection Manual
- NEPA Compliance Base Order P5090.2

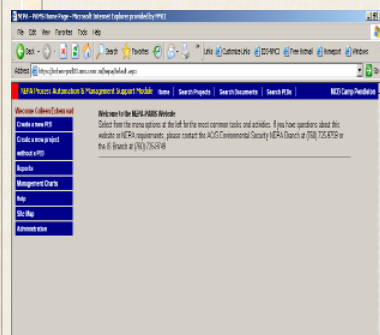


## NEPA PAMS Support Module



The NEPA Process Automation & Management Support Module (NEPA PAMS, or NEPA website) is an online system for managing NEPA projects and their related documents, comments, and work tasks.

### HELP





# Preliminary Environmental Data (PED) Form



Decision Type: CX

1. Project Title: 21 AREA BRANCH CLING PARKING LOT BLDG. 210735

2. Project ID: 10015966

3. PED Date: 18-Mar-08

4. Activity Sponsor (Unit/Command): BUMED

5. Point of Contact/Email: VENTURA VIDAUERRI

6. Phone/Fax: 725-0446

7. Project Required To (Check all that apply):  
 Correct Environmental Deficiency  
 Correct OSHA Deficiency  
 Accomplish Military Training  
 Enhance Quality of Life  
 Conduct Non-routine/Special Project  
 Conduct Regular/Recurring Maintenance  
 Other (Explain in Block 14)

8. Fund Source: BUMED

9. Funds Expire On: N/A

10. Action will be performed by: [ ]

11. Action Milestones and Duration: [ ]

12. Project will result in:  
 No  Yes

13. New or Modified Re:  
 New  Modify

14. Purpose and Need of Action (All narratives in total max 7000 characters):  
 The additional parking will be for the staff staffing is expected to double and the exist

15. Scope of Preferred Alternative (All narratives in total max 7000 characters):  
 The project will construct a 13,890sqy paved an existing dirt parking lot. The project is requested that the project be expedited, doing surveys and staking the site. The our drawings for by the Storm Water Branch and

16. Identify other alternatives (All narratives in total max 7000 characters): [ ]

17. Preferred Site Map Coordinates: Long: 1173995705 Lat: 33  
 Site Description: Coordinates are -117,3995705, 33,2218153. The site is located on the south side of 210735 and is used as a dirt parking lot.

18. Alternate Site #1 Map Coordinates: [ ]

19. Alternate Site #2 Map Coordinates: [ ]

20. THE PROJECT OR ACTION WILL:  
 a. Potentially affect the human environment, involve unique or unknown risks, or be ecologically controversial?  Blank  Y  N  U  
 b. Set a precedent, have significant future effects?  Blank  Y  N  U  
 c. Result in a change in traffic flow patterns on- or off-Base?  Blank  Y  N  U

21. THE PROJECT IS IN OR WITHIN:  
 a. 500 ft of a wetland area (free running stream, seasonal water, pond)?  Blank  Y  N  U  
 b. 500 feet of threatened or endangered species?  Blank  Y  N  U  
 c. 500 feet of habitat of threatened or endangered species?  Blank  Y  N  U  
 d. 500 feet of an archeological site?  Blank  Y  N  U  
 e. 500 feet of culturally or historically significant sites/buildings?  Blank  Y  N  U

22. THE PROJECT WILL:  
 a. Introduce increased air emissions (eg new equipment or increase in operational hours)?  Blank  Y  N  U  
 b. Introduce new, relocated or increased hazardous material use or hazardous waste?  Blank  Y  N  U  
 c. Result in new or increased vehicle fueling or maintenance?  Blank  Y  N  U  
 d. Introduce or increase aircraft flight operations?  Blank  Y  N  U  
 e. Occur within the "coastal zone" (within a mile of the coast)?  Blank  Y  N  U  
 f. Involve ground level elevating operations?  Blank  Y  N  U



# NEPA Process Automation & Management Support Module-Request comments from AC/S ES staff



NEPA Process Automation & Management Support Module Home Search Projects Search Documents Search PEDs MCB Camp Pendleton

Project Title: P614 Special Operations Training Group (SOTG) Battle Course

NEPA No: 060098

Document Type: Other

Document Title: Draft\_FONSI\_P614

Manage Comments  
 Collaborating branches: View the status of your comments for this document. When your branch comments are complete, check the **Complete** box on your branch's entry to record that. You must enter at least one comment to mark your comments as complete. After a few moments a message will appear to confirm the comments for your branch are marked as complete.

NEPA branch: To send requests for comments, check the 'Request' boxes for the desired branches, enter a suspense date at bottom, and then click **Request Comments** to open the email notification page.

Branch	Request	Request Date	Suspense Date	No of Comments	Most recent response	Elapsed Time	Complete
Air Quality	<input type="checkbox"/>					0	<input type="checkbox"/>
Cultural Resources	<input type="checkbox"/>					0	<input type="checkbox"/>
Drinking Water	<input type="checkbox"/>					0	<input type="checkbox"/>
HazMat	<input type="checkbox"/>					0	<input type="checkbox"/>
Installation Restoration	<input type="checkbox"/>						<input type="checkbox"/>
Land Management	<input type="checkbox"/>						<input type="checkbox"/>
Military Munitions	<input type="checkbox"/>						<input type="checkbox"/>
NEPA	<input type="checkbox"/>						<input type="checkbox"/>
Pollution Prevention	<input type="checkbox"/>						<input type="checkbox"/>
Project Oversight	<input type="checkbox"/>						<input type="checkbox"/>
PWO	<input type="checkbox"/>						<input type="checkbox"/>
Remediation	<input type="checkbox"/>						<input type="checkbox"/>
SpillPlanPrevent	<input type="checkbox"/>						<input type="checkbox"/>
Stormwater	<input type="checkbox"/>						<input type="checkbox"/>
Wastewater	<input type="checkbox"/>						<input type="checkbox"/>

**Project Comments** RENOVATE BUILDING 33322 TO HALF OFFICE SPACE AND HALF BEQ SPACE

NEPA No 20090277

PAGE NO/SECTION	BRANCH	ENTERED BY
PED	PED	MCDSUS/james.umins
Installation Restoration and Remediation: There are no known contaminated sites within the proposed project footprint. During construction if soil contamination (discolored and/or odorous) is discovered contact the Installation Restoration/Remediation Branch at 760-725-9744/9774 for necessary remedial requirements.		
	Cultural Resources	MCDSUS/dawn.hubbs
SHPD letter required.		







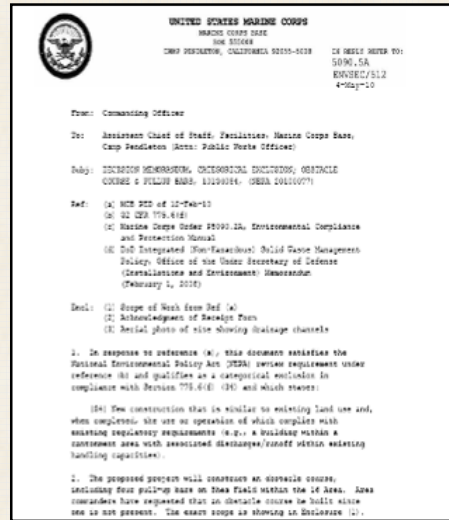
# Decision Memo



## Create Decision Memorandum

The NEPA website supports the creation of decision memoranda by converting the PED data elements into a draft document that may be edited to the exact requirements for the DM.

Elements of a DM are stored by the website and may be edited as required to minimize any manual editing.



# Questions



# MCB CAMP PENDLETON 22/23 AREA GROUNDWATER

20 May 2010

100<sup>th</sup> FFA Meeting



## 22/23 Area Groundwater

### Presentation Overview

- ❖ Site Description
- ❖ 1,2,3-Trichloropropane (TCP)
- ❖ Environmental Setting
- ❖ Summary of Field Investigations
- ❖ Nature and Extent of Contamination
- ❖ Remedial Investigation (RI) Conclusions
- ❖ Feasibility Study (FS) Alternatives

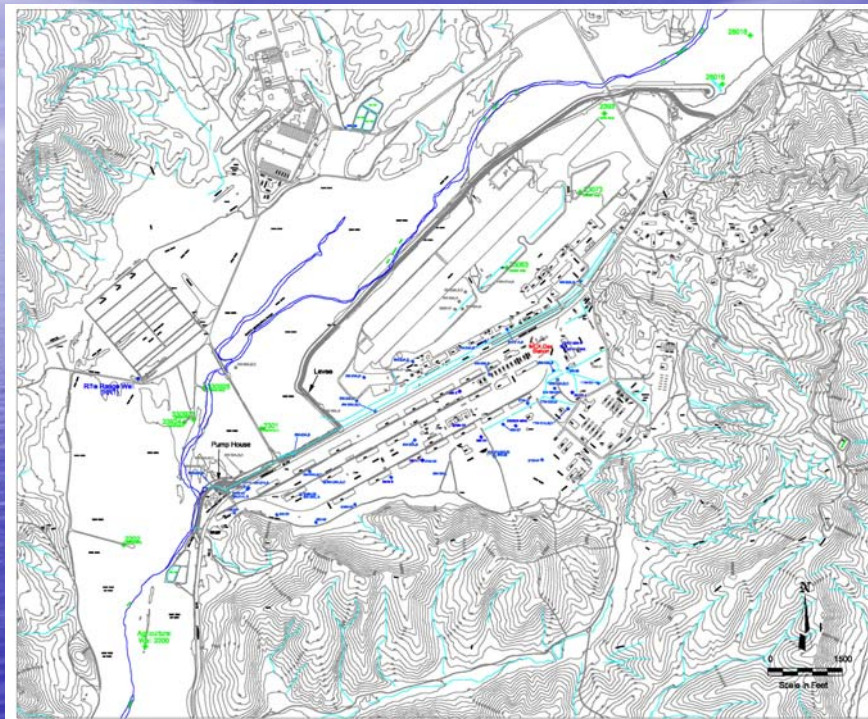


## 22/23 Area Groundwater

### Site Description

- ❖ This site consists only of the contaminated groundwater, not the overlying soils. No Further Action (NFA) decisions for the soil media are documented in the Operable Units 1, 2, and 3 Records of Decision (RODs).
- ❖ Facilities within this area include various industrial and office buildings, and air station complex.
- ❖ Nine groundwater supply wells are located in the Chappo sub-basin north and west of the site within the Santa Margarita River valley, including agricultural well 2200.

## 22/23 Area Groundwater





## 22/23 Area Groundwater

### Site Description

- ❖ Six different contaminants are considered remedial chemicals of concern (COCs): trichloroethene (TCE), cis-1,2-dichloroethene (DCE), 1,1-DCE, 1,4-dioxane, 1,2,3-TCP, and vinyl chloride.
- ❖ In 22 Area monitoring wells, 1,2,3-TCP exceeds the California response level, 1,4-dioxane exceeds the state notification level, and the others exceed Federal or State primary maximum contaminant levels (MCLs).
- ❖ Methyl tert-butyl ether (MTBE) and 1,2-dichloroethane (DCA) are also present in site groundwater, but are being addressed under a separate program that deals with fuel-related contaminants in 22/23 Area Groundwater associated with former fuel facilities.

## 22/23 Area Groundwater

### 1,2,3-Trichloropropane (TCP)

- ❖ State notification level = 0.005 µg/L, State response level = 0.5 µg/L.
- ❖ In 2003, new drinking water method introduced capable of detecting 1,2,3-TCP at or below 0.005 µg/L. The previous reporting limit for 1,2,3-TCP was 0.5 µg/L, using 8260B.
- ❖ MCB Camp Pendleton detected 1,2,3-TCP in Base supply well (2202) at a concentration of approximately 0.05 µg/L using the new method.
- ❖ Dozens of cities in California have reported 1,2,3-TCP in water supply wells.



# 22/23 Area Groundwater

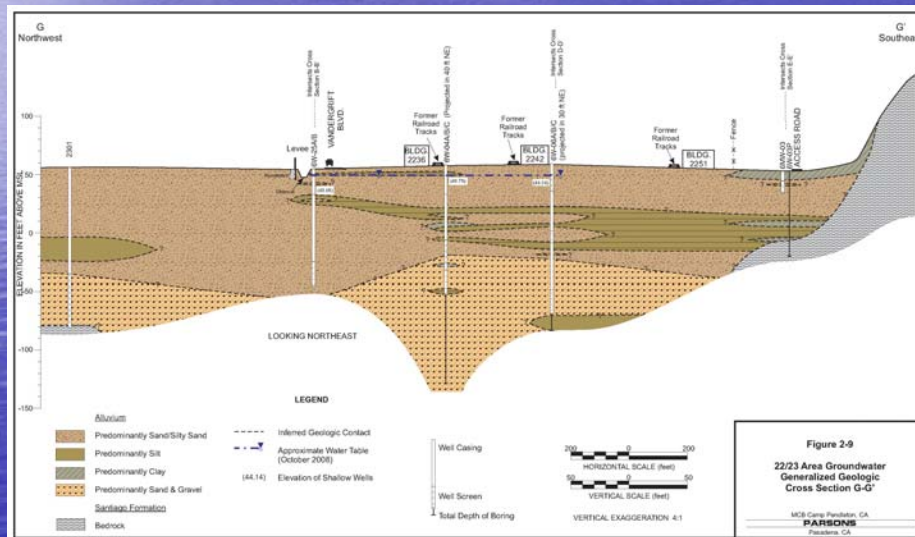
## Environmental Setting

- ❖ The site is generally flat, with hills surrounding the area to the south, southeast, and east. The Santa Margarita River bed occupies a relatively large, flat channel.
- ❖ In general, shallow subsurface geology at the site consists of Holocene stream-deposited alluvium (permeable) overlying bedrock of the Santiago Formation, which broadly consists of inter-bedded sandstone, siltstone, and mudstone (impermeable).
- ❖ The unconsolidated water bearing alluvial deposits are divided into the Upper and Lower Alluvium, with the underlying Lower Alluvium generally having a higher percentage of sand and gravel, and less fine-grained sediments than the Upper Alluvium.
- ❖ Maximum thickness of the alluvium is approximately 200 feet.

# 22/23 Area Groundwater

## Environmental Setting

- ❖ Soil beneath the site consists of unconsolidated sand and silt with some clay and gravel.



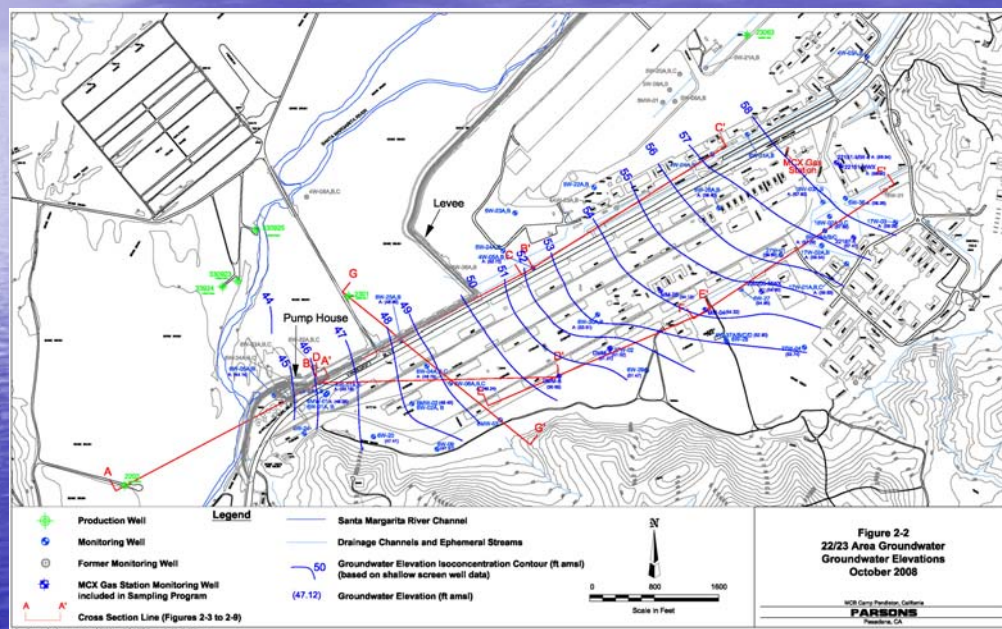
## 22/23 Area Groundwater

### Environmental Setting (continued)

- ❖ Groundwater occurs 5 to 12 feet below ground surface. Groundwater flow direction generally consistent from season to season, but may vary seasonally by as much as 5 feet.
- ❖ Based on calculations in the RI, it is believed that groundwater flow occurs at a rate of between 100 to 200 feet/year, which assumes the release occurred approximately 30 to 50 years ago.
- ❖ Studies performed at Base production wells by the USGS as part of the 22/23 Area RI demonstrate that (even within the coarser lower alluvial deposits), a large percentage of the flow occurs over narrow intervals.

## 22/23 Area Groundwater

### Environmental Setting (continued)





## 22/23 Area Groundwater

### Summary of Field Investigations (2001 to 2009)

- ❖ September to October 2001: Groundwater samples were collected and analyzed from 54 existing wells and nine temporary wells.
- ❖ March 2003 to July 2004: Groundwater samples were collected and analyzed during three events (at IR wells and MCX Gas Station investigation wells) using the new low-level 1,2,3-TCP method; 1,2,3-TCP was detected above the notification level in 16 of the 44 wells sampled, and levels appeared to increase with depth.
- ❖ October 2007: Groundwater samples were collected and analyzed from 11 new wells, 30 existing wells, and an additional 11 wells previously installed as part of other investigation programs in the 22 Area.

## 22/23 Area Groundwater

### Summary of Field Investigations (2001 to 2009)

- ❖ October to November 2008: Soil gas sampling was conducted to determine if COCs pose a risk via vapor intrusion. Groundwater samples were also collected and analyzed from 11 wells to confirm previous sampling results.
- ❖ December 2008: The USGS conducted down-hole logging on water supply well 2202 to identify which zones of the well screen were contributing the most flow and to evaluate where 1,2,3-TCP might be entering the well screen. Discrete groundwater samples were also collected and analyzed.
- ❖ July to August, 2009: The USGS conducted down-hole logging on six additional water supply wells to evaluate where VOCs, including 1,2,3-TCP, might be entering the well screens. Discrete groundwater samples were also collected and analyzed.

## 22/23 Area Groundwater Overview Of USGS Test



## 22/23 Area Groundwater USGS Well Logging

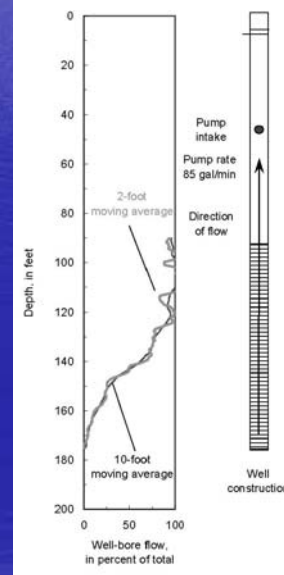
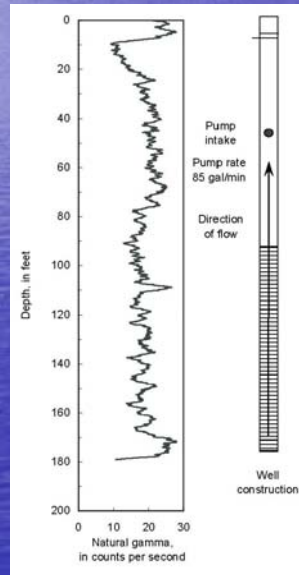
- ❖ Well Logging involved measuring flow using an electromagnetic flow meter and other instrumentation during un-pumped and pumped conditions.
- ❖ Depth Specific Logs produced by USGS for un-pumped and pumped conditions included:
  - Natural Gamma,
  - Well-Bore Flow (ft/min and gal/min),
  - Fluid Temperature, and
  - Fluid Resistivity.



## 22/23 Area Groundwater

### Well 2202 Logging Results

- ❖ Natural Gamma Log
- ❖ Well Bore Flow - (cumulative % of total)



## 22/23 Area Groundwater

### Other USGS Well Testing Results

- ❖ Most yield from thin layers.
- ❖ Transport of contaminants through thin layers is likely faster than if calculated based on average aquifer properties.
- ❖ Deeper zones can be a source of natural undesirable constituents (e.g., chloride, TDS).

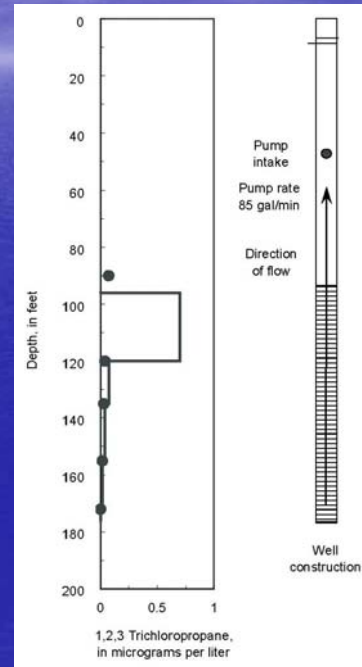
## 22/23 Area Groundwater

### Depth Specific Analytical Results at Well 2202

#### ❖ 1,2,3-TCP Results

Sample Depth	1,2,3-TCP Concentration
90 ft.	0.072 µg/L
120 ft.	0.039 µg/L
120 ft (Dup)	0.044 µg/L
135 ft.	0.028 µg/L
155 ft	0.015 µg/L
172 ft.	0.012 µg/L

Note: dots represent measured concentrations and line represents calculated concentrations.



## 22/23 Area Groundwater

### Other USGS Well Testing Results (Continued)

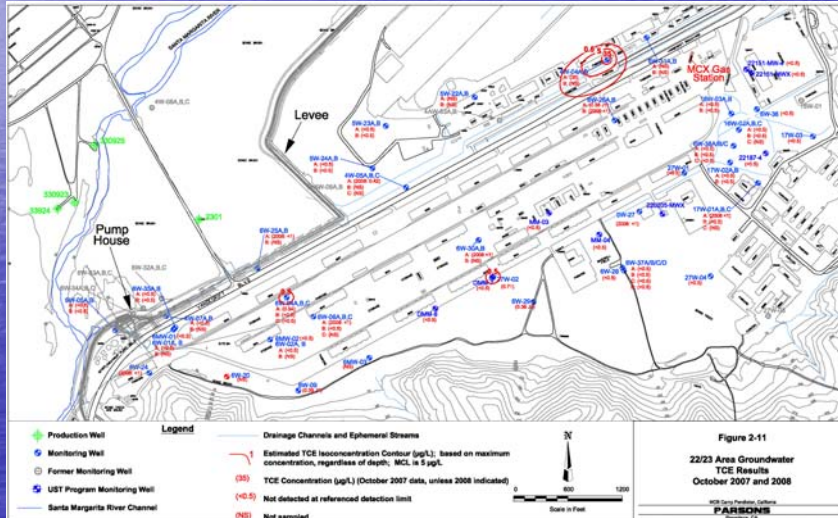
- ❖ In well 2202, one specific layer (90-120 ft. bgs) had a higher concentration of 1,2,3-TCP. The calculated concentration of 1,2,3-TCP in this layer (0.7 µg/L) was approximately an order of magnitude higher than maximum concentration in depth-specific samples (0.072 µg/L at 90 ft. bgs).
- ❖ With the exception of well 2202, 1,2,3-TCP were not detectable in Base supply wells within Chappo sub-basin sampled as part of the USGS testing.
- ❖ Non-TCP VOCs were not detectable in Base supply wells in the Chappo Subarea.



# 22/23 Area Groundwater

## Nature and Extent of Contamination

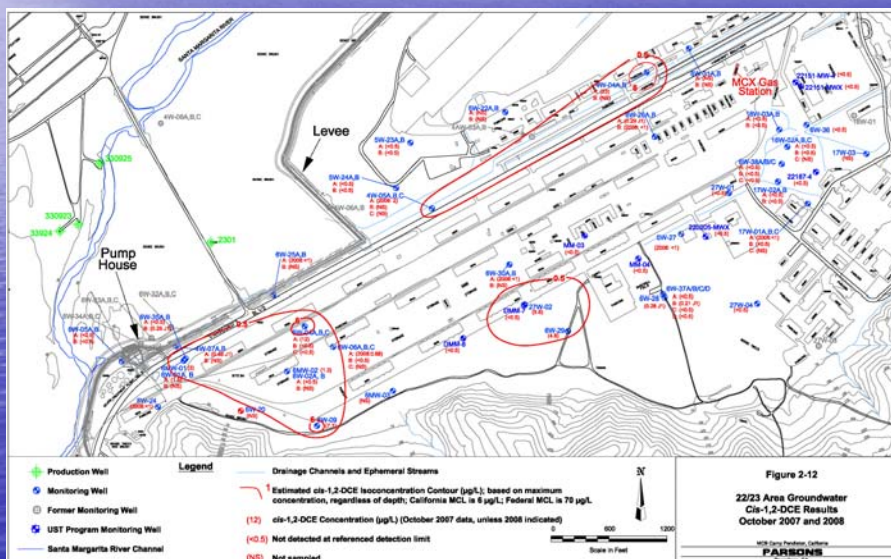
- ❖ TCE was detected in 4W-04A at 35 µg/L, above the MCL of 5 µg/L. This well has consistently had the highest TCE concentrations in the 22/23 Area.



# 22/23 Area Groundwater

## Nature and Extent of Contamination

- ❖ Cis-1,2-DCE was detected above its California MCL of 6 µg/L in wells 4W-04A (23 µg/L) and 6W-09 (7.1 µg/L).

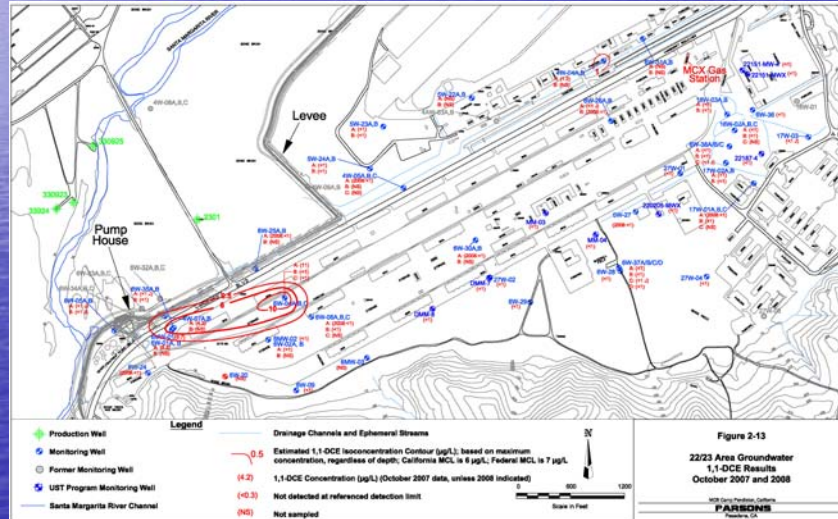




## 22/23 Area Groundwater

### Nature and Extent of Contamination

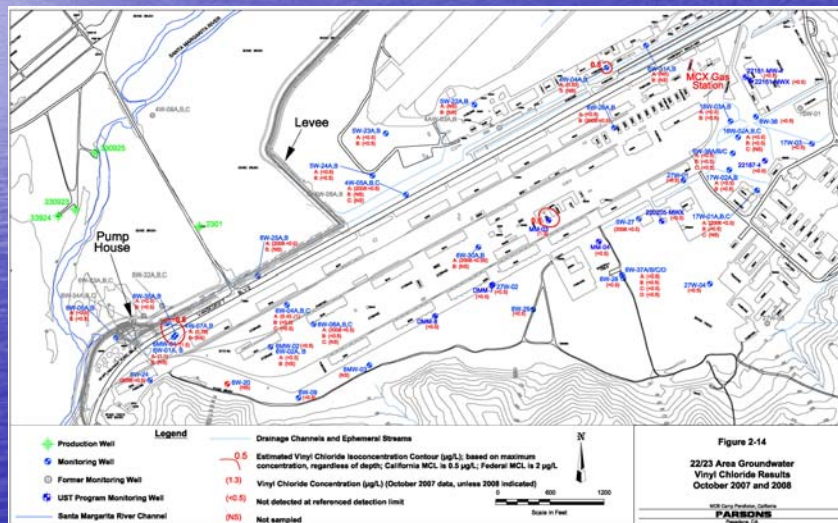
- ❖ 1,1-DCE was detected above both the Federal MCL of 7 µg/L and the CA MCL of 6 µg/L in 2007 in samples from wells: 6MW-01 (9.7 µg/L), 6W-01A (8.3 µg/L), and 6W-04A (11 µg/L).



## 22/23 Area Groundwater

### Nature and Extent of Contamination

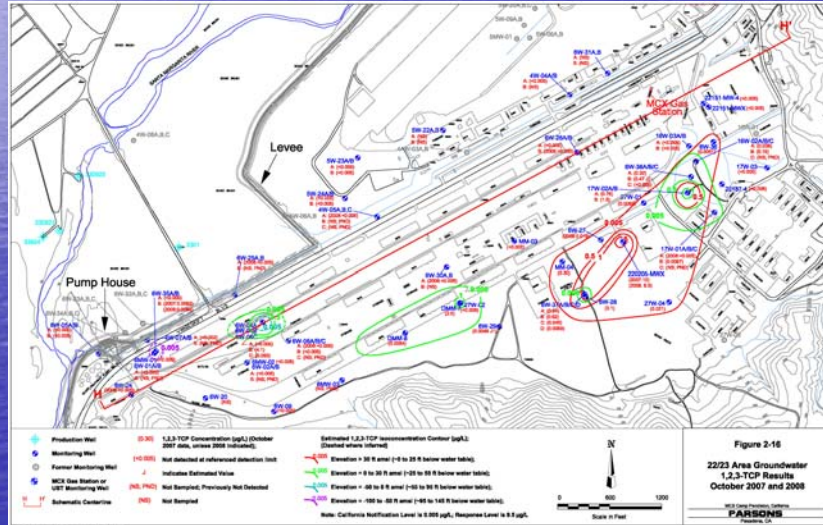
- ❖ Vinyl chloride was detected above the California MCL of 0.5 µg/L in wells 4W-04A (0.53 µg/L), 4W-7A (0.78 µg/L), 6MW-01 (1.5 µg/L), 6W-01A (1.1 µg/L), and MM-03 (1.3 µg/L).



# 22/23 Area Groundwater

## Nature and Extent of Contamination

- ❖ 1,2,3-TCP was detected above the state notification level of 0.005 µg/L in 17 wells and state response level of 0.5 µg/L in 12 wells. The highest detection was in 220205-MWX (10 µg/L).

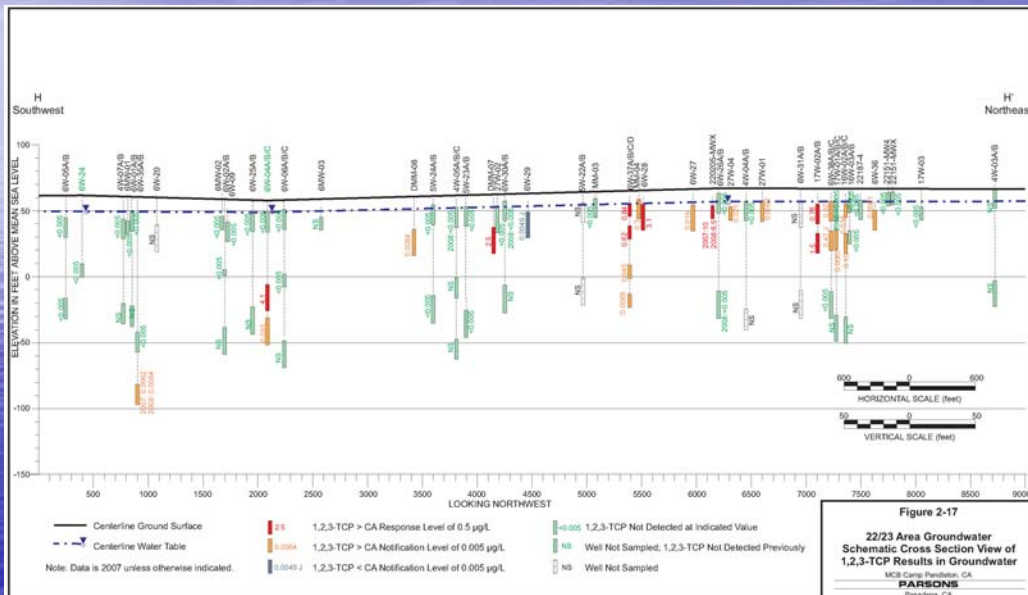


23

# 22/23 Area Groundwater

## Nature and Extent of Contamination

- ❖ Vertical profile of 1,2,3-TCP detections.



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## 22/23 Area Groundwater

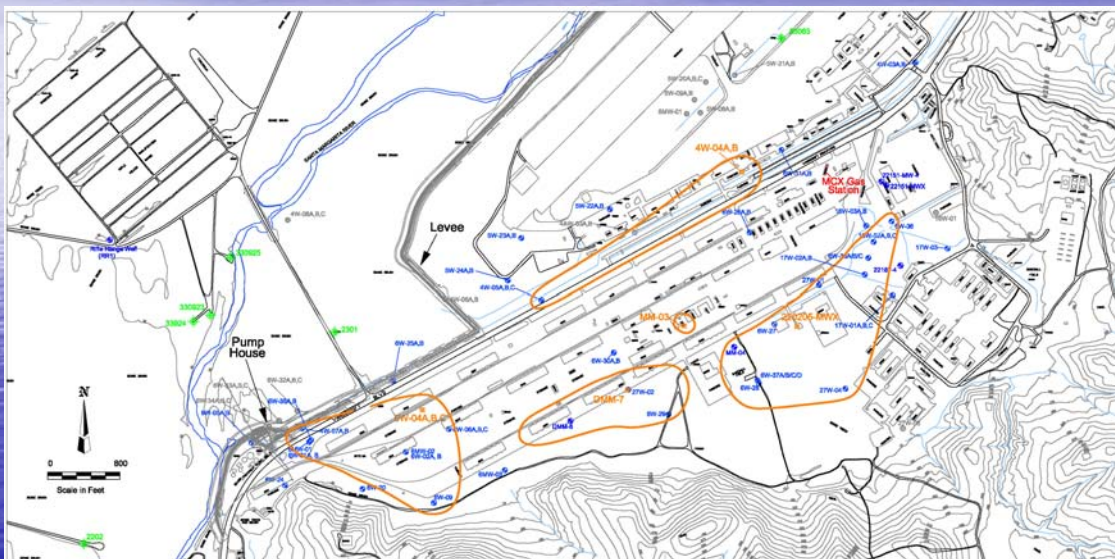
### Draft 22/23 Area RI/FS Summary

- ❖ COCs: TCE, cis-1,2-DCE, 1,1-DCE, 1,4-dioxane, 1,2,3-TCP, and vinyl chloride.
- ❖ Presence of cis-1,2-DCE and vinyl chloride indicate reductive dechlorination is occurring in some areas.
- ❖ However, groundwater contamination may remain above MCLs for several more decades if left untreated.
- ❖ There is no significant risk to indoor air receptors from soil gas contaminants in the 22 Area.
- ❖ 1,2,3-TCP has been detected in Well 2202 and also in Base Wells 330923 and 33924 (cross gradient from the site), and agricultural well 2200 (approximately ½ mile down gradient from the site).

## 22/23 Area Groundwater

### Draft 22/23 Area RI/FS Summary

- ❖ Five groundwater contaminant plume areas



## 22/23 Area Groundwater

### FS Alternatives

- ❖ Alternative 1: No Action
- ❖ Alternative 2: Land Use Controls and Long Term Monitoring
- ❖ Alternative 3: Alternate Water Supply by Installing New Base Well or Wells
- ❖ Alternative 4: Source Area Treatment via In Situ Technologies
- ❖ Alternative 5: Ex Situ Wellhead Treatment at Well 2202
- ❖ Alternative 6: Wellhead Treatment at Well 2202 and ReInjection of Treated Water

## 22/23 Area Groundwater

### FS Alternative 2

- ❖ Land Use Controls and Long Term Monitoring
  - Land use controls include restrictions on future access to the groundwater in the immediate vicinity of the site where groundwater contamination may be present above regulatory thresholds.
  - The long-term groundwater monitoring program involves monitoring groundwater quality to track contaminant concentrations and possible movement, provide early warning of potential impacts to downgradient receptors, and evaluate the attenuation of contamination in and downgradient of the VOC plumes.



## 22/23 Area Groundwater

### FS Alternative 3

- ❖ Alternate Water Supply by Installing New Base Well or Wells
  - New wells would be installed to replace contaminated wells.
  - Ideally, new wells would be installed in unimpacted zones of the aquifer in order to avoid the added cost of wellhead treatment.
  - To avoid placement of supply wells in contaminated zones, test wells are proposed as part of this alternative.
  - Test wells would be used to evaluate horizontal and vertical contaminant distribution, and capture zone analysis would be used to determine if the location will remain uncontaminated for the life of the water supply well.

## 22/23 Area Groundwater

### FS Alternative 4

- ❖ Source Area Treatment via In Situ Technologies
  - This alternative includes the installation and operation of in situ remediation systems to remove contaminant mass in two source areas with the highest contaminant concentrations.
  - Enhanced bioremediation and injectable zero valent iron (ZVI) were chosen as in situ remedies. Both are proven to remediate TCE and its breakdown products and both have been demonstrated to effectively treat 1,2,3-TCP in the laboratory.
  - It is recommended that pilot scale tests be conducted and the final determination be made regarding which technology chosen based on the pilot test results.



## 22/23 Area Groundwater

### FS Alternative 4

- ❖ Enhanced Bioremediation
  - Injection of organic substrates that allow microbes to degrade contamination.
  - Full scale implementation includes injection wells spaced 50 feet apart.
  - Solution of whey, oil, and pH buffer for short- and long-term effect.

## 22/23 Area Groundwater

### FS Alternative 4

- ❖ Zero Valent Iron
  - Small-scale iron particles are proposed due to the need to inject up to 40 feet below ground surface.
  - Direct-push would be used instead of injection wells, with each point spaced 5 to 10 feet apart, resulting in permeable reactive barriers (PRBs) within and downgradient of the plume.

## 22/23 Area Groundwater

### FS Alternative 4

- ❖ Zero Valent Zinc (ZVZ) Evaluation in Progress
  - ZVZ was considered instead of ZVI, but research is in the early stages.
  - If ZVZ is proven effective, it could be used instead of ZVI.
  - Sensitivity to geochemistry, pH, and particle size.
  - Necessary residence time still being evaluated.
  - If applied instead of ZVI, could not be injected due to large particle size.

## 22/23 Area Groundwater

### FS Alternative 5

- ❖ Ex Situ Wellhead Treatment at Well 2202
  - Ex situ wellhead treatment at well 2202 would include liquid phase activated carbon adsorption and filtration to treat 1,2,3-TCP to below detection limits.
  - Other ex situ technologies were evaluated, including advanced oxidation. However, liquid phase activated carbon adsorption with filtration was found to be the most cost-effective.
  - Filtration is needed to remove suspended solids prior to carbon treatment.
  - Well 2202 is currently piped to IM Plant 22. This alternative assumes that the ex situ treatment unit would be located at IM Plant 22 and, after treatment, that water from well 2202 would then be sent to IM Plant 24 for final treatment.



# 22/23 Area Groundwater

## FS Alternative 6

- ❖ Wellhead Treatment at Well 2202 and ReInjection of Treated Water
  - Ex situ wellhead treatment at well 2202 as described in Alternative 5
  - Transport of water via existing piping to treatment system, then transport to new injection well via new underground piping
  - Injection of treated water into aquifer in Chappo subbasin at same rate as extraction
  - ReInjection designed to create a mound or barrier to prevent the migration of water from 22 Area to 33 Area wells
  - Limited investigation upgradient of 33 Area wells to determine optimal placement for hydraulic protection of the wells
  - The limited investigation would be less than proposed in Alternative 3

# 22/23 Area Groundwater

## Summary of Comparative Analysis

Criteria	Alternative					
	1 No Action	2 Land Use Controls and Long Term Monitoring	3 Alternate Water Supply with Alternative 2	4 Source Area Treatment via In Situ Technologies with Alternative 2	5 Ex Situ Wellhead Treatment at Well 2202 with Alternative 2	6 Wellhead Treatment at Well 2202 and ReInjection of Treated Water with Alternative 2
<b>Threshold Criteria</b>						
Overall Protection of Human Health and the Environment	No	Yes	Yes	Yes	Yes	Yes
Compliance with ARARs	No	Yes	Yes	Yes	Yes	Yes
<b>Balancing Criteria</b>						
Long-Term Effectiveness and Permanence	○	◐	◑ to ●	◑ to ●	◑ to ●	◑ to ●
Reduction of Toxicity, Mobility, or Volume by Treatment	○	○	○	◑ to ●	○ to ◑	◑
Short-Term Effectiveness	Not Rated	●	◑ to ●	◑ to ●	◑ to ●	◑ to ●
Implementability	Not Rated	●	◑ to ●	◑	◑	○ to ◑
Cost (\$ million)	0	3.6	7.6	4A: 10.5 4B: 8.8	16.6	22.0

○ Low   ◐ Moderate   ● High

# MCB CAMP PENDLETON SITE 1115 PILOT STUDY UPDATE

20 May 2010  
100<sup>th</sup> FFA Meeting



## SITE 1115 FIELDWORK UPDATE

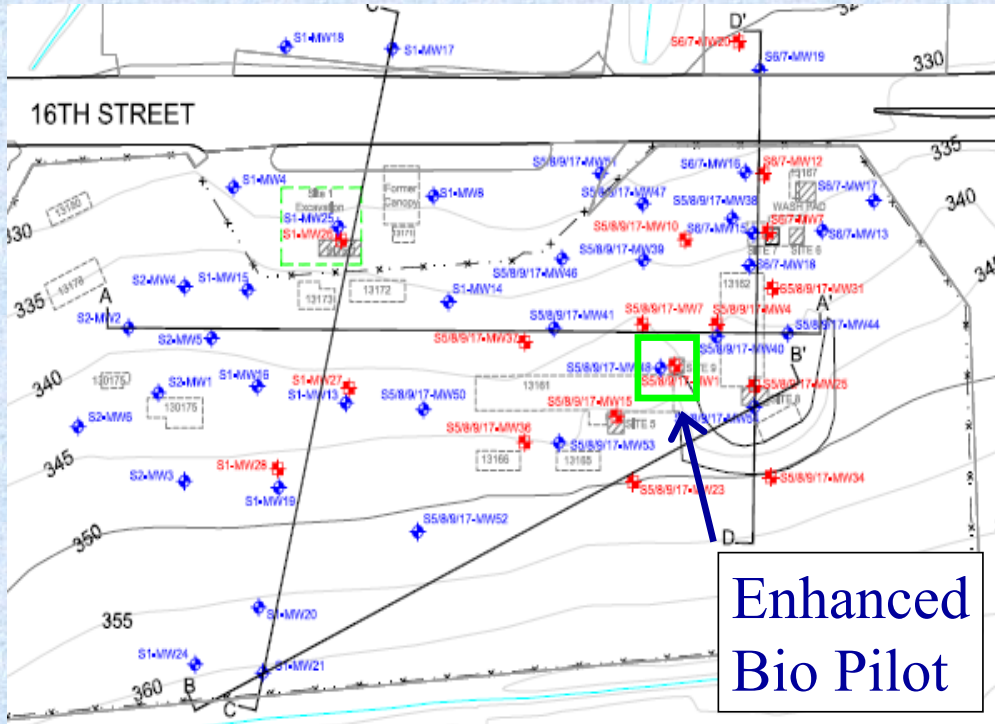
### Fieldwork Summary

- ❖ September 14-26, 2009:  
Substrate injection
- ❖ January 26-25, 2010:  
First performance  
monitoring event
- ❖ April 28-29, 2010:  
Second performance  
monitoring event
- ❖ July, 2010:  
Third performance  
monitoring event





# SITE 1115 LAYOUT



# NEWLY INSTALLED WELLS

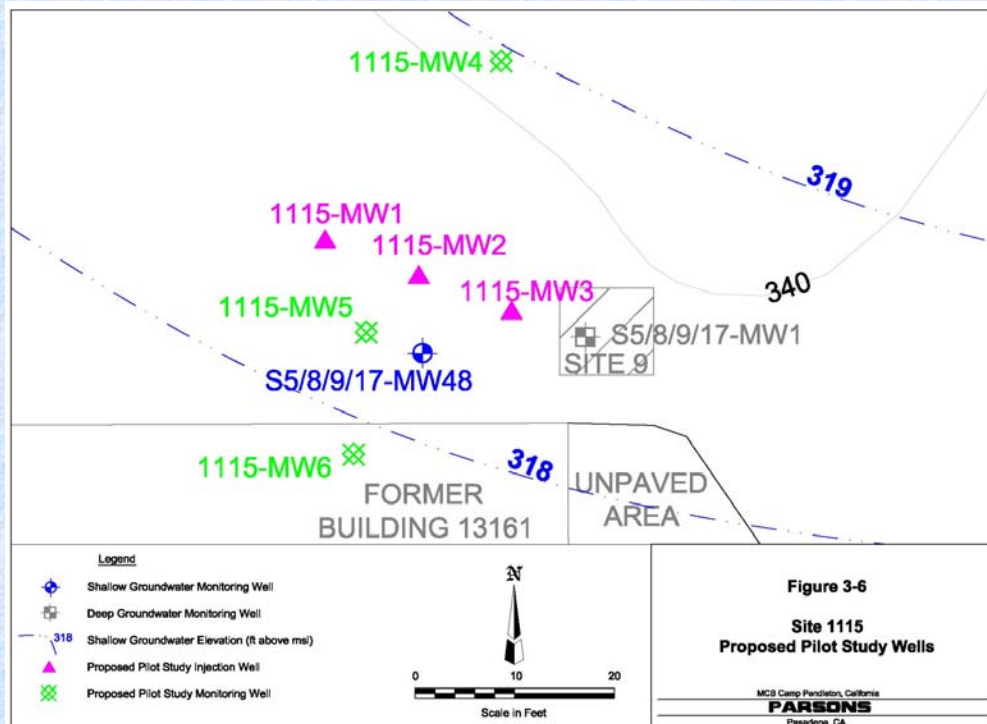
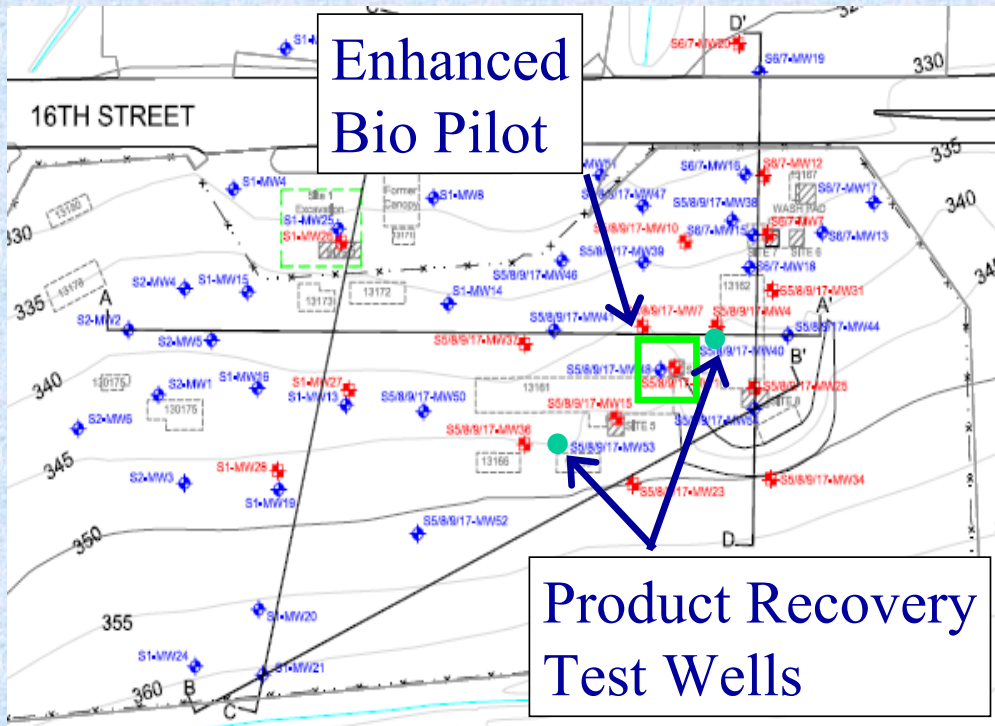


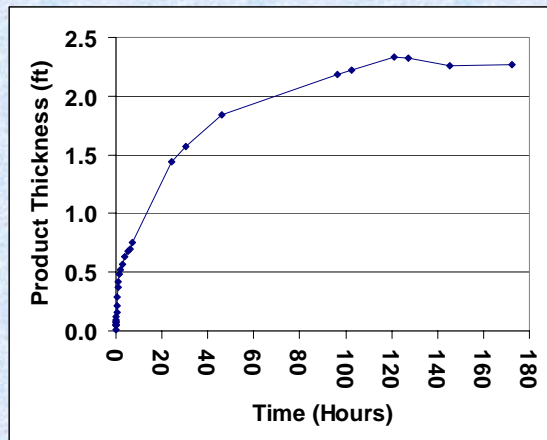
Figure 3-6  
Site 1115  
Proposed Pilot Study Wells

# SITE 1115 LAYOUT



## LNAPL RECOVERY TESTING

- ❖ S5/8/9/17-MW-40
- ❖ Pre-removal LNAPL thickness was 8.33 feet
- ❖ LNAPL recovered 27% of original thickness after 172 hours
- ❖ Recovery rate equates to 0.052 gal/day.
- ❖ LNAPL recovery testing at S5/8/9/17-MW54 yielded no useful results as LNAPL recovered only 0.59 ft after 146 hours.
- ❖ Significant product removal through active extraction is unlikely. Fuel sorbent socks with periodic replacement is likely the most efficient means of product removal at this well.



# SITE 1115 PILOT STUDY INJECTION

Summary of Substrate Injection  
Site 1115, MCB Camp Pendleton, CA

Injection Location	Oil/Water Emulsion				Total Injection Volume (gallons)	Estimated Radius of Influence (feet)	Substrate Injection Pressure (psi) <sup>a/</sup>	Substrate Flow Rate (gpm) <sup>b/</sup>
	Newman Zone (50% soybean oil) (gallons)	Neutral Zone (50% solids) (gallons)	Water (gallons)	Whey (pounds)				
1115MW-01	30.5	91.6	1,527.0	199.3	1,649.1	19	10 to 15	1.2
1115MW-02	3.7	11.0	182.6	23.8	197.3	8	18 to 21	0.3
1115MW-03	4.1	12.4	206.0	26.9	222.5	9	20 to 23	< 0.1
<b>TOTALS:</b>	<b>38</b>	<b>115</b>	<b>1,915.6</b>	<b>250.0</b>	<b>2,068.9</b>	--	--	--
<b>AVERAGES:</b>	--	--	--	--	--	<b>11.9</b>	--	--

<sup>a/</sup> psi = pounds per square inch

<sup>b/</sup> gpm = gallons per minute



# SITE 1115 PILOT STUDY INJECTION

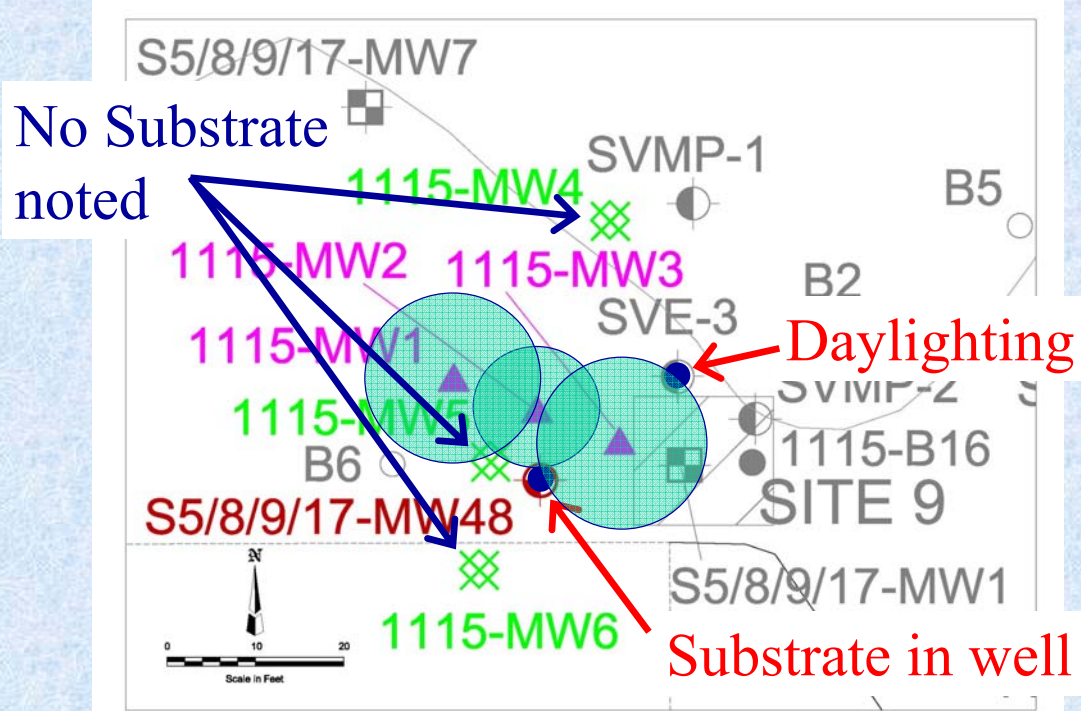
## Observations

- ❖ 2,070 gallons of substrate and water were successfully injected into the aquifer (25 to 35 ft bgs)
- ❖ Injection pressure was approximately 20 psi
- ❖ Substrate distribution was better than expected, likely do to semi-lithified soils
- ❖ Sidewinder tool did not work very well at Site 1115





# SUBSTRATE DISTRIBUTION



# SITE 1115 PILOT STUDY INJECTION

## Observations

- ❖ Well Spacing was closer than necessary at this site. Field observations indicate that ROI was approximately 12 to 15 feet or 2x the initial estimate.



# SITE 1115 PILOT STUDY

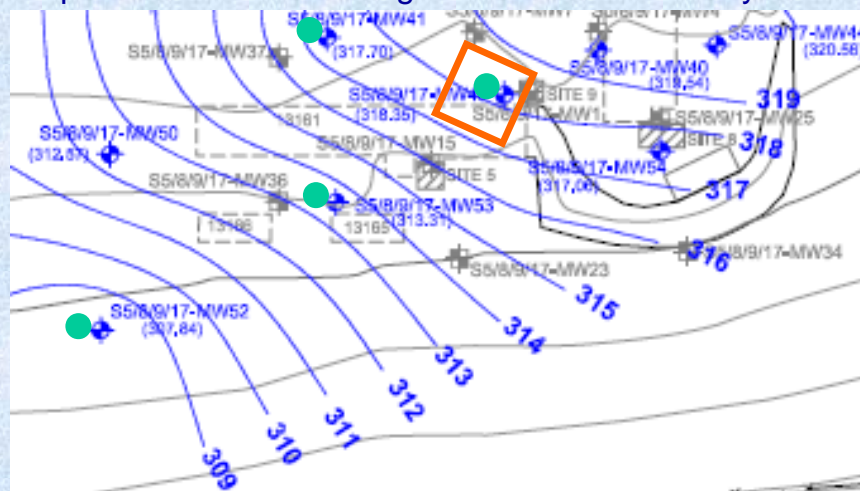
## Injection Conclusions

- ❖ Learned that we could apply this technique on larger scale if found to be effective at biological degradation (based on groundwater monitoring results)
- ❖ Injection by direct push wouldn't have worked at this part of the Site due to the tight subsurface conditions and the injection pressures needed
- ❖ Radius of influence calculations based on estimated porosity are low by a factor of approximately 2x likely due to poorly lithified nature of site soils.

# SITE 1115 PILOT STUDY

## Performance Monitoring

- ❖ First performance sampling event collected in January 2010
- ❖ Second performance sampling event collected in April 2010 – field data only available at this time
- ❖ Next performance monitoring event will occur in July 2010



# INITIAL PERFORMANCE RESULTS

## Treatment Area (Injection Wells, 1115-MW05, S5/8/9/17-MW48)

- ❖ TOC concentrations in January 2010 were very high (>5,000 mg/L) indicating that substrate was distributed within the treatment area.
- ❖ Baseline weakly anaerobic conditions have become deeply anaerobic (ORP ~ -200 mV) and are currently in the methanogenic range. These conditions are conducive to complete dechlorination
- ❖ pH conditions initially became too acidic (pH ~5.5) but rebounded by the April 2010 event. Current conditions are in the neutral range (pH 6.4 to 7.0) and are appropriate for biotic dechlorination
- ❖ Baseline TCE and cis-1,2-DCE concentrations decreased slightly (5-10%) by January 2010. Vinyl Chloride was not detected in baseline or January 2010 sampling rounds.

# INITIAL PERFORMANCE RESULTS

## Downgradient Wells (1115-MW06, S5/8/9/17-MW41, -MW52, -MW53)

- ❖ Geochemical data indicates that 1115-MW06 and S5/8/9/17-MW53 were impacted by geochemical shifts associated with the injected substrate (more negative ORP, increases in electrical conductivity and pH).
- ❖ S5/8/9/17-MW41 and -MW52 do not show evidence of impact.
- ❖ Upgradient well 1115-MW4 shows no evidence of substrate impact.



# MCB CAMP PENDLETON SITE 21 PILOT STUDY UPDATE

20 May 2010  
100<sup>th</sup> FFA Meeting



## SITE 21 FIELDWORK UPDATE

### Fieldwork Summary

- ❖ November 9-13:  
Well installations
- ❖ November 16-18:  
Well development
- ❖ November 23-24:  
Baseline sampling  
event



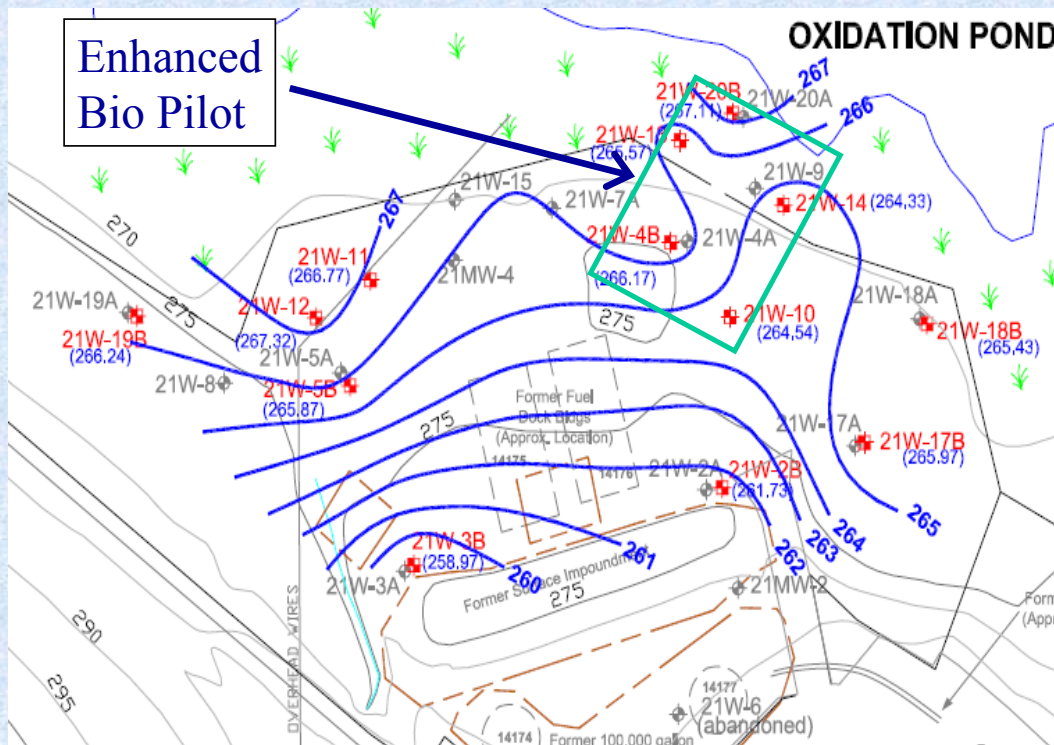
# SITE 21 FIELDWORK UPDATE

## Fieldwork Summary (Continued)

- ❖ December 14: Site wide pre-injection groundwater elevation measurements
- ❖ December 14-18: Substrate injection
- ❖ December 16: RWQCB site visit
- ❖ December 17: Soil sampling activities



## SITE 21 LAYOUT





# SITE 21 PILOT STUDY INJECTION

Well ID	Injection Points		Substrate Injection Mixture						Total Volume		Injection Interval (feet)	Estimated Effective Porosity (percent)	Radius of Influence (feet)	Injection Time at 2 gpm (hours)			
	Interval (feet)	Spacing (feet)	Emulsion Product			Substrate Injection Mixture			Water (gallons)	Substrate (pounds)							
			Volume (gallons)	Oil Component (gallons) (pounds)	Buffer Agent (gallons)	Whey Product (pounds)	80% Lactose by weight (pounds)										
								Water (gallons)							Substrate (pounds)	Substrate (gallons)	
21W-26	40-45	NA	18	10.4	80.9	33.6	362.9	183	700	264	751	4	9%	9.4	6.3		
21W-27	31-46	NA	40	23.7	184.9	76.8	829.4	419	1,600	604	1,717	13	9%	8.1	14.3		
<b>TOTAL:</b>			58	34	266	110	1,192	603	2,300	868	2,468			Days:	1		
<b>SUBSTRATE CONCENTRATIONS</b>																	
Final Percent Substrate by Weight:			4.5%			Final Lactose Concentration (injection Fluid):			18.8 grams/liter			Percent Lactose by Volume in Emulsion:			NA		
Final Percent Water by Weight:			95.5%			Final Oil Concentration:			12.9 grams/liter			Percent Oil Product by Volume in Emulsion:			2.5%		
<b>EFFECTIVE TREATMENT ZONE CONCENTRATIONS</b>																	
Total Design Factor:			8.0			Final Lactose Concentration (Treatment Fluid):			664 mg/L			Final Vegetable Oil Concentration (mg/L):			456		
Design Life (years):			3.0			Lactate Design Factor:			5.0			Vegetable Oil Design Factor:			3.0		
Total Porosity of Treatment Zone + Groundwater Flux						69,934						gallons					

# SITE 21 PILOT STUDY INJECTION

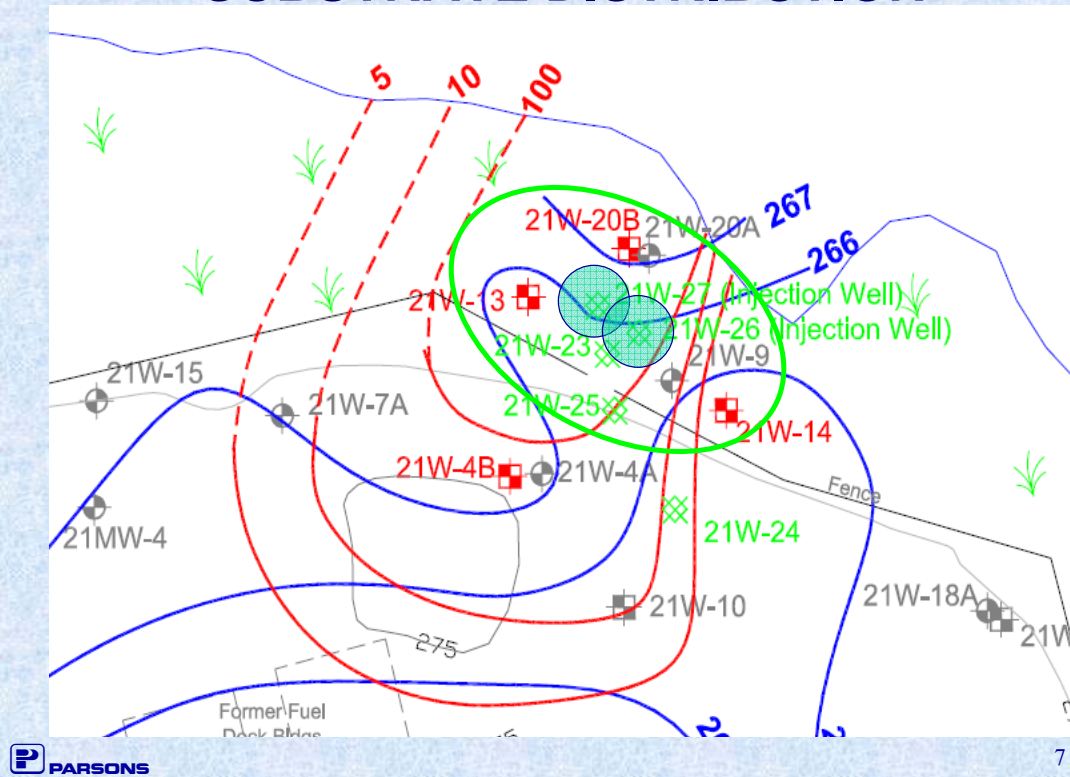
## Observations

- ❖ 2,468 gallons of substrate and water were successfully injected into the aquifer (31 to 46 ft bgs)
- ❖ Injection pressure was <20 psi
- ❖ Hydraulic impact was observed at 21W-13, 21W-14, 21W-20B, 21W-23, and 21W-25 in the form of rising water levels.
- ❖ Substrate was not observed in any of these wells





## SUBSTRATE DISTRIBUTION



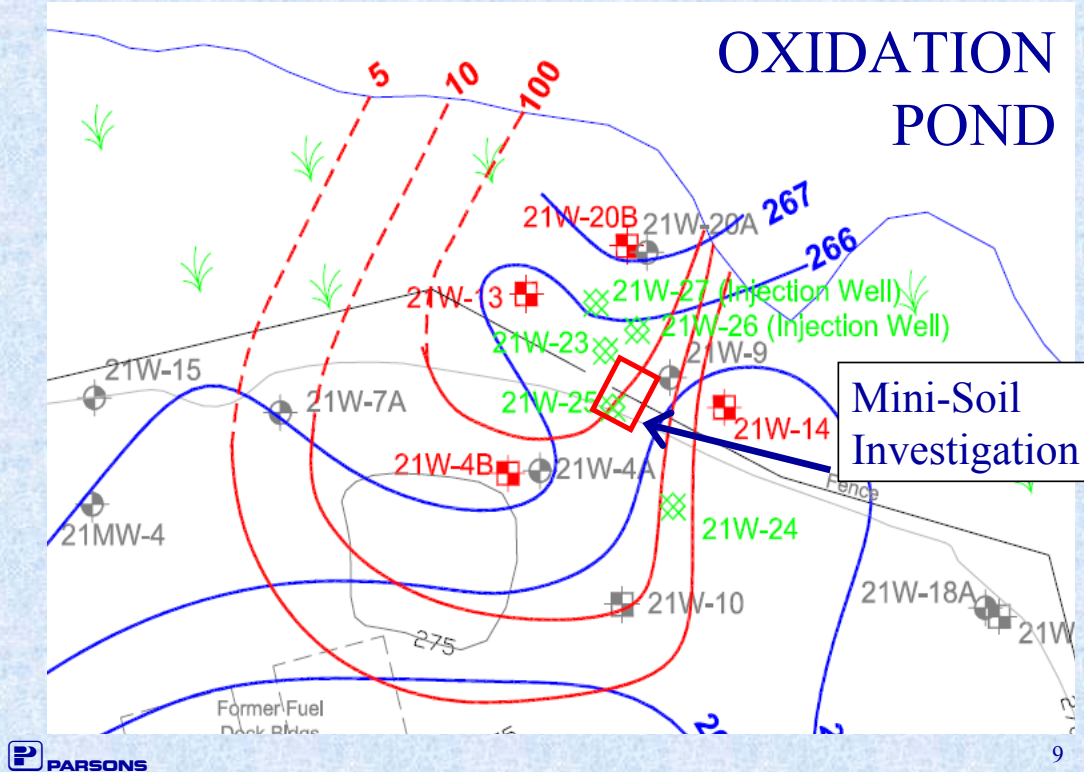
## SITE 21 PILOT STUDY PERFORMANCE MONITORING

- ❖ Post-injection sampling has not been conducted to date due to high surface water conditions in the pond related to a clogged pond overflow.



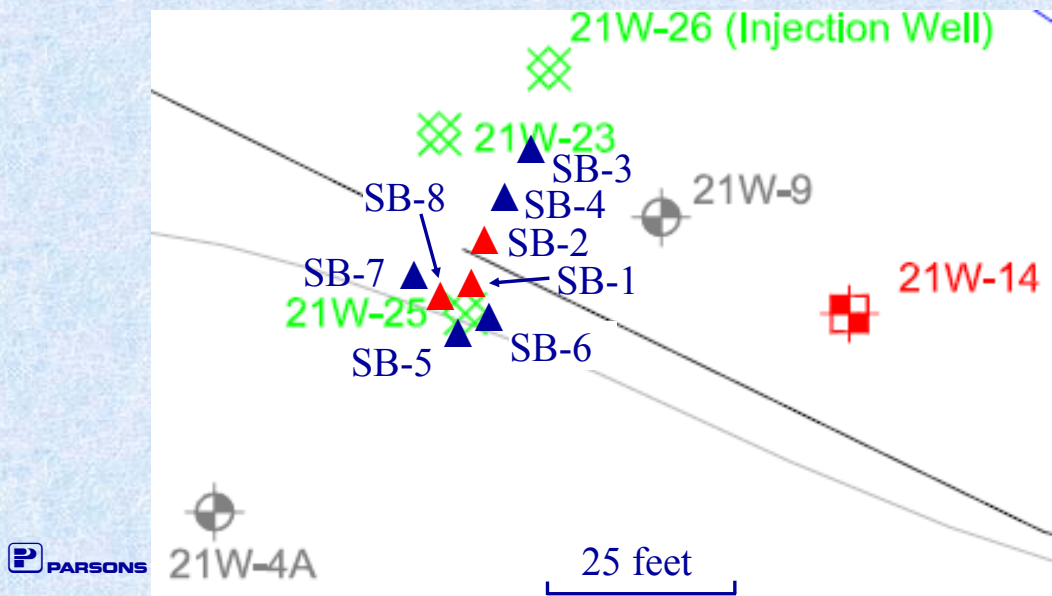
# SITE 21 NEWLY INSTALLED WELLS

## OXIDATION POND



## DRILLING OBSERVATIONS AT 21W-25

- ❖ During drilling, petroleum impacted soils were noted from ground surface to 20 ft bgs at 21W-25. A hand auger investigation was conducted around 21W-25 to determine shallow extent TPH in soil.



## SITE 21 SOIL SAMPLING RESULTS

Boring ID / Depth	TPH-G (mg/kg)	TPH-D (mg/kg)
21-SB1 (3.0 ft)	2,300	4,400
21-SB3 (3.8 ft)	10	<0.28
21-SB5 (3.4 ft)	<5.6	<0.26
21-SB6 (5.7 ft)	24	<0.28
21-SB7 (3.7 ft)	<5.7	<0.25
21-SB8 (3.3 ft)	1,500	3,800

## SOIL SAMPLING CONCLUSIONS

- ❖ Small localized source of petroleum contaminants in vicinity of well 21W-25
- ❖ Area of fuel contamination laterally bounded by shallow hand augers
- ❖ Soils contain TPH-diesel (2,300 mg/kg) and TPH-gasoline (4,400 mg/kg)
- ❖ Note that fuel constituents have been detected at Site 21 previously and this site has been a vehicle maintenance and storage area for some time