Casmalia Site Remediation

RI/FS Work Plan Supplement

Geophysics Experimental Plan

Prepared for:

USEPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Prepared by:

Casmalia Resources Site Steering Committee

CB Consulting, Inc.

Linda Bertelsen, P.E.

MACTEC Engineering and Consulting, Inc.

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February , 2004

1.0 INTRODUCTION

The Casmalia Resources Site Steering Committee (CSC) has prepared this Geophysics Survey Experimental Plan (Experimental Plan) as a supplement to the Remedial Investigation/ Feasibility Study (RI/FS) Work Plan for the Casmalia Hazardous Waste Management Facility (site). The CSC is submitting the draft Experimental Plan to the United States Environmental Protection Agency (USEPA) by March 1, 2004 as was required by EPA's January 8, 2004 letter to the CSC on this subject. The Experimental Plan describes procedures for a surface geophysical investigation at selected areas of the site to survey beneath buried waste and other areas of the site for potential low areas or depressions in the claystone weathered and unweathered (or UHSU/LHSU) contact surface. Such low spots, if present, represent potential areas where free-phase DNAPL may have accumulated in the subsurface. As described in further detail in the revised Final RI/FS Work Plan (dated January 31, 2004) the potential low spots detected by the geophysical investigation will be targeted for intrusive investigations including CPT work and the possible installation of DNAPL observation wells.

The geophysical investigation will include two parts: a Pilot Study and a Production Survey. Accordingly, this Experimental Plan is divided into two parts. Part A presents procedures for the Pilot Study and Part B presents procedures for the Production Survey. The Pilot Study will be a test survey on the toe of the Pesticide/Solvent (P/S) Landfill, where there are large amounts of drummed waste. The Production Survey will scan a much larger portion of the site that includes the Burial Trench Area, Central Drainage Area, and selected areas south of the PSCT. The Production Survey will be expanded to include the P/S Landfill if the Pilot Study results show that surface geophysics can be effective there. The Pilot Study and Production Survey areas are shown on Figure EP-1.

The CSC will test seismic refraction, seismic reflection, and micro-gravity methods for the Pilot Study at the P/S Landfill, whereas the Production Survey will be performed using seismic refraction. The CSC selected seismic refraction as the primary investigation method because previous geophysical surveys along the Casmalia site perimeter (*RI/FS Work Plan, Section 5.2.10 and Appendix A.4, Woodward and Clyde, 1988a*) have demonstrated that the contact between the weathered and unweathered claystone (designated as the Upper and Lower Hydrostratigraphic Units (HSU), respectively) can be detected with refraction.

At this time, the CSC is concerned that seismic refraction or seismic reflection (or any other surface geophysical method for that matter) cannot effectively assess subsurface conditions at the P/S Landfill due to the presence of large amounts of drummed waste. Accordingly, as discussed with USEPA, the CSC will perform a Pilot Study to test the performance of seismic refraction, seismic reflection, and micro-gravity at the P/S Landfill. Seismic reflection was selected in addition to seismic refraction because its high-resolution capabilities might prove effective for delineating subsurface features beneath buried waste; additionally, because seismic reflection requires shorter surface array length than refraction (for a given investigation depth) a refection survey can be focused more directly within the toe of the P/S Landfill. Micro-gravity was selected to test the possibility that potential low areas can be revealed through density contrasts between the native claystone and buried waste.

The geophysical investigation will be performed by a qualified geophysical subcontractor to be selected by the CSC. The geophysics team will comprise a crew chief, whose primary responsibilities will be data quality control, geophysical instrument operation, and field logbook maintenance, one or more technicians, and a geophysical analyst who will process and interpret the data. It is expected both the CSC and USEPA will participate in the data interpretation. The CSC will provide direct field oversight and it is assumed that the USEPA will also maintain a field presence.

The investigation end products will include a written report to the USEPA. The report will describe equipment and field procedures, describe and explain data processing sequences, detail any problems encountered, and present the investigation results and interpretation. The report will also include survey location maps, data contour maps and profiles, and intermediate data processing products as appropriate. Additionally, the report will include a CD with raw and final processed data, scanned images of the field logbook, and a digital copy of the report document itself.

PART A – PILOT STUDY

A.1 Pilot Study Overview

As stated previously, the Pilot Study objective is to test the effectiveness of seismic refraction, seismic reflection, and micro-gravity at the P/S Landfill, where it is feared that large amounts of drummed waste may degrade data quality to such a degree that useable subsurface information cannot be obtained. The Pilot Study will be performed along co-located seismic and micro-gravity lines so the results from the three different geophysical methods can be directly compared. Two Pilot Study test lines are planned. The first line will be positioned across the toe of the P/S Landfill, along bench 1. The second line will be positioned along the landfill axis to intersect the first line in a north-south direction (Figure EP-2). To the extent possible, the test lines have been positioned to include "ground truth" locations where refuse thickness and/or the depth of the Upper/Lower HSU contact has been documented. As shown on Figure EP-2, potential ground truth locations in the immediate vicinity of the P/S Landfill toe are limited to the Gallery Well, PZ-LA-01, and possibly RP-20B. These boreholes show that the Upper/Lower HSU contact depth ranges between 70 and 90 feet below ground surface (bgs) in the landfill toe area; however, other areas of the P/S Landfill reportedly contain up to 140 feet of waste. Accordingly, the planned investigation depth for the geophysical Pilot Study will be 150 feet.

A.2 Seismic Refraction Test Survey

A.2.1 Seismic Refraction Field Plan

The seismic refraction line locations for the Pilot Study are shown on Figure EP-2. The USEPA has advised that the sensor array length for seismic refraction should be eight times the investigation depth. Given an investigation depth of 150 feet, this equates to a sensor array (spread) length of 1200 feet. The CSC notes that a 1200-foot long east-west spread will extend beyond the P/S Landfill, approaching the Metals Landfill to the east and crossing the PSCT Trench to the west (Figure EP-2). While this does provide the opportunity to use TP-4 and SW-15 for additional ground truth, the CSC recognizes the potential for degradation of data quality along the east-west line. Degradation will be result from ray path disruption and energy attenuation as the seismic energy crosses lateral discontinuities at the PSCT Trench and P/S Landfill boundaries (in addition to degradation caused by the drummed waste itself). Close attention will be paid to these issues during data acquisition, processing, and interpretation.

The CSC plans to use a geophone spacing of 12.5 feet in keeping with the parameters of the seismic refraction production survey, which is designed to provide sufficient resolution potential to detect subsurface features on the order of 25 feet in diameter (although both the CSC and USEPA have acknowledged that a 25-foot target likely will not be detected beneath 140 feet of refuse at the P/S Landfill). Accordingly, a 96-channel seismic system will be required to achieve 1200-foot long spreads with a 12.5-foot geophone separation. It is anticipated that 5 shotpoints per spread will be used to facilitate data processing and interpretation using the generalized reciprocal method (GRM), a technique for delineating undulating refractors (contacts). Explosives are often used to generate enough seismic energy for such long refraction spreads; however, the CSC understands that explosives cannot be used at the Casmalia site. Therefore, seismic energy will likely be produced with an accelerated weight drop system such as the Geometrics PWD-80, a highly mobile pickup truck mounted system that can be readily moved along the seismic line. As one of the Pilot Study goals is to optimize data acquisition parameters for the subsequent seismic refraction Production Survey, other seismic sources may be tested.

As shown on Figure EP-2, the north-south refraction spread will be placed adjacent to the Gallery Well and the east-west spread will be placed alongside PZ-LA-01 and RP-20B. A fiberglass tape measure will be used to position the geophones and mark the shotpoint locations. The locations and elevations will then be surveyed to 0.01-foot accuracy by a licensed land surveyor.

The seismic refraction Pilot Study test survey will be performed in close communication with the USEPA and the CSC expects that a USEPA representative will be present during fieldwork to provide input and approve field decisions. The CSC will process and evaluate the data immediately upon completion of the fieldwork and, in conjunction with the USEPA, make a determination as to whether or not seismic refraction can reliably and accurately detect the Upper/Lower HSU contact, or the buried waste/native claystone contact, at the P/S Landfill. As part of the data evaluation, the CSC will provide the USEPA will all raw and processed data to facilitate agreement on data processing sequence and agreement on the final interpretation. The CSC will verbally discuss the results of the refraction test survey with USEPA before the Pilot Study final report is issued.

Details of the seismic refraction Pilot Study test survey are summarized below:

Investigation Depth 150 feet bgs

Spread Length 1200 feet (assuming spread length = 8 x investigation depth as stipulated by USEPA)

Geophone Spacing 12.5 feet, nominal

Seismograph Geometrics StrataVisor, or equivalent

Seismic Source Geometrics PWD-80, or equivalent

Shotpoint Spacing 300 feet (nominal), five shotpoints per spread

Positioning Tape measure for layout, followed by licensed land surveyor for horizontal and vertical to 0.01 foot

Ground Truth

Well ID	Depth to U/L HSU Contact *
Gallery Well	69 ft
PZ-LA-01	94 ft
RP-20B	74 ft
TP-4	61 ft
SW-15	53 ft
WP-8D	79 ft

(* from Well Inventory Summary, Table 4 and 2003 Topography-- see Appendix B)

Data Processing Field preview for QC using seismograph software on-board
Final processing using Generalized Reciprocal Method (GRM) software

Deliverables Report with location map, interpreted velocity profiles, TD plots, raw data with first break picks, and copy of field logbook. (provided in hardcopy and CD as appropriate)

A.2.2 Seismic Refraction Field Procedures

Health and Safety

The CSC has prepared a Heath and Safety Plan for field work at the Casmalia site (*Casmalia Hazardous Waste Management Facility, Safety and Health Plan, Revision 5.0, March 24, 2003*, MACTEC 2003). Additionally, a hazard analysis specific to the geophysics work, along with a hospital route map, is included in Appendix A.

Pre-Mobilization

The following steps will be taken before mobilization to the Casmalia site:

1. Review and discuss pertinent information and data (e.g., maps, borehole data, results of previous refraction surveys)
2. Review and discuss survey objectives — investigation depth and estimated target size
3. Review and discuss survey parameters (e.g., spread length, geophone spacing, number of shotpoints)
4. Obtain necessary permissions/permits (e.g., for site access, off road travel)
5. Review seismic survey coverage (i.e., spread placement, shotpoint locations) displayed on Figure EP-2.
6. Bench test field equipment. Check/set seismograph date and time as appropriate
7. Gather and load equipment and tools, including redundant geophones and cables for backup in case of equipment failure in field.
8. Mobilize to site.

On Site

These procedures will be followed upon site arrival:

1. Check equipment functions the day before field work begins to insure that nothing was damaged during transport; repair/replace broken equipment, place seismograph batteries on charge, etc., as appropriate.
2. Attend kick-off meeting(s), perform site walk.
3. Re-assess seismic line placement; revise if necessary.

Data Acquisition

These procedures will be followed for data acquisition:

1. Lay out tape measure and geophone cables, trigger wires, along seismic line as appropriate. Plant geophones into ground and connect to cable. Mark shotpoint locations using spray paint, lath, pin flags, etc. Record location of nearby well(s) relative to seismic line.

2. Geophysics crew chief enters spread parameters (e.g., geophone spacing, shotpoint positions) into seismograph memory as appropriate.
3. As a final check, the geophysics crew chief walks the length of the spread.
4. From the seismograph, the crew chief checks spread connectivity and for “dead” channels/geophones. Walk line again to recheck connections, swap out cables, geophones as necessary.
5. Monitor for noise; adjust gains (if required).
6. Initiate seismic energy release at first shotpoint. Inspect resulting seismic record on seismograph view screen. Check noise levels. Check first breaks. Check again for dead channels/geophones. No more than five (5) dead channels will be allowed.
7. Crew chief, with input from USEPA as appropriate, decides if record is acceptable. Decision will be made on the basis of first break quality, noise level, and data completeness.
8. If record is acceptable, record data to seismograph memory
9. Stack data from additional shots as appropriate.
10. Record seismic data file name in field logbook.
11. Print and annotate final seismogram. Verify correct survey parameters as displayed on seismogram hardcopy.
12. Repeat for all shotpoints along spread.
13. Interpret data and perform preliminary analysis and modeling in field to assess investigation depth.
14. Test different energy source(s), as appropriate.
15. Land surveyor performs topographic survey along seismic line.
16. Plot and annotate actual seismic line location on basemap using existing site features (e.g., monitoring wells) for reference. Use GPS if practicable.
17. Crew chief verifies that appropriate information (e.g., date, time, crew, line designation & orientation, weather, noise conditions, etc.) has been recorded in field logbook.
18. Pick up spread.
19. Repeat steps 1 – 18 at second line location.
20. At day’s end: download data to laptop and backup to disk, if appropriate.
21. As appropriate, submit copy of data and field notes to USEPA

A.2.3 Seismic Refraction Data Management

Seismic refraction data will be recorded in digital format onto the seismograph’s hard drive memory as the survey progresses. A separate data file will be created at each shotpoint, and each file will be assigned a unique file name that will identify the line name and shotpoint number. Additionally, the data will be output in hardcopy format (as seismograms- waveforms from each geophone) for each shotpoint. Pertinent information about each file (e.g., date, time, seismic source location, field conditions, crew names) will also be recorded in the geophysics crew chief’s field logbook. The logbook will be scanned periodically and the resulting image files will be named according to date and seismic line so the log entries can be readily correlated to the appropriate seismic data files. The scanned log book images will be incorporated into the digital data set. Digital data will be copied onto backup media each evening. A second backup set will be made and hand-delivered to the USEPA Casmalia site trailer. The CSC will keep the first backup set in its own field office.

To track the data processing sequence, the names of the raw data files and associated processed data files, including those from velocity layer modeling runs, will be tabulated on a worksheet. File names for resulting graphics products (TD plots, velocity profiles, contour maps) will also be tabulated as appropriate. Additionally, the graphics products will be annotated with creation dates and time and the names of the data files from which they were produced. It is expected that the raw seismic waveform data will be stored in a binary format read by the processing software, while the TD and contouring data sets will be stored in an a directly readable format such as an EXCEL worksheet or ASCII text file. It is expected that the modeling runs will produce both raster and/or vector image files (e.g., .bmp and/or AutoCAD .dwg) and text files with the calculated depths to velocity layer interfaces beneath shotpoints and geophones along each seismic line.

To facilitate retrieval, data files associated with the modeling runs will be grouped according to seismic line. The raw data files for each shot point will be grouped in separate folders beneath each the seismic line folders. All files and the entire working directory structure will be burned to a CD or DVD as appropriate and provided to the USEPA when the processing and modeling has been competed.

A.3 Seismic Reflection

The seismic reflection portion of the Pilot Study will proceed as a walk-away test. In general, a walk-away test is performed at the very beginning of a reflection survey to assess the performance of the reflection method at a given site and to optimize data acquisition parameters for data production. Walk-away tests provide information about ambient noise levels and the dominant frequency of the seismic body wave generated by various seismic sources. The frequency information can be used to estimate the resolution capabilities of a reflection survey at a given site. A walk-away test employs a relatively short array of closely spaced geophones and a series of more widely-spaced shotpoints that are “walked”, or moved farther and farther away from the geophone array. This procedure enables the response from progressively deeper portions of the subsurface to be assessed. For the Pilot Study, the walk-away test will be used in lieu of a full-fledged reflection survey to determine if seismic reflection will be effective at the P/S Landfill.

As shown on Figure EP-2, two walk-away test lines are planned. The north-south line will be placed adjacent to the Gallery Well and the east-west line will be placed alongside PZ-LA-01 and RP-20B. A fiberglass tape measure will be used to position the geophones and mark the shotpoint locations. The locations and elevations will then be surveyed to 0.01-foot accuracy by a licensed land surveyor. The CSC will use a 96 channel seismic system and geophone group spacing of 5 feet for a geophone array length of up to 480 feet, which should be sufficient to examine the reflection response to a depth of 150 feet. Unlike seismic refraction, seismic reflection can achieve deeper investigation depths with a relatively short geophone array (lateral coverage is achieved by moving, or “rolling”, geophones along the seismic line). Accordingly, the CSC will fit the geophone array for east-west test line (along bench 1) into the landfill toe, a distance of approximately 400 feet. The north-south array along the P/S landfill axis will be extended the full 480 feet. For each line, the near shotpoint will be placed 5 feet from the first geophone and three more shotpoints will be placed at 100-foot intervals to test the response at greater offset distances and with a source across the landfill boundary, in the case of the east-west test line.

Seismic energy will be produced with an accelerated weight drop system such as the Geometrics PWD-80, a highly mobile pickup truck mounted system that can be readily moved along the seismic line. Other seismic sources, such as hammer and plate, may also be tested.

The seismic reflection walk-away test survey will be performed in close communication with the USEPA and the CSC expects that a USEPA representative will be present during fieldwork to provide input and approve field decisions. The CSC will process and evaluate the data immediately upon completion of the fieldwork and, in conjunction with the USEPA, make a determination as to whether or not seismic reflection can image the Upper/Lower HSU contact, or the buried waste/native claystone contact, at the P/S Landfill. As part of the data evaluation, the CSC will provide the USEPA will all raw and processed data to facilitate agreement on data processing sequence and agreement on the final interpretation. The CSC will verbally discuss the results of the walk-away test survey with USEPA before the Pilot Study final report is issued.

Details of the seismic reflection walk-away test are summarized below:

Investigation Depth 150 feet bgs

Spread Length Line 1, east-west = 400 feet
Line 2, north-south = 480 feet

Geophone Spacing 5 feet, nominal

Seismograph Geometrics StrataVisor, or equivalent

Seismic Source Geometrics PWD-80, or equivalent

Shotpoint Spacing From first geophone 5 feet, 100, 200, 300 (4 shotpoints per test)

Positioning Tape measure for layout, followed by licensed land surveyor for horizontal and vertical to 0.01 foot

Ground Truth

Well ID	Depth to U/L HSU Contact *
Gallery Well	69 ft
PZ-LA-01	94 ft
RP-20B	74 ft
TP-4	61 ft
SW-15	53 ft
WP-8D	79 ft

* from Well Inventory Summary, Table 4 and 2003 Topography

Data Processing Field preview for QC using seismograph software on-board
Final processing using WinSeis or similar program suite

Deliverables Report with body wave frequency analysis and assessment of resolution capabilities of reflection survey. Raw data and walk-away data panels including trace amplitude vs. source-receiver distance, results of filtering operations, copy of field logbook. (provided in hardcopy and CD as appropriate)

A.3.1 Seismic Reflection Walk-Away Test Field Procedures

Health and Safety

The CSC has prepared a Heath and Safety Plan for field work at the Casmalia site (*Casmalia Hazardous Waste Management Facility, Safety and Health Plan, Revision 5.0, March 24, 2003*, MACTEC 2003). Additionally, a hazard analysis specific to the geophysics work, along with a hospital route map, is included in Appendix A.

Pre-Mobilization

The following steps will be taken before mobilization to the Casmalia site:

1. Review and discuss pertinent information and data (e.g., maps, borehole data, information from seismic refraction surveys)
2. Review and discuss survey objectives — investigation depth and estimated target size
3. Review and discuss survey parameters (e.g., spread length, geophone spacing, number and location of shotpoints)
4. Obtain necessary permissions/permits (e.g., for site access, off road travel)
5. Review walk-away test line locations (i.e., spread placement, shotpoint locations) displayed on Figure EP-2.
6. Bench test field equipment. Check/set seismograph date and time as appropriate
7. Gather and load equipment and tools, including redundant geophones and cables for backup in case of equipment failure in field.
8. Mobilize to site.

On Site

These procedures will be followed upon site arrival:

1. Check equipment functions the day before field work begins to insure that nothing was damaged during transport; repair/replace broken equipment, place seismograph batteries on charge, etc., as appropriate.
2. Attend kick-off meeting(s), perform site walk.
3. Re-assess test line placement; revise if necessary.

Data Acquisition

These procedures will be followed for data acquisition:

1. Lay out tape measure and geophone cables, trigger wires, along seismic line as appropriate. Plant geophones into ground and connect to cable. Mark shotpoint locations using spray paint, lath, pin flags, etc. Record location of nearby well(s) relative to seismic line.
2. Geophysics crew chief enters spread parameters (e.g., geophone spacing, shotpoint positions) into seismograph memory as appropriate.
3. As a final check, the geophysics crew chief walks the length of the spread.
4. From the seismograph, the crew chief checks spread connectivity and for “dead” channels/geophones. Walk line again to recheck connections, swap out cables, geophones as necessary.

5. Monitor for noise; adjust gains (if required).
6. Initiate seismic energy release at first shotpoint. Inspect resulting seismic record on seismograph view screen. Check noise levels. Check first breaks. Check again for dead channels/geophones. No more than five (5) dead channels will be allowed.
7. Crew chief, with input from USEPA as appropriate, decides if record is acceptable. Decision will be made on the basis of apparent reflector continuity, noise level, and data completeness.
8. If record is acceptable, record data to seismograph memory
9. Record seismic data file name in field logbook.
10. Print and annotate final seismogram. Verify correct survey parameters as displayed on seismogram hardcopy
11. Repeat for all shotpoints.
12. Test different energy source(s), as appropriate.
13. Land surveyor performs topographic survey along seismic line.
14. Plot and annotate actual walk-away test line location on basemap using existing site features (e.g., monitoring wells) for reference. Use GPS if practicable.
15. Crew chief verifies that appropriate information (e.g., date, time, crew, line designation & orientation, weather, noise conditions, etc.) has been recorded in field logbook.
16. Pick up spread.
17. Repeat steps 1 – 16 at second line location.
18. At day's end: download data to laptop and backup to disk, if appropriate.
19. As appropriate, submit copy of data and field notes to USEPA

A.2.3 Seismic Reflection Data Management

Seismic reflection data will be recorded in digital format onto the seismograph's hard drive memory as the survey progresses. A separate data file will be created at each shotpoint, and each file will be assigned a unique file name that will identify the line name, shotpoint number, and seismic source type as appropriate. Additionally, the data will be output in hardcopy format (as seismograms- waveforms from each geophone) for each shotpoint. Pertinent information about each file (e.g., date, time, seismic source location, field conditions, crew names) will also be recorded in the geophysics crew chief's field logbook. The logbook will be scanned periodically and the resulting image files will be named according to date and seismic line so the log entries can be readily correlated to the appropriate seismic data files. The scanned log book images will be incorporated into the digital data set. Digital data will be copied onto backup media each evening. A second backup set will be made and hand-delivered to the USEPA Casmalia site trailer. The CSC will keep the first backup set in its own field office.

To track the data processing sequence, the names of the raw data files and associated processed data files, including those from filter tests and frequency analyses, will be tabulated on a worksheet. File names for resulting graphics products (e.g., filter panels, amplitude spectra) will also be tabulated as appropriate. Additionally, the graphics products will be annotated with creation dates and time and the names of the data files from which they were produced. It is expected that the raw seismic waveform data will be stored in a binary format read by the seismic processing software.

To facilitate retrieval, data files associated with the modeling runs will be grouped according to seismic line. The raw data files for each shot point will be grouped in separate folders beneath each the seismic line folders. All files and the entire working directory structure will be burned to a CD or DVD as appropriate and provided to the USEPA when the processing and modeling has been competed.

A.4 Micro-Gravity

Micro-gravity measurements will be made within an approximately 1100- by 1100-foot area in the P/S Landfill. Measurement station locations are shown on Figure EP-2. Micro-gravity measurements will be made at 10-foot intervals along east-west and north-south alignments coincident with the seismic test lines so the results from the two surveys can be directly compared. The 10-foot station spacing will be used within a 600- by 750-foot area centered on the toe of the P/S Landfill. The measurement spacing will be expanded to 20 feet beyond the immediate landfill toe area. This will be done to maximize data coverage within the more limited level-of-effort framework of a test survey. Approximately 210 measurements will be obtained. Gravity measurements will be made using a Graviton-EG, Lacoste & Romberg's new fully automated self-leveling gravimeter. Station locations will be measured with a fiberglass tape and marked with PVC pin flags or spray paint and will be surveyed by a licensed land surveyor to 0,01 foot accuracy to facilitate the topographic corrections necessary for optimal modeling and interpretation.

A base station will be established near the survey area. The base station will be reoccupied approximately every three hours and at the beginning and end of each day to obtain repeat measurements that will enable time-varying instrument drift to be removed from the gravity data. Gravity measurements will be recorded in the instrument's digital memory and in the geophysicist's field log book along with pertinent information such as time and station designation as appropriate. Gravity data shall be processed and interpreted immediately after the field work is completed. Deliverables will include a copy of the geophysicist's field log and appropriate data profiles (e.g., observed gravity, residual gravity, Bouguer anomaly) together with forward and inversion modeling results.

The micro-gravity test survey will be performed in close communication with the USEPA and the CSC expects that a USEPA representative will be present during fieldwork to provide input and approve field decisions. The CSC will process and evaluate the data immediately upon completion of the fieldwork and, in conjunction with the USEPA, make a determination as to whether or not micro-gravity will be useful for delineating the Upper/Lower HSU contact, or the buried waste/native claystone contact, at the P/S Landfill. As part of the data evaluation, the CSC will provide the USEPA will all raw and processed data to facilitate agreement on data processing sequence and agreement on the final interpretation. The CSC will verbally discuss the results of the micro-gravity test survey with USEPA before the Pilot Study final report is issued.

The CSC recognizes that removing the effects of the severe topography at the Casmalia site will be a critical part of the data processing sequence. Accordingly, the CSC will use three sources of topographic data for the terrain corrections: 1) Gravity measurement station elevations surveyed to 0.01 foot (vertical) by a licensed land surveyor as part of the micro-gravity test survey, 2) The most current of the detailed topographic data sets (2-foot contour interval) available for the Casmalia site, 3) regional topographic data derived from USGS topographic quadrangles. To perform the terrain correction, the raw gravity measurements and the topographic data will be input into the GEOSOFT Oasis montaj geophysical data processing system's Xcelleration Gravity and Terrain Correction Tool. The Xcelleration tool uses topographic data to generate local and regional digital elevation models (DEM) which are divided into a grid of compartments or cells centered on each gravity measurement station. The tool then calculates the average elevation within each cell and uses the difference between the cell elevation and station elevation to calculate that cell's contribution to the gravity measurement adjustment (correction) for the station. This process is repeated automatically for all cells surrounding each gravity station to obtain the total correction for that station. The grid is then re-centered on the next measurement station and the process is repeated. The resulting terrain correction values are tabulated and written to a spreadsheet alongside the original raw gravity measurements. Adjacent spreadsheet columns hold terrain-corrected measurements, and XY locations and elevations of each station. The Xcelleration tool will also be used to perform instrument drift and tide corrections and compute free air and bouguer anomaly values. The corrected data sets will be output to modeling software for analysis. The CSC appreciates the complexity of micro-gravity data processing and welcomes USEPA input on this matter.

Details of the micro-gravity test survey are summarized below:

Instrument Lacoste & Romberg Graviton-EG gravimeter, or similar instrument

Station Spacing 10 and 20 feet (approximately 210 points)

Positioning Tape measure for layout, followed by licensed land surveyor for horizontal and vertical to 0.01 foot

Ground Truth

Well ID	Depth to U/L HSU Contact *
Gallery Well	69 ft
PZ-LA-01	94 ft
RP-20B	74 ft
TP-4	61 ft
SW-15	53 ft
WP-8D	79 ft

* from Well Inventory Summary, Table 4 and 2003 Topography

Data Processing Field preview for QC by comparing baseline and base station values as survey progresses. Terrain corrections to be performed using using GEOSOFT Oasis montaj Xcelleration module. Micro-g Solutions, Inc.'s "g-Absolute" gravity processing software suite or similar product will be used for modeling.

Deliverables Report with interpretation and analysis of resolution capabilities of micro-gravity survey. Tabulated raw and corrected data and appropriate data profiles and and modeling results, copy of field logbook. (provided in hardcopy and CD as appropriate)

A.4.1 Micro-Gravity Field Procedures

Health and Safety

The CSC has prepared a Heath and Safety Plan for field work at the Casmalia site (*Casmalia Hazardous Waste Management Facility, Safety and Health Plan, Revision 5.0, March 24, 2003*, MACTEC 2003). Additionally, a hazard analysis specific to the geophysics work, along with a hospital route map, is included in Appendix A.

Pre-Mobilization

The following steps will be taken before mobilization to the Casmalia site:

1. Review and discuss pertinent information and data (e.g., maps, borehole data, borehole geophysical density logs)
2. Review and discuss survey objectives — investigation depth and estimated target size
3. Review and discuss survey parameters (e.g., station spacing, grid layout, anticipated production rate and associated data coverage)
4. Obtain necessary permissions/permits (e.g., for site access, off road travel)
5. Review grid coverage as displayed on Figure EP-2.
6. Bench test field instrument. Check/set date and time codes as appropriate
7. Pack gravimeter instrument taking care that it is adequately cushioned and secured.
8. Mobilize to site.

On Site

These procedures will be followed upon site arrival:

1. Check gravimeter the day before field work begins to insure that no damage was incurred transport; repair/replace as necessary; place battery charge, etc., as appropriate.
2. Attend kick-off meeting(s), perform site walk.
3. Re-assess station spacing, grid placement and coverage. revise if necessary.

Data Acquisition

1. Install survey grid; establish baseline and base station.
2. Obtain reading at base station, record in log book; record time.
3. Obtain readings along baseline.
4. Obtain readings along grid lines; record times at beginning of each line (minimum).
5. Revisit base station periodically (e.g., every 3 hours) and take reading.
6. After gravity measurements obtained at all grid points perform land survey to obtain location and elevation of each point.
7. Check grid location as plotted on basemap using existing site features (e.g., monitoring wells) for reference, revise as necessary
8. At day's end: download data to laptop and backup to disk, if appropriate.
9. Submit copy of data and field notes to USEPA

A.4.2 Micro-Gravity Data Management

The micro-gravity readings will be recorded in digital format onto the gravimeter's hard drive memory as the survey progresses. Additionally, the readings will be recorded in the geophysics crew chief's field logbook, as appropriate, along with other pertinent information such as date, time, seismic source location, field conditions, crew names, etc. The logbook will be scanned periodically and the resulting image files will be named with a date identifier so the log entries can be readily correlated to the appropriate micro-gravity data files. The scanned log book images will be incorporated into the digital data set. In addition to the micro-gravity data, topographic data will also be obtained for each measurement station. The topographic data in the form of an X and Y coordinate and elevation, will be obtained in a separate survey by a licensed land surveyor and comprise a vital part of the micro-gravity data set. Digital data will be copied onto backup media each evening. A second backup set will be made and hand-delivered to the USEPA Casmalia site trailer. The CSC will keep the first backup set in its own field office.

To track the data processing sequence, the names of the raw data files and associated processed data files will be tabulated on a worksheet. The CSC recognizes that terrain corrections are critical for micro-gravity data processing. Accordingly, the file name worksheet will correlate the model output with the appropriate terrain data set. File names for resulting graphics products (gravity profiles, 2D models, contour maps) will also be tabulated as appropriate. Additionally, the graphics products will be annotated with creation dates and time and the names of the data files from which they were produced. It is expected that the micro-gravity data will be stored in an a directly readable format such as ASCII text file. It is expected that the modeling runs will produce both raster and/or vector image files (e.g., .bmp and/or AutoCAD .dwg) and text files with the calculated depths to gravity layer interfaces beneath measurement stations. All files and the entire working directory structure will be burned to a CD or DVD as appropriate and provided to the USEPA when the processing and modeling has been competed.

PART B – PRODUCTION SURVEY

B.1 Production Survey Overview

A geophysical Production Survey using seismic refraction is planned for the Burial Trench Area, Central Drainage Area, and selected areas south of the PSCT trench (Figures EP-1, EP-3). The objective of the production survey is to search for potential low areas or depressions in the Upper/Lower HSU contact and for low areas in the native claystone surface beneath buried waste. As shown on Figure EP-3, the survey will be performed within an approximately 600- by 600-foot section of the Burial Trench Area, a 950- by 950 foot section of the Central Drainage Area, and a 2,000-foot long area extending approximately 300 feet south of the PSCT. Figure EP-3 shows the location of the 16 planned individual seismic refraction lines. To the extent possible, the lines are oriented parallel to slope contours and positioned along site roads to minimize topographic effects on the seismic data and to facilitate rapid data collection.

Results from the seismic refraction portion of the Pilot Study will be incorporated into the production survey as appropriate. At present, the Experimental Plan calls for a geophone spacing of 12.5 feet to provide sufficient resolution potential to detect low spots on the order of 25 feet in diameter (although both the CSC and USEPA have acknowledged that a 25-foot target likely will not be detected below 75 feet bgs). Borehole data indicates that the depth to the UHSU/LHSU contact surface is on the order of 30 to 60 feet bgs in the Production Survey Area, increasing the likelihood that 25-foot wide target will be detected. The UHSU/LHSU contact depths are presented in Appendix K of the Remedial Investigation/ Feasibility Study (RI/FS) Work Plan and are also included in Appendix B.

A 96-channel seismic system such as the Geometrics StrataVisor will be used, resulting in spreads up to 1200 feet long with a potential investigation depth of at least 150 feet. The seismic spreads in the Burial Trench Area have been shortened to approximately 800 feet, corresponding to a potential investigation depth of 100 feet. Five shotpoints per spread will be used to facilitate data processing and interpretation using the generalized reciprocal method (GRM), a technique for delineating undulating refractors (contacts). Seismic energy will be produced with an accelerated weight drop system such as the Geometrics PWD-80, a highly mobile pickup truck mounted system that can be readily moved along the seismic line.

The seismic refraction Production Survey will be performed in close communication with the USEPA and the CSC expects that a USEPA representative will be present during fieldwork to provide input and approve field decisions. The CSC will process and evaluate the data as the survey progresses. As part of the data evaluation, the CSC will provide the USEPA will all raw and processed data to facilitate agreement on data processing sequence and agreement on the final interpretation. The CSC will verbally discuss the results of the refraction production with USEPA and specifically advise of any potential low areas indicated. Final production survey results will be presented in the RI/FS report. The report will include a discussion of the results, the interpretation, and any problems encountered. The report will also include a description of equipment and field procedures. The report will include a basemap showing seismic line locations and contour maps showing the elevation of the interpreted Upper/Lower HSU contact. Raw data, along with TD plots and velocity layer model depth sections will also be included.

Details of the seismic refraction Production Survey are summarized below:

Investigation Depth	up to 150 feet bgs
Spread Length	800 to 1200 feet
Geophone Spacing	12.5 feet, nominal
Seismograph	Geometrics StrataVisor, or equivalent
Seismic Source	Geometrics PWD-80, or equivalent
Shotpoint Spacing	300 feet (nominal), five shotpoints per spread
Positioning	Tape measure for layout, followed by licensed land surveyor for horizontal and vertical to 0.01 foot
Ground Truth	**(See Appendix B)**
Data Processing	Field preview for QC using seismograph software on-board Final processing using Generalized Reciprocal Method (GRM) software
Deliverables	Report with location map, interpreted velocity profiles, TD plots, raw data with first break picks, copy of field logbook. (provided in hardcopy and CD as appropriate)

B.2 Seismic Refraction Field Procedures

Health and Safety

The CSC has prepared a Heath and Safety Plan for field work at the Casmalia site (*Casmalia Hazardous Waste Management Facility, Safety and Health Plan, Revision 5.0, March 24, 2003*, MACTEC 2003). Additionally, a hazard analysis specific to the geophysics work, along with a hospital route map, is included in Appendix A.

Pre-Mobilization

The following steps will be taken before mobilization to the Casmalia site:

1. Review and discuss pertinent information and data (e.g., maps, borehole data, results of previous refraction surveys)
2. Review and discuss survey objectives — investigation depth and estimated target size
3. Review and discuss survey parameters (e.g., spread length, geophone spacing, number of shotpoints)
4. Obtain necessary permissions/permits (e.g., for site access, off road travel)
5. Review seismic survey coverage (i.e., spread placement, shotpoint locations) displayed on Figure EP-3.
6. Bench test field equipment. Check/set seismograph date and time as appropriate

7. Gather and load equipment and tools, including redundant geophones and cables for backup in case of equipment failure in field.
8. Mobilize to site.

On Site

These procedures will be followed upon site arrival:

1. Check equipment functions the day before field work begins to insure that nothing was damaged during transport; repair/replace broken equipment, place seismograph batteries on charge, etc., as appropriate.
2. Attend kick-off meeting(s), perform site walk.
3. Re-assess seismic line placement; revise if necessary.

Data Acquisition

These procedures will be followed for data acquisition:

1. Lay out tape measure and geophone cables, trigger wires, along seismic line as appropriate. Plant geophones into ground and connect to cable. Mark shotpoint locations using spray paint, lath, pin flags, etc. Record location of nearby well(s) relative to seismic line.
2. Geophysics crew chief enters spread parameters (e.g., geophone spacing, shotpoint positions) into seismograph memory as appropriate.
3. As a final check, the geophysics crew chief walks the length of the spread.
4. From the seismograph, the crew chief checks spread connectivity and for “dead” channels/geophones. Walk line again to recheck connections, swap out cables, geophones as necessary.
5. Monitor for noise; adjust gains (if required).
6. Initiate seismic energy release at first shotpoint. Inspect resulting seismic record on seismograph view screen. Check noise levels. Check first breaks. Check again for dead channels/geophones. No more than five (5) dead channels will be allowed.
7. Crew chief, with input from USEPA as appropriate, decides if record is acceptable. Decision will be made on the basis of first break quality, noise level, and data completeness.
8. If record is acceptable, record data to seismograph memory
9. Stack data from additional shots as appropriate.
10. Record seismic data file name in field logbook.
11. Print and annotate final seismogram. Verify correct survey parameters as displayed on seismogram hardcopy.
12. Repeat for all shotpoints along spread.
13. Interpret data and perform preliminary analysis and modeling in field to assess investigation depth and plausibility of velocity layering
14. Land surveyor performs topographic survey along seismic line.
15. Plot and annotate actual seismic line location on basemap using existing site features (e.g., monitoring wells) for reference. Use GPS if practicable.
16. Crew chief verifies that appropriate information (e.g., date, time, crew, line designation & orientation, weather, noise conditions, etc.) has been recorded in field logbook.
17. Pick up spread.

18. Repeat steps 1 – 17 at next line location.
19. At day's end: download data to laptop and backup to disk, if appropriate.
20. As appropriate, submit copy of data and field notes to USEPA

B.3 Seismic Refraction Data Management

Seismic refraction data will be recorded in digital format onto the seismograph's hard drive memory as the survey progresses. A separate data file will be created at each shotpoint, and each file will be assigned a unique file name that will identify the line name and shotpoint number. Additionally, the data will be output in hardcopy format (as seismograms- waveforms from each geophone) for each shotpoint. Pertinent information about each file (e.g., date, time, seismic source location, field conditions, crew names) will also be recorded in the geophysics crew chief's field logbook. The logbook will be scanned periodically and the resulting image files will be named according to date and seismic line so the log entries can be readily correlated to the appropriate seismic data files. The scanned log book images will be incorporated into the digital data set. Digital data will be copied onto backup media each evening. A second backup set will be made and hand-delivered to the USEPA Casmalia site trailer. The CSC will keep the first backup set in its own field office.

To track the data processing sequence, the names of the raw data files and associated processed data files, including those from velocity layer modeling runs, will be tabulated on a worksheet. File names for resulting graphics products (TD plots, velocity profiles, contour maps) will also be tabulated as appropriate. Additionally, the graphics products will be annotated with creation dates and time and the names of the data files from which they were produced. In particular, computer generated contour maps will be annotated with appropriate contouring parameters such as grid cell size and gridding algorithm used.

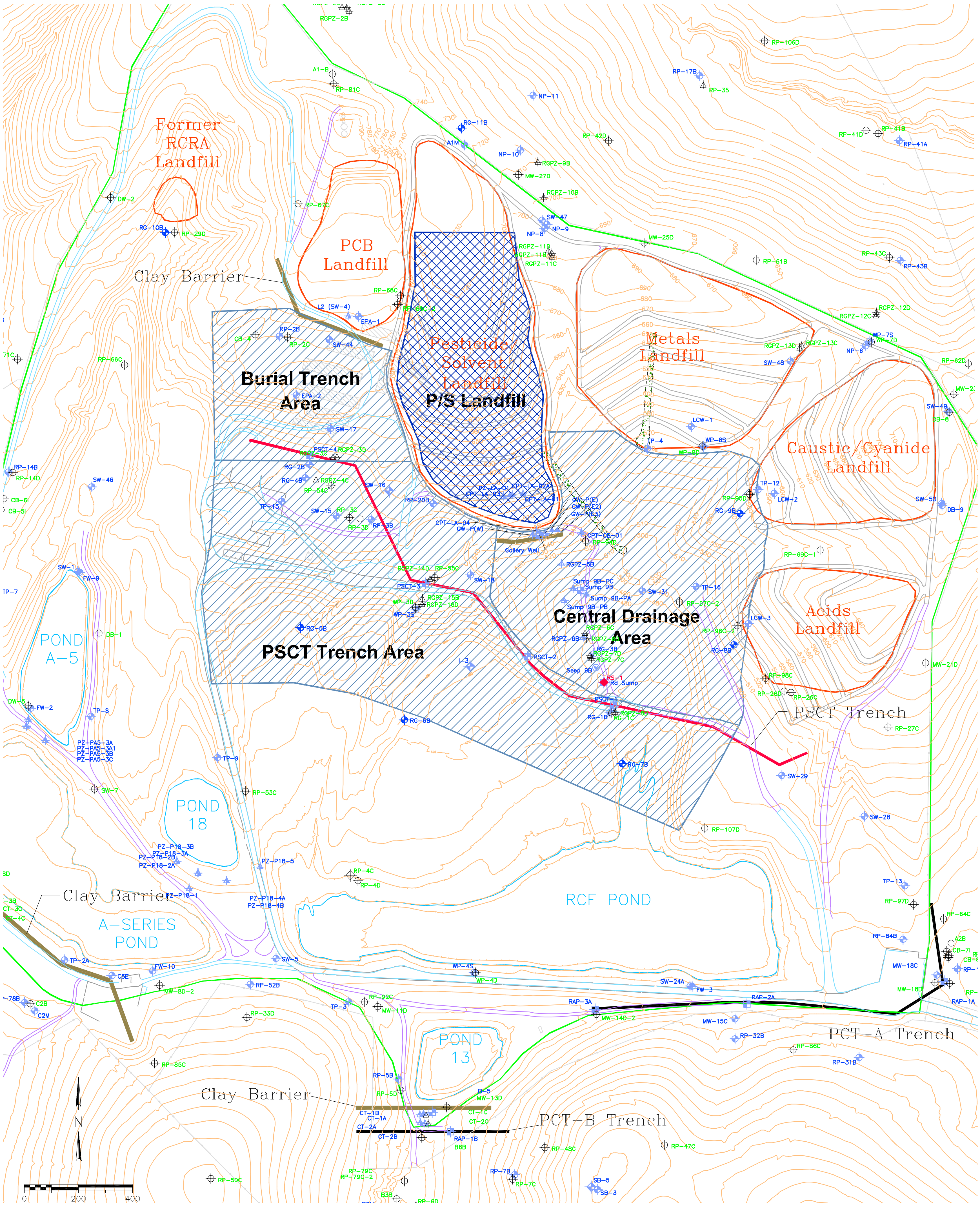
It is expected that the raw seismic waveform data will be stored in a binary format read by the processing software, while the TD and contouring data sets will be stored in an a directly readable format such as an EXCEL worksheet or ASCII text file. It is expected that the modeling runs will produce both raster and/or vector image files (e.g., .bmp and/or AutoCAD .dwg) and text files with the calculated depths to velocity layer interfaces beneath shotpoints and geophones along each seismic line.

To facilitate retrieval, data files associated with the modeling runs will be grouped according to seismic line. The raw data files for each shot point will be grouped in separate folders beneath each the seismic line folders. All files and the entire working directory structure will be burned to a CD or DVD as appropriate and provided to the USEPA when the processing and modeling has been competed.

Attachments:

Figure EP-1 Pilot Study and Production Survey Area Map
Figure EP-2 Pilot Study Line and Grid Point Locations
Figure EP-3 Production Survey Line Locations
Figure EP-4 Hospital Route Map

Appendix A Geophysical Survey Hazard Analysis
Appendix B Well Inventory Summary, Table 4



LEGEND

Pilot Study Area:

Production Survey Area:

Burial trench

Landfill Boundaries

Facility and Zone 1 boundary

Perimeter source control trench (PSCT)

Plume capture collection trench (PCT)

Clay Barrier

MW-15C Upper HSU monitoring well

GW-P(E) Upper HSU piezometer

RAP-2A Upper HSU extraction point

SW-10 Upper HSU other well

POND18 Upper HSU surface water sample

RP-63C Lower HSU monitoring well

CT-1C Lower HSU piezometer

WP-5D Lower HSU other well

NOTES:

Topo map revised 1998, 2000, 2003. Topo with P/S landfill and borrow area revised 2000. (Foster-Wheeler).

Zone 1 boundary (green) is approximate and includes the area within the facility boundary.

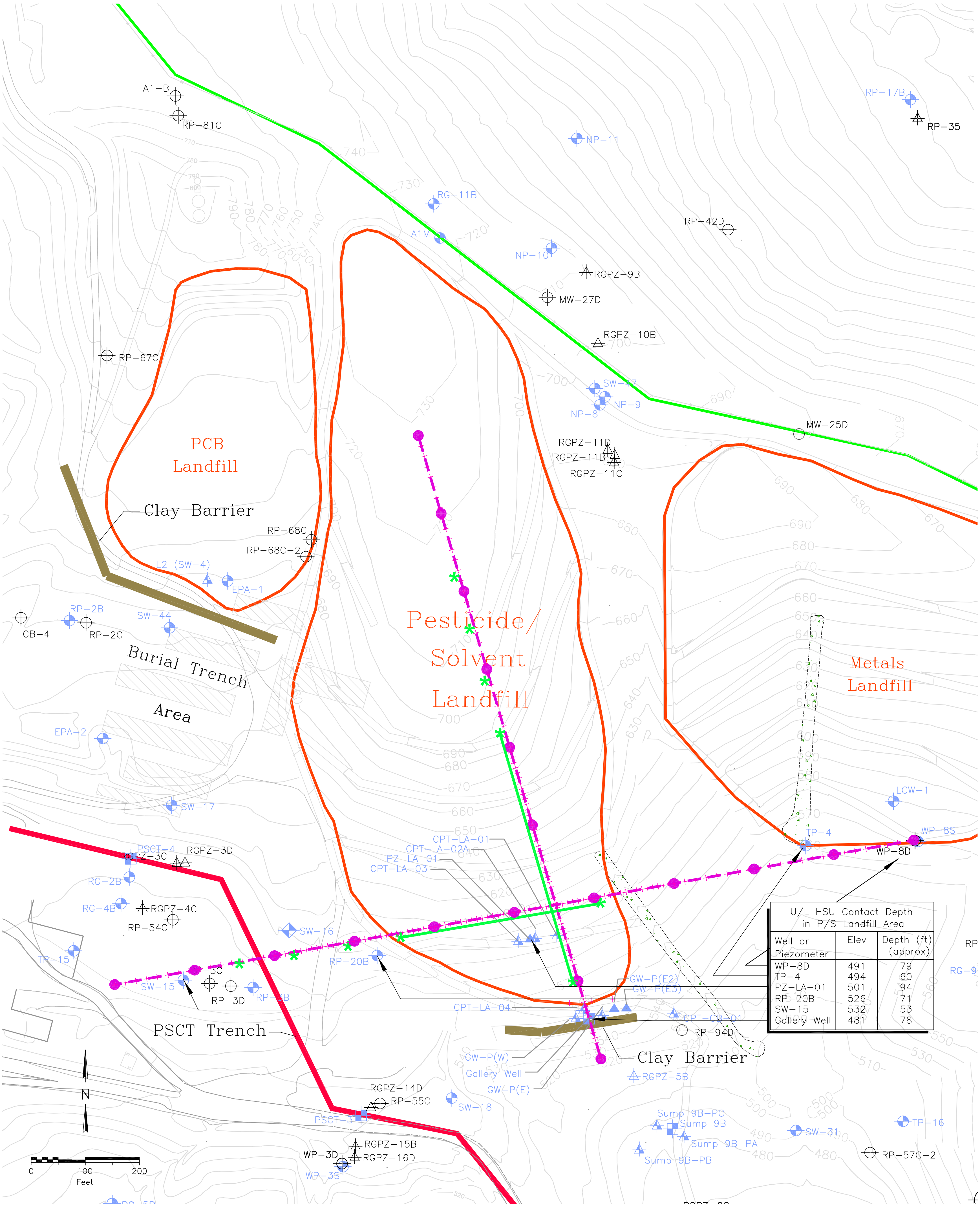
CSC

Pilot Study and Production Survey Area Map
Geophysics Experimental Plan
RI/FS Work Plan Supplement
Casmalia Site Remediation

FIGURE
EP-1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	52874 1000		2/04	

FIG EP-1.DWG 1.0
20040225.1530



U/L HSU Contact Depth in P/S Landfill Area

Well or Piezometer	Elev	Depth (ft) (approx)
WP-8D	491	79
TP-4	494	60
PZ-LA-01	501	94
RP-20B	526	71
SW-15	532	53
Gallery Well	481	78

LEGEND

- Seismic Refraction Spread
- Seismic Refraction Shotpoint
- Seismic Reflection (Walk-Away Test) Spread
- Seismic Reflection Shotpoint
- Micro-Gravity Measurement Station
- MW-15C Upper HSU monitoring well
- GW-P(E) Upper HSU piezometer
- RAP-2A Upper HSU extraction point
- SW-10 Upper HSU other well
- POND18 Upper HSU surface water sample
- RP-63C Lower HSU monitoring well
- CT-1C Lower HSU piezometer
- WP-5D Lower HSU other well
- MET Meteorological Station
- Landfill Boundaries
- Facility and Zone 1 boundary
- Perimeter source control trench (PSCT)
- Plume capture collection trench (PCT)
- Clay Barrier

NOTES:

Topo map revised 1998, 2000, 2003. Topo with P/S landfill and borrow area revised 2000. (Foster-Wheeler).

Zone 1 boundary (green) is approximate and includes the area within the facility boundary.

FIG EP-2.DWG 1.0
20040223.1450

CSC

Pilot Study Survey Locations
Geophysics Experimental Plan
RI/FS Work Plan Supplement
Casmalia Site Remediation

FIGURE **EP-2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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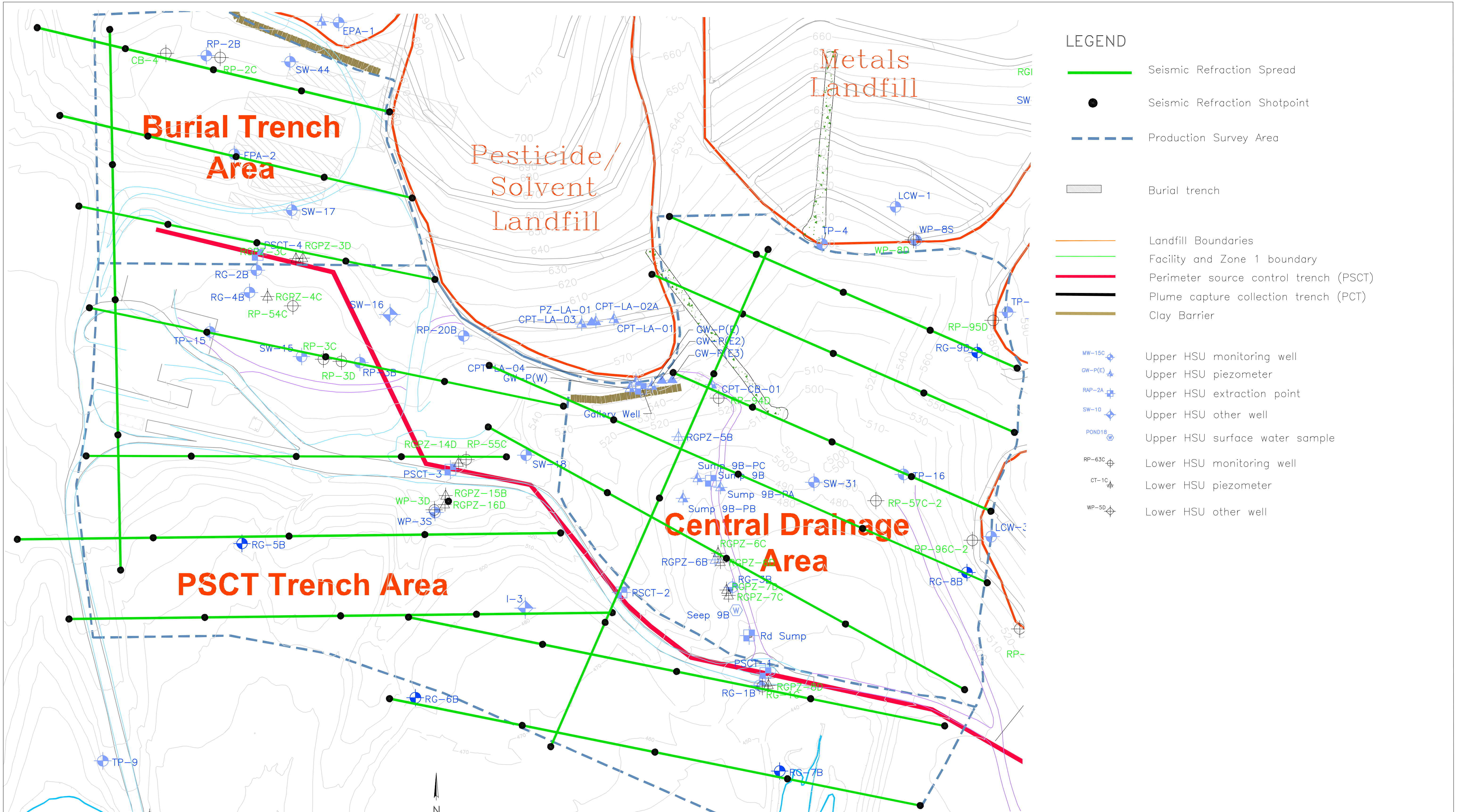
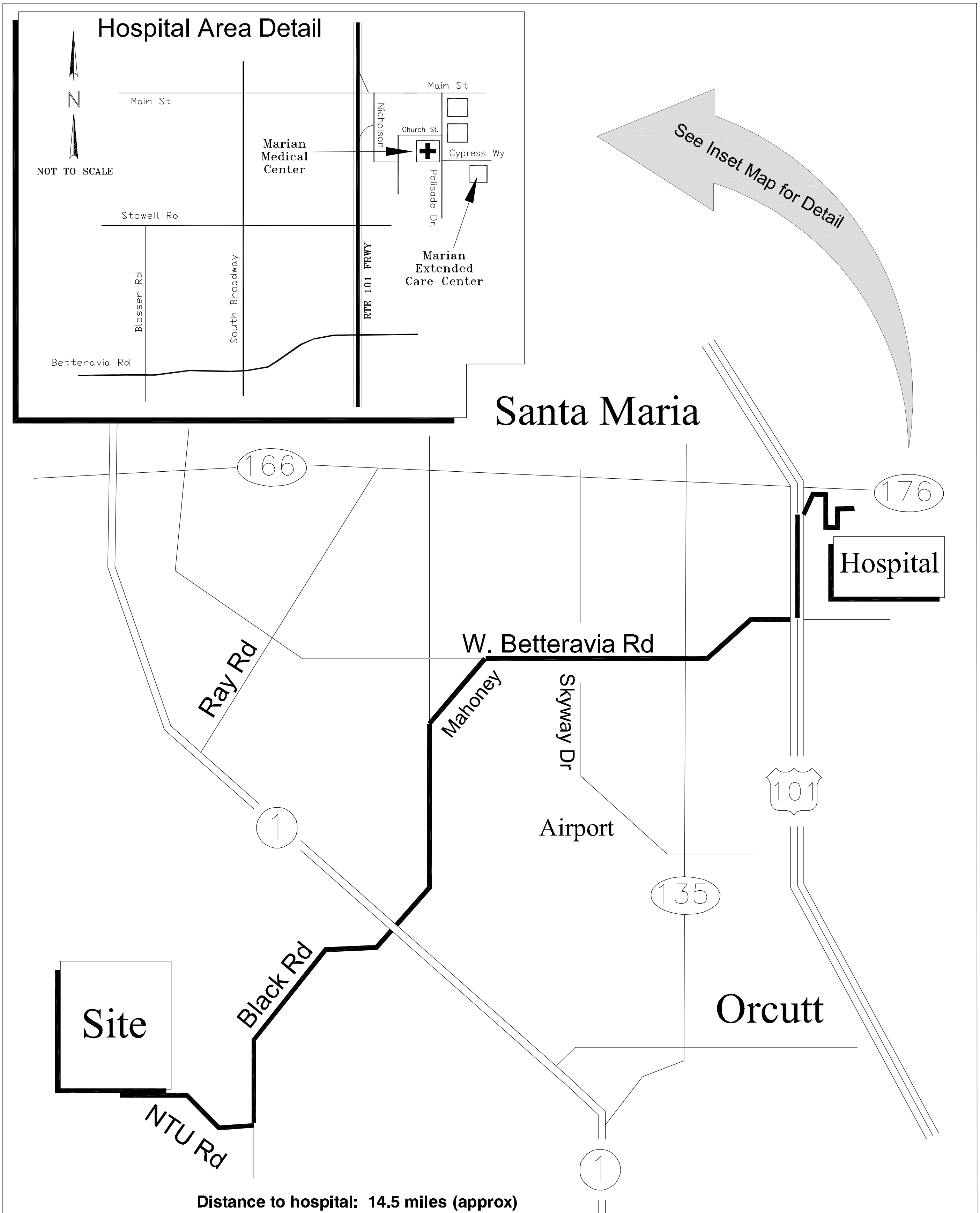


CSC

Production Survey Line Location Map
Geophysics Experimental Plan
RI/FS Work Plan Supplement
Casmalia Site Remediation

FIGURE **EP-3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	52874 1000		2/04	



CSC

Hospital Route Map
Geophysics Experimental Plan
RI/FS Work Plan Supplement
Casmalia Site Remediation

FIGURE
EP-4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
Rws	52874 1000		2/04	

FIG EP-4.DWG 1.0
20040225.1553

APPENDIX A

Geophysical Survey Hazard Analysis

Geophysical Survey Hazard Analysis

Work Activity:

Personal Protective Equipment (PPE):

☐ Goggles	☐ Lifeline/Body Harness	☐ Supplied Respirator	☐ Life Vest
☐ Face Shields	☒ Hard Hat	☐ Air Purifying Respirator[a]	☒ Gloves[c]
☒ Safety Glasses	☒ Cold weather steel toed boots	☐ Welding/Pipe Clothing	☒ Coveralls[c]
	☐ Chemical resistant steel toed boots[c]	☐ Welding Mask/Goggles	☒ Hearing protection[b]

Analyzed By	Position/Title	Reviewed By	Position/Title	Date
Roark Smith	Senior Geophysicist	Peter B. Rice, C.I.H., C.S.P.	Principal Safety and IH Specialist	2/26/04

Job Steps	Potential Hazards	Critical Actions
1. Set up seismic survey transect.	Mechanical hazards – operating machinery and mechanized equipment (1,2,3,4)[f]	Administrative – only qualified[d] operators using equipment, tools
2. Layout sensor arrays.	Acoustical hazards – loud and/or sustained noise (1,2,3,4)[f]	Hazard inspection and monitoring – noise Wear hearing protection at all times
3. Establish shot points and initialize energy source.	Electrical hazards from geophysical equipment power supply (2,3,4)[f]	Engineering – check power cables & connections for wear. Cover batteries with insulated shield
4. Obtain seismic data.	Physical hazards – slips, trips, and falls, extreme temperatures, uneven terrain, vibration (1,2,3,4,5,6,7)[f]	Stand clear of stand clear of weight drop system and equipment power supply. Monitor temperature and wind, wear appropriate weather clothing, take breaks, drink fluids, eat often
5. Set up micro-gravity survey grid.	Ergonomic hazards – lifting, repetitive motions (1,2,3,4,5,6,7)[f]	Use proper lifting techniques. Do not overload while hand-carrying equipment
6. Obtain micro-gravity data.	Chemical hazards – exposure to airborne contaminants, contaminated soil, battery acid (1,2,3,4,5,6,7)	Wear appropriate PPE[e] (as defined at top of page), personnel decontamination, monitor dust if visible
7. Perform land survey .	Biological hazards – spiders, snakes, mountain lion, badgers (1,2,3,4,5,6,7)[f]	Keep site clean of animal-attracting smells, remain aware of surroundings, and monitor animal activity in the area

Equipment to be Used	Inspection Requirements	Training Requirements
Weight drop impulse energy system.	Equipment Safety Checklist	Project-specific, initial health and safety briefing
Hand tools	Visual inspection daily and before each use	Pre-shift tailgate safety briefings. Review this Job Hazard Analysis
Seismograph, geophones, and cables.	Visual inspection of geophones and cables, test effective operation of seismograph with on board functionality tests.	Hazardous Waste Operations training for employees performing tasks associated with hazardous wastes
Gravimeter	Verify operational status and occupy set base station daily.	First Aid & CPR for a least two employees onsite per shift
Truck	Vehicle/Equipment Safety Checklist	Site specific training on biological hazards

[a] Respiratory protection will be used if dust or contaminants become a problem. Dust will be monitored visually and by respiratory/nasal irritation. A respirator will be used if TOV readings are above 1 ppm (sustained for 1 minute) in the breathing zone as measured with a PID. Full face respirators will be used when TOV readings are above 10 ppm.

[b] Noise protection will be used whenever sound-pressure levels exceed 85 decibels steady state (when normal communications becomes difficult at 3 feet) or 140 decibels impulse, regardless of the duration of exposure.

[c] As necessary to prevent or minimize exposure as determined by the SSHO.

[d] Qualified: Training and experience with tasks, hazards, and safe work practices as determined by the employer.

[e] SSHO will make the final determination on proper PPE.

[f] Numbers correspond to job steps

APPENDIX B

Well Inventory Summary, Including UHSU/LHSU Contact Elevations

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
A1-B	WL	Yes	759.78	757.8*	6	PVC	357	148.9	608.9	123.8	634	147.8	610	U	5.9	751.9	93.65	Yes	Casing reduced
A1M	WL	Yes	726.51	723.50	6	PVC	180	176	547.502	18.502	705	176.002	547.5	W/U	46	677.502	46.71	Yes	Casing reduced
A2B	CQ	No	453.25	452.63	6	PVC	61	61	391.632	36.632	416	56.632	396	U	34	418.632	20.41	Yes	
A2M	WL	No	419.40	416.14	6	PVC	18	18	398.143	7.143	405.5	12.643	400	W	15	401.143	6.42	Yes	
B3B	CQ	No	384.88	384.22	6	PVC	70	65	319.216	39.216	345	63.216	321	U	25	359.216	46.82	Yes	
B3M	CQ	No	386.56	384.14	4	PVC	25	25	359.137	8.137	376	20.637	363.5	A	NE		13.9	Yes	
B4M	WL	No	370.70	367.92	4	PVC	25	26	341.918	10.918	356.6	23.918	344.1	A	NE		5.85	Yes	Well ID changed from B4M2 to match log
B-5	CQ	No	407.72	405.00	8	PVC		45	359.996	27	380.72		NA	GCW	NA		31.52	Yes	Gallery collection well
B6B	WL	Yes	401.27	398.93	6	PVC	62	62	336.933	50.433	349.8	60.433	339.8	U	37	361.933	38.16	Yes	Casing added
C1B	WL	No	439.52	435.98	6	PVC	87	87	348.983	71.483	361	81.483	351	U	62	373.983	25.23	Yes	
C2B	WL	No	452.31	449.02	6	PVC	95	95	354.021	83.021	366.1	93.021	356.1	U	70	379.021	39.89	Yes	
C2M	WL	No	448.92	445.54	6	PVC	58	58	387.542	7.042	435	52.542	390	F/W	55	390.542	31.64	Yes	
C3M	CQ	No	418.10	415.85	4	PVC	40	40	375.853	17.853	398	38.853	377	W	37	378.853	9.11	Yes	
C4M	CQ	No	456.57	453.23	6	PVC	90	89	364.231	7.231	446	83.731	369.5	F/W	86.5	366.731	49.11	Yes	
C-5	CQ	No	452.38	451.06		PVC		NA		50	NA	70	NA	GCW	NE		53.2	No	
C5E	WL	No	452.49	451.59	6	PVC		NA			NA		NA	GCW	NE		46.2	Yes	
C6B	WL	No	454.30	451.29	6	PVC	106	106	345.289	91.289	360	100.789	350.5	U	90.5	360.789	46.95	Yes	
CD-1	WL	No	452.76	450.23	2	PVC		NA			NA		NA	NA	NE		16	Yes	
CD-2	WL	No	449.23	448.20	4	PVC		NA			NA		NA	NA	NE		25.31	Yes	
CpH	WL	No	436.66	436.09	2	PVC	120	121	315.085	110.085	326	120.085	316	U	101	335.085	26.35	Yes	
D1B	CQ	No	479.55	478.86	6	PVC	130	103	375.856	77.856	401	101.856	377	U	47	431.856	14.81	Yes	
D1M	WL	No	479.05	475.48	6	PVC	47	47	428.478	7.478	468	41.978	433.5	W	44	431.478	12.19	Yes	
DB-1	CQ	No	482.24	481.75	4	PVC	53.5	53	428.751	42.831	439	52.831	429	U	9	472.751	17.38	Yes	

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
DB-8	WL	No	680.20	677.83	4	PVC	80.5	79.5	598.33	68.43	609.4	78.43	599.4	U	40	637.83	52.15	Yes	
DW-2	WL	No	680.37	677.64	4	PVC	130	125.5	552.141	105.441	572.2	115.441	562.2	U	44	633.641	97.61	Yes	
FW-9	WL	No	483.23	478.73	4	PVC	25.5	17.3	461.431	1.83	476.9	11.831	466.9	F	NE		16.89	Yes	
Gallery Well	WL		561.20	559.23	10	PVC		77.94	481.293	54.94	506.258	74.94	486.258	W/U	78	481.233	66.5	No	Casing added
GW-P(E)	WL		558.16	556.42	1	PVC	54.3	54.3	502.115	49.315	507.1	54.315	502.1	NA	NE		39.9	No	
GW-P(W)	WL		561.39	559.83	1	PVC	55.5	55.5	504.326	50.426	507.1	55.026	504.8	NA	NE		42.53	No	
GW-PZ-E2	WL		556.69	556.27	1	PVC	45	45	516.69	35	521.69	45	511.69	NA	NE		40.37	No	
GW-PZ-E3	WL		553.66	553.34	1	PVC	45	45	508.66	35	518.66	45	508.66	NA	NE		40.05	No	
LCW-1	WL	Yes	579.33	577.3*	2	PVC		48.9	528.4	37.8	539.5	47.8	529.5	W	47.9	529.4	dry approx. 47.98'	Yes	Casing added
LCW-2	WL	Yes	594.92	592.9*	2	PVC		72.9	520.3	81.6	512.3	70.6	522.3	W	70.6	522.3	dry approx. 64.2'	Yes	Casing added
LCW-3	WL	Yes	548.45	546.415*	2	PVC		28	518.415	35.515	510.9	25.515	520.9	W		519.415	58.95	Yes	
MW-11D	WL		434.51	432.54	4	PVC	273.5	272.5	160.036	253.336	179.2	273.336	159.2	U	50.5	382.036	37.2	Yes	
MW-13D	WL		410.55	407.96	4	PVC	200	200	207.957	180.057	227.9	200.057	207.9	U	54	353.957	13.06	Yes	
MW-14D-2	WL		422.92	421.39	4	PVC	166	164	257.393	155.193	266.2	165.193	256.2	U	38	383.393	20.51	Yes	
MW-15C	WL		451.16	449.52	4	PVC	44.5	41	408.524	32.724	416.8	42.724	406.8	W/U	38	411.524	38.32	Yes	
MW-18C	CQ		452.99	450.97	4	PVC	60	32.5	418.468	24.068	426.9	34.068	416.9	W	29	421.968	26.39	Yes	
MW-18D	WL		452.18	451.45	4	PVC	280	262	189.451	262.151	189.3	277.151	174.3	U	29	422.451	35.36	Yes	
MW-1BL	WL		917.91	915.40	4	PVC	320	280	635.402	260.502	654.9	280.502	634.9	U	100	815.402	221.71	Yes	
MW-21D	WL		606.62	604.71	4	PVC	331	325	279.707	306.007	298.7	326.007	278.7	U	48	556.707	110.8	Yes	
MW-23D	WL		684.85	682.82	4	PVC	204.5	180	502.818	160.518	522.3	180.518	502.3	U	40	642.818	62.76	Yes	
MW-25D	CQ		682.01	680.06	4	SS	428	420	260.055	390.155	289.9	420.155	259.9	U	36	644.055	108.5	Yes	
MW-27D	CQ		709.51	707.94	4	PVC	451.5	373	334.936	343.136	364.8	373.136	334.8	U	29	678.936	136.97	Yes	
MW-2BL	WL		475.71	470.06	4	PVC	105	93.7	376.357	83.957	386.1	93.957	376.1	U	57	413.057	NA	Yes	

Table 4

Well Construction Details

Well Inventory Report

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Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
MW-2BU	WL		579.89	577.97	4	PVC	44.5	43.5	534.467	33.867	544.1	43.867	534.1	W	NA		28.98	Yes	
MW-3BL	WL		549.35	547.66	4	PVC	220	216	331.661	196.661	351	216.661	331	U	34	513.661	15.74	Yes	
MW-3BU	WL		510.25	508.24	4	PVC	55	49	459.237	38.837	469.4	48.837	459.4	W	51	457.237	10.43	Yes	
MW-4BL	WL		505.80	503.98	4	PVC	139	115	388.984	106.084	397.9	116.084	387.9	U	40	463.984	26.45	Yes	
MW-4BU	WL		510.51	507.53	4	PVC	44	44	463.531	33.531	474	43.531	464	U	30	477.531	25.72	Yes	
MW-5BL	WL		510.74	508.63	4	PVC	130	120	388.63	110.73	397.9	120.73	387.9	U	56	452.63	7.15	Yes	
MW-5BU	WL		472.12	469.87	4	PVC	53	53	416.873	43.943	425.93	53.943	415.93	U	39	430.873	0.05	Yes	
MW-6D	WL		457.21	455.60	4	PVC	170.9	169	286.6	149.4	306.2	169.4	286.2	U	29	426.6	29.4	Yes	
MW-7BL	WL		904.02	901.45	4	PVC	325	320	581.445	300.245	601.2	321.245	581.2	U	90	811.445	219.47	Yes	
MW-7BU	CQ		615.26	614.41	4	PVC	52.8	57	557.413	46.813	567.6	56.813	557.6	W	52	562.413	30.47	Yes	
MW-7C	CQ		454.00	452.18	4	PVC	100	85.5	366.684	80.084	372.1	90.084	362.1	U	76	376.184	46.09	Yes	
MW-7D	CQ		454.20	451.92	4	PVC	173.5	172.5	279.421	152.821	299.1	172.821	279.1	U	86	365.921	46.28	Yes	
MW-8D-2	WL		456.04	454.05	4	PVC		250	204.048	187.848	272.6	197.848	252.6	U	35	419.048	46.01	Yes	
NP-11	WL		666.12	663.78	4	STEEL		35	628.779		NA		NA	N/A	NE		_	Yes	
NP-8	WL		694.13	695.11	4	STEEL		24	671.107		NA		NA	N/A	20	675.107	24.1	Yes	
PSCT-1	CQ		454.51	450.99	8	PVC		53.18	397.81	43.919	407.07	52.419	398.57	W	NE		31.6	No	
PSCT-2	CQ		503.51	502.49	8	PVC		61.89	440.60	54.093	448.4	62.493	440	W	NE		48.91	No	
PSCT-3	CQ		561.34	560.03	8	PVC		65.94	494.09	55.681	504.35	63.981	496.05	W	NE		55.41	No	
PSCT-4	CQ		593.18	591.17	8	PVC		66.15	525.02	47.298	543.87	65.198	525.97	W	NE		47.49	No	
PZ-LA-01	WL	Yes	595.65	595.43	0.75	PVC	97	97	498.65	87	508.65	97	498.65	W/U	94	501.65	_	No	Casing collapsed @71' bgs
PZ-P18-1	WL		458.76	456.80	2	PVC	45	45	411.801	28.252	426.229	43.252	411.229	F/A	NE		15.71	Yes	
PZ-P18-2A	WL		476.85	474.56	2	PVC		20	454.56	12.858	459.092	17.858	454.092	F/A	NE		dry 26.84'	Yes	
PZ-P18-2B	WL		476.85	474.56	2	PVC	35	32	442.56	24.858	447.022	29.858	442.022	F/A	NE		dry 26.84'	Yes	

Table 4
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Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
PZ-P18-3A	WL		477.84	475.22	2	PVC	45	20	455.215	12.544	459.701	17.544	454.701	F/A	NE		dry 30.38'	Yes	
PZ-P18-3B	WL		477.83	475.22	2	PVC	45	35	440.215	27.544	444.691	32.544	439.691	W	NE		dry 30.38'	Yes	
PZ-P18-4A	WL		478.03	475.77	2	PVC	45	20	455.772	12.946	460.126	17.946	455.126	F/A	NE		dry 32.03'	Yes	
PZ-P18-4B	WL		478.00	475.77	2	PVC	45	45	430.772	32.946	440.176	42.946	430.176	F/A	NE		dry 32.03'	Yes	
PZ-P18-5	WL/CQ		470.96	468.60	2	PVC	45	40	428.596	32.827	432.889	37.827	427.889	W	40.5	428.096	26.25	Yes	
PZ-PA5-1A	WL		475.89	473.37	2	PVC	25	25	448.366	17.676	452.61	22.676	447.61	F/A	NE		17.11	Yes	
PZ-PA5-1A1	WL		475.89	473.37	2	PVC	25	15	458.366	2.672	467.62	12.672	457.62	F/A	NE		dry at 18.2'	Yes	
PZ-PA5-2A	WL		475.72	473.25	2	PVC	50	25	448.245	12.751	457.85	22.751	447.85	F/A	NE		16.51	Yes	
PZ-PA5-2B	WL		475.71	473.25	2	PVC	50	35	438.245	27.711	443.03	32.711	438.03	F/A	NE		18.86	Yes	
PZ-PA5-2C	WL		475.72	473.25	2	PVC	50	45	428.245	37.713	432.792	42.713	427.792	F/A	NE		23.22	Yes	
PZ-PA5-3A	WL		473.98	471.42	2	PVC	45	23	448.421	10.598	458.22	20.598	448.22	F/A	NE		16.91	Yes	
PZ-PA5-3A1	WL		473.93	471.42	2	PVC	45	9	462.421	1.689	467.22	6.689	462.22	F/A	NE		11.21	Yes	
PZ-PA5-3B	WL		474.04	471.42	2	PVC	45	33	438.421	25.585	443.276	30.585	438.276	F/A	NE		19.56	Yes	
PZ-PA5-3C	WL		474.08	471.42	2	PVC	45	43	428.421	35.565	443.126	40.565	428.126	F/A	NE		18.05	Yes	
RAP-1A	CQ		449.40	448.13	8	PVC		37.5	410.628	20.128	428	37.128	409	W/U	22.8	425.328	35.65	No	
RAP-1B	CQ		416.07	413.70	8	PVC		69.7	344.002	50.502	363.2	70.002	343.7	W/U	56.9	356.802	58.16	No	
RAP-1C	CQ		450.67	447.09	8	PVC		64.5	382.59	45.09	402	64.09	383	W/U	50	397.09	60.71	No	
RAP-2A	WL		447.10	445.32	8	PVC		52.8	392.521	34.821	410.5	54.121	391.2	W/U	36.5	408.821	50.72	No	
RAP-3A	CQ		423.05	421.15	8	PVC		51.6	369.554	33.154	388	52.154	369	W/U	37.5	383.654	50.85	No	
RIMW-1	CQ		496.75	494.69	4	PVC	40	30.5	464.19	10	484.69	30	464.69	U	8	486.69	9.45	Yes	
RIMW-2	CQ		457.60	455.65	4	PVC	45	40.5	415.15	20	435.65	40	415.65	W/U	25.5	430.15	5.16	Yes	
RIMW-3	CQ		482.50	480.29	4	PVC	35	31.5	448.79	6	474.29	31	449.29	A/W	NE		5.24	Yes	
RIMW-5	CQ		592.64	590.56	4	PVC	65	60.5	530.06	40	550.56	60	530.56	U	31	559.56	57.04	Yes	

Table 4
Well Construction Details
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RIMW-6	CQ		618.10	616.09	4	PVC	70.5	70.5	545.59	45	571.09	70	546.09	U	38	578.09	72.08	Yes	
RIMW-7	CQ		641.36	639.38	4	PVC	80	75.5	563.88	50	589.38	75	564.38	F/A	64	575.38	58.6	Yes	
RIMW-8	CQ		658.93	656.92	4	PVC	70	65.5	591.42	45	611.92	65	591.92	W/U	60	596.92	39.18	Yes	
RIMW-9	CQ		453.96	452.11	4	PVC	67	63.5	388.61	43	409.11	63	389.11	F/A	NE		46.4	Yes	
RIPZ-2	WL		399.49	397.40	2	PVC	50.5	50.5	346.90	35	362.40	50	347.40	W/U	42.3	355.10	19.9	Yes	
RIPZ-3	WL		444.12	441.65	0.75	PVC	34.5	27	414.65	17	424.65	27	414.65	A/W	34.5	407.15	13.32	Yes	
RIPZ-4	WL		448.34	445.69	0.75	PVC	34	32.5	413.19	22.5	423.19	32.5	413.19	W	NE		20.56	Yes	
RIPZ-5	WL		451.09	451.74	2	PVC	65	64.5	387.24	44	407.74	64	387.74	F/A	NE		42.08	Yes	
RIPZ-6	WL		465.87	463.82	2	PVC	51	50.5	413.32	30	433.82	50	413.82	U	20.5	443.32	46.23	Yes	
RIPZ-7	WL		480.44	477.71	0.75	PVC	38	33.2	444.51	23.2	454.51	33.2	444.51	F/A	NE		19.23	Yes	
RIPZ-8	CQ		531.35	529.00	2	PVC	62	32.5	496.50	12	517.00	32	497.00	W/U	30	499.00	13.58	Yes	
RIPZ-9	WL		594.92	592.94	2	PVC	65.5	65.5	527.44	50	542.94	65	527.94	U	26	566.94	44.78	Yes	
RIPZ-10B	WL		747.01	744.92	2	PVC	86	85.5	659.42	55	689.92	85	659.92	U	31	713.92	75.03	Yes	
RIPZ-10C	WL		746.44	744.46	2	PVC	136	135.5	608.96	115	629.46	135	609.46	U	30	714.46	118.69	Yes	
RIPZ-10D	WL		746.48	744.68	2	PVC	240	220.5	524.18	200	544.68	220	524.68	U	30	714.68	162.11	Yes	
RIPZ-11	WL		487.24	485.23	2	PVC	65	50.5	434.73	30	455.23	50	435.23	U	31.8	453.43	27.21	Yes	
RIPZ-12	WL		573.18	573.22	0.75	SS	89	89	484.22	79	494.22	89	484.22	F/A	NE		68.02	Yes	
RIPZ-15	WL		655.27	653.41	2	PVC	200	160.5	492.91	140	513.41	160	493.41	U	60	593.41	84.41	Yes	
RIPZ-16	WL		625.13	622.79	2	PVC	200	150.5	472.29	135	487.79	150	472.79	U	52.8	569.99	70.63	Yes	
RIPZ-17	WL		759.40	757.59	2	PVC	160	160.5	597.09	150	607.59	160	597.59	U	30	727.59	98.49	Yes	
RIPZ-18	WL		449.22	447.41	2	PVC	40.5	40.5	406.91	25	422.41	40	407.41	W/U	30	417.41	16.88	Yes	
RIPZ-19	WL		496.15	493.51	2	PVC	61	60.5	433.01	40	453.51	60	433.51	U	35	458.51	33.46	Yes	
RIPZ-20	WL		558.91	559.31	2	PVC	68	65.5	493.81	55	504.31	65	494.31	U	40	519.31	47.56	Yes	

Table 4
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RIPZ-22	WL		606.46	606.86	0.75	SS	105	105	501.86	95	511.86	105	501.86	F/A	NE		87.62	Yes	
RIPZ-23	WL		560.38	560.57	0.75	PVC	52	52	508.57	32	528.57	52	508.57	F/A	NE		49.74	Yes	
RIPZ-24	WL		557.24	557.41	0.75	PVC	50	50	507.41	30	527.41	50	507.41	F/A	NE		38.85	Yes	
RIPZ-25	WL		485.34	483.27	0.75	PVC	23	23	460.27	3	480.27	23	460.27	F/A	NE		6.55	Yes	
RIPZ-26	WL		468.33	465.71	0.75	PVC	18	15	450.71	5	460.71	15	450.71	F/A	NE		5.91	Yes	
RG-10B	CQ		608.67	606.80	4	PVC	40	23	581.395	8	598.795	23	583.795	W/U	11	595.795	7.45	Yes	
RG-11B	CQ		726.72	724.63	4	PVC	55	50	671.532	35	689.632	50	674.632	W/U	40	684.632	51.84	Yes	
RG-11B-2	CQ		725.60	723.68	4	PVC	81.5	80.5	643.18	60	663.68	80	643.68	U	43.3	680.38	80.38	Yes	
RG-1B	CQ		453.73	451.43	4	PVC	39	38.4	413.025	23.715	427.71	38.715	412.71	W/U	32	419.425	24.41	Yes	
RG-1C	CQ		452.36	450.52	4	PVC	97	92.5	358.018	82.238	368.28	92.238	358.28	U	29	421.518	58.35	Yes	
RG-2B	CQ		593.99	590.40	2	PVC	69.5	34	556.404	27.154	563.25	37.154	553.25	W/U	31.6	558.804	35.4	Yes	
RG-3B	CQ		468.35	466.81	4	PVC	40	36.5	430.313	21.373	445.44	36.373	430.44	W/U	32.6	434.213	6.65	Yes	
RG-4B	CQ		590.59	588.61	4	PVC	42	33	555.612	17.842	570.77	32.842	555.77	W/U	30.5	558.112	38.47	Yes	
RG-5B	CQ		513.17	510.75	4	PVC	50	31	477.748	15	495.748	30	480.748	W/U	23	487.748	11.55	Yes	
RG-6B	CQ		477.50	475.44	4	PVC	30	26	446.743	11	464.443	26	449.443	W/U	16	459.443	12.22	Yes	
RG-7B	CQ		455.36	452.87	4	PVC	45	42.5	408.272	32	420.872	42	410.872	W/U	41	411.872	25.3	Yes	
RG-8B	CQ	Yes	539.13	537.1*	4	PVC	55	59.7	474.718	39.2	497.918	59.2	477.918	W	59.7	477.418	48.95	Yes	Casing added
RG-9B	CQ	Yes	585.96	584*	4	PVC	66	91.4	490.964	70.9	513.064	90.9	493.064	W	91.9	492.064	79.32	Yes	Casing added
RGPZ-10B	WL		704.47	701.84	2	PVC	55	55	644.343	44.5	657.343	54.5	647.343	U	39.5	662.343	56.65	Yes	
RGPZ-10B-2	WL		704.93	702.66	2	PVC	76	75.5	627.16	55	647.66	75	627.66	U	30.8	671.86	76.96	Yes	
RGPZ-11B	WL	Yes	692.45	690.4*	2	PVC	80	90.1	597.624	74.8	615.624	84.8	605.624	U	33.3	663.624	73.15	Yes	Casing added
RGPZ-11C	WL	Yes	691.35	689.3*	2	PVC	155	162.6	522.823	150.6	538.723	160.6	528.723	U	33.1	662.223	76.9	Yes	Casing added
RGPZ-11D	WL	Yes	692.37	690.4*	2	PVC	218	228	459.231	217.7	472.731	227.7	462.731	U	33.2	657.231	73.3	Yes	Casing added

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RGPZ-12C	WL		654.68	652.45	2	PVC	155	150.3	502.146	140	512.446	150	502.446	U	61	589.446	69.55	Yes	
RGPZ-12D	WL		653.66	651.00	2	PVC	251	245.3	403	225	426	245	406	U	61	590	122.1	Yes	
RGPZ-13C	WL	Yes	640.75	638.8*	2	PVC	140	140.4	495.626	125.1	513.726	140.1	498.726	U	52.1	586.726	51.6	Yes	Casing added
RGPZ-13D	WL	Yes	639.27	637.3*	2	PVC	200	203.135	431.965	183.1	454.165	203.1	434.165	U	52.1	585.165	76.45	Yes	Casing added
RGPZ-14D	WL		562.17	559.94	2	PVC	200	197.3	359.639	187	372.939	197	362.939	U	35	517.939	55	Yes	
RGPZ-15B	WL		561.36	559.09	2	PVC	67	65.3	490.994	55	504.094	65	494.094	U	51	508.094	54.45	Yes	
RGPZ-16D	WL		560.73	558.54	2	PVC	253	235.3	318.743	225	333.543	235	323.543	U	29.5	529.543	61.45	Yes	
RGPZ-2B	WL	Yes	751.68	749.7*	2	PVC	92	55.8	690.446	35.8	713.946	55.8	693.946	U	17.3	732.446	37.85	Yes	Casing reduced
RGPZ-2C	WL	Yes	752.08	750*	2	PVC	200	134.1	615.518	123.8	626.218	133.8	616.218	U	17.3	732.718	85.05	Yes	Casing reduced
RGPZ-2D	WL	Yes	752.47	750.4*	2	PVC	250	213	534.721	192.7	557.721	212.6	537.721	U	16.2	734.221	148.2	Yes	Casing reduced
RGPZ-3C	WL		593.37	591.17	2	PVC	135	132.3	455.671	122	469.171	132	459.171	U	17	574.171	111.25	Yes	
RGPZ-3D	WL		593.54	591.37	2	PVC	200	166	421.971	156	435.371	166	425.371	U	17	574.371	39.6	Yes	
RGPZ-4C	WL		591.08	588.42	2	PVC	125	103.3	481.92	93	495.42	103	485.42	U	30	558.42	36.95	Yes	
RGPZ-5B	WL		514.08	512.33	2	PVC	50	40	467.531	29.5	482.831	39.5	472.831	W	39.5	472.831	21.9	Yes	
RGPZ-6B	WL		472.90	470.35	2	PVC	35	29	439.951	19	451.351	29	441.351	W/U	25	445.351	13.13	Yes	
RGPZ-6C	WL		472.95	470.68	2	PVC	100	98	369.677	88	382.677	98	372.677	U	25	445.677	12.26	Yes	
RGPZ-6D	WL		471.32	469.23	2	PVC	165	164.3	301.928	154	315.228	164	305.228	U	25	444.228	32.2	Yes	
RGPZ-7C	WL		466.83	464.91	2	PVC	100	100	362.809	90	374.909	100	364.909	U	24.5	440.409	9.6	Yes	
RGPZ-7D	WL		467.78	465.55	2	PVC	152	148.3	314.847	138	327.547	148	317.547	U	27	438.547	8	Yes	
RGPZ-8D	WL		450.69	448.51	2	PVC	150	140.3	305.711	130	318.511	140	308.511	U	35	413.511	136.37	Yes	
RGPZ-9B	WL		713.48	711.21	2	PVC	75	70	638.012	59.5	651.712	69.5	641.712	U	58	653.212	54.78	Yes	
RP-100A	CQ		441.86	441.00	4	PVC	60	25	415.996	15.396	425.6	25.396	415.6	A	38	402.996	13.25	Yes	
RP-101C	CQ		448.04	446.27	4	PVC	64	55.5	390.768	45.468	400.8	55.468	390.8	U	29	417.268	29.41	Yes	

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
RP-103B	CQ		371.73	369.79	4	PVC	32	29	340.788	24.588	345.2	29.588	340.2	W	NE		7.02	Yes	
RP-106D	WL		545.26	543.15	4	PVC	325	310	233.152	290.052	253.1	310.052	233.1	U	41	502.152	35.49	Yes	
RP-107D	CQ		477.36	476.24	4	PVC	205	190	286.236	170.536	305.7	190.536	285.7	U	23	453.236	49.42	Yes	
RP-108A	WL		356.61	350.47	4	PVC	15	12	338.47	7.57	342.9	12.57	337.9	W	NE		9.7	Yes	
RP-108B	CQ		356.20	354.45	4	PVC	60	31	323.445	23.345	331.1	31.345	323.1	W/U	26	328.445	7.89	Yes	
RP-109B	CQ		475.85	474.35	4	PVC	62	55	419.349	45.449	428.9	55.449	418.9	W/U	53	421.349	20.93	Yes	
RP-109D	CQ		475.55	473.55	4	PVC	175	175	298.55	155.55	318	175.55	298	U	53	420.55	20.91	Yes	
RP-10A	WL		455.64	453.57	4	PVC	66	45	408.569	35.569	418	45.569	408	A	63	390.569	16.66	Yes	
RP-110B	CQ		477.65	475.62	4	PVC	60	60	415.615	50.415	425.2	60.415	415.2	W/U	55	420.615	36.8	Yes	
RP-110D	WL		476.71	474.68	4	PVC	160	150	324.677	140.177	334.5	150.177	324.5	U	55	419.677	35.77	Yes	
RP-111B	WL		565.53	562.84	4	PVC	140	128	434.838	118.038	444.8	128.038	434.8	U	64	498.838	90.08	Yes	
RP-111D	WL		565.37	562.08	4	PVC	200	180	382.075	170.075	392	180.075	382	U	58	504.075	100.92	Yes	
RP-11A	WL		444.18	442.84	4	PVC	54	45	397.842	35.842	407	45.842	397	A	52	390.842	16.38	Yes	
RP-12A	WL		438.85	437.02	4	PVC	63	43	394.018	33.018	404	43.018	394	A	55	382.018	25.58	Yes	
RP-13B	CQ		458.22	456.24	4	PVC	50	47	409.242	37.242	419	47.242	409	W	46	410.242	32.82	Yes	
RP-14B	WL		574.55	573.51	4	PVC	65	52	521.509	69.339	530.6	79.339	520.6	W	49	524.509	47.85	Yes	
RP-14D	WL		570.63	569.66	4	PVC	210	195	374.66	185.53	384	195.53	374	U	43	526.66	60.95	Yes	
RP-15C	WL		515.34	515.25	4	PVC	37	37	478.253	33.353	481.9	33.353	481.9	U	2	513.253	3.28	Yes	2-logs, 1 V.W.P. 1 MW.
RP-16C	WL		701.15	699.89	4	PVC	160	158.5	541.393	155.793	544.1	155.793	544.1	U	26.2	673.693	9	Yes	
RP-16D	WL		701.02	701.29	4	PVC	249	231	470.292	227.892	473.4	227.892	473.4	U	29	672.292	71.65	Yes	
RP-17B	CQ		532.75	531.63	4	PVC	68	62	469.634	52.634	479	62.634	469	W	66	465.634	38.05	Yes	
RP-18C	WL		451.02	450.47	4	PVC	120	120.5	329.974	116.274	334.2	116.274	334.2	U	76	374.474	44.82	Yes	
RP-18D	WL	Yes	450.76	446.42	4	PVC	180	167	279.415	157.415	289	167.415	279	U	70	376.415	36.91	Yes	Casing reduced

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
RP-1D	CQ		839.48	838.32	4	PVC	232.5	232	606.32	212.32	626	232.32	606	U	58	780.32	154.55	Yes	
RP-20B	CQ		599.30	597.00	4	PVC	81	76	521.002	67.002	530	77.002	520	W	71	526.002	64.16	Yes	
RP-23C	WL	Yes	655.28	652*	4	PVC	161	164.3	487.741	160.7	491.3	160.7	491.3	U	43.3	608.741	571.71	Yes	Casing added
RP-24D	WL		450.78	449.35	4	PVC	150	146	303.352	135.352	314	145.352	304	U	25	424.352	21.98	Yes	
RP-25C	WL		659.38	658.57	4	PVC	189	185	473.571	181.071	477.5	181.071	477.5	U	56	602.571	89.48	Yes	
RP-25D	WL		661.03	659.57	4	PVC	249	210	449.57	205.57	454	205.57	454	U	52	607.57	106.96	Yes	
RP-26C	WL	Yes	545.49	543.5*	4	PVC	56.3	62.6	480.934	52.5	491	62.5	481	U	37.1	506.434	56.7	Yes	Casing added
RP-26D	WL	Yes	539.66	537.7*	4	PVC	233.3	169	368.724	176.7	369	196.7	349	U	23.5	514.224	90.75	Yes	Casing added
RP-27C	WL		574.64	573.51	4	PVC	82	80	493.51	69.51	503.6	79.51	493.6	U	51	522.51	44.63	Yes	
RP-28B	CQ		447.89	446.23	4	PVC	70	60	386.228	49.728	396.5	59.728	386.5	W	66	380.228	35.24	Yes	
RP-29D	WL	Yes	599.58	595.93	4	PVC	125	99	496.933	88.933	507	98.933	497	U	13	582.933	16.74	Yes	Casing added
RP-2B	WL	Yes	673.61	669.27	4	PVC	63.1	55	614.265	44.265	625	54.265	615	W/U	52.5	616.765	55.88	Yes	
RP-2C	WL		673.64	669.29	4	PVC	215.8	196	473.288	186.288	483.3	196.288	473.3	U	53	616.288	78.61	Yes	
RP-2D	WL		674.21	669.83	4	PVC	275.8	261	408.831	255.331	414.5	255.331	414.5	U	56	613.831	132.2	Yes	
RP-30B	WL		569.59	567.59	4	PVC	48	45	522.591	35.591	532	45.591	522	W/U	40	527.591	38.31	Yes	
RP-32B	WL		469.61	467.37	4	PVC	44.5	41.5	425.87	32.87	PVC	42.87	424.5	W/U	40	427.37	dry approx. 44'	Yes	
RP-32D	WL		466.58	467.34	4	PVC	220	219	248.335	218.835	248.5	218.835	248.5	U	41	426.335	59.86	Yes	
RP-33C	WL		485.90	483.81	4	PVC	81	76	407.807	71.707	412.1	71.707	412.1	U	39	444.807	56.45	Yes	
RP-33D	WL		485.07	483.52	4	PVC	130.5	128	355.521	117.521	366	127.521	356	U	41	442.521	50.5	Yes	
RP-34C	WL		713.92	711.49		PVC	180	178	533.494	178.794	532.7	178.794	532.7	U	51	660.494	98.7	Yes	
RP-35	WL		533.06	531.29	4	PVC	268	264	267.285	262.285	269	264.285	267	U	53	478.285	NA	Yes	
RP-38	WL		613.69	611.77		PVC	160	157.5	454.265	157.965	453.8	157.965	453.8	U	72	539.765	_	Yes	
RP-3B	WL	Yes	590.73	587.23	4	PVC	82.3	61	526.232	50.232	537	60.232	527	W/U	57.3	529.932	55.67	Yes	Casing reduced

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
RP-3C	WL	Yes	588.20	585.58	4	PVC	95.2	82.8	502.778	71.578	514	81.578	504	U	44.3	541.278	dry approx. 49.7'	Yes	Casing reduced
RP-3D	WL	Yes	589.60	586.37	4	PVC	162.2	137.1	449.272	126.872	459.5	136.872	449.5	U	49.6	536.772	54.02	Yes	Casing reduced
RP-40	WL		648.85	650.31	4	PVC	62	61	589.311	61.211	589.1	61.211	589.1	U	34	616.311	_	Yes	
RP-41A	WL		500.23	498.57	4	PVC	29	28	470.573	24.073	474.6	29.073	469.6	W	NE		27.85	Yes	
RP-41B	WL		501.04	500.77	4	PVC	64	60	440.771	50.371	450.4	60.371	440.4	U	44	456.771	27.28	Yes	
RP-41D	CQ		504.07	501.92	4	PVC	345	272	229.922	252.322	249.6	272.322	229.6	U	43	458.922	23.78	Yes	
RP-42C	WL		617.71	614.78	4	PVC	120	117	497.784	117.084	497.7	117.084	497.7	U	38	576.784	57.53	Yes	
RP-42D	WL		616.93	615.57	4	PVC	240	238.5	377.066	219.066	396.5	239.066	376.5	U	45	570.566	53.46	Yes	
RP-43B	WL		593.34	592.70	4	PVC	50	49	543.7	36.7	553.7	46.7	543.7	W	45	547.7	39.51	Yes	
RP-44C	WL		644.54	642.61	4	PVC	190	189	453.608	178.908	463.7	188.908	453.7	U	52	590.608	106.11	Yes	
RP-45B-2	WL		457.22	455.39	4	PVC	65	60.5	394.887	49.287	404.3	59.287	394.3	U	34	421.387	34.81	Yes	
RP-47C	WL		560.54	558.60	4	PVC	234	218	340.602	198.402	360	218.402	340	U	45	513.602	165.47	Yes	
RP-48C	WL		509.03	508.12	4	PVC	150	152	356.117	132.117	376	142.117	366	U	60	448.117	118.61	Yes	
RP-4D	WL	Yes	443.41	438.92	4	PVC	150	131	307.919	115.919	323	125.919	313	U	24	414.919	6.76	Yes	Casing reduced
RP-50C	WL		582.58	580.97	4	PVC	173	172	408.973	162.573	420.4	172.573	410.4	U	75	505.973	136.55	Yes	
RP-52B	WL		462.62	461.09	4	PVC	43.5	43	418.089	33.849	427.5	43.849	417.5	W/U	41	420.089	23.3	Yes	
RP-53C	WL		494.16	492.86	4	PVC	80.9	82	410.859	71.559	421.3	81.559	411.3	U	39	453.859	31.04	Yes	
RP-54C	CQ		590.45	588.26	4	PVC	140	136	452.255	115.855	472.4	135.855	452.4	U	34	554.255	32.5	Yes	
RP-55C	WL		561.82	560.88	4	PVC	111	109.5	451.384	108.264	445	108.264	425	U	44	516.884	54.24	Yes	
RP-55C-2	CQ		562.97	560.26	4	PVC	140	135	425.264	115.884	452	135.884	452	U	49	511.264	54.1	Yes	
RP-57C	WL	Yes	503.11	498.64	4	PVC	105	85	413.641	75.241	423.4	85.241	413.4	U	51	447.641	32.8	Yes	Casing reduced
RP-59B	CQ		378.13	376.32	4	PVC	34	34	342.316	23.716	352.6	33.716	342.6	W/U	28	348.316	12.38	Yes	
RP-5B	WL		421.76	420.81	4	PVC	46	44	376.809	33.809	387	43.809	377	W/U	37	383.809	20.78	Yes	

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
RP-5C	WL		420.68	419.10	4	PVC	89	82	337.104	75.904	343.2	75.904	343.2	U	35	384.104	19.89	Yes	
RP-5D	WL		419.22	417.02	4	PVC	144	135	282.018	125.018	292	135.018	282	U	34	383.018	12.3	Yes	
RP-61B	CQ		656.97	655.25	4	PVC	106	102	553.252	92.152	563.1	102.152	553.1	U	51	604.252	59.74	Yes	
RP-62B-1	CQ		685.88	684.09	4	PVC	90	79	605.094	69.394	614.7	79.394	604.7	U	45	639.094	60.55	Yes	
RP-62B-2	WL		680.20	678.04	4	PVC	60	61	617.04	53.64	624.4	53.64	624.4	U	48	630.04	56.37	Yes	
RP-62D	WL		676.65	674.84	4	PVC	305	300	374.841	280.541	394.3	300.541	374.3	U	50	624.841	163.65	Yes	
RP-63B	WL		691.20	689.43	4	PVC	105	98	591.426	97.926	591.5	97.926	591.5	U	50	639.426	71.25	Yes	
RP-63C	CQ		693.68	692.13	4	PVC	124	91	601.132	81.132	611	91.132	601	U	55	637.132	64.9	Yes	
RP-63D	WL		693.24	691.26	4	PVC	186	186	505.264	165.664	525.6	185.664	505.6	U	53	638.264	88.68	Yes	
RP-64B	CQ		465.43	462.99	4	PVC	40	38	424.99	27.59	435.4	37.59	425.4	W	35.5	427.49	27.37	Yes	
RP-65B	CQ		411.50	409.94	4	PVC	28	29	380.939	18.939	391	28.939	381	W/U	24	385.939	7.31	Yes	
RP-65C-2	WL		415.74	413.84	4	PVC	188.5	186.5	227.339	176.539	237.8	186.539	227.8	U	27	386.839	21.06	Yes	Well ID changed from RP-65C to match log
RP-66C	WL		518.01	515.90	4	PVC	99	97.5	418.401	87.501	428.4	97.501	418.4	U	6.5	509.401	0	Yes	
RP-67C	WL		741.35	739.05	4	PVC	200	198	541.052	177.952	561.1	197.952	541.1	U	60	679.052	102.07	Yes	
RP-68C-2	WL		697.27	694.42	4	SS	174	173	521.417	152.417	542	172.417	522	U	52	642.417	84.39	Yes	
RP-69C-1	WL		599.41	595.61	4	SS	301.8	311	284.607	262.707	305	282.707	285	U	65	530.607	74.07	Yes	
RP-69C-2	WL	Yes	603.99	602*	4	PVC	130.26	115.6	486.414	87.9	496.1	87.9	486.1	U	67.9	534.114	_	Yes	Casing added
RP-6A	WL		384.80	383.72	4	PVC	15.5	15	368.72	9.72	374	14.72	369	A	NA		12.48	Yes	
RP-6B	WL		384.87	383.90	4	PVC	32	32	351.904	21.904	362	31.904	352	A	32	351.904	12.91	Yes	
RP-6C	WL		382.91	382.16	4	PVC	100	90	292.162	81.162	301	91.162	291	U	32	350.162	74.19	Yes	
RP-6D	WL		388.35	381.92	4	PVC	150	148.5	233.422	137.922	244	147.922	234	U	35	346.922	0	Yes	
RP-70D-1	WL		579.27	576.98		PVC	400	324.5	252.476	324.776	252.2	324.776	252.2	U	45	531.976	180.47	Yes	
RP-70D-2	WL		579.27	576.98		PVC	400	394	182.976	394.776	182.7	394.276	182.7	U	45	531.976	61.02	Yes	RP-70D-2 nested well pair with RP-70D-1.

Table 4
Well Construction Details
Well Inventory Report
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RP-71C	WL		606.23	604.56	4	PVC	84	75	529.56	65.86	538.7	75.86	528.7	U	23	581.56	70.62	Yes	
RP-72A	CQ		379.75	377.14	4	PVC	35	34	343.143	24.543	352.6	34.543	342.6	A	NE		22.09	Yes	
RP-72B	WL		385.26	382.72	4	PVC	58	58	324.717	48.517	334.2	58.517	324.2	W/U	54	328.717	21.69	Yes	
RP-72D	CQ		382.51	380.49	4	PVC	148	144	236.489	135.589	244.9	145.589	234.9	U	51	329.489	22.56	Yes	
RP-73A-1	WL		379.17	377.28	4	PVC	15	14.5	362.78	10.28	367	15.28	362	A	NE		9.62	Yes	
RP-73A-2	WL		383.59	381.57	4	PVC	46	43	338.566	33.466	348.1	43.466	338.1	A	NA		13.08	Yes	
RP-73B	WL		378.12	377.01	4	PVC	38	38	339.006	28.506	348.5	38.506	338.5	W/U	34.5	342.506	9.03	Yes	
RP-73D	WL		380.14	377.97	4	PVC	150	146	231.971	136.571	241.4	146.571	231.4	U	30	347.971	13.86	Yes	
RP-74C	WL		562.80	560.90	4	PVC	143	141	419.895	131.495	429.4	141.495	419.4	U	45	515.895	84.78	Yes	
RP-75A	CQ		345.69	344.04	4	PVC	24.5	23.5	320.544	14.944	329.1	24.944	319.1	A	24.5	319.544	10.11	Yes	
RP-75B	CQ		346.48	344.49	4	PVC	55	54	290.49	43.89	300.6	53.89	290.6	W	45	299.49	16.65	Yes	
RP-75C	CQ		346.44	344.30	4	PVC	118	101	243.301	91.301	253	101.301	243	U	44.5	299.801	5.6	Yes	
RP-76A	CQ		413.43	411.85	4	PVC	37.5	36	375.845	26.645	385.2	36.645	375.2	A	37.5	374.345	14.22	Yes	
RP-78B	WL		449.76	448.36	4	PVC	48.5	47.5	400.855	37.155	411.1	47.155	401.1	W	48.5	399.855	36.73	Yes	
RP-79C-2	WL		385.65	384.00	4	PVC	69.6	68.5	315.498	58.898	325.1	68.898	315.1	U	27.5	356.498	10.73	Yes	Well ID changed from RP-79C to match log
RP-7B	WL		486.88	486.26	4	PVC	65	66	420.263	56.263	430	66.263	420	W	66.5	419.763	65.5	Yes	
RP-7C	WL		485.86	485.38	4	PVC	120	117	368.383	107.383	378	117.383	368	U	66	419.383	107.72	Yes	
RP-80C	WL		426.69	424.64	4	PVC	103	103	321.64	92.84	331.8	102.84	321.8	U	53	371.64	16	Yes	
RP-81C	WL	Yes	761.50	759.5*	4	PVC	203	102.9	656.611	93.3	666.2	103.3	656.2	U	20	739.611	67.5	Yes	Casing reduced
RP-82C	WL		688.32	685.94	4	PVC	94.2	87	598.935	87.435	598.5	87.435	598.5	U	33	652.935	NA	Yes	
RP-83D	WL		687.29	684.80	4	PVC	135	129.6	555.2	130.2	554.6	130.2	554.6	U	34.5	650.3	50.97	Yes	
RP-84A-2	CQ		420.89	419.08	4	PVC	37	36	383.082	26.682	392.4	36.682	382.4	A	NE		15.22	Yes	
RP-84B	WL		418.96	417.59	4	PVC	54.8	54	363.593	44.493	373.1	54.493	363.1	W/U	47	370.593	13.91	Yes	

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
RP-85C	WL		507.65	506.23	4	PVC	148	132	374.231	121.631	384.6	131.631	374.6	U	60	446.231	83.52	Yes	
RP-86C	WL		493.04	490.81	4	PVC	180.35	179	311.808	169.208	321.6	179.208	311.6	U	35	455.808	75.22	Yes	
RP-87C-1	WL		389.83	386.93	4	PVC	120	118.5	268.433	118.533	268.4	118.533	268.4	U	96	290.933	209.57	Yes	
RP-87C-2	WL		388.41	385.79	4	PVC	59	55	330.788	45.088	340.7	55.088	330.7	A	NE		25.81	Yes	
RP-88C	WL		489.55	490.40	4	PVC	200.8	196	294.4	196.1	294.3	196.1	294.3	U	56	434.4	170	Yes	
RP-89A	WL		582.05	579.92	4	PVC	60	49	530.922	39.022	540.9	49.022	530.9	W/U	42	537.922	28.35	Yes	
RP-8C	WL		580.06	577.58	4	PVC	221	195	382.58	185.58	392	195.58	382	U	52	525.58	185.73	Yes	
RP-92C	WL		436.78	434.71	4	PVC	375	350	84.711	330.211	104.5	350.211	84.5	U	42	392.711	37.51	Yes	
RP-94D	CQ		531.20	527.77	4	PVC	221	228	299.769	207.769	320	227.769	300	U	42	485.769	36.02	Yes	Casing added
RP-95D	CQ	Yes	583.28	581.3*	4	PVC	326.8	349.6	231.739	331.4	271.7	351.4	251.7	U	92.8	488.539	64.5	Yes	Casing added
RP-96C-2	CQ	Yes	541.61	539.6*	4	PVC		73.2	466.375	81.7	477.1	91.7	467.1	U	35.2	504.375	dry at 75.8	Yes	Casing added
RP-97D	WL		476.48	474.91	4	PVC	220	201	273.912	180.812	294.1	200.812	274.1	U	40	434.912	49.51	Yes	
RP-98C	CQ	Yes	533.43	531.4*	4	PVC	100.3	44.7	486.672	49.5	477.2	59.5	487.2	U	37.7	493.672	53.25	Yes	Casing added
RP-99A	WL		553.90	551.79	4	PVC	41	40	511.794	30.394	521.4	40.394	511.4	A/U	39.5	512.294	25	Yes	
RP-9B	WL		585.96	465.99	4	PVC	38	32	433.988	22.988	443	32.988	433	W	34	431.988	13.73	Yes	
RS-1	O		460.29	457.36		PVC		5.8	451.559		456.4		451.5	W	NA		6.85	N	Road Sump.
Sump 9B	WL		487.29	484.41	8	PVC		27	457.409	8.409	476	27.409	457	W	31	453.409	11.02	N	
SUMP 9B-CW	WL	Yes	486.26	484.00	4	PVC	31	31	453.00	21	463.00	31	453.00	NA			21.7	Yes	
SUMP 9B-PA	O		483.79	483.45	3/4	PVC	15	15	468.448	13	470.45	15	468.45	NA	NA		3.09	N	
SUMP 9B-PB	O		484.42	484.19	3/4	PVC	15	15	469.188	13	471.18	15	469.18	NA	NA		6.85	N	
SUMP 9B-PC	O		533.43	487.54	3/4	PVC	15	17	470.544	15	472.54	17	470.54	NA	NA		7.48	N	
SW-1	WL	Yes	473.97	470.97	4	PVC	38.5	22.7	448.269	7.869	463.1	17.869	453.1	W	17	453.969	9.27	Yes	Casing reduced
SW-15	WL	Yes	587.84	584.74	4	PVC	82.5	57.2	527.54	41.54	543.2	51.54	533.2	W	52.7	532.04	dry approx. 42'	Yes	Casing reduced

Table 4
Well Construction Details
Well Inventory Report
Casmalia, California

Well Name	Well Type	Modifications Since Original Construction	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Well Casing Diameter (in)	Well Casing Material	Depth of Boring (ft bgs)	Total Well Depth (ft bgs)	Bottom of Casing Elevation (ft MSL)	Top of Screen Depth (ft bgs)	Top of Screen Elevation (ft MSL)	Bottom of Screen Depth (ft bgs)	Bottom of Screen Elevation (ft MSL)	Lithology of Screened Interval	Depth to Weathered/ Unweathered Contact (ft bgs)	Elevation of Weathered/ Unweathered Contact (ft MSL)	Water level Depth (feet)	Locked ?	Comments
SW-17	WL		630.12	628.90	4	PVC	60	62.3	566.601	46.801	582.1	56.801	572.1	W	56.4	572.501	50.65	Yes	
SW-18	WL		558.95	557.91	4	PVC	50	52	505.914	36.014	521.9	46.014	511.9	W	46	511.914	47.02	Yes	
SW-28	WL		498.95	496.08	4	PVC	21.5	20.5	475.58	5.45	490.63	15.45	480.63	W/U	9	487.08	13.81	Yes	
SW-29	CQ	Yes	499.40	497.15	4	PVC	34.5	24.4	472.75	8.87	488.28	18.87	478.28	W/U	16.4	480.75	18.15	Yes	Casing reduced
SW-31	CQ		497.07	484.72	4	PVC	78	52.6	432.123	42.073	442.65	52.073	432.65	F/U	50.1	434.623	11.54	Yes	
SW-44	CQ		671.93	671.17	4	PVC	75.5	74.6	596.565	59.865	611.26	69.865	601.26	W/U	68	603.165	57.01	Yes	
SW-46	CQ		493.86	490.63	4	PVC	43	42.5	448.133	25.113	465.52	35.113	455.52	F/U	35	455.633	5.26	Yes	
SW-47	CQ		698.10	696.90	4	PVC	34	35.4	661.502	19.902	677	29.902	667	W/U	26.4	670.502	27.654	Yes	
SW-48	WL	Yes	630.35	628.3*	4	PVC	55	63.3	564.979	42.6	585.7	52.6	575.7	W/U	47.8	580.479	54.29	Yes	Casing added
SW-50	WL		680.52	678.73	4	PVC	71.5	70.8	607.932	55.342	623.39	65.342	613.39	W	68.4	610.332	62.95	Yes	
T-2	WL		579.37	579.09	2	PVC	280	244	335.093	233.093	346	243.093	336	U	56	523.093	187.32	Yes	
T-9	WL		814.31	813.36	2	PVC	172	172	641.355	162.355	651.2	172.355	641.2	U	116	697.355	130.12	Yes	
TP-13	WL		487.69	486.48	4	PVC	55	50	436.478	39.478	447	49.478	437	W/U	43.5	442.978	36.88	Yes	
TP-15	WL		591.28	588.44	4	PVC	59.7	46.7	541.74	47.44	551.3	37.44	541.3	W	47.7	540.74	45.89	Yes	Casing reduced
TP-2A	WL		453.54	452.93		PVC	71	66	386.927	54.927	397.1	65.927	387.1	W	67	385.927	22.95	Yes	Changed to TP-2 in 3/26/87 instead of TP-
TP-3	WL		442.84	441.39	4	PVC	52	49	392.392	38.392	402.6	48.392	392.6	W	50	391.392	15.3	Yes	
TP-4	CQ	Yes	563.00	561*	4	PVC	61.4	81.2	479.773	54	506.65	64	496.65	W	66.5	494.523	50.8	Yes	Casing added
TP-5	WL		421.13	419.62	4	PVC	68	64	355.618	53.618	365.9	63.618	355.9	W	64	355.618	16.64	Yes	
TP-7	WL		538.61	537.30	4	PVC	45	39.7	497.595	29.795	508	39.795	498	U	31.5	505.795	33.2	Yes	
TP-8	WL	Yes	475.65	475.54	4	PVC	21	18	457.544	8.044	467.5	18.044	457.5	W	16.5	459.044	13.35	Yes	Casing added
TP-9	WL		509.23	503.92	4	PVC		39.8	464.124	30.044	474.1	40.044	464.1	W	40.8	463.124	44.68	Yes	
WB-4	WL		494.26	492.02	1	PVC	67	67	425.022	47.022	482.5	67.022	449.5	W	52	440.022	4.89	Yes	
WB-4	WL		494.30	492.02		PVC	67	67	425.022	47.022	445	67.022	425	W/U	52	440.022	4.89	Yes	

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WB-6	WL		550.72	548.14	2	PVC	26.5	24.6	523.544	13.144	534.5	24.144	523.5	W	24.6	523.544	dry approx. 22.4'	Yes	
WP-3D	CQ		558.59	558.08	2	PVC	151	148.6	409.482	128.582	429.49	138.582	419.49	U	55.6	502.482	63.69	Yes	
WP-3S	CQ		558.70	556.91	4	PVC	58	57.5	499.414	42.514	514.58	52.514	504.58	W	55	501.914	54.42	Yes	
WP-4D	WL		446.80	443.95	4	PVC	129.5	128.5	315.452	113.532	330.42	123.532	320.42	U	48	395.952	40.01	Yes	
WP-4S	WL		446.12	443.78	4	PVC	49	48.5	395.283	38.363	405.42	48.363	395.42	W	48	395.783	25.27	Yes	
WP-7D	CQ		655.29	653.3*	2	PVC	151	153.3	499.987	138.3	514.98	153.3	499.98	U	42.3	610.987	54.17	Yes	Casing added
WP-7S	CQ	Yes	654.83	652.8*	4	PVC	43	46.1	606.719	35.5	617.28	45.5	607.28	W/U	42.6	610.219	43.8	Yes	Casing added
WP-8D	CQ	Yes	574.63	572.5*	2	PVC	138.7	145.7	426.777	124.8	447.7	134.8	437.7	U	80.7	491.777	62.45	Yes	Casing added
WP-8S	WL	Yes	574.61	572.5*	4	PVC	78.2	87.3	485.185	76.9	498.23	86.9	488.23	W/U	80.2	492.285	71.95	Yes	Casing added

Notes:

‡ Well has been modified since original construction

* Ground surface elevation not re-surveyed after casing elevation change. Measurement approximate.

Most well casings constructed from PVC. Some with stainless steel.

Well Type: WL = water level, CQ = chemical quality, O = omitted from monitoring program

ft MSL = feet above mean sea level

ft bgs = feet below ground surface

NE = not encountered

NA = not available

F = fill

A = alluvium

W = weathered claystone

U = unweathered claystone

GCW = gallery collection well