UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105

December 20, 2012

MEMORANDUM

SUBJECT: Addendum No. 2 to the September 2009 Remedial Investigation Sampling and Analysis Plan, Halaco Superfund Site, Oxnard, CA

FROM: Wayne Praskins, Remedial Project Manager
Superfund Division, SFD-7-3

TO: Marlon Mezquita, Chemical Engineer, PE
Quality Assurance Office, MTS-3

This memorandum, revised on December 20, 2012, provides information regarding planned groundwater sampling and analysis at the Halaco Superfund Site in Oxnard, CA (the "Site"). The memo is organized into four sections: (1) Project Management, (2) Data Acquisition, (3) Assessment and Oversight, and (4) Data Review, Evaluation of Data Usability, and Data Validation. Section 1 addresses Data Quality Objective (DQO) Steps 1-7.

Because the planned sampling is similar to work described in the September 2009 "Field Sampling Plan, Halaco Superfund Site, Remedial Investigation, Oxnard, California" and the September 2009 "Quality Assurance Project Plan, Halaco Superfund Site, Remedial Investigation, Oxnard, California" (collectively, the "2009 Plans"), we are submitting this memo as an addendum to the 2009 Plans. The 2009 Plans were prepared by CH2M HILL and approved by the EPA Region 9 Quality Assurance Office (QAO) on October 7, 2009. The QAO assigned the plans Document Control Number X6CA0001QV2.

This is the second addendum to the 2009 Plans. The first addendum was dated May 31, 2011 and approved by the EPA QAO on June 15, 2011.

SECTION 1.0, PROJECT MANAGEMENT

The Halaco Site

The Site is located in coastal Ventura County at 6200 Perkins Road, Oxnard, CA 93033. Halaco Engineering Company operated a secondary metal smelter at the Site from 1965 to 2004, recovering aluminum, magnesium, and zinc from dross, castings, cans, car parts, and other scrap metal. The Site includes an 11-acre area containing the former smelter, and an adjacent 26-acre waste management area where wastes were deposited. Immediately adjacent to the Site is a

portion of the Ormond Beach wetlands, which are one of the few remaining wetlands in the area and home to several endangered or threatened species. **Figure** 1 shows key areas at the Site.

During its 40 years of operation, Halaco produced a large quantity of waste (i.e., slag) containing residual metals from the smelting process. From about 1965 to 1970, Halaco discharged waste into unlined settling ponds in or adjacent to the Oxnard Industrial Drain (the "OID"). From about 1970 to 2002, Halaco deposited wastes into unlined earthen settling ponds east of the smelter. More than 700,000 cubic yards of waste remain on-site.

Site Hydrogeology

Figure 2 provides a geologic cross section through the Oxnard Plain, where the Site is located. Groundwater occurs beneath the Site in several distinct aquifers. The shallowest aquifer, known as the Semiperched aquifer, extends to a depth of about 90 feet below ground at the Site. The next deepest aquifer, the Oxnard aquifer, is separated from the Semiperched aquifer by a 30-foot thick clay and silt aquitard that limits the movement of groundwater between the two aquifers. Background water quality in the Semiperched aquifer is poor, making it unsuitable for drinking or irrigation.

Additional information on Site hydrogeology is provided in "Surface Water and Groundwater Sampling and Analysis Results," Halaco Superfund Site, prepared for US EPA by CH2M HILL, March 2012 (the "2012 Groundwater Report").

Previous Groundwater Sampling and Analysis at the Site

In 2009-2010, in accordance with the 2009 Plans, CH2M HILL directed and oversaw the installation of groundwater monitoring wells and piezometers at 34 locations, and collected groundwater samples for laboratory analysis at more than 40 locations. **Figure** 3 shows the locations of the wells and piezometers installed in 2009-2010, and wells previously installed at or near the Site. The primary objectives of the testing were to better understand the movement, nature, and extent of groundwater contamination at the Site.

Groundwater elevations were measured five times in 2009-2010: three times when the coastal sand berm that prevents surface water in the OID from draining directly to the ocean was intact, and twice when it was breached. Groundwater samples were collected for laboratory analysis on two occasions. All groundwater samples were analyzed for metals, and most samples were analyzed for five thorium and radium isotopes. Some samples were analyzed for volatile and semi-volatile organic compounds, total petroleum hydrocarbons (TPH), and total organic carbon (TOC). Complete results from the 2009-2010 sampling and analysis effort are available in the 2012 Groundwater Report.

Data Quality Objectives

DQO Step 1 - Conceptual Site Model: Groundwater Movement and Groundwater Quality

Based on the testing in 2009-2010, and previous studies by EPA and others, EPA has concluded the following.

- Groundwater in the Semiperched aquifer generally moves northward across the Site. Its movement is affected by surface water levels in, and recharge from, the OID, Ormond Beach lagoon, and Nature Conservancy properties, and a groundwater "sink" to the north of the Halaco properties. **Figure**s 4 and 5 show interpreted groundwater elevation contours in November 2009 and February 2010. **Figure** 4 shows conditions when the coastal sand berm was intact, resulting in high surface water elevations recharging the Semiperched aquifer. **Figure** 5 shows conditions when the sand berm was breached, resulting in lower surface water elevations and a stronger east-to-west groundwater hydraulic gradient. **Figures** 4 and 5 show the location of the Oxnard sanitary sewer line along McWane Blvd and Perkins Road that may be the cause of the groundwater sink.

  Dewatering activities between 2005 and 2007 associated with the construction of the city of Oxnard wastewater treatment plant "headworks facility" may also have influenced groundwater movement in the Semiperched aquifer at the Site. Section 4.4.1.4 of the March 2012 Groundwater Report provides additional information on the dewatering.

  Halaco's operations contaminated shallow groundwater in the Semiperched aquifer. Table 1 provides a list of chemicals of potential concern (COPCs) for the Site. The primary groundwater contaminants are metals, chlorides, and ammonia. Thorium and radium have been detected in groundwater at the Site but, based on previous groundwater analyses, are not expected to be present above background levels in the area addressed by this investigation. Dioxins and furans are present at elevated levels in solid media at the site, but have low solubilities and are not expected in groundwater. The contamination extends to Perkins Road to the west, to the Nature Conservancy property to the east, and downward to the top of the aquitard separating the Semiperched aquifer from the higher quality Oxnard aquifer groundwater below the aquitard.

- **Figure** 6 shows the approximate eastern and western boundaries of the contaminated groundwater in the Semiperched aquifer. The southern boundary is likely to be at or near the ocean shoreline, and may vary with depth. (Recharge from the coastal lagoon may have displaced shallow groundwater in the southern portion of the Site, but not affected contaminated water in deeper portions of the Semiperched aquifer.) The northern extent of groundwater contamination to the north of Perkins Road has not been determined.

- Total Petroleum Hydrocarbons [TPH-diesel] were frequently detected in groundwater in the Semiperched aquifer, in wells known to be affected by Halaco's wastes (e.g., MW-12/12C), and at several locations where groundwater is thought to be unaffected by

Halaco's operations (e.g., MW-23C, MW-27C). TPH-diesel was also detected in all four samples from wells screened in the Oxnard Aquifer (MW-2D, MW-3D, MW-6D, and MW-19D). **Table** 2 summarizes the TPH results from the 2009-2010 sampling.

- Samples collected from wells in the Oxnard aquifer did not provide clear evidence of a Site impact. The Oxnard aquifer is used as a source of drinking water in the region. Since the early 1990s, water in the Semi-perched aquifer has, on average, been at lower pressure than water in the underlying Oxnard aquifer, reducing the risk that groundwater in the Semi-perched aquifer has moved or will move downward and impact the Oxnard aquifer.

Figure 7 depicts the approximate extent of groundwater contamination in a vertical cross section generally cutting west to east across the Site.

DQO Steps 2, 3, and 4 - Sampling Project Objectives, Data Gaps, and Study Boundaries

The objectives of the planned sampling are as follows.

1) Define the northern extent of groundwater contamination at the Site.

This objective will be accomplished by installing new groundwater monitoring wells to the north of McWane Blvd. and analyzing groundwater samples from the new wells for constituents of potential concern, including metals, chlorides, and ammonia, and general chemistry. The wells will be screened in the Semiperched aquifer. The concentrations of COPCs and other indicator chemicals in the new wells will be compared to those indicative of Site impacts (e.g., elevated metals, potassium, ammonia, and TDS).

2) Evaluate the cause of the "groundwater sink" that appears responsible for the northward movement of contaminated groundwater across the Site and specifically provide data to further test the hypothesis that contaminated groundwater is infiltrating into the Oxnard sewer trunk line along McWane Blvd. and Perkins Road.

This objective will be accomplished by installing new groundwater monitoring wells to the north of McWane Blvd. and measuring groundwater elevations at the new wells and all existing wells at the Halaco Site, and preparing a potentiometric map that will depict groundwater flow directions in the vicinity of the sewer line.

3) Evaluate whether the TPH-diesel detected in groundwater samples collected from the Oxnard aquifer, and at several wells in the Semiperched aquifer where other water quality results do not suggest Site impacts, is of natural origin.

This objective will be evaluated by sampling the new wells to the north of McWane Blvd., a subset of existing wells in the Semiperched aquifer where TPH-diesel was detected, and all four wells in the Oxnard aquifer. The samples will be analyzed using a modified TPH-diesel analytical method that will include a cleanup step to remove polar

substances that may interfere with the TPH analysis. The results using the TPH-diesel cleanup analysis will be compared to the previous results to assess whether the previous detections are of natural origin.

4) Verify that the Site has not affected groundwater quality in the Oxnard aquifer.

This objective will be evaluated by sampling the four Oxnard aquifer wells and analyzing the groundwater samples for metals, chlorides, ammonia, and general chemistry. The concentrations of these chemicals will be compared to the concentrations indicative of Site impacts.

5) Provide another snapshot of groundwater gradients and flow directions to supplement the five measurement events in 2009-2010.

This objective will be evaluated by measuring groundwater elevations at the new wells and all existing wells at the Halaco Site, and preparing a potentiometric map that will depict groundwater flow directions across the Site. All existing wells are south of McWane Blvd.

DQO Step 5 - Decision Rules

The data will be used to develop and evaluate remedial alternatives to address potential risks posed by the contaminated groundwater. Remedial alternatives are expected to include active "pump and treat" and monitored natural attenuation. The data will be evaluated using the methods described in the 2009 Plans.

DQO Step 6 - Acceptance Criteria

Nine new wells will be installed at three well clusters. This will provide sufficient areal coverage and sample density to represent groundwater conditions immediately north of the sewer line. The well clusters will be located in three different groundwater environments that each represent areas with different hydraulic stresses on the groundwater system and different groundwater and contaminant flow paths. One well cluster will be located immediately north of the Waste Management Area (east of the OID), where groundwater flow is affected by recharge from the OID and TNC properties and possibly the unknown sink. The second cluster will be located north of the Smelter Parcel (west of the OID), where groundwater flow is affected by the unknown sink and recharge from the OID. The third cluster will be located immediately west of Perkins Rd. between the Halaco Properties and the Oxnard headworks facility, where groundwater may have been drawn northwestward from the Site by historical dewatering activities.

Data from the new wells will be examined for evidence of horizontal groundwater gradients pointing toward the sewer line, indicating that the sewer line is influencing groundwater flow. The absence of such gradients would indicate that the sewer line is not influencing groundwater flow or that the wells were located too far from the sewer line to detect its impact.

Data from the new wells will also be examined for evidence that Halaco's wastes have affected groundwater quality in the Semiperched aquifer north of McWane Blvd. The absence of such evidence would suggest that the sewer line has prevented the movement of Halaco-affected groundwater north of McWane Blvd, that any Site-affected groundwater has moved north beyond the wells, or that Halaco-affected groundwater that historically moved north of McWane Blvd. subsequently infiltrated into the sewer line.

DQO Step 7 - Plan for Obtaining Data

Groundwater Wells – Selection of Existing Wells and Locations and Design for New Wells

Three new groundwater well clusters will be installed at the following locations north of the Halaco Properties to satisfy objectives #1 and #2.

- well cluster #1: north of McWane Blvd and the sewer line, east of the OID;
- well cluster #2: north of McWane Blvd and the sewer line, west of the OID;
- well cluster #3: adjacent to Perkins Rd between the Smelter Parcel and the City of Oxnard's sanitary sewer headworks facility.

Figure 8 shows the planned locations of the proposed new wells, which are as follows:

	Well Number	Approximate Depth	Approximate Distance from Sewer Line
Cluster 1	MW-28B	30 feet	100 feet
	MW-28C	70 feet	100 feet
	MW-29B	30 feet	50 feet
Cluster 2	MW-30B	30 feet	100 feet
	MW-30C	70 feet	100 feet
	MW-31B	30 feet	50 feet
Cluster 3	MW-32B	30 feet	100 feet
	MW-32C	70 feet	100 feet
	MW-33B	30 feet	50 feet

The locations were selected to satisfy the following criteria:

- obtain data north of the northernmost groundwater wells or piezometers at the Site;
- obtain data close enough to the Oxnard sewer line to detect the impact, if any, of the sewer line on groundwater levels and hydraulic gradients immediately west of the sewer line at Cluster 1 and immediately north of the sewer line at Clusters 2 and 3;
- obtain data west of Perkins Road to intercept Site-affected groundwater that may have been drawn northwestward from the Site toward the "headworks facility" by dewatering activities from 2005-2007.

Each of the three well clusters will consist of two shallow wells screened to a maximum depth of 30 feet below ground surface (bgs) and one deeper well screened to a maximum depth of 70 feet bgs. Final well locations will be selected to maximize the chance that horizontal gradients pointing toward the sewer line will be detected, if they occur. The distance from the sewer line to the wells, the distance between the two shallow wells in each cluster, and the orientation of the wells will all be considered.

The two shallow wells will be used to prepare potentiometric maps to assess the horizontal groundwater gradients near the sewer line. Evidence that the sewer line is influencing groundwater flow include any of the following: a west-to-east horizontal gradient at planned well pair MW-28/29, north-to-south horizontal gradients at planned well pairs MW-30/31 or MW-32/33, or south-to-north gradients at existing wells on the Halaco Properties. All three wells in each cluster will be used to assess potential water quality impacts.

The nine new wells and nine existing wells will be sampled to satisfy objectives #1, 3, and #4. **Figure** 8 shows the locations of the existing wells to be sampled. All of the existing wells selected for analysis are wells where TPH-diesel was detected. One of the nine existing wells is known to be affected by Halaco's wastes (MW-12); four are screened in the Semi-perched aquifer and believed to be unaffected or only slightly affected by Halaco's wastes (MW-21, -23C, -25C, and 27C), and four are screened in the Oxnard Aquifer and believed to be unaffected by Halaco's wastes (MW-2D, -3D, -6D, and -19D).

SECTION 2.0, DATA ACQUISITION

Sample Collection Methods and Field Measurements

The new wells will be installed using hollow stem auger or sonic drilling methods. Soil core samples will be collected at 5-foot intervals for lithologic logging. The wells will be constructed using 2-inch diameter, Schedule 40 PVC, and developed by surging and pumping.

Groundwater samples will be collected one time from the nine new wells and the nine existing groundwater monitoring wells using the same low flow purge techniques used during the 2009-2010 effort.

Groundwater levels will be measured one time at the nine new wells and at all 52 wells at the Site, including the nine existing wells where groundwater samples will be collected. **Table** 3 lists all of the existing wells and piezometers at the Site. Water levels will also be measured at staff gauges located in The Nature Conservancy Land and the OID. The locations of the staff gauges are shown on **Figure** 3.

The following field parameters will also be measured during well development and sampling: pH, temperature, and electrically conductivity. Table 4 provides construction information for the wells that pre-date the 2009-2010 field work and Table 5 provides construction information for the wells that were installed during 2009-2010. The well logs are provided in the 2012 Groundwater Report.

Request for Analysis

Tables 6 and 7 provide the Request for Analysis tables for all planned field samples and associated QC samples. Table 6 provides information for the primary and duplicate groundwater samples. Table 7 provides information for equipment blank samples. All samples will be analyzed for metals (total and dissolved), General Chemistry, TPH-diesel, and modified TPH-diesel. The modified TPH-diesel analysis will include a cleanup step to remove polar substances that may interfere with the TPH analysis. This is commonly done using a solid phase extraction material such as silica gel, Florisil, or other materials. The modified TPH analysis will be completed by the Region 9 lab or a private lab. The other analyses will be completed by the Region 9 lab and/or a Contract Laboratory Program (CLP) lab. A method description, target detection and reporting limits, and acceptance criteria for the modified TPH analysis will be provided after a laboratory is selected.

The Region 9 Sample Coordination Center (RSCC) analytical request form is included as an attachment.

Field Standard Operating Procedures (SOPs)

The previously approved Field Standard Operating Procedures (SOPs) will be used. They are included as Appendices to the 2009 Plan.

- SOP 6-1 Location of Field Sampling Stations with Global Positioning System (GPS)
- SOP 6-3 Ground Penetrating Radar (GPR)
- SOP 6-10 Soil Logging
- SOP 6-14 Installation of Shallow Monitoring Wells
- SOP 6-15 Installation of Deep Monitoring Wells
- SOP 6-17 Low-flow Groundwater Sampling
- SOP 6-19 Water-level Measurements
- SOP 6-21 Documentation and Records
- SOP 6-22 Digital Camera Use and Documentation
- SOP 6-23 Calibration of Field Instruments
- SOP 6-24 Decontamination of Sampling Equipment
- U.S. EPA Region IX Instructions for Sampling Shipping and Documentation (Appendix C in the 2009 Plan)

Access, Utility Clearance, Investigation Derived Wastes (IDW)

The two new well clusters north of McWane Blvd are expected to be installed on land owned by The Nature Conservancy and the new well cluster between the Smelter Parcel and the headworks facility is expected to be installed on property owned by either the City of Oxnard or New-Indy Containerboard LLC. EPA will be responsible for access arrangements.

A subcontractor will locate underground utilities before well drilling begins

Drill cuttings (solid IDW) will be placed with similar materials at the Site as directed by EPA. Decontamination water will be placed into a temporary storage tank for subsequent disposal to the City of Oxnard's sanitary sewer line (POTW), pending agreement by the City.

SECTION 3.0, ASSESSMENT AND OVERSIGHT

The contractor project manager (PM) is responsible for monitoring QA procedures. If problems arise, the EPA TOPO may direct the PM to conduct a field audit. An audit may evaluate 1) procedures for identifying samples, COC procedures, field notebooks, sampling procedures, and field measurements; 2) whether sampling personnel were adequately trained; 3) whether equipment was in proper working order and properly calibrated; 4) whether appropriate sample containers, sample preservatives, and techniques were used; 5) whether sample packaging and shipment were appropriate; and 7) whether QC samples were properly collected.

Audit reports will be prepared after any audit. If an audit finds unacceptable conditions or data, the PM will be responsible for developing and initiating corrective action. Corrective action may include the following:

- Reanalyzing samples if holding time criteria permit
- Resampling and analyzing
- Recommendations to evaluate and/or modify sampling and analytical procedures
- Accepting qualified or flagged data
- Inquiries or recommendations to the analytical laboratory (if samples analyzed by the Region 9 lab) or program manager (if samples analyzed by a CLP laboratory)

Performance Evaluation (PE) Samples are not planned.

SECTION 4.0, DATA REVIEW, EVALUATION OF DATA USABILITY, AND DATA VALIDATION

All sample analytical batches will be reviewed at Tier 2 (CLP Level 1B). Additional analytical batches may also be reviewed at Tier 3 depending on the results of the Tier 2 review.

Schedule

Sample collection is tentatively scheduled for February or March 2013.

Attachments

The following are attached:

- Signature page
- Figures 1 - 8
- Tables 1-7
- Region 9 Sample Coordination Center (RSCC) analytical request form

Figures

1	Halaco Superfund Site Areas
2	Geologic Cross Section
3	Groundwater Monitoring Well Locations
4	Groundwater Elevation Contour Map – 11/16/2009
5	Groundwater Elevation Contour Map – 2/22/2010
6	Approximate East-West Extent of Groundwater Impacted by Halaco's Operations
7	Hydrogeologic Cross Section A-A' with TDS
8	Planned Groundwater Monitoring Well Locations

Tables

1	Chemicals of Potential Concern (COPCs)
2	TPH Analytical Results, Groundwater
3	Groundwater Monitoring and Piezometers Well Survey Data
4	Construction of Existing Groundwater Monitoring Wells
5	Construction of New Groundwater Monitoring Wells and Piezometers
6	Request for Analysis, Groundwater Samples
7	Request for Analysis, Equipment Blanks

Second Addendum to the September 2009 Sampling and Analysis Plan

Halaco Superfund Site

USEPA Region 9, Superfund Division

December 20, 2012

EPA Project Manager: Wayne Praskins
EPA Contractor: Mark Wuttig, CH2M HILL

For EPA use:

Approved by EPA Project Manager: _____ Date: 1/9/13

Expedited Review? ☐Yes ☐No

Received by QA Office: Marlon Mezquita Date: 12/20/12

Reviewed by: Marlon Mezquita Date: 12/28/12

Approved: Eugenia McNaughton Date: 12/27/12
Region 9 Quality Assurance Manager

Aerial image © Google Earth, 2007. Annotation by CH2M HILL, 2008.

FIGURE 1
Halaco Superfund Site Areas
Halaco Site Remedial Investigation
Oxnard, California

CH2MHILL

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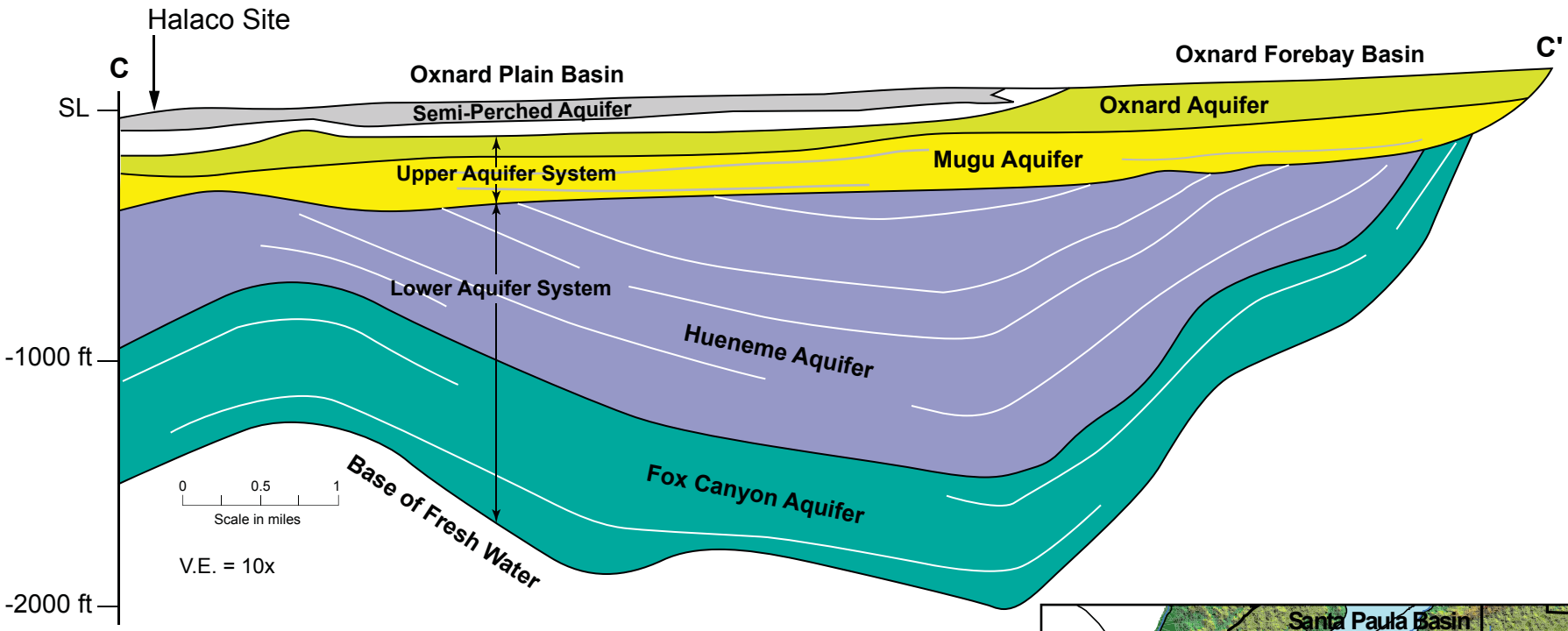

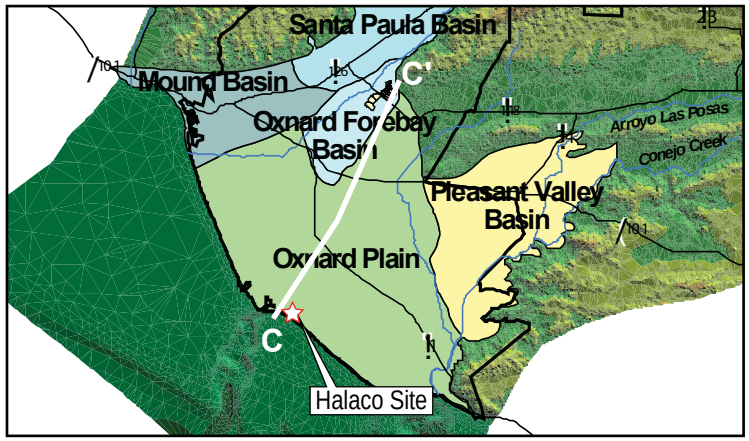

FIGURE 2
Geologic Cross Section
Halaco Site Remedial Investigation
Oxnard, California

Source: Modified from Mukae and Turner, 1975

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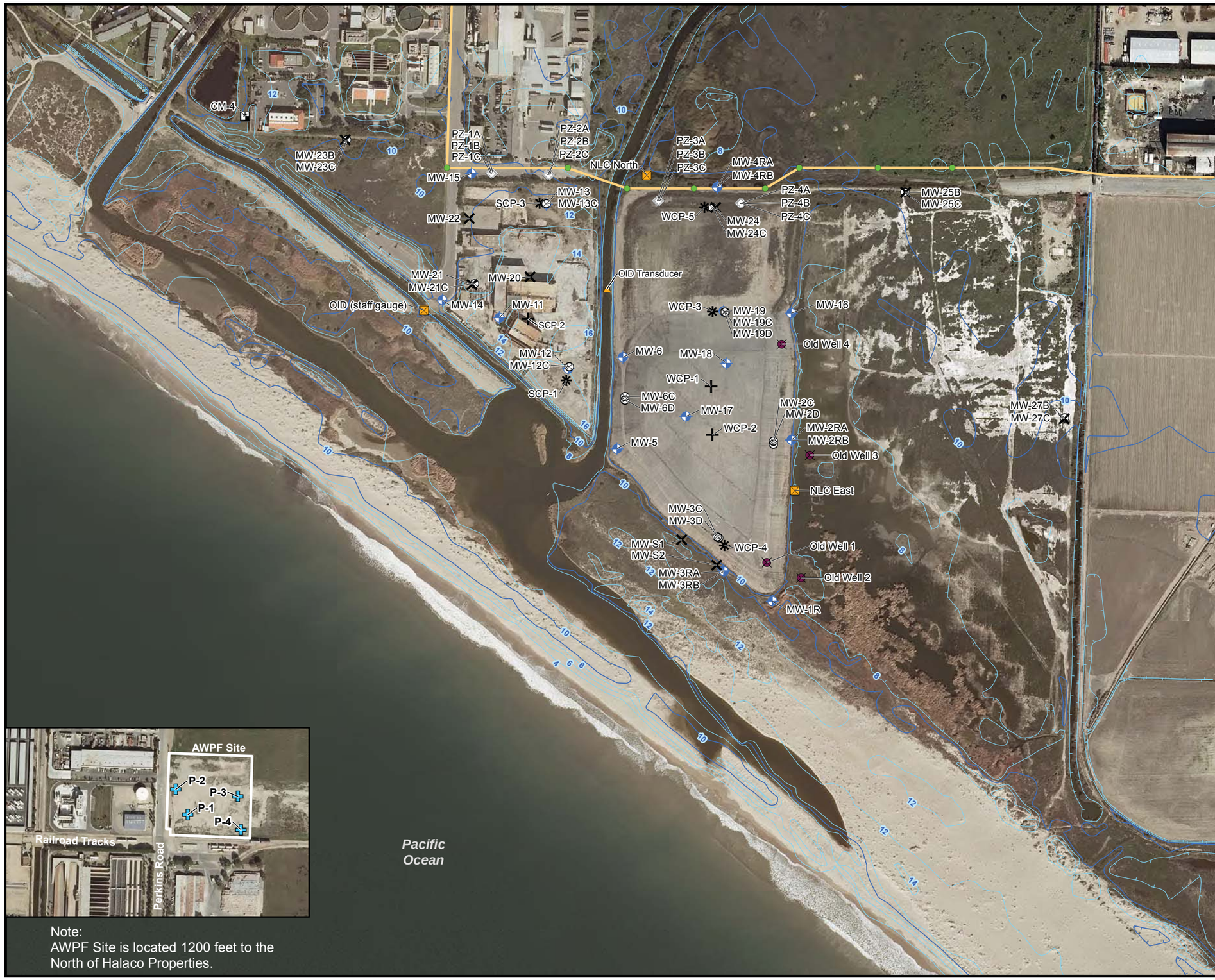

Note:
AWPF Site is located 1200 feet to the North of Halaco Properties.

LEGEND

Groundwater Monitoring Locations

- USGS Regional Monitoring Well
- Existing Shallow Groundwater Monitoring Well
- New Shallow Well, Water Quality
- New Deeper Well, Water Quality
- Shallow CPT Boring
- Deep CPT Boring
- New Piezometer Cluster, Water Level
- Former Monitoring Well (Destroyed)
- Surface Water Gauging Station
- Former Surface Water Pressure Transducer
- AWPF Piezometers

Sewer Line

- Oxnard Sewer Trunk Line
- Manhole

Ground Elevation Contours, ft msl (AMEC, 2006)

- 2 ft Contour
- 10 ft Contour

N

0 200 400
Feet
1 inch = 400 feet

FIGURE 3
Groundwater Monitoring Well Locations
HALACO SITE REMEDIAL INVESTIGATION
OXNARD, CALIFORNIA

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LEGEND

Groundwater Monitoring Locations

- USGS Regional Monitoring Well
- Existing Shallow Groundwater Monitoring Well
- New Shallow Well, Water Quality
- New Deeper Well, Water Quality
- New Piezometer Cluster, Water Level
- Surface Water Gauging Station
- Former Surface Water Pressure Transducer

Sewer Line

- Oxnard Sewer Trunk Line
- Manhole

Ground Elevation Contours, ft (AMEC, 2006)

- 2 ft Contour
- 10 ft Contour

Groundwater Elevation Contours

- Shallow "A" and "B" Wells 1 ft Contour
- Deeper "C" Wells 0.5 ft Contour

Groundwater Elevation, ft

- MW-21: 6.38

Surface Water Elevation, ft

- NCL East: 7.95

Note:
Elevation Datum is NAVD 1988

N

0 200 400
Feet
1 inch = 400 feet

FIGURE 4
Groundwater Elevation Contour Map
Semiperched Aquifer - 11/16/2009
HALACO SITE REMEDIAL INVESTIGATION
OXNARD, CALIFORNIA

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LEGEND

Groundwater Monitoring Locations

- USGS Regional Monitoring Well
- Existing Shallow Groundwater Monitoring Well
- New Shallow Well, Water Quality
- New Deeper Well, Water Quality
- New Piezometer Cluster, Water Level
- Surface Water Gauging Station
- Former Surface Water Pressure Transducer

Sewer Line

- Oxnard Sewer Trunk Line
- Manhole

Ground Elevation Contours, ft (AMEC, 2006)

- 2 ft Contour
- 10 ft Contour

Groundwater Elevation Contours

- Shallow "A" and "B" Wells 1 ft Contour
- Deeper "C" Wells 0.5 ft Contour

Groundwater Elevation, ft

- MW-21: 3.72

Surface Water Elevation, ft

- NCL East: 7.60

Note:
Elevation Datum is NAVD 1988

N

0 200 400
Feet
1 inch = 400 feet

FIGURE 5
Groundwater Elevation Contour Map
Semiperched Aquifer - 2/22/2010
HALACO SITE REMEDIAL INVESTIGATION
OXNARD, CALIFORNIA

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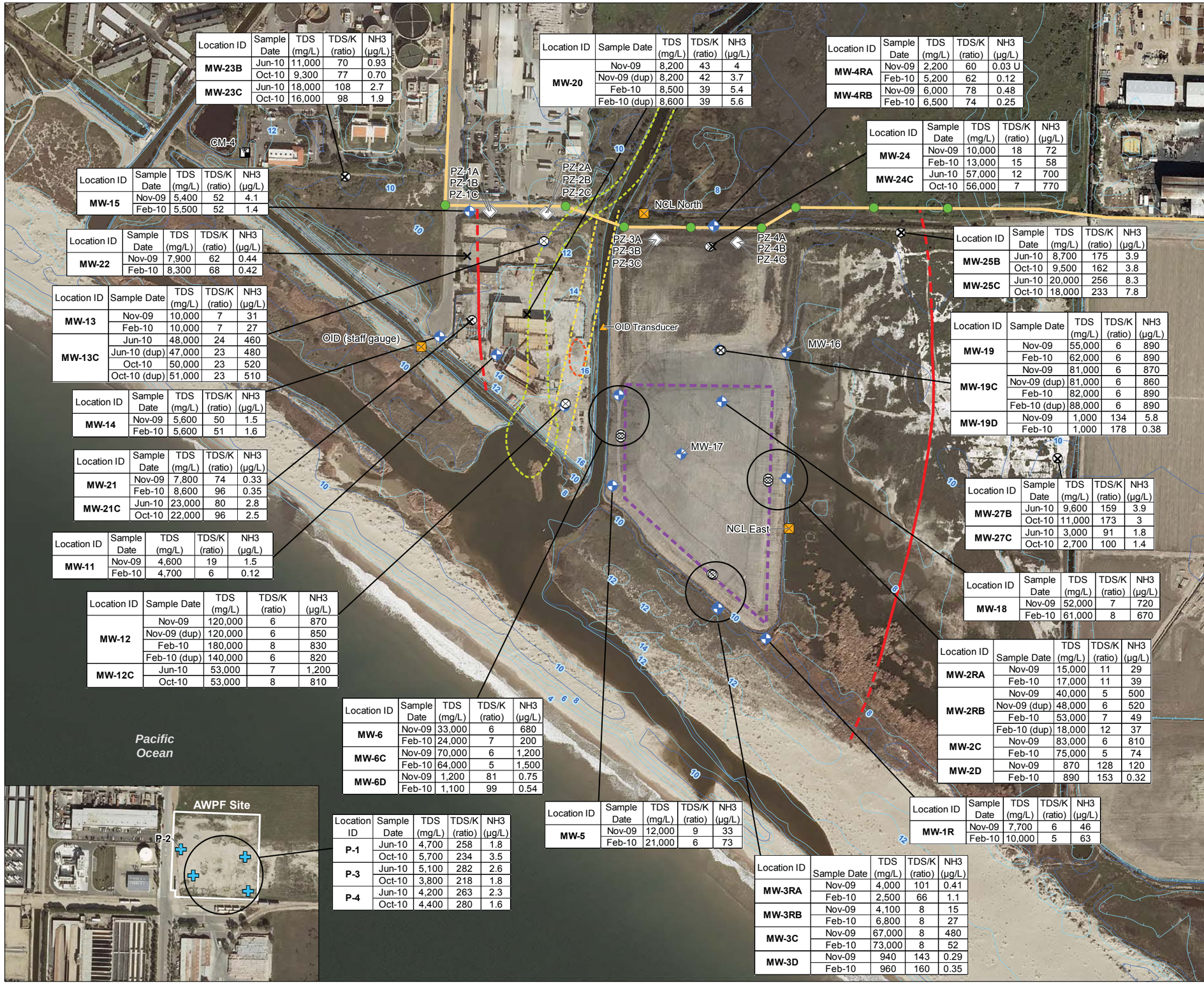


Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-23B	Jun-10	11,000	70	0.93
	Oct-10	9,300	77	0.70
MW-23C	Jun-10	18,000	108	2.7
	Oct-10	16,000	98	1.9

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-20	Nov-09	8,200	43	4
	Nov-09 (dup)	8,200	42	3.7
	Feb-10	8,500	39	5.4
	Feb-10 (dup)	8,600	39	5.6

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-4RA	Nov-09	2,200	60	0.03 U
	Feb-10	5,200	62	0.12
MW-4RB	Nov-09	6,000	78	0.48
	Feb-10	6,500	74	0.25

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-24	Nov-09	10,000	18	72
	Feb-10	13,000	15	58
MW-24C	Jun-10	57,000	12	700
	Oct-10	56,000	7	770

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-15	Nov-09	5,400	52	4.1
	Feb-10	5,500	52	1.4

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-22	Nov-09	7,900	62	0.44
	Feb-10	8,300	68	0.42

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-25B	Jun-10	8,700	175	3.9
	Oct-10	9,500	162	3.8
MW-25C	Jun-10	20,000	256	8.3
	Oct-10	18,000	233	7.8

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-13	Nov-09	10,000	7	31
	Feb-10	10,000	7	27
MW-13C	Jun-10	48,000	24	460
	Jun-10 (dup)	47,000	23	480
	Oct-10	50,000	23	520
	Oct-10 (dup)	51,000	23	510

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-19	Nov-09	55,000	6	890
	Feb-10	62,000	6	890
MW-19C	Nov-09	81,000	6	870
	Nov-09 (dup)	81,000	6	860
	Feb-10	82,000	6	890
	Feb-10 (dup)	88,000	6	890
MW-19D	Nov-09	1,000	134	5.8
	Feb-10	1,000	178	0.38

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-14	Nov-09	5,600	50	1.5
	Feb-10	5,600	51	1.6

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-21	Nov-09	7,800	74	0.33
	Feb-10	8,600	96	0.35
MW-21C	Jun-10	23,000	80	2.8
	Oct-10	22,000	96	2.5

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-27B	Jun-10	9,600	159	3.9
	Oct-10	11,000	173	3
MW-27C	Jun-10	3,000	91	1.8
	Oct-10	2,700	100	1.4

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-11	Nov-09	4,600	19	1.5
	Feb-10	4,700	6	0.12

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-18	Nov-09	52,000	7	720
	Feb-10	61,000	8	670

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-12	Nov-09	120,000	6	870
	Nov-09 (dup)	120,000	6	850
	Feb-10	180,000	8	830
	Feb-10 (dup)	140,000	6	820
MW-12C	Jun-10	53,000	7	1,200
	Oct-10	53,000	8	810

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-2RA	Nov-09	15,000	11	29
	Feb-10	17,000	11	39
MW-2RB	Nov-09	40,000	5	500
	Nov-09 (dup)	48,000	6	520
	Feb-10	53,000	7	49
	Feb-10 (dup)	18,000	12	37
MW-2C	Nov-09	83,000	6	810
	Feb-10	75,000	5	74
MW-2D	Nov-09	870	128	120
	Feb-10	890	153	0.32

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-6	Nov-09	33,000	6	680
	Feb-10	24,000	7	200
MW-6C	Nov-09	70,000	6	1,200
	Feb-10	64,000	5	1,500
MW-6D	Nov-09	1,200	81	0.75
	Feb-10	1,100	99	0.54

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-1R	Nov-09	7,700	6	46
	Feb-10	10,000	5	63

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
P-1	Jun-10	4,700	258	1.8
	Oct-10	5,700	234	3.5
P-3	Jun-10	5,100	282	2.6
	Oct-10	3,800	218	1.8
P-4	Jun-10	4,200	263	2.3
	Oct-10	4,400	280	1.6

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-5	Nov-09	12,000	9	33
	Feb-10	21,000	6	73

Location ID	Sample Date	TDS (mg/L)	TDS/K (ratio)	NH3 (µg/L)
MW-3RA	Nov-09	4,000	101	0.41
	Feb-10	2,500	66	1.1
MW-3RB	Nov-09	4,100	8	15
	Feb-10	6,800	8	27
MW-3C	Nov-09	67,000	8	480
	Feb-10	73,000	8	52
MW-3D	Nov-09	940	143	0.29
	Feb-10	960	160	0.35

LEGEND

Groundwater Monitoring Locations

- USGS Regional Monitoring Well
- Existing Shallow Groundwater Monitoring Well
- New Shallow Well, Water Quality
- New Deeper Well, Water Quality
- New Piezometer Cluster, Water Level
- Surface Water Gauging Station
- Former Surface Water Pressure Transducer
- AWPF Piezometers

Sewer Line

- Oxnard Sewer Trunk Line
- Manhole

Ground Elevation Contours, ft (AMEC, 2006)

- 2 ft Contour
- 10 ft Contour

Historical OID Alignment

- 1929 OID
- 1959 OID
- 1969 Pond

Approximate Extent of Impacted Groundwater and Former Ponds

- Approximate East-West Extent of Groundwater Impacted by Halaco's Operations
- Approximate Extent of Former Process Waste Settling Pond

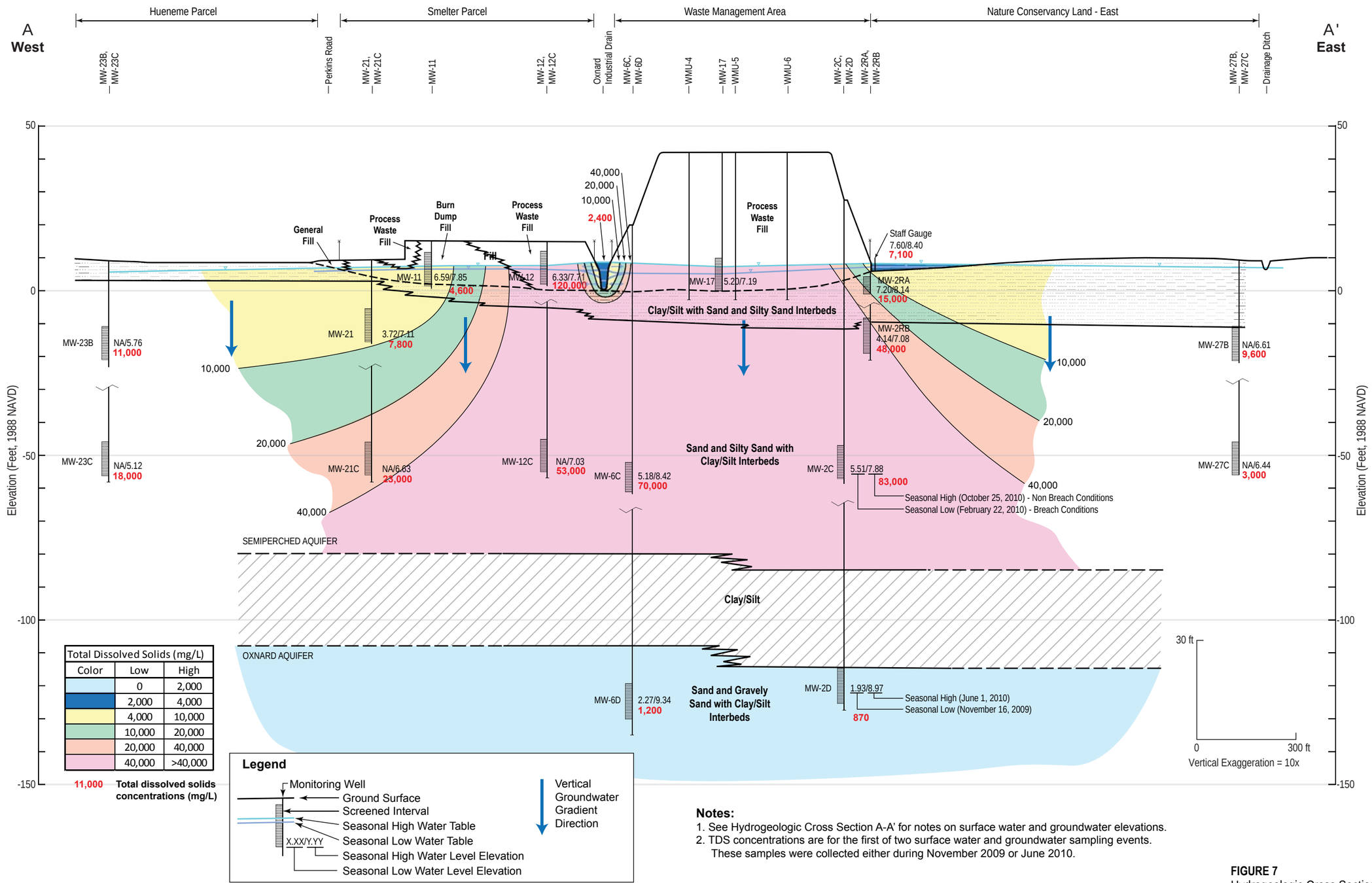
Note:
Elevation Datum is NAVD 1988

N

0 200 400
Feet

1 inch = 200 feet

FIGURE 6
Approximate East-West Extent of Groundwater Impacted by Halaco's Operations
HALACO SITE REMEDIAL INVESTIGATION
OXNARD, CALIFORNIA



Notes:

1. See Hydrogeologic Cross Section A-A' for notes on surface water and groundwater elevations.
2. TDS concentrations are for the first of two surface water and groundwater sampling events. These samples were collected either during November 2009 or June 2010.

FIGURE 7
Hydrogeologic Cross Section A-A' with TDS
Halaco Site Remedial Investigation
Oxnard, California

CH2MHILL

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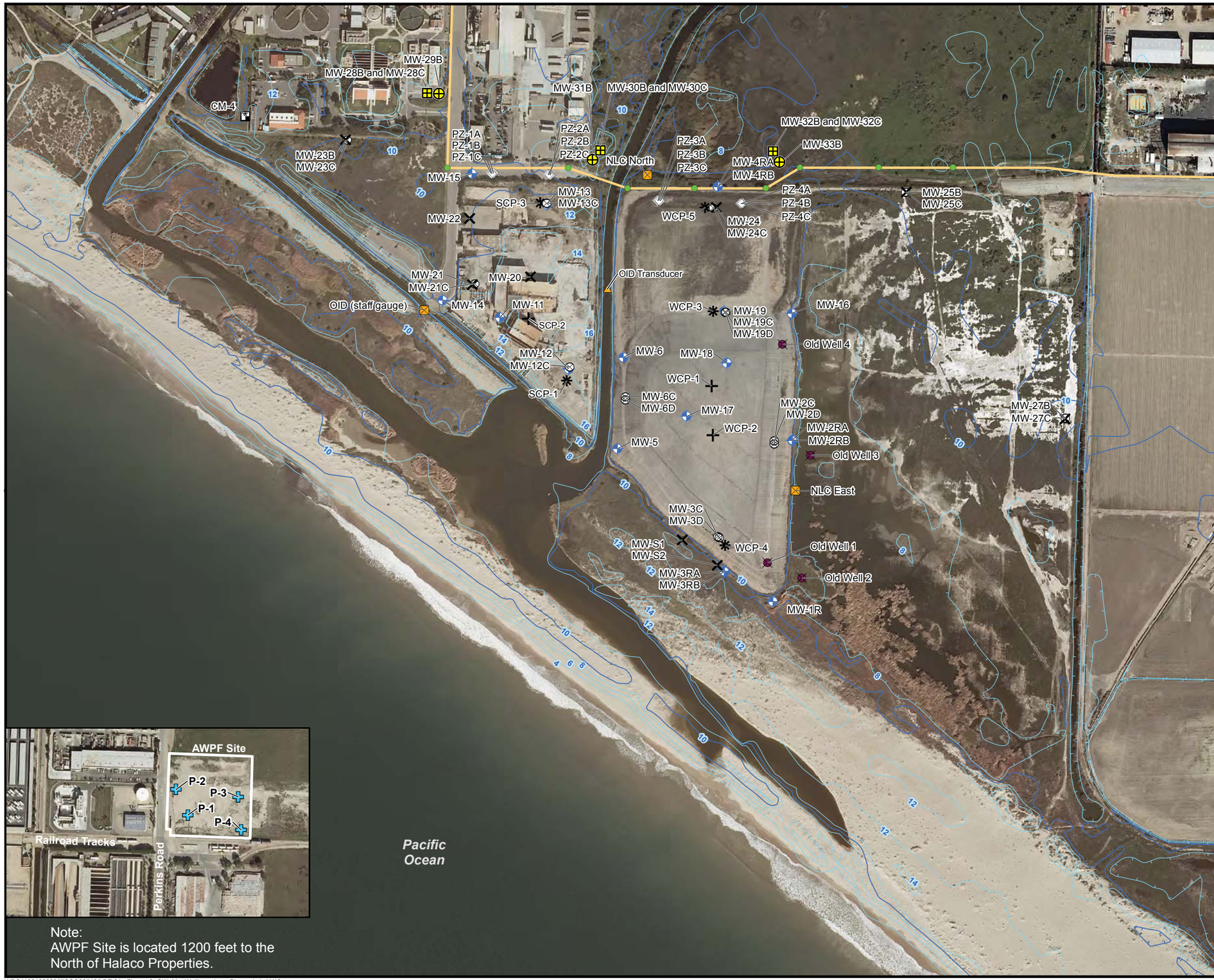

Note:
AWPF Site is located 1200 feet to the North of Halaco Properties.

LEGEND

Existing Groundwater Monitoring Locations

- USGS Regional Monitoring Well
- Existing Shallow Groundwater Monitoring Well
- New Shallow Well, Water Quality
- New Deeper Well, Water Quality
- Shallow CPT Boring
- Deep CPT Boring
- New Piezometer Cluster, Water Level
- Former Monitoring Well (Destroyed)
- Surface Water Gauging Station
- Former Surface Water Pressure Transducer
- AWPF Piezometers

Sewer Line

- Oxnard Sewer Trunk Line
- Manhole

Ground Elevation Contours, ft msl (AMEC, 2006)

- 2 ft Contour
- 10 ft Contour

Planned Groundwater Monitoring Locations

- New Shallow Well
- New Shallow and Deeper Well Pair

N

0 200 400
Feet
1 inch = 400 feet

FIGURE 8
Planned Groundwater Monitoring Well Locations
HALACO SITE REMEDIAL INVESTIGATION
OXNARD, CALIFORNIA

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Table 1
Chemicals of Potential Concern (COPCs)
Halaco Site Remedial Investigation

Analytical Group	Analyte
Metals	Aluminum
	Antimony
	Arsenic
	Barium
	Beryllium
	Cadmium
	Calcium
	Chromium
	Cobalt
	Copper
	Iron
	Lead
	Magnesium
	Manganese
	Mercury
	Nickel
	Potassium
	Selenium
	Silver
	Sodium
	Thallium
	Vanadium
	Zinc
Dioxins/Furans	Chlorinated dibenzo-p-dioxins
	Chlorinated dibenzofurans
Ammonia	Ammonia
Radionuclides	Thorium-228
	Thorium-230
	Thorium-232
	Radium-226
	Radium-228

Note: Total Petroleum Hydrocarbons are considerd indicator parameters, rather than COPCs.

TABLE 2

TPH Analytical Results, Groundwater

Halaco Site Remedial Investigation, Oxnard, California

Location	Sample ID	Duplicate (Dup)	Date	Time	TPH as Gasoline Result	Q	TPH as Diesel Result	Q	TPH as Motor Oil Result	Q
1	GW-MW-1R-1109		11/19/09	11:50	50	U	240	U	940	U
2	GW-MW-2RA-1109		11/18/09	7:10	50	U	220	J	940	U
	GW-MW-2RB-1109		11/17/09	14:45	160		230	U	920	U
	GW-MW-102RB-1109	Dup	11/17/09	14:45	160		230	U	920	U
	GW-MW-2C-1109		11/17/09	14:30	340		210	J	900	U
	GW-MW-2D-1109		11/17/09	12:10	50	U	140	J	950	U
3	GW-MW-3RA-1109		11/19/09	10:30			240	U	940	U
	GW-MW-3RB-1109		11/19/09	9:25	50	U	210	J	940	U
	GW-MW-3C-1109		11/18/09	8:20	190		230	U	910	U
	GW-MW-3D-1109		11/18/09	7:10	50	U	260		950	U
4	GW-MW-4RA-1109		11/20/09	6:40	50	U	360		940	U
	GW-MW-4RB-1109		11/20/09	7:10	50	U	240	U	940	U
5	GW-MW-5-1109		11/18/09	10:00	50	U	340		940	U
6	GW-MW-6-1109		11/20/09	8:15	95		240		930	U
	GW-MW-6C-1109		11/18/09	11:05	460		300		910	U
	GW-MW-6D-1109		11/18/09	9:55	50	U	180	J	950	U
11	GW-MW-11-1109		11/19/09	9:05	50	U	260		1000	U
12	GW-MW-12-1109		11/20/09	9:55	93		1000		890	U
	GW-MW-112-1109	Dup	11/20/09	9:55	93		1100		890	U
	GW-MW-12C-0610		6/3/10	9:15	190		140		920	U
13	GW-MW-13-1109		11/19/09	7:10	50	U	320		940	U
	GW-MW-13C-0610		6/3/10	10:30	320		120		930	U
	GW-MW-113C-0610	Dup	6/3/10	10:30	300		230	U	920	U
14	GW-MW-14-1109		11/18/09	14:20	50	U	250	J	510	J
15	GW-MW-15-1109		11/18/09	12:00	50	U	240	U	940	U
18	GW-MW-18-1109		11/20/09	10:30	300		230	U	920	U
19	GW-MW-19-1109		11/17/09	8:30	260		280		920	U
	GW-MW-19C-1109		11/17/09	8:10	430		230	J	940	U
	GW-MW-119C-1109	Dup	11/17/09	8:10	440		180	J	900	U
	GW-MW-19D-1109		11/17/09	10:15	50	U	270		950	U
20	GW-MW-20-1109		11/18/09	14:20	50	U	160	J	940	U
	GW-MW-120-1109	Dup	11/18/09	14:20	50	U	220	J	940	U
21	GW-MW-21-1109		11/19/09	12:15	50	U	170	J	940	U
	GW-MW-21C-0610		6/3/10	12:00	50	U				
22	GW-MW-22-1109		11/19/09	7:10	50	U	130	J	1000	U
23	GW-MW-23B-0610		6/3/10	14:45	50	U	240	U	950	U
	GW-MW-23C-0610		6/3/10	13:30	50	U	3100		6200	
24	GW-MW-24-1109		11/17/09	11:20	50	U	250		940	U
	GW-MW-24C-0610		6/2/10	14:45	170		550		940	U
25	GW-MW-25B-0610		6/2/10	11:30	50	U	230	U	940	U
	GW-MW-25C-0610		6/2/10	12:45	33		240	U	950	U
27	GW-MW-27B-0610		6/2/10	9:00	50	U	230	U	940	U
	GW-MW-27C-0610		6/2/10	10:10	50	U	260		1000	U

Notes:

Units are in µg/L

Data Qualifiers (Q):

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

TABLE 3

Groundwater Monitoring Well and Piezometer Survey Data

Halaco Site Remedial Investigation, Oxnard, California

		Year and Date Installed					Survey Data (SAGE)								
							Vertical Elevaetions *					Horizontal Coordiantes			
Loca-tion	Well	2003 (Padre)	2006 (Weston)	2009 (CH2M HILL)	2010 (CH2M HILL)	Date Installed	Surface Comp-letion (A/F)	Outer TOC Elevation (feet, 1988 NAVD)	Inner TOC Elevation (feet, 1988 NAVD)	Ground Surface Elevation (feet, 1988 NAVD)	Stickup (feet above ground surface)	North Latitude **	West Longitude **	(Y) Northing ***	(X) Easting ***
Monitoring Wells															
1	MW-1R	X				11/6/03	A	10.93	10.46	8.16	2.30	34-08-07.26433	119-10-46.32652	1873733.3773	6204734.2083
2	MW-2RA	X				11/6/03	A	10.56	10.01	7.91	2.10	34-08-13.85882	119-10-45.54947	1874399.1506	6204807.3427
	MW-2RB	X				11/6/03	A	10.64	9.81	7.91	1.90	34-08-13.83923	119-10-45.55851	1874397.1802	6204806.5590
	MW-2C			X		10/24/09	A	30.03	29.63	27.57	2.07	34-08-13.67557	119-10-46.44658	1874381.5485	6204732.0733
	MW-2D			X		10/21/09	A	30.23	29.67	27.46	2.21	34-08-13.79673	119-10-46.43842	1874393.7882	6204732.9031
3	MW-3RA	X				11/5/03	A	10.95	9.93	8.22	1.71	34-08-08.45219	119-10-48.75659	1873855.8051	6204531.3631
	MW-3RB	X				11/5/03	A	10.84	10.00	8.09	1.91	34-08-08.44117	119-10-48.72962	1873854.6647	6204533.6177
	MW-3C			X		10/24/09	A	27.42	27.10	24.77	2.33	34-08-09.85207	119-10-49.10103	1873997.6837	6204504.4235
	MW-3D			X		10/20/09	A	27.69	27.35	25.13	2.23	34-08-09.81535	119-10-49.02910	1873993.9006	6204510.4254
4	MW-4RA	X				2/20/03	A	11.76	10.51	9.56	0.95	34-08-24.05361	119-10-49.45559	1875433.5094	6204491.1312
	MW-4RB	X				2/20/03	A	11.29	11.29	9.52	1.77	24-08-24.06008	119-10-49.48660	1875434.1935	6204488.5323
5	MW-5	X				2/20/03	A	20.43	20.20	18.76	1.44	34-08-13.34168	119-10-54.09709	1874355.3155	6204088.2910
6	MW-6	X				2/20/03	A	16.32	16.14	14.87	1.27	34-08-17.05670	119-10-53.91087	1874730.6516	6204108.3578
	MW-6C			X		10/27/09	A	21.85	21.17	19.70	1.46	34-08-15.46151	119-10-53.76754	1874569.3010	6204118.8608
	MW-6D			X		10/26/09	A	22.02	21.71	19.92	1.79	34-08-15.33293	119-10-53.76887	1874556.3052	6204118.5960
11	MW-11		X			6/19/06	F	13.82	13.57	13.69	-0.12	34-08-18-57610	119-10-59.99224	1874890.2477	6203599.0265
12	MW-12		X			6/19/06	A	16.33	14.81	14.15	0.66	34-08-16.54480	119-10-56.57039	1874681.5367	6203884.2164
	MW-12C				X	5/12/10	A	17.60	17.29	14.86	2.43	34-08-16.63955	119-10-56.51753	1874691.0558	6203888.7722
13	MW-13		X			6/19/06	F	10.06	9.85	9.86	-0.01	34-08-23.22963	119-10-57.81228	1875358.4770	6203787.7860
	MW-13C				X	5/11/10	F	9.72	9.37	9.79	-0.42	34-08-23.26095	119-10-57.81198	1875361.6362	6203787.8483
14	MW-14		X			6/21/06	F	8.17	7.91	7.86	0.05	34-08-19.24504	119-11-02.80982	1874960.6547	6203363.0064
15	MW-15		X			6/21/06	F	8.42	8.25	8.39	-0.14	34-08-24.40882	119-11-01.50506	1875481.3220	6203479.0701
16	MW-16		X			6/20/06	F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
17	MW-17		X			6/22/06	A	47.00	45.82	42.49	3.33	34-08-14.71563	119-10-50.75890	1874490.8996	6204370.5019
18	MW-18		X			6/26/06	A	45.87	45.83	41.81	4.02	34-08-16.91210	119-10-48.83814	1874711.0259	6204534.5503
19	MW-19		X			6/21/06	F	17.73	17.37	17.64	-0.27	34-08-19.02335	119-10-49.02560	1874924.6188	6204521.3005
	MW-19C			X		10/23/09	A	20.46	19.85	17.99	1.86	34-08-18.99854	119-10-48.94008	1874922.0621	6204528.8116
	MW-19D			X		10/23/09	A	20.43	19.86	18.00	1.86	34-08-18.99660	119-10-48.98592	1874921.9116	6204524.9571
20	MW-20			X		11/6/09	F	13.37	12.99	13.37	-0.38	34-08-20.25587	119-10-58.53427	1875058.6337	6203723.9199
21	MW-21			X		11/6/09	F	9.10	8.60	9.10	-0.50	34-08-19.88501	119-11-01.24339	1875023.8277	6203485.7781
	MW-21C				X	5/10/10	F	9.03	8.65	9.10	-0.44	34-08-19.94239	119-11-01.23851	1875029.5812	6203495.9038
22	MW-22			X		11/6/09	F	8.55	8.18	8.44	-0.26	34-08-22.56769	119-11-01.56806	1875295.3172	6203471.6845
23	MW-23B				X	5/18/10	A	11.99	11.91	9.39	2.53	34-08-25.66515	119-11-07.71368	1875614.4603	6202958.4931
	MW-23C				X	5/18/10	A	11.81	11.48	9.02	2.46	34-08-25.66507	119-11-07.65143	1875614.3909	6202963.7248
24	MW-24			X		11/9/09	A	17.68	16.87	14.74	2.12	34-08-18.99660	119-10-48.98592	1875351.1106	6204486.0764
	MW-24C				X	5/17/10	A	18.12	17.92	14.95	2.97	34-08-23.23656	119-10-49.64984	1875351.1058	6204473.8350
25	MW-25B				X	5/13/10	A	12.31	12.06	9.56	2.50	34-08-24.02964	119-10-40.22484	1875421.9786	6205266.9303
	MW-25C				X	5/13/10	A	12.42	12.21	9.60	2.62	34-08-24.03023	119-10-40.28074	1875422.0935	6205262.2331
27	MW-27B				X	5/14/10	A	11.70	11.54	8.90	2.64	34-08-14.93769	119-10-32.23112	1874495.0852	6205928.0392
	MW-27C				X	5/14/10	A	11.73	11.44	8.86	2.58	34-08-14.98209	119-10-32.22595	1874499.5680	6205928.5264
Piezometers															
1	PZ-1A			X		11/3/09	F	8.67	8.55	8.66	-0.11	34-08-24.42817	119-11-00.45275	1875482.2739	6203567.6402
	PZ-1B			X		11/3/09	F	8.65	8.34	8.64	-0.29	34-08-24.42322	119-11-00.53463	1875481.8545	6203560.7525
	PZ-1C			X		11/5/09	F	8.65	8.39	8.64	-0.25	34-08-24.42721	119-11-00.58040	1875482.3033	6203556.9102
2	PZ-2A			X		11/3/09	F	9.31	9.13	9.30	-0.17	34-08-24.41167	119-10-57.66602	1875477.8494	6203801.8400
	PZ-2B			X		11/3/09	F	9.35	9.19	9.34	-0.16	34-08-24.41386	119-10-57.73587	1875478.1398	6203795.9720
	PZ-2C			X		11/5/09	F	9.22	9.00	9.21	-0.22	34-08-24.42190	119-10-57.79015	1875479.0058	6203791.4192
3	PZ-3A			X		11/10/09	A	17.12	17.00	15.24	1.76	34-08-23.46007	119-10-52.38485	1875376.4406	6204244.5818
	PZ-3B			X		11/10/09	A	17.31	17.08	15.22	1.86	34-08-23.46399	119-10-52.33225	1875376.7856	6204249.0078
	PZ-3C			X		11/9/09	A	17.29	17.11	15.28	1.83	34-08-23.46149	119-10-52.27638	1875376.4777	6204253.7002
4	PZ-4A			X		11/9/09	A	15.41	15.07	13.36	1.71	34-08-23.41592	119-10-48.33490	1875367.9800	6204584.9214
	PZ-4B			X		11/9/09	A	15.38	15.07	13.25	1.82	34-08-23.42272	119-10-48.28289	1875368.6157	6204589.3013
	PZ-4C			X		11/6/09	A	15.18	15.02	13.12	1.90	34-08-23.43159	119-10-48.23133	1875369.4617	6204593.6447

Notes n/a = Not available; ags = Above ground surface; A = Above ground (monument); F = Flush with ground (vault); * MSL elevation, survey feet (NAVD 1988); ** degrees, minutes, seconds (NAD 1983) (CORPSCON6); *** CA State Plane Coordinates System Zone 5, Survey feet

TABLE 4

Construction of Existing Groundwater Monitoring Wells

Halaco Site Remedial Investigation, Oxnard, California

Location	Well	Well Log Construction Information							Survey Information						Revised Well Construction Information (based on total depth measurement on 3-6-08)					
									2007 SAGE Survey (1988 NAVD)											
		Date Installed	Surface Comp-letion (S/F)	Total Depth (feet, BTOC)	Total Depth (feet, bgs)	Top of Screen (feet, bgs)	Screen Length (feet)	Well Diameter (inches)	Inner TOC Elevation (feet, 1988 NAVD)	Outer TOC Elevation (feet, 1988 NAVD)	Ground Surface Elevation (feet, 1988 NAVD)	Calcu-lated Inner TOC Stickup (feet, ags)	2003 Padre Associates Survey TOC Elevation (feet, NGVD 1929)	Difference in TOC between 2003 and 2007 Surveys (feeet)	Field Measured Total Depth (feet, BTOC)	Calculated Total Depth (feet, bgs)	Calculated Top of Screen Elevation (feet, 1988 NAVD)	Calculated Bottom of Screen Elevation (feet, 1988 NAVD)	Calculated Total Depth minus Well Log Total Depth (feet)	Comment
Wells Installed by Padre Associates (2003)																				
1	MW-1R	11/6/03	S	19.94	17.5	12.5	5	2	10.46	10.93	8.16	2.30	7.87	2.59	20.00	17.70	-4.34	-9.34	0.20	-
2	MW-2RA	11/6/03	S	11.79	9	4	5	2	10.01	10.56	7.91	2.10	7.44	2.57	11.92	9.82	3.91	-1.09	0.82	-
	MW-2RB	11/6/03	S	29.87	27	17	10	2	9.81	10.64	7.91	1.90	7.25	2.56	30.00	28.10	-9.09	-19.09	1.10	-
3	MW-3RA	11/5/03	S	10.11	8	3	5	2	9.93	10.95	8.22	1.71	7.34	2.59	11.19	9.48	5.22	0.22	1.48	-
	MW-3RB	11/5/03	S	21.79	20	15	5	2	10.00	10.84	8.09	1.91	7.4	2.60	22.41	20.50	-6.91	-11.91	0.50	-
4	MW-4RA	2/20/03	S	19.75	18.5	3.5	15	2	10.51	11.76	9.56	0.95	8.75	1.76	20.22	19.27	6.06	-8.94	0.77	-
	MW-4RB	2/20/03	S	31.27	30	20	10	2	11.29	11.29	9.52	1.77	9.23	2.06	31.32	29.55	-10.48	-20.48	-0.45	-
5	MW-5	2/20/03	S	22.07	20	10	10	2	20.20	20.43	18.76	1.44	17.8	2.40	22.23	20.79	8.76	-1.24	0.79	-
6	MW-6	2/20/03	S	20.02	18.5	3.5	15	2	16.14	16.32	14.87	1.27	13.54	2.60	19.72	18.45	11.37	-3.63	-0.05	-
Wells Installed by Weston Solutions (2007)																				
11	MW-11	6/19/06	F	n/a	12	2	10	1	13.57	13.82	13.69	-0.12	n/a	n/a	7.32	7.44	11.69	1.69	-4.56	Potential material in well
12	MW-12	6/19/06	S	n/a	13	3	10	1	14.81	16.33	14.15	0.66	n/a	n/a	12.72	12.06	12.09	2.09	-0.94	-
13	MW-13	6/19/06	F	n/a	13	3	10	1	9.85	10.06	9.86	-0.01	n/a	n/a	10.53	10.54	6.86	-3.14	-2.46	Potential material in well
14	MW-14	6/21/06	F	n/a	12	2	10	1	7.91	8.17	7.86	0.05	n/a	n/a	10.84	10.79	5.86	-4.14	-1.21	-
15	MW-15	6/21/06	F	n/a	16	6	10	1	8.25	8.42	8.39	-0.14	n/a	n/a	15.63	15.77	2.39	-7.61	-0.23	-
16	MW-16	6/20/06	F	n/a	17	4	13	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Wellhead submerged
17	MW-17	6/22/06	S	n/a	26	16	10	1	45.82	47.00	42.49	3.33	n/a	n/a	45.74	42.41	10.08	0.08	16.41	Wellheads raised (+) or
18	MW-18	6/26/06	S	n/a	33	23	10	1	45.83	45.87	41.81	4.02	n/a	n/a	48.91	44.89	6.92	-3.08	11.89	lowered (-) during EPA
19	MW-19	6/21/06	F	n/a	25	15	10	1	17.37	17.73	17.64	-0.27	n/a	n/a	17.65	17.92	9.72	-0.28	-7.08	wastepile regrading

Notes:

n/a = Not available
ags = Above ground surface
bgs = Below ground surface
S = Stickup well completion (above ground monument)
F = Flush mount well completion (below ground vault)
TOC = Top of casing
BTOC = Below top of casing

TABLE 5

Construction of New Groundwater Monitoring Wells and Piezometers

Halaco Site Remedial Investigation, Oxnard, California

						Year and Date Installed			Survey Information				Well Log Construction					Well Screen Elevation	
Location	Well	Aquifer	Relative Depth	Surface Completion (A/F)	Drilling Method	2009 (Oct/Nov)	2010 (May)	Date Installed	Outer TOC Elevation (feet, 1988 NAVD)	Inner TOC Elevation (feet, 1988 NAVD)	Ground Surface Elevation (feet, 1988 NAVD)	Stickup (feet ags)	Total Diameter (feet, bgs)	Total Depth (feet, bgs)	Top of Screen (feet, bgs)	Bottom of Screen (feet, bgs)	Screen Length (feet)	Calculated Top of Screen Elevation (feet, 1988 NAVD)	Calculated Bottom of Screen Elevation (feet, 1988 NAVD)
Monitoring Wells																			
2	MW-2C	Semiperched	Medium	A	Sonic	X		10/24/09	30.03	29.63	27.57	2.07	2	85.0	74.6	84.6	10	-47.03	-57.03
	MW-2D	Oxnard	Deep	A	Sonic	X		10/21/09	30.23	29.67	27.46	2.21	2	152.4	142.0	152.0	10	-114.54	-124.54
3	MW-3C	Semiperched	Medium	A	Sonic	X		10/24/09	27.42	27.10	24.77	2.33	2	85.0	74.6	84.6	10	-49.83	-59.83
	MW-3D	Oxnard	Deep	A	Sonic	X		10/20/09	27.69	27.35	25.13	2.23	2	150.4	140.0	150.0	10	-114.87	-124.87
6	MW-6C	Semiperched	Medium	A	Sonic	X		10/27/09	21.85	21.17	19.70	1.46	2	82.0	71.6	81.6	10	-51.90	-61.90
	MW-6D	Oxnard	Deep	A	Sonic	X		10/26/09	22.02	21.71	19.92	1.79	2	150.0	139.6	149.6	10	-119.68	-129.68
12	MW-12C	Semiperched	Medium	A	HSA		X	5/12/10	17.60	17.29	14.86	2.43	2	70.3	60.0	70.0	10	-45.14	-55.14
13	MW-13C	Semiperched	Medium	F	HSA		X	5/11/10	9.72	9.37	9.79	-0.42	2	66.3	56.0	66.0	10	-46.21	-56.21
19	MW-19C	Semiperched	Medium	A	Sonic	X		10/23/09	20.46	19.85	17.99	1.86	2	74.5	64.1	74.1	10	-46.11	-56.11
	MW-19D	Oxnard	Deep	A	Sonic	X		10/23/09	20.43	19.86	18.00	1.86	2	142.4	132.0	142.0	10	-114.00	-124.00
20	MW-20	Semiperched	Shallow	F	HSA	X		11/6/09	13.37	12.99	13.37	-0.38	2	30.0	19.6	29.6	10	-6.23	-16.23
21	MW-21	Semiperched	Shallow	F	HSA	X		11/6/09	9.10	8.60	9.10	-0.50	2	25.0	14.6	24.6	10	-5.50	-15.50
	MW-21C	Semiperched	Medium	F	HSA		X	5/10/10	9.03	8.65	9.10	-0.44	2	65.3	55.0	65.0	10	-45.90	-55.90
22	MW-22	Semiperched	Shallow	F	HSA	X		11/6/09	8.55	8.18	8.44	-0.26	2	24.5	14.1	24.1	10	-5.66	-15.66
23	MW-23B	Semiperched	Shallow	A	HSA		X	5/18/10	11.99	11.91	9.39	2.53	2	30.3	20.0	30.0	10	-10.61	-20.61
	MW-23C	Semiperched	Medium	A	HSA		X	5/18/10	11.81	11.48	9.02	2.46	2	65.3	55.0	65.0	10	-45.98	-55.98
24	MW-24	Semiperched	Shallow	A	HSA	X		11/9/09	17.68	16.87	14.74	2.12	2	32.4	22.0	32.0	10	-7.26	-17.26
	MW-24C	Semiperched	Medium	A	HSA		X	5/17/10	18.12	17.92	14.95	2.97	2	66.8	56.5	66.5	10	-41.55	-51.55
25	MW-25B	Semiperched	Shallow	A	HSA		X	5/13/10	12.31	12.06	9.56	2.50	2	30.3	20.0	30.0	10	-10.44	-20.44
	MW-25C	Semiperched	Medium	A	HSA		X	5/13/10	12.42	12.21	9.60	2.62	2	65.3	55.0	65.0	10	-45.40	-55.40
27	MW-27B	Semiperched	Shallow	A	HSA		X	5/14/10	11.70	11.54	8.90	2.64	2	30.3	20.0	30.0	10	-11.10	-21.10
	MW-27C	Semiperched	Medium	A	HSA		X	5/14/10	11.73	11.44	8.86	2.58	2	65.3	55.0	65.0	10	-46.14	-56.14
Piezometers																			
1	PZ-1A	Semiperched	Shallow	F	DP	X		11/3/09	8.67	8.55	8.66	-0.11	0.75	10.5	9.5	10.5	1	-0.84	-1.84
	PZ-1B	Semiperched	Medium	F	DP	X		11/3/09	8.65	8.34	8.64	-0.29	0.75	20.5	19.5	20.5	1	-10.86	-11.86
	PZ-1C	Semiperched	Deep	F	HSA	X		11/5/09	8.65	8.39	8.64	-0.25	0.75	32.5	31.5	32.5	1	-22.86	-23.86
2	PZ-2A	Semiperched	Shallow	F	DP	X		11/3/09	9.31	9.13	9.30	-0.17	0.75	10.5	9.5	10.5	1	-0.20	-1.20
	PZ-2B	Semiperched	Medium	F	DP	X		11/3/09	9.35	9.19	9.34	-0.16	0.75	20.5	19.5	20.5	1	-10.16	-11.16
	PZ-2C	Semiperched	Deep	F	HSA	X		11/5/09	9.22	9.00	9.21	-0.22	0.75	32.5	31.5	32.5	1	-22.29	-23.29
3	PZ-3A	Semiperched	Shallow	A	HSA	X		11/10/09	17.12	17.00	15.24	1.76	0.75	10.5	9.5	10.5	1	5.74	4.74
	PZ-3B	Semiperched	Medium	A	HSA	X		11/10/09	17.31	17.08	15.22	1.86	0.75	20.5	19.5	20.5	1	-4.28	-5.28
	PZ-3C	Semiperched	Deep	A	HSA	X		11/9/09	17.29	17.11	15.28	1.83	0.75	32.5	31.5	32.5	1	-16.22	-17.22
4	PZ-4A	Semiperched	Shallow	A	HSA	X		11/9/09	15.41	15.07	13.36	1.71	0.75	10.5	9.5	10.5	1	3.86	2.86
	PZ-4B	Semiperched	Medium	A	HSA	X		11/9/09	15.38	15.07	13.25	1.82	0.75	20.5	19.5	20.5	1	-6.25	-7.25
	PZ-4C	Semiperched	Deep	A	HSA	X		11/6/09	15.18	15.02	13.12	1.90	0.75	32.5	31.5	32.5	1	-18.38	-19.38

Notes:

A = Above ground (monument)
F = Flush with ground (vault)

ags = Above ground surface
bgs = below ground surface

HSA = Hollow Stem Auger
DP = Direct Push

TABLE 6
Request for Analysis, Groundwater Samples
Halaco Site Remedial Investigation

					Metals		TPH		General Chemistry		Field
Area	**No. of Sample Loca-tions**	**Aquifer**	**Sample ID**	**QC Sample**	**TAL Metals - Total (unfiltered)**	**TAL Metals - Dissolved (field-filtered)**	**TPH-diesel (no clean up)**	**TPH-diesel - Modified (with cleanup)**	**TDS, Hardness, Alkalinity (all forms), Anions (Cl, SO4, F, Br), NO3, NO2,**	**NH3, TKN**	**Field (EC, pH, T, Eh, DO, turbidity) ***
				Temperature	4 degrees C						-
				Preservative	HNO3 pH<2	HNO3 pH<2	-	-	-	H2SO4 pH<2	-
				Container	1-0.5L Poly	1-0.5L Poly	2-1L Amber Glass	2-1L Amber Glass	1-1L Poly	1-0.5L Amber Glass	-
				Holding Time, Extraction	-	-	14 days	14 days	Variable (48 hr min for NO3)^^	-	-
				Holding Time, Analysis	6 mths^	6 mths^	40 days	40 days		28 days	-
New wells, Cluster 1	3	Semiperched	GW- Well_Name-EventDate	Note							
			MW-28B-mmyy		X	X	X	X	X	X	X
			MW-28C-mmyy		X	X	X	X	X	X	X
			MW-29B-mmyy		X	X	X	X	X	X	X
New wells, Cluster 2	3	Semiperched	GW- Well_Name-EventDate								
			MW-30B-mmyy		X	X	X	X	X	X	X
			MW-30C-mmyy	**	X	X	X	X	X	X	X
			MW-130C-mmyy	Duplicate	D	D	D	D	D	D	-
			MW-31B-mmyy		X	X	X	X	X	X	X
New wells, Cluster 3	3	Semiperched	GW- Well_Name-EventDate								
			MW-32B-mmyy		X	X	X	X	X	X	X
			MW-32C-mmyy		X	X	X	X	X	X	X
			MW-33B-mmyy		X	X	X	X	X	X	X
Existing wells	5	Semiperched	GW- Well_Name-EventDate								
			MW-12-mmyy		X	X	X	X	X	X	X
			MW-21-mmyy		X	X	X	X	X	X	X
			MW-23C-mmyy		X	X	X	X	X	X	X
			MW-25C-mmyy	**	X	X	X	X	X	X	X
			MW-125C-mmyy	Duplicate	D	D	D	D	D	D	-
			MW-27C-mmyy		X	X	X	X	X	X	X
Existing wells	4	Oxnard	GW- Well_Name-EventDate								
			MW-2D-mmyy		X	X	X	X	X	X	X
			MW-3D-mmyy		X	X	X	X	X	X	X
			MW-6D-mmyy		X	X	X	X	X	X	X
			MW-19D-mmyy		X	X	X	X	X	X	X
Total	**18**				**20**	**20**	**20**	**20**	**20**	**20**	**18**

Notes:
(*) QC samples not collected for field paramters.
(**) = Collect Duplicate sample.
(^) = Holding time for metals is 6 months, except for mercury which is 28 days.

TABLE 7
Request for Analysis, Equipment Blanks
Halaco Site Remedial Investigation

			Metals	TPH		General Chemistry	
Matrix	**No. of Samples**	**Sample ID**	**TAL Metals**	**TPH-diesel (no clean up)**	**TPH-diesel - Modified (with cleanup)**	**TDS, Hardness, Alkalinity (all forms), Anions (Cl, SO4, F, Br), NO3, NO2,**	**NH3, TKN**
		Temperature	4 degrees C				
		Preservative	HNO3 pH<2	-	-	-	H2SO4 pH<2
		Container	1-0.5L Poly	2-1L Amber Glass	2-1L Amber Glass	1-1L Poly	1-0.5L Amber Glass
		Holding Time, Extraction	-	14 days	14 days	Variable (48 hr min for NO3)^^	-
		Holding Time, Analysis	6 mths^	40 days	40 days		28 days
Water	2	GW- EB-mmyy-xxx					
		EB-mmyy-001	X	X	X	X	X
		EB-mmyy-002	X	X	X	X	X
Total	2		2	2	2	2	2

Notes:
(^) = Holding time for metals is 6 months, except for mercury which is 28 days.
(^^) = Holding times: NO3 and NO2 - 48 hours, TDS - 7 days, Alkalinity - 14 days, and Anions (Cl, SO4, F, Br) - 28 day

REGION 9 SAMPLE COORDINATION CENTER (RSCC)
SUPERFUND ANALYTICAL REQUEST FORM

Section 1

Sampling Event Name: Additional Groundwater Sampling		
Site Name: Halaco Superfund Site	**Sampling Dates:** February or March 2013	
[X] RI/FS [ ] RA [ ] Enforcement [ ] PA/SI [ ] Emergency Resp. [ ] Fed. Facilities		
Site Spill ID: X6	**OU: 00**	**CERCLIS ID:** CAD009688052
EPA Project Manager: Wayne Praskins	**Phone:** (415) 972-3181	**Mail Code:** SFD-7

Section 2

Sampling Organization (if other than above): CH2M HILL	
Mailing Address: 375 East Hillcrest Dr., #125 Thousand Oaks, CA 91360	
Project Manager: Mark Wuttig	**E-mail:** mwuttig@ch2m.com
Office Phone: 805-371-7817, ext. 38073	**Office Fax:** 805-371-7818
Sampler: Cem Kamali	**E-mail:** ckamali@ch2m.com
Office Phone: 714-435-6247	**Mobile Phone:** 714-651-7336

Section 3

Title of QA plan or addendum to existing plan under which this sampling event will occur: Addendum No. 2 to the September 2009 Remedial Investigation Sampling and Analysis Plan, Halaco Superfund Site, Oxnard, CA

EPA Quality Assurance Office DCN: Marlon Mezquita, PE

In compliance with EPA Order 5360.1, the EPA Region 9 Quality Management Plan, Section 1.1.2, states that, "An appropriate QA planning document … will be developed and approved for each environmental data collection activity prior to the initiation of data collection."

Section 4

Type of Data Deliverable	Data Distribution (include e-mail address if appropriate)
Hard copy report	1. Mark Wuttig (mwuttig@ch2m.com) 2. Wayne Praskins (Praskins.wayne@epa.gov)
Electronic report copy	1. Mark Wuttig (mwuttig@ch2m.com) 2. Wayne Praskins (Praskins.wayne@epa.gov)
Electronic Data Deliverable (EDD) for R9 Lab Results*	1. Mark Wuttig (mwuttig@ch2m.com) 2. Wayne Praskins (Praskins.wayne@epa.gov)

* Excel table. Other EDD formats may be available upon request

Section 5
(Fill in table or attach copy of analytical description from Sampling and Analysis Plan)

Analysis (method, CLP SOW number, or R9 Lab SOP number)	Matrix	No. of samples	TAT*
CLP ILM05.4 (TAL Metals)	Water	22	standard
EPA 8015M (TPH-diesel range)	Water	22	standard
EPA 8015M (TPH-diesel range, with cleanup to remove polar substances that interfere with the TPH analysis)	Water	22	standard
EPA 350.2 (Ammonia)	Water	22	standard
EPA 120 (Electrical Conductivity)	Water	22	standard
EPA 160.1 (Total Dissolved Solids)	Water	22	standard
EPA 130 (Hardness)	Water	22	standard
EPA 150 (pH)	Water	22	standard
SM2320B (Bicarbonate, Carbonate, Hydroxide Alkalinity as $CaCO_3$)	Water	22	standard
EPA 300 (Chloride, Sulfate, Nitrate, Nitrite, Fluoride, Bromide)	Water	22	standard
EPA 351.2 (Total Kjeldahl Nitrogen)	Water	22	standard

* See instructions

For CLP VOCs and/or SVOCs, are matrix spike/matrix spike duplicate (MS/MSD) required for this project? _____Yes X No (not applicable)

Section 6
Include (or attach separately) any discussion of expanded or reduced analyte lists, required reporting limits, specialized preparation or analytical procedures, etc.

A full documentation package, including raw data and sample custody documentation, will be generated and kept on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Rose Fong or Joe Eidelberg at the Region 9 Quality Assurance Office.

See below for analyte lists and required reporting limits.

WATER MATRIX ANALYSES

CLP ILM05.4 (TAL Metals) – Water

Analyte	Required Project Criteria Water (ug/L)	ILM05.4 CRQL ICP-AES Water (ug/L)	ICP-MS Water (ug/L)
Aluminum *	87	200	--
Antimony	6	60	2
Arsenic *	0.045	10	1
Barium *	4	200	10
Beryllium *	0.66	5	1
Cadmium *	0.25	5	1
Calcium	116000	5000	--
Chromium	50	10	2
Cr +3	74		
Cr +6	11		
Cobalt	11	50	1
Copper	3.1	25	2
Iron	1000	100	--
Lead	2.5	10	1
Magnesium	82000	5000	--
Manganese	120	15	1
Mercury	0.63	0.2	--
Nickel	8.2	40	1
Potassium	53000	5000	--
Selenium	50	35	5
Silver *	0.36	10	1
Sodium	680000	5000	--
Thallium	2	25	1
Vanadium	20	50	5
Zinc	81	60	2

EPA 8015M – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
TPH-diesel	NC	1
TPH-diesel, with cleanup	NC	1

Note: NC = no specific criteria as these analytes are being evaluated for general assessment purposes

EPA 350.2 (Ammonia) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Ammonia	NC	0.3

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes

EPA 120 (Electrical Conductivity) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Electrical Conductivity (EC)	NC	TBD

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes; TBD = To be determined upon selection of analytical laboratory

EPA 160.1 (Total Dissolved Solids) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Electrical Conductivity (EC)	NC	TBD

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes; TBD = To be determined upon selection of analytical laboratory

EPA 130 (Hardness) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Electrical Conductivity (EC)	NC	TBD

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes; TBD = To be determined upon selection of analytical laboratory

EPA 150 (pH) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Electrical Conductivity (EC)	NC	TBD

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes; TBD = To be determined upon selection of analytical laboratory

EPA 2320B – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Bicarbonate Alkalinity as $CaCO_3$	NC	20
Carbonate Alkalinity as $CaCO_3$	NC	20
Hydroxide Alkalinity as $CaCO_3$	NC	20

Note: NC = no specific criteria as these analytes are being evaluated for general assessment purposes

EPA 300 (Major Anions) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Chloride	NC	1
Sulfate	NC	1
Nitrate	NC	0.1
Nitrite	NC	0.1
Fluoride	NC	0.1
Bromide	NC	1

Note: NC = no specific criteria as these analytes are being evaluated for general assessment purposes; TBD = To be determined upon selection of analytical laboratory

EPA 351.2 (TKN) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Total Kjeldahl Nitrogen	NC	0.1

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes

EPA 415 (Total Organic Carbon) – Water

	Project-specific criteria	Reporting Limit/Target Detection Limit (mg/L)
Total Organic Carbon	NC	2

Note: NC = no specific criteria as this analyte is being evaluated for general assessment purposes