APPENDIX D

PROPOSED WATER QUALITY SAMPLING AND ANALYSIS PLAN

February 22, 2011

Mr. Joseph J. Miller, P.E.
SCS Engineers
6601 Koll Center Parkway, Suite 140
Pleasanton, California 94566

Re: Proposed Water Quality Sampling and Analysis Plan, Central Landfill, Sonoma County, California (Project Task 16)

Dear Mr. Miller:

On behalf of Sonoma County Department of Transportation and Public Works, Integrated Waste Division (County), Pacific GeoScience has prepared this proposed Sampling and Analysis Plan (SAP) for the monitoring of ground water, surface water and leachate environmental media at the Central Disposal Site (CDS) in Sonoma County, California. The proposed SAP has been prepared in anticipation of new Waste Discharge Requirements (WDRs) from the California Regional Water Quality Control Board, North Coast Region (RWQCB) for the expansion of Landfill 1 and 2 waste management units (WMUs) at the CDS. This SAP presents details of the recommended monitoring and reporting program for the applicable environmental media at the CDS in response to landfill expansion.

As you know, environmental monitoring at the CDS is currently performed pursuant to the requirements of Monitoring and Reporting Program No. R1-2004-0040 (MRP) issued by the RWQCB in June 2004. The County began implementation of the MRP in August 2004. A copy of the MRP is attached to this letter in Appendix A. Pacific GeoScience has made certain recommendations to modify the MRP so that it is more consistent with the statistical methods used to establish Water Quality Protection Standards (WQPS) for ground water and surface water. These modifications are also based on the evaluation of over six (6) years of monitoring data collected under the MRP, plus additional data collected from various media since August 2000. The evaluation of these data indicate that certain analytical constituents can be eliminated from the monitoring programs without a loss of meaningful data, either because of the paucity of constituent detections or the unsuitability of these parameters to detect leachate or landfill gas (LFG) impact on ground water.

A site plan of the CDS, showing the current monitoring network, is presented in Figure 1. A recent ground water/leachate contour map of the CDS (using November 2010 water level data), with the proposed waste limits for landfill expansion, is presented in Figure 2. The proposed monitoring network, also with the proposed waste limits for landfill expansion, is presented in Figure 3. The monitoring installations recommended for decommissioning are shown in Figure 3.

The County has and shall maintain water quality monitoring systems that are appropriate for detection monitoring and corrective action, and that comply with Subchapter 3, Chapter 3, Subdivision 1, Division 2, Title 27, of the California Code of Regulations (CCR). Pacific GeoScience recommends implementation of the proposed monitoring programs using the same field procedures that have been utilized over the past 10+ years. These procedures are presented in Appendix B.

MONITORING NETWORK MODIFICATIONS

The ground water, surface water, and leachate monitoring networks are recommended to be modified based on the results of water quality data collected over the past six and a half (6.5) years under the current MRP. Additional data collected since August 2000 have been included in this evaluation for certain monitoring locations. The recommended modifications of the MRP for each environmental media and monitoring program are addressed below.

Ground Water Monitoring Network

The current ground water network specified in the MRP for monitoring both Landfills 1 and 2 at the CDS consists of 31 Detection wells/locations, 13 Corrective Action wells/locations, one Seep Investigation well, and 40 piezometers. The wells included in each monitoring program are listed in Table 1, attached (refer to the "Current MRP Usage" column in this table). Of the 31 Detection monitoring wells, 9 have been identified by the RWQCB as background wells and 18 have been listed as Point of Compliance (POC) wells in the MRP. The County has voluntarily monitored six (6) additional locations as Detection or Seep Investigation wells (F-20, F-35, LP-1, WV-1, WV-2, and WV-3) and 40 piezometers, none of which are included in the MRP. All wells that are not sampled are used as piezometers to evaluate the site-wide ground water flow conditions. Modifications to the current monitoring network are described in the following sections.

Detection Monitoring Wells

Recommended changes to the Detection Well network consist of the following (reference Table 1):

- Because the WQPS are not established using background data, the sampling of background locations is not necessary to evaluate landfill performance. Background wells F-12, F-14, F-15, F-16, and MW-1 should be used as piezometers and not sampled because intrawell statistical methods are used to evaluate quarterly water quality data; comparative statistics of upgradient versus downgradient water quality are not employed. Background ground water quality has been well defined at the CDS during the detection monitoring program implemented since the mid to late 1990s. [Note that 12 of the 31 Detection monitoring wells currently being sampled at CDS are located upgradient or transgradient of landfilled waste.]

- All DW-series wells (DW-1R, DW-3A, DW-3B, DW-4B, DW-5, and DW-7), screened in deep water-bearing zones, should be used as piezometers and not sampled. Other than background well DW-4B, no volatile organic compounds (VOCs) or other anomalous water quality data have been detected in quarterly samples collected from these wells from 2000 through 2010. The deep well network was installed to evaluate the possible occurrence of deep ground water flow paths moving radially away from the CDS. This concern was addressed during Pacific GeoScience's 2004-2005 hydrogeologic investigation reported in *Landfill 1 Delineation Assessment Report, Central Disposal Site, Sonoma County,*

California, dated February 15, 2005 (DAR). Results of the DAR investigation indicated that any leachate impacts to ground water quality would be limited to the shallowest water-bearing zones because of an upward hydraulic gradient that occurs in the Franciscan Assemblage bedrock underlying most of the site. That is, in a group of wells, those screened in deeper water-bearing zones will have higher ground water elevations than wells screened in shallower zones. An example of this is shown in Figure 4 for a group of piezometers installed in the Landfill 2 expansion area. The occurrence of benzene in upgradient well DW-4B samples is highly anomalous (as is the ground water level in the well and certain inorganic monitoring parameter concentrations), but it is not related to landfill operations.

- Detection well F-35, located downgradient of well F-10, is impacted by Methyl Tert-Butyl Ether (MTBE) and should become a Corrective Action well. The lower concentrations of MTBE in well F-35 samples relative to well F-10 samples appear to be related to MTBE occurrence at well F-10, which is located in an upgradient direction from well F-35.

- Well A-3 has a bent casing that prevents the well from being sampled, therefore, it should be used as a piezometer. This is a very shallow well (12 feet below ground surface, or BGS) that is only occasionally saturated and, therefore, provides limited data on water quality conditions at the site. Note that well A-2 is located close to A-3, is also shallow (14 feet BGS), and likely monitors the same alluvial/colluvial water-bearing zone as well A-3. Samples are obtained from well A-2 when water is present during the wet season. Water levels should continue to be obtained from well A-3 on a quarterly schedule.

- Well F-29 should be decommissioned prior to construction of the Landfill 2 expansion area. It should be used as a piezometer until decommissioned.

- Well LP-1, currently used as a Seep Investigation well, should be decommissioned. This well has previously yielded samples with low concentrations of MTBE, however, no VOCs have been detected in the past 15 consecutive quarterly monitoring events (the last time MTBE was detected was in February 2007 at 0.52 ug/L, just above the reporting limit of 0.50 ug/L). Therefore, because it appears unlikely that MTBE will again occur at this location, there is no need to continue monitoring this Seep Investigation well.

- One Detection well installation is recommended to supplement the Landfill 1 Detection monitoring network. The proposed well should be located midway between wells HA-1 and HA-2 at the POC. This well has been tentatively identified as F-39. The location of the proposed well is shown in Figure 3. This well should be installed in the uppermost water-bearing zone. It is not known if the well will be installed in Franciscan Assemblage bedrock or in the Wilson Grove Formation because the contact between these geologic units exists in this area. A work plan for the installation of this well will be provided to the RWQCB

for review and concurrence prior to mobilization for field work. All necessary permits will be obtained prior to the start of field work.

- One Detection well installation is recommended to adequately monitor the western expansion of Landfill 2. The proposed well should be located on the perimeter road of Leachate Pond No. 2 at the POC. This well has been tentatively identified as F-36. The location of the proposed well is shown in Figure 3. This well should be installed in the uppermost water-bearing zone, anticipated to be within Franciscan Assemblage bedrock. A work plan for the installation of this well will be provided to the RWQCB for review and concurrence prior to mobilization for field work. All necessary permits will be obtained prior to the start of field work.

- Based on the recommended changes to the monitoring network given above, the resulting network of Detection monitoring wells/locations at CDS would consist of the following:

  Landfill 1: A-2, F-2N, F-13, proposed well F-39, HA-1, HA-2, LP#2UNDER, ST1W-1, ST1W-2, and ST1W-3.

  Landfill 2: A-1R, A-8, F-11, F-17, F-18, F-31, and proposed well F-36.

Corrective Action Wells

Recommended changes to the Corrective Action Well network consist of the following (reference Table 1):

- Based on the exceedingly rare occurrence of VOCs in samples from Corrective Action wells F-5, MW-3A, and MW-3R since August 2000, these wells should be removed from the sampling program and be used instead as piezometers that are monitored quarterly. The detection of VOCs in samples from these wells in 1997 and 1998 was related to LFG interactions with ground water. The LFG extraction system has since remediated VOC occurrence at these locations. There have been only 3 VOC detections in the last 42 quarterly samples obtained from well F-5, no VOC detections in the last 42 well MW-3A samples, and one VOC detection in the past 42 samples from well MW-3R. A description of each VOC detection is provided in Table 2. Each of these VOC detections is believed to be false positive because they have not occurred repeatedly. Note that no anthropogenic constituents have been detected in annual ground water COC samples collected from these wells since 2000. These data are also presented in Table 2.

- Based on the exceedingly rare occurrence of VOCs in samples from corrective action wells A-7, A-8, and F-32 since February 2005, wells A-7 and F-32 should be removed from the sampling program and be used instead as piezometers that are monitored quarterly. Well A-8 should become a Detection Monitoring and POC well for the alluvial aquifer that occurs downgradient of Landfill 2. There

has been one VOC detection in the last 24 quarterly samples from well F-32, which is believed to be false positive because it has not occurred again. No VOCs have been detected in 24 quarterly samples from wells A-7 and A-8. A summary of VOC occurrence in samples from wells A-7, A-8, and F-32 is provided in Table 2. Note that no anthropogenic COCs have been detected in annual ground water samples collected from these wells since 2005. These data are also presented in Table 2.

- Wells F-3, F-8, F-30, and the Trench Riser should be decommissioned prior to construction of the Landfill 2 expansion area. These wells will be used as piezometers until they are decommissioned.

- Based on the recommendations provided above, the resulting network of Corrective Action wells/locations at CDS would consist of the following:

  Wells F-10 and F-35, and LF2UNDER (Landfill 2 Underdrain).

Point of Compliance Wells

The current MRP lists wells A-1 (now A-1R), A-2, A-3, A-7, A-8, HA-1, HA-2, F-2 (now F-2N), F-3, F-8, F-11, F-13, F-17, F-18, F-19, ST1W-1, ST1W-2, and ST1W-3 as POC wells. Recommended changes to the POC well network consist of the following (reference Table 1):

- As noted above, wells A-3 and A-7 should become piezometers for the reasons given.

- Wells F-3 and F-8 will be decommissioned during landfill expansion.

- Well F-19 should become a piezometer because this location is transgradient to Landfill 2. The hydraulic relationship of well F-19 to Landfill 2 is shown in the ground water/leachate contour map in Figure 2. Note that the proposed limits of refuse have been added to this map.

- Compliance well F-2N should become an interior Detection monitoring location downgradient of the Rock Extraction Area expansion area (it is not located at the POC - see Figure 2).

- Corrective Action well F-31 should become a Detection monitoring well. This well is located downgradient of Landfill 2 at the POC and is installed in the uppermost bedrock water-bearing zone. Note that, based on the ground water/leachate contour map presented in Figure 2, well F-32 is located directly upgradient of well F-31. Consequently, inclusion of well F-32 in the Detection monitoring network would be redundant (well F-32 is recommended to be used as a piezometer).

- Based on the recommendations provided above, the resulting network of POC wells at CDS will consist of the following:

  Landfill 1: A-2, F-13, proposed well F-39, HA-1, HA-2, ST1W-1, ST1W-2, and ST1W-3.

  Landfill 2: A-1R, A-8, F-11, F-17, F-18, F-31, and proposed well F-36.

Well and Piezometer Decommissioning

Landfill expansion will result in the need to decommission 29 ground water monitoring wells and piezometers at the CDS. Based on the proposed limits of refuse on final grading for Landfills 1 and 2, as illustrated in Figure 3, attached, these locations are:

- Detection Monitoring wells F-29, WV-1, WV-2, and WV-3.
- Corrective Action locations F-3, F-8, F-30, and Trench Riser.
- Seep Investigation well LP-1.
- Piezometers F-33, F-34, TMW-4 through TMW-11, TMW-14 through TMW-17, and WV-4 through WV-9.

The locations to be decommissioned are listed in Table 1 and shown in Figure 3. Because landfill expansion will occur in phases separated by many years, the monitoring installations slated for decommissioning will be removed approximately 3 to 6 months prior to landfill construction in the applicable area. The monitoring installations recommended for decommissioning will be used as piezometers until they are destroyed. The County will submit a work plan for the decommissioning of these installations and gain concurrence from the RWQCB prior to the start of field work for each phase of well destruction. It is anticipated that all wells and piezometers installed in native materials will be decommissioned by over-drilling the well casing to the original borehole depth, removing the well screen, casing, and annular fill materials, then grouted from the bottom of the borehole to ground surface using a tremie pipe. Proper well decommissioning procedures will ensure there are no preferential pathways into subsurface materials beneath the landfill expansion areas from the prior well installation.

Surface Water Monitoring Network

There is one change recommended for the surface water monitoring network. Upstream (background) station Ditch should be removed from the surface water monitoring program because intra-sampling location statistical analyses are performed at the site to establish the WQPS. Background water quality data are not needed to statistically evaluate downstream data. Stations SW-1, SW-6, and SW-7 will continue to be monitored to evaluate downstream surface water quality at the CDS. Note that the removal of the Ditch station would apply only to the surface water monitoring program and not the Compost monitoring program. The collection and analysis of monthly Compost water samples from the Ditch, SW-3, and SW-6 would continue,

however, no statistical analyses are performed on these data.

Leachate Monitoring Network

Leachate within the landfill units at the CDS is evaluated in terms of its quality and level using separate monitoring networks. Currently, only Landfill 1 has a liquid level monitoring network.

Leachate Sampling Network

The leachate sampling network currently consists of 12 locations, as listed below:

- Landfill 1 LCRS (LF1LCRS, collected at LWS-1),
- Landfill 2 LCRS (LF2LCRS),
- Leachate Pond No. 1 Outfall (LEACHPOND1),
- Leachate Pond No. 2 Outfall (LEACHPOND2),
- Leachate Pond No. 1 Upper LCRS (LP#1UPLCRS),
- Leachate Pond No. 1 Lower LCRS (LP#1LOLCRS),
- Leachate Pond 2 LCRS, and
- Five (5) leachate extraction wells (LEW-1, LEW-2, V-61, V-66.5, and V-86).

Pacific GeoScience recommends that the 5 leachate extraction wells be removed from the monitoring network. These locations have been monitored since August 2004 and have provided abundant data (26 sampling events) on possible leachate variability from within the landfill footprint. The analytical data provided from these installations, however, is not significantly different than that obtained from the leachate sampling locations at the southern (downhill) parts of the landfills. Indeed, the leachate pond and LCRS samples provide a better composite of leachate from within each landfill unit than the individual extraction wells. All remaining leachate monitoring locations will be used to evaluate leachate quality at the CDS. In addition, new LCRS sumps installed during landfill expansion will be added to the leachate sampling network.

Leachate Level Network

The current leachate piezometer network consists of 23 locations installed within the Landfill 1 footprint, as shown in Figures 1, 2, and 3. Each piezometer is screened in refuse at the base of the landfill. Much, if not all, of the Landfill 1 leachate level network will be decommissioned during various phases of landfill expansion; the network will be replaced after placement of the final fill layer. Leachate piezometer decommissioning will occur in phases, as needed, 3 to 6 months prior to landfill expansion in a given area. The monitoring installations will continue to be used as piezometers until they are destroyed. The County will submit a work plan for the decommissioning of these installations and gain concurrence from the RWQCB prior to the start of field work for each phase of piezometer destruction. It is anticipated that the leachate piezometers will be decommissioned by pressure grouting inside the screen and casing to the ground surface using a tremie pipe. After fill operations have been completed in Landfill 1, a work plan for installation of a new leachate piezometer network will be submitted to the RWQCB for their review and concurrence prior to field mobilization. A similar network of leachate piezometers will be installed, however, the number of piezometers and their

locations may not be identical to the existing network.

Landfill Gas Monitoring Network

This discussion is limited to the perimeter probe LFG monitoring network around Landfill 2 (the EC-series probes), including the Cleanout Riser at the Landfill 2 Underdrain sampling station, and the Temporary Monitoring Probes (TMPs, not shown in Figure 1) installed between Landfills 1 and 2. The CCR Title 27 perimeter probe network installed at CDS is specifically excluded from this discussion.

Pacific GeoScience understands the EC-series probes and the TMPs will be decommissioned during construction of the Landfill 2 expansion areas. The Cleanout Riser will remain, however, continued LFG monitoring of this location is not warranted. The Landfill 2 Underdrain station will continue to serve as a Corrective Action monitoring location that will provide adequate data on the interaction of LFG with ground water in the underdrain. Consequently, unsaturated zone monitoring, as described in the MRP, will no longer be performed at the CDS. The site-wide CCR Title 27 perimeter probe LFG monitoring data, collected quarterly, will be included in the water monitoring reports if so requested from the RWQCB.

MONITORING PARAMETERS

Pacific GeoScience recommends certain changes in the monitoring parameters for the various environmental monitoring programs at the CDS. Each of these programs is addressed individually below.

Annual Constituents Of Concern Parameters

In accordance with Federal Subtitle D, Appendix II, the COCs currently specified in the MRP are as follows:

- Speciated alkalinity (carbonate and bicarbonate alkalinity).
- Dissolved inorganics (metals).
- VOCs, including MTBE, by EPA Method 8260.
- Semivolatile Organic Compounds (SVOCs) by EPA 8270.
- Organochlorine Pesticides and PCBs by EPA 8080.
- Chlorinated Herbicides by EPA 8150.
- Organophosphorus Pesticides by EPA 8141

Pursuant to federal regulations, the Subtitle D Appendix II list above will be performed every 5 years for ground water, surface water, and leachate monitoring locations. (The 5-year COC analyses were last performed in November 2008 during the fourth quarter 2008 monitoring event, and reported in February 2009.) However, based on a review of leachate monitoring data collected from multiple locations at CDS since the beginning of 2005, Pacific GeoScience recommends annual testing of a subset of the 5-year COCs. These are referred to as the Annual COCs.

An evaluation of leachate data indicates that organochlorine pesticides and PCBs, chlorinated herbicides, and organophosphorus pesticides have been rarely, if ever, detected in 66 leachate samples collected since February 2005. The results of this evaluation are presented in

Tables 3 and 4, attached. The infrequency of detecting these constituents in leachate, which is the most concentrated source material on-site that could impact ground water quality, warrants their removal from the list of Annual COCs for the site (i.e., leachate at CDS is not characterized by the occurrence of these COCs).

A similar evaluation was made for SVOCs (Table 5), total and dissolved metals (Table 6), and general chemistry parameters (Table 7), each attached. There is a greater, yet still low, frequency in the detection of SVOCs in leachate. When detected, however, their concentrations can be high. Consequently, SVOCs should remain on the Annual COC list. Of the 17 dissolved CAM metals tested in 66 leachate samples, 8 metals (antimony, beryllium, cadmium, mercury, molybdenum, selenium, silver, and thallium) have never been detected. Similarly, total cadmium was never detected in 263 leachate samples. Although dissolved mercury has not been detected in 66 leachate samples collected since February 2005, it should be retained for analysis out of concern for the potential need of on-site leachate treatment if it should be detected. Therefore, except for mercury, the non-detected metals should be removed from the Annual COC list. The remaining parameters evaluated, total metals and general chemistry parameters, were frequently detected in leachate and can serve as a pool for the selection of indicator parameters to be used in a quarterly ground water detection monitoring program. The recommended list of Annual COCs for the CDS is as follows:

- Dissolved and Total Metals (arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc).
- VOCs, full list, including MTBE, by EPA Method 8260.
- Semivolatile Organic Compounds (SVOCs) by EPA Method 8270.

The complete list of Subtitle D Appendix II COCs will be evaluated every 5 years.

Detection Monitoring Parameters for Leachate and Ground Water

The occurrence of VOCs in ground water is the most unambiguous evidence of leachate and/or LFG impact on water quality. Indeed, results of the complete scan of COCs that are performed annually on Corrective Action samples indicate that VOCs are the only anthropogenic constituents detected. However, based on the high frequency of detection and elevated concentrations in leachate relative to CDS ground water (see Tables 6 and 7), certain inorganic indicator parameters can be useful in evaluating possible water quality impact. The following field and laboratory parameters are recommended for monitoring of leachate and ground water samples, including Corrective Action monitoring locations (monitoring frequency is quarterly, or as noted). The monitoring parameters proposed for ground water and leachate are summarized in Table 8.

- Field parameters (dissolved oxygen, pH, specific conductance, temperature, turbidity)
- Speciated alkalinity
- Ammonia
- Chemical Oxygen Demand
- Chloride
- Specific Conductivity
- Total Kjeldahl Nitrogen

- Total Dissolved Solids
- Total Metals (calcium, magnesium, sodium)
- Dissolved Metals (arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc), performed annually during the November event.
- Volatile Organic Compounds (EPA 601/602 list + MTBE, by EPA Method 8260)
- Leachate and Corrective Action samples should also be tested for the Annual COCs (listed above) during the November event each year.

The rationale for removing specific parameters from the current monitoring program at CDS are given below.

- Fluoride is not as frequently detected in leachate and has a standard deviation almost twice that of the average, indicating highly variable concentrations in leachate.
- Nitrate and nitrite are infrequently detected in leachate, and, when detected, have a very high variability in concentration (standard deviation greater than the average).
- The pH of leachate is very similar to that of CDS ground water.
- The average sulfate concentration in leachate is less than that of CDS ground water.
- The average concentration of iron in leachate is less than that of CDS ground water.
- Iron and manganese, as well as certain CAM 17 metals, occur naturally in CDS soils and bedrock and can lead to false indications of impact by the leaching effects of acid (used to preserve metals samples) on particulate matter that may be entrained in the water sample.
- Although tritium is present at high concentrations in leachate, it has not proven to be a reliable indicator of leachate impact on ground water samples from Corrective Action wells.

GROUND WATER ELEVATION MONITORING

The ground water surface elevation in all wells and piezometers is measured on a quarterly basis and is used to determine the direction and gradient of ground water flow. The ground water level (in feet and hundredths, relative to a mean sea level datum) taken prior to purging the well, or taken prior to the collection of a grab sample, will be used to fulfill the ground water gradient/direction analyses requirement. For each monitored ground water body, the water level will be measured in each well and piezometer to determine ground water gradient and direction at least quarterly, including the times of expected highest and lowest elevations of the water level for the respective ground water body. Ground water elevations for all upgradient and downgradient wells for a given ground water body shall be measured within a period of time short enough to avoid temporal variations in ground water flow which could preclude accurate determination of ground water gradient and direction. This information shall be tabulated and be displayed on a water table contour map for the site and included in the quarterly monitoring reports. Additional monitoring wells shall be added to the program as needed.

DETECTION GROUND WATER MONITORING PROGRAM

An outline of the proposed detection ground water monitoring program follows. Any additional monitoring wells, piezometers, or stations constructed at the site shall be added to the ground water monitoring network.

Detection Monitoring Frequency
Detection monitoring will be performed quarterly, as follows:

- February, March, April — 1st quarter event
- May, June, July — 2nd quarter event
- August, September, October — 3rd quarter event
- November, December, January — 4th quarter event (annual analyses performed)

Detection Monitoring Locations
- Landfill 1: A-2, F-2N, F-13, proposed well F-39, HA-1, HA-2, LP#2UNDER, ST1W-1, ST1W-2, and ST1W-3.

- Landfill 2: A-1R, A-8, F-11, F-17, F-18, F-31, and proposed well F-36.

Detection Monitoring Parameters (all performed quarterly, except as noted)
- Field parameters (dissolved oxygen, pH, specific conductance, temperature, turbidity)
- Speciated alkalinity
- Ammonia
- Chemical Oxygen Demand
- Chloride
- Specific Conductivity
- Total Kjeldahl Nitrogen
- Total Dissolved Solids
- Total Metals (calcium, magnesium, and sodium)
- Dissolved metals (arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc) performed annually during the fourth quarter event when all locations are most likely to have sufficient liquid available to sample.
- Volatile Organic Compounds (EPA 601/602 list + MTBE by EPA 8260).

CORRECTIVE ACTION GROUND WATER MONITORING PROGRAM
An outline of the proposed corrective action ground water monitoring program follows.

Corrective Action Monitoring Frequency
Corrective action monitoring will be performed quarterly, as follows:

- February, March, April — 1st quarter event
- May, June, July — 2nd quarter event
- August, September, October — 3rd quarter event
- November, December, January — 4th quarter event (annual analyses performed)

Corrective Action Monitoring Locations

- Landfill 1: Wells F-10 and F-35
- Landfill 2: Landfill 2 Underdrain

Corrective Action Monitoring Parameters (all performed quarterly, except as noted)

- Field parameters (dissolved oxygen, pH, specific conductance, temperature, turbidity)
- Speciated alkalinity
- Ammonia
- Chemical Oxygen Demand
- Chloride
- Specific Conductivity
- Total Kjeldahl Nitrogen
- Total Dissolved Solids
- Total Metals (calcium, magnesium, and sodium)
- Volatile Organic Compounds (EPA 601/602 list + MTBE by EPA 8260 performed quarterly, complete EPA 8260 list + MTBE performed annually in November)
- Dissolved and Total Metals (arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc, performed annually in November)
- Semivolatile Organic Compounds (SVOCs) by EPA 8270 (performed annually in November).

SURFACE WATER MONITORING PROGRAM

An outline of the proposed detection surface water monitoring program follows. Surface water sampling shall begin with the first runoff in the fall of each year and shall continue until surface runoff ceases in the dry season. The proposed surface water monitoring parameters are summarized in Table 8. Note that there are no changes in the parameters used for surface water monitoring from that included in the current MRP, however, there are recommended changes in the frequency that these parameters are tested.

Surface Water Monitoring Frequency

At a minimum, surface water monitoring will be performed quarterly, as follows:

- February, March, April — 1st quarter event
- May, June, July — 2nd quarter event
- August, September, October — 3rd quarter event
- November, December, January — 4th quarter event (annual analyses performed)
- Weekly monitoring will begin with first seasonal runoff, ending with dry season.

Surface Water Monitoring Locations

Surface water monitoring stations will consist of SW-1, SW-6, and SW-7, which also constitute the points of compliance for surface water runoff from both landfill units.

Surface Water Monitoring Parameters (frequency as noted)

Weekly Field Parameters
- Ammonia, Unionized Ammonia
- Temperature, pH, Specific Conductivity
- Dissolved Oxygen
- Hardness, as $CaCO_3$
- Turbidity

Quarterly Laboratory Parameters
- Ammonia, Unionized Ammonia
- Chloride
- Nitrate, as N
- Nitrite, as N
- Speciated Alkalinity
- Sulfate
- Total Dissolved Solids
- Total Kjeldahl Nitrogen
- Total Settleable Solids
- Total Suspended Solids

Annual Laboratory Parameters
- Chemical Oxygen Demand
- Total Organic Carbon
- Biochemical Oxygen Demand
- Bioassay Test (96 hour)
- CAM 17 Metals

LEACHATE MONITORING PROGRAM

An outline of the proposed leachate monitoring program follows.

Leachate Monitoring Frequency

Detection monitoring will be performed quarterly, as follows:

• February, March, April	1st quarter event
• May, June, July	2nd quarter event
• August, September, October	3rd quarter event
• November, December, January	4th quarter event (annual analyses performed)

Leachate Monitoring Locations
- Landfill 1 LCRS, Landfill 2 LCRS, Leachate Pond No. 1 Upper LCRS, Leachate Pond No. 1 Lower LCRS, Leachate Pond No. 1, Leachate Pond No. 2, Leachate Pond 2 LCRS, and new LCRS sumps installed during landfill expansion.

Leachate Monitoring Parameters (all performed quarterly, except as noted)

- Field parameters (pH, specific conductance, temperature, turbidity)
- Speciated alkalinity
- Ammonia
- Chemical Oxygen Demand
- Chloride
- Specific Conductivity
- Total Kjeldahl Nitrogen
- Total Dissolved Solids
- Total Metals (calcium, magnesium, and sodium)
- Volatile Organic Compounds (EPA 601/602 list + MTBE by EPA 8260 performed quarterly, complete EPA 8260 list + MTBE performed annually in November)
- Dissolved and Total Metals (arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc, performed annually in November).
- Semivolatile Organic Compounds (SVOCs) by EPA 8270 (performed annually in November)

REPORTING

The County will report monitoring data and information as required in the forthcoming Monitoring and Reporting Program to be issued by the RWQCB, and as required in the General Monitoring and Reporting Requirements. Included in the reports will be a narrative discussion of the monitoring results, including notations of any water quality violations shall precede tabular summaries of the water quality data. In reporting the monitoring data required by this program, the County will arrange the data in tabular form so that the date, the constituents, the concentrations, and the units are readily discernible. The data shall be summarized in such a manner so as to illustrate clearly the compliance with waste discharge requirements or the lack thereof. Historical and current monitoring data shall be graphed at least once annually and submitted within the Annual Report. Graphs for the same constituent shall be plotted at the same scale to facilitate visual comparison of monitoring data.

Detection Monitoring Report

Monitoring reports shall be prepared and submitted to the RWQCB quarterly by the 15th day of the month following the end of each calendar quarter. The reports shall include the results of all monitoring programs listed herein. The proposed monitoring and reporting period is as follows:

Quarter	Quarter No.	Reporting Date
February, March, April	1	May 15
May, June, July	2	August 15
August, September, October	3	November 15
November, December, January	4	February 15 (Annual Report)

Annual Report

An Annual Report, which summarizes the monitoring results for the prior four quarters, will be submitted to the RWQCB by February 15, annually. The report shall contain both tabular and graphical summaries of the detection and corrective action monitoring data and a discussion of the progress toward re-establishment of compliance with WDRs and the WQPS, as appropriate. The Annual Report information will be included with the fourth quarter monitoring report. The Annual Report shall also include the results of the CCR Title 27 perimeter probe LFG monitoring program if so requested by the RWQCB.

Water Quality Protection Standard Report

Water Quality Protection Standards will be established using statistical and non-statistical evaluations of ground water and surface water data. Statistical concentration limits will be calculated based on the intra-sampling location monitoring approach, whereby a unique set of concentration limits is established for individual monitoring wells and surface water stations. Consequently, background monitoring locations are not used in the evaluation of downgradient monitoring data; background monitoring locations are, therefore, not necessary. The concentration limits are dependent on the number of measurements in the data set and are updated quarterly using water quality data collected during each monitoring event. Volatile organic compound data and other anthropogenic (i.e., not naturally occurring) organic compounds (e.g., semivolatile organic compounds, pesticides, etc.) for ground water samples are evaluated non-statistically because they do not occur naturally in the environment at CDS. The concentration limit for anthropogenic compounds, such as VOCs, are set at the laboratory's practical quantitation limit (PQL).

Concentration limits for inorganic monitoring parameters are calculated using the historical ("background") data for each monitoring location. A concentration limit will be determined for each of the inorganic indicator parameters for each monitoring location if the historical data set contained four (4) or more concentrations above the PQL. The measured concentration of the indicator parameters for the quarterly sampling event are then compared to their respective concentration limit to see if a statistical exceedance has occurred.

The concentration limit for indicator parameters is a one-sided (two-sided for pH) normal tolerance limit for 95 percent confidence and 95 percent coverage. Determination of a normal tolerance limit requires an estimate of the mean and standard deviation based on n "background" observations from a normal distribution. The "background" observations are the historical data set for each monitoring location. Statistical information describing the "background" observations, including the arithmetic mean and standard deviation as well as the count (i.e., number of concentrations reported above the PQL), and the minimum and maximum concentration for each indicator parameter are presented in the quarterly reports for each ground water and surface water monitoring location. For the one-sided tolerance limit (i.e., mean plus a "K factor" times the standard deviation), the factor K is required, as referred to in the statement, "At least a proportion, P, of the normal population is less than the mean plus K times the standard deviation at a selected confidence" (Gibbons, 1994). The K factors are taken from Tables 4.1 and 4.2 in *Statistical Methods for Groundwater Monitoring* (Gibbons, 1994) for constructing two-sided and one-side tolerance limits, respectively. The tables provide K values for $n = 4$ to ∞. Therefore, tolerance limits are not calculated for data sets with 3 or less concentrations above the PQL.

Calculation of the normal tolerance limit assumes that the measurements have a normal distribution. The distribution of each monitoring location data set will be evaluated annually (in the fourth quarter of each year) by comparing histograms of actual concentrations to ideal normally distributed concentrations with the same mean and standard deviation along with the Kolmogorov-Smirnov test for normality (K-S Test). Any changes to the WQPS methodology will be included in the Annual Report.

Constituents-of-Concern

The results of Annual COC monitoring will be reported in the Annual Report for that year. The results of 5-year COC monitoring shall be submitted in the subsequent monitoring report for the period in which said monitoring was performed. The next 5-year COC monitoring event for the CDS is tentatively scheduled for November 2013.

Notification of Release and Retest

For any WMU, if the results of a detection monitoring program show that there is a measurably significant increase in an indicator parameter or waste constituent over the WQPS at or beyond the points of compliance (i.e., measurably significant evidence of an exceedance or release), the County will:

- Immediately notify the RWQCB by telephone or email of the exceedance,
- Within seven days of the initial findings, follow up with written notification (or acknowledgment of the RWQCB's finding),
- Within 30 days of the initial finding, resample for the constituent(s) or parameter(s) at the point where the standard was exceeded, and
- Within 60 days of the initial finding, submit the results of the resampling and statistical analysis, indicating whether or not an exceedance or release was confirmed by the retest.

Existing Release - Amended Programs

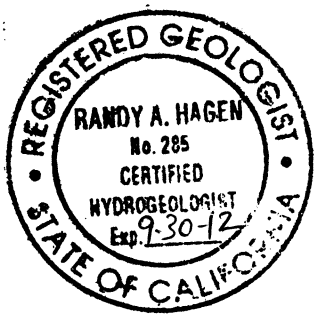
Within 30 days of confirmation of an exceedance from an existing release, the County will submit, for RWQCB staff approval, an amendment to the Corrective Action Program, describing measures planned or taken to mitigate the exceedance. The County will also note any necessary changes to the Detection Monitoring Program and Corrective Action Monitoring Program monitoring locations as a result of the exceedance.

Responding to a Release Discovery

Upon verifying a measurably significant evidence of a release from a WMU according to Section 20420(j) of Title 27 and Section A.6 of this MRP, the County will follow the procedures and timeline described in Section 20420(k) of Title 27.

I trust this is the information you require at this time. Please do not hesitate to call me if you have questions. We appreciate this opportunity to be of service to you and Sonoma County.

Very Truly Yours,



Randy A. Hagen, P.G., C.HG.
Principal

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Appendix A. Monitoring and Reporting Program No. R1-2004-0040
Appendix B. Water Monitoring Procedures

Table 1. Proposed Changes to the Ground Water Monitoring Network, Central Landfill, Sonoma County, CA

Monitoring Location	Current MRP Usage	Relative Hydraulic Position to Waste	Landfill Monitored	Well Depth (Ft. BGS)	Geologic Unit Screened	Proposed Usage	Comments
A-1R	Detection/POC well	Downgadient	Landfill 2	16	Alluvium/Colluvium	Detection/POC well	
A-2	Detection/POC well	Downgradient	Landfill 1	14	Alluvium/Colluvium	Detection/POC well	Seasonally dry
A-3	Detection/POC well	Downgradient	Landfill 1	12	Alluvium/Colluvium	Piezometer	Bent casing, seasonally dry
A-4	Not in MRP, Piezo.	Downgradient	Landfill 1	21	Alluvium/Colluvium	Piezometer	
A-5	Not in MRP, Piezo.	Downgradient	Landfill 1	29	Alluvium/Colluvium	Piezometer	
A-7	CA, POC	Downgradient	Landfill 2	17	Alluvium/Colluvium	Piezometer	
A-8	CA, POC	Downgradient	Landfill 2	20	Alluvium/Colluvium	Detection/POC well	
DW-1R	Detection/Background	Upgradient	Landfill 1	210	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
DW-3A	Detection/Background	Transgradient	Landfill 1	112	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
DW-3B	Detection/Background	Transgradient	Landfill 1	177	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
DW-4B	Detection/Background	Upgradient	Landfill 2	196	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
DW-5	Not in MRP, Piezo.	Transgradient	Landfill 2	111	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
DW-7	Detection	Downgradient	Landfill 1	178	Franciscan Assemblage	Piezometer	Deep well screened in lower WBZ
F-2N	Detection/POC well	Transgradient	Landfill 1	40	Franciscan Assemblage	Detection well	Downgradient of REA upon expansion, not at POC
F-3	CA, POC	Downgradient	Landfill 1	41	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-5	CA	Upgradient	Landfill 1	32	Franciscan Assemblage	Piezometer	
F-8	CA, POC	Downgradient	Landfill 1	47	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-10	CA	Downgradient	Landfill 1	50	Franciscan Assemblage	CA well	VOCs detected in well samples.
F-11	Detection/POC well	Downgradient	Landfill 2	31	Franciscan Assemblage	Detection/POC well	
F-12	Detection/Background	Upgradient	Landfill 1	48	Franciscan Assemblage	Piezometer	
F-13	Detection/POC well	Downgradient	Landfill 1	41	Franciscan Assemblage	Detection/POC well	
F-14	Detection/Background	Transgradient	Landfill 2	155	Franciscan Assemblage	Piezometer	
F-15	Detection/Background	Upgradient	Landfill 2	41	Franciscan Assemblage	Piezometer	
F-16	Detection/Background	Transgradient	Landfill 2	140	Franciscan Assemblage	Piezometer	
F-17	Detection/POC well	Downgradient	Landfill 2	65	Franciscan Assemblage	Detection/POC well	
F-18	Detection/POC well	Downgradient	Landfill 2	78	Franciscan Assemblage	Detection/POC well	
F-19	Detection/POC well	Transgradient	Landfill 2	43	Franciscan Assemblage	Piezometer	
F-20	Not in MRP, Detection	Transgradient	Landfill 1	61	Franciscan Assemblage	Piezometer	
F-21	Not in MRP, Piezo.	Upgradient	Landfill 1	119	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-22	Not in MRP, Piezo.	Transgradient	Landfill 1	58	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-23	Not in MRP, Piezo.	Transgradient	Landfill 1	53	Wilson Grove Formation	Piezometer	West Valley expansion area well
F-24	Not in MRP, Piezo.	Transgradient	Landfill 1	220	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-25	Not in MRP, Piezo.	Transgradient	Landfill 1	144	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-26	Not in MRP, Piezo.	Transgradient	Landfill 1	65	Wilson Grove Formation	Piezometer	West Valley expansion area well

Table 1. Proposed Changes to the Ground Water Monitoring Network, Central Landfill, Sonoma County, CA

Monitoring Location	Current MRP Usage	Relative Hydraulic Position to Waste	Landfill Monitored	Well Depth (Ft. BGS)	Geologic Unit Screened	Proposed Usage	Comments
F-27	Not in MRP, Piezo.	Transgradient	Landfill 1	70	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-28	Not in MRP, Piezo.	Transgradient	Landfill 1	54	Franciscan Assemblage	Piezometer	West Valley expansion area well
F-29	Detection	Downgradient	Landfill 1	86	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-30	CA	Downgradient	Landfill 1	36	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-31	CA	Downgradient	Landfill 2	35	Franciscan Assemblage	Detection/POC well	Screened in uppermost bedrock WBZ
F-32	CA	Downgradient	Landfill 2	35	Franciscan Assemblage	Piezometer	Screened in uppermost bedrock WBZ
F-33	Not in MRP, Piezo.	Downgradient	Landfill 1	22	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-34	Not in MRP, Piezo.	Downgradient	Landfill 1	39	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
F-35	Not in MRP, Detection	Downgradient	Landfill 1	70	Franciscan Assemblage	CA well	MTBE detected in well samples.
F-36	Not in MRP, Proposed	Downgradient	Landfill 2	~60 - 70	Franciscan Assemblage	Detection/POC well	To be located on south side of Leachate Pond 2 road
F-37	Not in MRP, Piezo.	Downgradient	Landfill 2	18	Franciscan Assemblage	Piezometer	
F-38	Not in MRP, Piezo.	Downgradient	Landfill 1	35	Franciscan Assemblage	Piezometer	
F-39	Not in MRP, Proposed	Downgradient	Landfill 1	~40 - 45	Fran. or Wilson Grove Fm.	Detection/POC well	To be located midway between wells HA-1 and HA-2
HA-1	Detection/POC well	Downgradient	Landfill 1	43	Franciscan Assemblage	Detection/POC well	
HA-2	Detection/POC well	Downgradient	Landfill 1	40	Wilson Grove Formation?	Detection/POC well	
LF2 UNDER	CA	Downgradient	Landfill 2	N/A	Franciscan Assemblage	CA location	Low concentrations of VOCs detected.
LP#2UNDER	Detection	Downgradient	Landfill 1	N/A	Unknown	Detection	Lea. Pond 2 underdrain, seasonally dry
LP-1	Not in MRP, SI well	Downgradient	Landfill 1	32	Alluvium/Colluvium	Decommission*	No longer need Seep Investigation well
LP-2	Not in MRP, Piezo.	Transgradient	Landfill 1	34	Wilson Grove Formation?	Piezometer	
MW-1	Detection/Background	Upgradient	Landfill 1	59	Franciscan Assemblage	Piezometer	
MW-3A	CA	Downgradient	Landfill 1	21	Alluvium/Colluvium	Piezometer	
MW-3R	CA	Downgradient	Landfill 1	33	Franciscan Assemblage	Piezometer	Screened in uppermost bedrock WBZ
PZ-1	Not in MRP, Piezo.	Transgradient	Landfill 1	27	Franciscan Assemblage	Piezometer	
PZ-2	Not in MRP, Piezo.	Transgradient	Landfill 1	18	Franciscan Assemblage	Piezometer	
PZ-3	Not in MRP, Piezo.	Transgradient	Landfill 1	30	Franciscan Assemblage	Piezometer	
PZ-3A	Not in MRP, Piezo.	Transgradient	Landfill 1	13	Alluvium/Colluvium	Piezometer	
ST1W-1	Detection/POC well	Downgradient	Landfill 1	38	Franciscan Assemblage	Detection/POC well	
ST1W-2	Detection/POC well	Downgradient	Landfill 1	55	Franciscan Assemblage	Detection/POC well	
ST1W-3	Detection/POC well	Downgradient	Landfill 1	58	Franciscan Assemblage	Detection/POC well	
TMW-4	Not in MRP, Piezo.	Downgradient	Landfill 1	42	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-5	Not in MRP, Piezo.	Downgradient	Landfill 1	44	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-6	Not in MRP, Piezo.	Downgradient	Landfill 1	39	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-7	Not in MRP, Piezo.	Downgradient	Landfill 1	25	Franciscan Assemblage	Decommission*	Located in LF 2 expansion area construction zone
TMW-8	Not in MRP, Piezo.	Downgradient	Landfill 1	44	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint

Table 1. Proposed Changes to the Ground Water Monitoring Network, Central Landfill, Sonoma County, CA

Monitoring Location	Current MRP Usage	Relative Hydraulic Position to Waste	Landfill Monitored	Well Depth (Ft. BGS)	Geologic Unit Screened	Proposed Usage	Comments
TMW-9	Not in MRP, Piezo.	Downgradient	Landfill 1	28	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-10	Not in MRP, Piezo.	Downgradient	Landfill 1	24	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-11	Not in MRP, Piezo.	Upgradient	Landfill 2	28	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-12	Not in MRP, Piezo.	Upgradient	Landfill 2	40	Franciscan Assemblage	Piezometer	
TMW-13	Not in MRP, Piezo.	Upgradient	Landfill 2	40	Franciscan Assemblage	Piezometer	
TMW-14	Not in MRP, Piezo.	Downgradient	Landfill 1	35	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-15	Not in MRP, Piezo.	Downgradient	Landfill 1	60	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-16	Not in MRP, Piezo.	Downgradient	Landfill 1	94	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TMW-17	Not in MRP, Piezo.	Downgradient	Landfill 1	61	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
TRENCHRIS	CA	Downgradient	Landfill 1	N/A	Franciscan Assemblage	Decommission*	Located in Landfill 2 expansion area footprint
WV-1	Not in MRP, Detection	Downgradient	Landfill 1	15	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-2	Not in MRP, Detection	Downgradient	Landfill 1	16	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-3	Not in MRP, Detection	Downgradient	Landfill 1	26	Franciscan Assemblage	Decommission*	Located in LF 1 expansion area construction zone
WV-4	Not in MRP, Piezo.	Downgradient	Landfill 1	18	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-5	Not in MRP, Piezo.	Downgradient	Landfill 1	18	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-6	Not in MRP, Piezo.	Downgradient	Landfill 1	32	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-7	Not in MRP, Piezo.	Downgradient	Landfill 1	62	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-8	Not in MRP, Piezo.	Downgradient	Landfill 1	19	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint
WV-9	Not in MRP, Piezo.	Downgradient	Landfill 1	28	Franciscan Assemblage	Decommission*	Located in Landfill 1 expansion area footprint

*These installations will be used as piezometers until decommissioned.

Note: all wells screened in uppermost water-bearing zone (WBZ) unless noted otherwise.

Wells not included in the MRP are voluntarily monitored by the County as Detection wells or piezometers.

MRP = Monitoring and Reporting Program No. R1-2004-0040

BGS = Below Ground Surface

POC = Point of Compliance Well

CA = Corrective Action Well/Location

Back. = Background Well

Piezo. = Piezometer

SI = Seep Investigation Well

REA = Rock Extraction Area

Table 2. COC Data Summary for Selected Corrective Action Well Samples, Central Landfill, Sonoma Co., CA

Constituents of Concern	Samples collected since August 2000						Samples collected since February 2005					
	Well F-5		Well MW-3A		Well MW-3R		Well A-7		Well A-8		Well F-32	
	No. of Analyses	No. of Detections	No. of Analyses	No. of Detections	No. of Analyses	No. of Detections	No. of Analyses	No. of Detections	No. of Analyses	No. of Detections	No. of Analyses	No. of Detections
Volatile Organic Compounds (by EPA Method 8260)	42	3 (1)	42	0	43	1 (2)	24	0	24	0	24	1 (3)
Semivolatile Organic Compounds (by EPA Method 8270)	11	0	11	0	11	0	6	0	6	0	6	0
Chlorinated Herbicides (by EPA Method 8151)	11	0	11	0	11	0	6	0	6	0	6	0
Organochlorine Pest. & PCBs (by EPA Method 8080)	11	0	11	0	11	0	6	0	6	0	6	0
Organophosphorus Pesticides (by EPA Method 8141)	11	0	11	0	11	0	6	0	6	0	6	0

COC = Constituents of Concern

(1) Toluene detected at 0.80 ug/L in 11/13/04 sample. Bromoform and Dibromochloromethane, respectively, detected at 1.1 and 0.80 ug/L in 8/9/06 sample.

(2) Chloromethane detected at 0.59 ug/L in 11/9/10 sample. No VOCs detected in 11/29/10 retest sample.

(3) Chloroform detected at 2.1 ug/L in 8/12/08 sample. No VOCs detected in 9/10/08 retest sample.

Table 3. Organophosphorus, Organochlorine Pesticides and PCBs Detected in Leachate Samples
Central Landfill, Sonoma Co., CA

Organophosphorus Pesticides by EPA 8141	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average Concentration	Standard Deviation
				(ug/L)	(ug/L)	(ug/L)	(ug/L)
Azinphos methyl	66	0	0%	--	--	--	--
Chlorpyrifos	66	0	0%	--	--	--	--
Coumaphos	66	0	0%	--	--	--	--
Demeton	66	0	0%	--	--	--	--
Diazinon	66	0	0%	--	--	--	--
Dichlorvos	66	0	0%	--	--	--	--
Dimethoate	66	0	0%	--	--	--	--
Disulfoton	66	0	0%	--	--	--	--
Ethion	66	0	0%	--	--	--	--
Ethoprophos	66	0	0%	--	--	--	--
Fensulfothion	66	0	0%	--	--	--	--
Fenthion	66	0	0%	--	--	--	--
Malathion	66	0	0%	--	--	--	--
Mevinphos	66	0	0%	--	--	--	--
Naled	66	0	0%	--	--	--	--
Parathion-ethyl	66	0	0%	--	--	--	--
Parathion-methyl	66	0	0%	--	--	--	--
Phorate	66	0	0%	--	--	--	--
Ronnel	66	0	0%	--	--	--	--
Tetrachlorvinphos	66	0	0%	--	--	--	--

Organochlorine Pesticides and PCBs by EPA 8080	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average Concentration	Standard Deviation
				(ug/L)	(ug/L)	(ug/L)	(ug/L)
Aldrin	66	0	0%	--	--	--	--
alpha-HCH	66	0	0%	--	--	--	--
beta-HCH	66	0	0%	--	--	--	--
delta-HCH	66	0	0%	--	--	--	--
gamma-HCH (Lindane)	66	0	0%	--	--	--	--
Chlordane (tech)	66	0	0%	--	--	--	--
4,4'-DDD	66	0	0%	--	--	--	--
4,4'-DDE	66	1	1.5%	0.29	0.29	0.29	--
4,4'-DDT	66	2	3.0%	0.030	0.27	0.15	0.17
Dieldrin	66	0	0%	--	--	--	--
Endosulfan I	66	0	0%	--	--	--	--
Endosulfan II	66	0	0%	--	--	--	--
Endosulfan sulfate	66	0	0%	--	--	--	--
Endrin	66	0	0%	--	--	--	--
Endrin aldehyde	66	0	0%	--	--	--	--
Heptachlor	66	0	0%	--	--	--	--
Heptachlor epoxide	66	0	0%	--	--	--	--
Methoxychlor	66	0	0%	--	--	--	--
Toxaphene	66	0	0%	--	--	--	--
PCB Aroclor 1016	66	0	0%	--	--	--	--
PCB Aroclor 1221	66	0	0%	--	--	--	--
PCB Aroclor 1232	66	0	0%	--	--	--	--
PCB Aroclor 1242	66	0	0%	--	--	--	--
PCB Aroclor 1248	66	0	0%	--	--	--	--
PCB Aroclor 1254	66	0	0%	--	--	--	--
PCB Aroclor 1260	66	0	0%	--	--	--	--

Table 4. Chlorinated Herbicides Detected in Leachate Samples
Central Landfill, Sonoma Co., CA

Chlorinated Herbicides by EPA 8050/8151	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average Concentration	Standard Deviation
				(ug/L)	(ug/L)	(ug/L)	(ug/L)
2,4-D	66	0	0%	0	0	--	--
2,4-DB	66	0	0%	0	0	--	--
2,4,5-T	66	0	0%	0	0	--	--
2,4,5-TP	66	0	0%	0	0	--	--
Dalapon	66	0	0%	0	0	--	--
Dicamba	66	0	0%	0	0	--	--
Dinoseb	66	1	1.5%	19	19	19	--
MCPA	66	1	1.5%	330	330	330	--
MCPP	66	0	0%	0	0	--	--
Dichloroprop	66	1	1.5%	1	1	1	--

Table 5. Semivolatile Organic Compounds Detected in Leachate Samples, Central Landfill, Sonoma Co., CA

Semivolatile Organic Compounds by EPA 8270	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concen.	Maximum Concen.	Average Concen.	Standard Deviation
				(ug/L)	(ug/L)	(ug/L)	(ug/L)
Acenaphthene	66	0	0%	--	--	--	--
Acenaphthylene	66	0	0%	--	--	--	--
Anthracene	66	0	0%	--	--	--	--
Benzidine	66	0	0%	--	--	--	--
Benzoic Acid	66	4	6%	75	790,000	198,334	394,446
Benzo(a)anthracene	66	0	0%	--	--	--	--
Benzo(b)fluoranthene	66	0	0%	--	--	--	--
Benzo(k)fluoranthene	66	0	0%	--	--	--	--
Benzo(g,h,i)perylene	66	0	0%	--	--	--	--
Benzo(a)pyrene	66	0	0%	--	--	--	--
Benzyl alcohol	66	4	6%	84	93,000	23,771	46,155
Bis(2-chloroethoxy)methane	66	0	0%	--	--	--	--
Bis(2-chloroethyl) ether	66	0	0%	--	--	--	--
Bis(2-chloroisopropyl)ether	66	0	0%	--	--	--	--
Bis(2-ethylhexyl) phthalate	66	0	0%	--	--	--	--
4-Bromophenyl phenyl ether	66	0	0%	--	--	--	--
Butylbenzyl phthalate	66	1	1.5%	11	11	11	--
4-Chloroanaline	66	0	0%	--	--	--	--
4-Chloro-3-methylphenol	66	0	0%	--	--	--	--
2-Chloronaphthalene	66	0	0%	--	--	--	--
2-Chlorophenol	66	0	0%	--	--	--	--
4-Chlorophenyl phenyl ether	66	0	0%	--	--	--	--
Chrysene	66	0	0%	--	--	--	--
Dibenzo(a,h)anthracene	66	0	0%	--	--	--	--
Dibenzofuran	66	0	0%	--	--	--	--
Di-n-butyl phthalate	66	0	0%	--	--	--	--
1,2-Dichlorobenzene	66	0	0%	--	--	--	--
1,3-Dichlorobenzene	66	0	0%	--	--	--	--
1,4-Dichlorobenzene	66	0	0%	--	--	--	--
3,3-Dichlorobenzidine	66	0	0%	--	--	--	--
2,4-Dichlorophenol	66	0	0%	--	--	--	--
Diethyl phthalate	66	1	1.5%	18	18	18	--
2,4-Dimethylphenol	66	0	0%	--	--	--	--
Dimethyl phthalate	66	0	0%	--	--	--	--
4,6-Dinitro-2-methylphenol	66	0	0%	--	--	--	--
2,4-Dinitrophenol	66	0	0%	--	--	--	--
2,4-Dinitrotoluene	66	0	0%	--	--	--	--
2,6-Dinitrotoluene	66	0	0%	--	--	--	--
Di-n-octyl phthalate	66	0	0%	--	--	--	--
1,2-Diphenylhydrazine	66	0	0%	--	--	--	--
Fluoranthene	66	0	0%	--	--	--	--
Fluorene	66	0	0%	--	--	--	--
Hexachlorobenzene	66	0	0%	--	--	--	--
Hexachlorobutadiene	66	0	0%	--	--	--	--
Hexachlorocyclopentadiene	66	0	0%	--	--	--	--
Hexachloroethane	66	0	0%	--	--	--	--
Indeno(1,2,3-cd)pyrene	66	0	0%	--	--	--	--
Isophorone	66	0	0%	--	--	--	--
2-Methylnaphthalene	66	0	0%	--	--	--	--
2-Methylphenol (o-Cresol)	66	1	1.5%	69	69	69	--
3 &/or 4-Methylphenol (m/p-Cresol)	66	8	12%	45	1,500	580	555
Naphthalene	66	3	5%	120	200	173	46
2-Nitroaniline	66	0	0%	--	--	--	--
3-Nitroaniline	66	0	0%	--	--	--	--
4-Nitroaniline	66	0	0%	--	--	--	--
Nitrobenzene	66	0	0%	--	--	--	--
2-Nitrophenol	66	0	0%	--	--	--	--
4-Nitrophenol	66	0	0%	--	--	--	--
N-Nitrosodiphenylamine	66	0	0%	--	--	--	--
N-Nitrosodi-n-propylamine	66	0	0%	--	--	--	--
Pentachlorophenol	66	0	0%	--	--	--	--
Phenanthrene	66	0	0%	--	--	--	--
Phenol	66	9	14%	18	1,400	430	535
Pyrene	66	1	1.5%	570	570	570	--
1,2,4-Trichlorobenzene	66	0	0%	--	--	--	--
2,4,5-Trichlorophenol	66	0	0%	--	--	--	--
2,4,6-Trichlorophenol	66	0	0%	--	--	--	--

Table 6. Metal Concentrations in Leachate Samples Compared to Ground Water, Central Landfill, Sonoma County, California

Metals (dissolved)	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average Concentration	Standard Deviation
				(mg/L)	(mg/L)	(mg/L)	(mg/L)
Antimony	66	0	0%	--	--	--	--
Arsenic	66	37	56%	0.011	0.25	0.060	0.054
Barium	66	66	100%	0.079	2.1	0.776	0.434
Beryllium	66	0	0%	--	--	--	--
Cadmium	66	0	0%	--	--	--	--
Chromium	66	27	41%	0.012	0.068	0.033	0.015
Cobalt	66	22	33%	0.020	0.079	0.042	0.018
Copper	66	14	21%	0.023	0.290	0.067	0.068
Lead	66	3	5%	0.010	0.070	0.031	0.034
Mercury	66	0	0%	--	--	--	--
Molybdenum	66	0	0%	--	--	--	--
Nickel	66	57	86%	0.021	0.270	0.089	0.062
Selenium	66	0	0%	--	--	--	--
Silver	66	0	0%	--	--	--	--
Thallium	66	0	0%	--	--	--	--
Vanadium	66	23	35%	0.010	0.039	0.017	0.007
Zinc	66	35	53%	0.013	1.1	0.138	0.249

Metals (total)	Number of Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average CDS Leachate Conc.	Standard Deviation	Average CDS Ground Water
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Cadmium	263	0	0%	--	--	**--**	--	**--**
Calcium	263	263	100%	26	440	**163**	94	**61**
Chromium	263	86	33%	0.010	0.12	**0.029**	0.018	**--**
Iron	263	260	99%	0.050	130	**6.6**	10.3	**18**
Lead	263	40	15%	0.010	11	**0.42**	1.74	**--**
Magnesium	263	263	100%	13	240	**106**	55	**35**
Manganese	263	263	100%	0.072	9.0	**2.3**	2.1	**0.49**
Nickel	263	171	65%	0.020	0.36	**0.094**	0.061	**--**
Sodium	263	263	100%	42	2200	**620**	490	**66**
Zinc	263	170	65%	0.010	7.0	**0.40**	1.00	--

Note: Data evaluated from leachate samples collected from February 2005 through November 2010.
Ground water averages obtained from pooled Compliance well data from over 1,300 samples collected from 1995 through 2010.
Note that statistics are provided for detected values only.

Table 7. General Chemistry Concentrations in Leachate Samples Compared to Ground Water
Central Landfill, Sonoma County, California

General Chemistry Parameter	Number of Leachate Analyses	Number of Detections	Detection Percentage	Minimum Concentration	Maximum Concentration	Average CDS Leachate Concentration	Standard Deviation	Average CDS Ground Water Conc.
				(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Alkalinity, Bicarbonate	263	263	100%	120	4,300	**1,795**	1,073	--
Alkalinity, Carbonate	263	0	0%	--	--	--	--	--
Alkalinity, Hydroxide	263	0	0%	--	--	--	--	--
Alkalinity, Total	263	263	100%	120	4,300	**1,795**	1,073	**263**
Ammonia as NH3	263	260	99%	0.20	1,100	**301**	275	**0.68**
COD	263	263	100%	7	4,400	**1,184**	963	**44**
Chloride	263	263	100%	13	4,000	**1,027**	826	**53**
Fluoride	263	174	66%	0.10	60	**4.3**	8.4	**0.59**
Nitrate as N	263	50	19%	0.21	380	**13**	54	**2.8**
Nitrite as N	263	37	14%	0.01	0.47	**0.088**	0.11	--
pH (pH units)	263	263	100%	6.00	8.00	**7.17**	0.36	**7.57**
Specific Cond. (uS/cm)	263	263	100%	530	20,000	**6,239**	4,026	**770**
Sulfate as SO4	263	222	84%	0.65	200	**32**	40	**50**
Total Kjeldahl Nitrogen	263	259	98%	0.42	870	**270**	243	**1.8**
Total Dissolved Solids	263	263	100%	290	20,000	**3,100**	2,217	**431**

Note: Leachate data evaluated from samples collected from February 2005 through November 2010.
Ground water averages obtained from pooled Compliance well data from over 1,300 samples collected from 1995 through 2010.
Note that statistics are provided for detected values only.

Table 8. Proposed Monitoring Parameters for Various Environmental Media, Central Landfill, Sonoma County, CA

5-year Constituents of Concern
(applies to ground water, surface water, and leachate monitoring locations)

Constituents	Test Method*	Units	Frequency
VOCs (full list w/MTBE)	EPA 8260	ug/L	Every 5 years
Semivolatile Organic Compounds	EPA 8270	ug/L	Every 5 years
Chlorinated Herbicides	EPA 8151	ug/L	Every 5 years
Organochlorine Pesticides & PCBs	EPA 8080	ug/L	Every 5 years
Organophosphorus Pesticides	EPA 8141	ug/L	Every 5 years
Alkalinity (speciated)	SM2320	mg/L	Every 5 years
CAM 17 Dissolved Metals	Various	mg/L	Every 5 years

Ground Water Detection Monitoring Parameters for 17 Wells/Locations (1)
(field parameters dissolved oxygen, pH, SC, temp., turbidity monitored each event)

Constituents	Test Method*	Units	Frequency
Alkalinity (speciated)	SM2320	mg/L	Quarterly
Ammonia	SM4500C	mg/L	Quarterly
Chemical Oxygen Demand	SM5220D	mg/L	Quarterly
Chloride	EPA 300.0	mg/L	Quarterly
Specific Conductivity (SC)	EPA 120.1	mg/L	Quarterly
Total Kjeldahl Nitrogen	SM4500-No B	mg/L	Quarterly
Total Dissolved Solids	SM2540C	mg/L	Quarterly
Total Metals (2)	EPA 6010	mg/L	Quarterly
Dissolved Metals (3)	Various	mg/L	Annually
VOCs (601/602 list + MTBE)	EPA 8260	ug/L	Quarterly

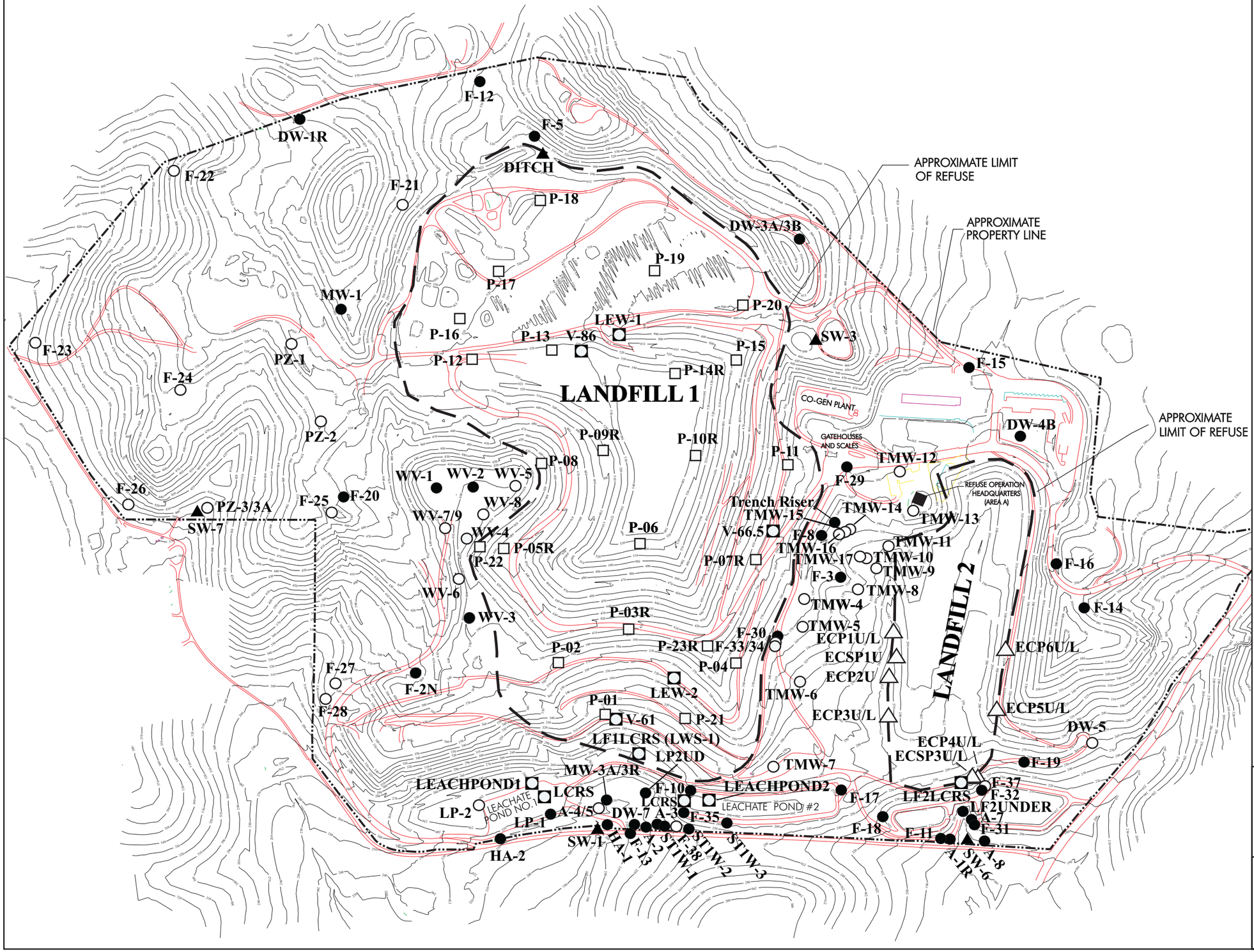
Leachate (4) and Corrective Action (5) Monitoring Parameters
(field parameters dissolved oxygen, pH, SC, temp., turbidity monitored each event)

Constituents	Test Method*	Units	Frequency
Alkalinity (speciated)	SM2320	mg/L	Quarterly
Ammonia	SM4500C	mg/L	Quarterly
Chemical Oxygen Demand	SM5220D	mg/L	Quarterly
Chloride	EPA 300.0	mg/L	Quarterly
Specific Conductivity (SC)	EPA 120.1	mg/L	Quarterly
Total Kjeldahl Nitrogen	SM4500-No B	mg/L	Quarterly
Total Dissolved Solids	SM2540C	mg/L	Quarterly
Total Metals (2)	EPA 6010	mg/L	Quarterly
VOCs (601/602 list + MTBE)	EPA 8260	ug/L	Quarterly
VOCs (full list w/MTBE)	EPA 8260	ug/L	Annually
Semivolatile Organic Compounds	EPA 8270	ug/L	Annually
Dissolved and Total Metals (3)	Various	mg/L	Annually

Surface Water Monitoring Parameters
(applies to samples from stations SW-1, SW-6, and SW-7)

Constituents	Test Method*	Units	Frequency
Ammonia, Unionized Ammonia	Field Test	mg/L	Weekly
Temperature	Field Test	^{o}F	Weekly
pH	Field Test	pH units	Weekly
Specific Conductance (SC)	Field Test	uS/cm	Weekly
Dissolved Oxygen	Field Test	mg/L	Weekly
Hardness, as CaCO3	Field Test	mg/L	Weekly
Turbidity	Field Test	NTUs	Weekly
Ammonia, Unionized Ammonia	SM4500C	mg/L	Quarterly
Chloride	EPA 300.0	mg/L	Quarterly
Nitrate, as N	EPA 300.0	mg/L	Quarterly
Nitrite, as N	SM4500-NO2 B	mg/L	Quarterly
Speciated Alkalinity	SM2320	mg/L	Quarterly
Sulfate	EPA 300.0	mg/L	Quarterly
Total Dissolved Solids	SM2540C	mg/L	Quarterly
Total Kjeldahl Nitrogen	SM4500-No B	mg/L	Quarterly
Total Settleable Solids	EPA 160.5	mg/L	Quarterly
Total Suspended Solids	SM2540D	mg/L	Quarterly
Chemical Oxygen Demand	SM5220D	mg/L	Annual
Total Organic Carbon	SM5310C	mg/L	Annual
Biochemical Oxygen Demand	SM5210B	mg/L	Annual
Bioassay Test (96 hour)	EPA600	% survival	Annual
CAM 17 Metals	various	mg/L	Annual

Notes:
(1) Wells A-1R, A-2, A-8, F-2N, F-11, F-13, F-17, F-18, F-31, F-36, F-39, HA-1, HA-2, ST1W-1, ST1W-2, ST1W-3, and LP#2UNDER
(2) Total metals consist of calcium, magnesium, and sodium
(3) Annual metals consist of arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc.
(4) LF1LCRS, LF2LCRS, LEACHPOND1, LEACHPOND2, LP#2LCRS, LP#1UPLCRS, and LP#1LOLCRS (plus any new LCRS sumps)
(5) Wells F-10, F-35, and LF2UNDER
Annual analyses performed during fourth quarter monitoring event.
*Test methods may be modified periodically as laboratory protocol dictates or as methods are upgraded by US EPA and other agencies.



EXPLANATION

- Ground Water Monitoring Well
- Ground Water Piezometer
- Surface Water Monitoring Station
- Leachate Piezometer
- Leachate Monitoring Station
- East Canyon LFG Probe
- Approximate Property Line
- Approximate Limit of Refuse
- Topographic Elevation Contour (feet, relative to County datum)

All locations approximate.

Base map source: Sonoma County Department of Transportation and Public Works.

North

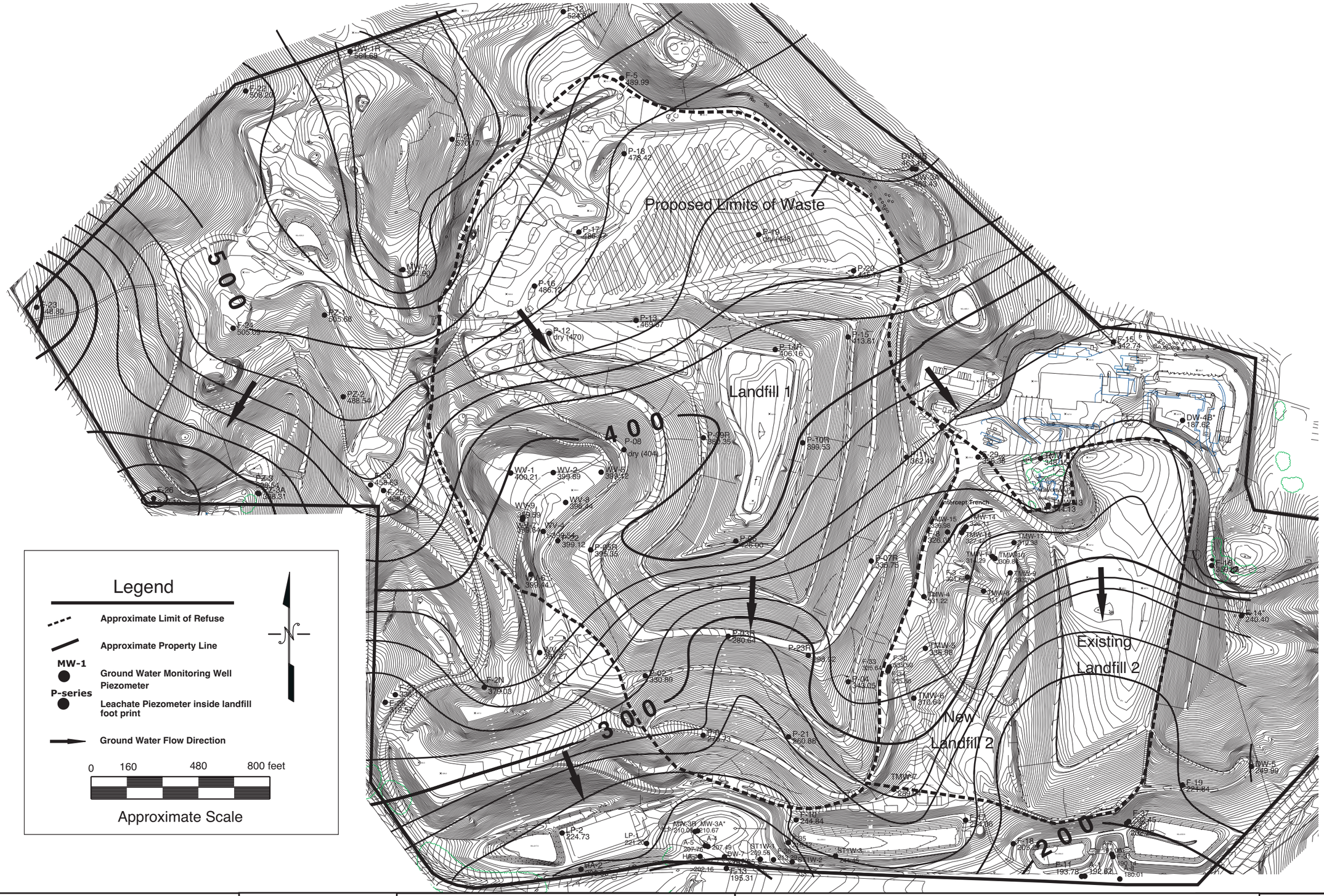
0 250 500

Scale In Feet

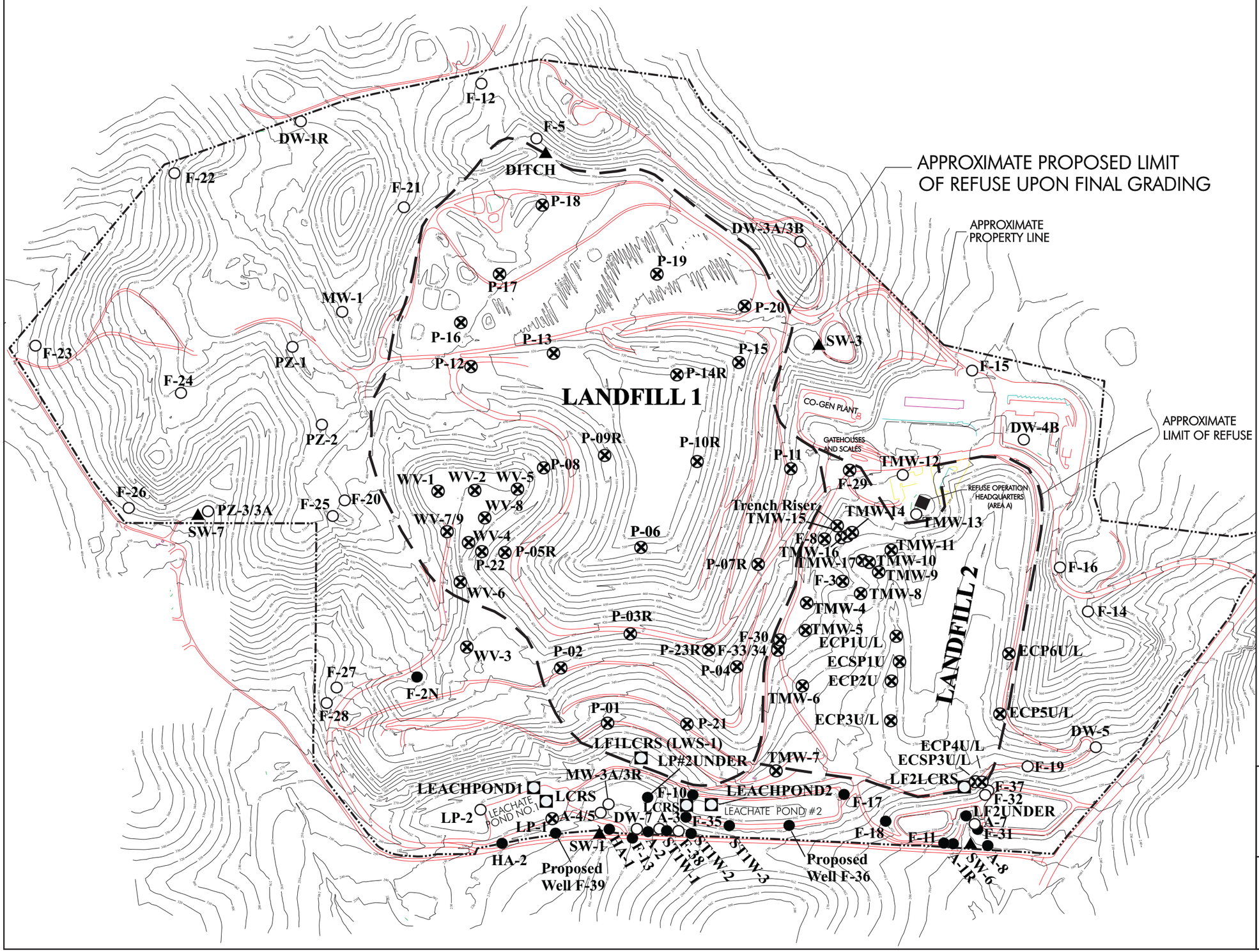
Pacific GeoScience

Central Landfill Site Plan
Petaluma, CA

Figure 1



Pacific GeoScience	Job No: 1037A Drawn: EWH Date: Jan. 2011	Contour Interval = 20 feet All locations approximate *Ground water well not contoured Leachate elevations contoured with ground water elevations Estimated elevations in parentheses	**Ground Water/Leachate Contour Map (4Q10) and Proposed Limits of Waste Central Landfill Petaluma, California**	**Figure 2**



EXPLANATION

- Detection or CA Monitoring Well
- Ground Water Piezometer
- Decommissioned Well/Piezo./LFG Probe
- Surface Water Monitoring Station
- Leachate Monitoring Station
- Approximate Property Line
- Approximate Permitted Limit of Refuse Upon Final Grading (obtained from Dwg. 8, Proposed Final Grading Plan, SCS Eng.)
- Topographic Elevation Contour (feet, relative to County datum)

CA = Corrective Action

All locations approximate.

Base map source: Sonoma County Department of Transportation and Public Works.

North

0 250 500

Scale In Feet

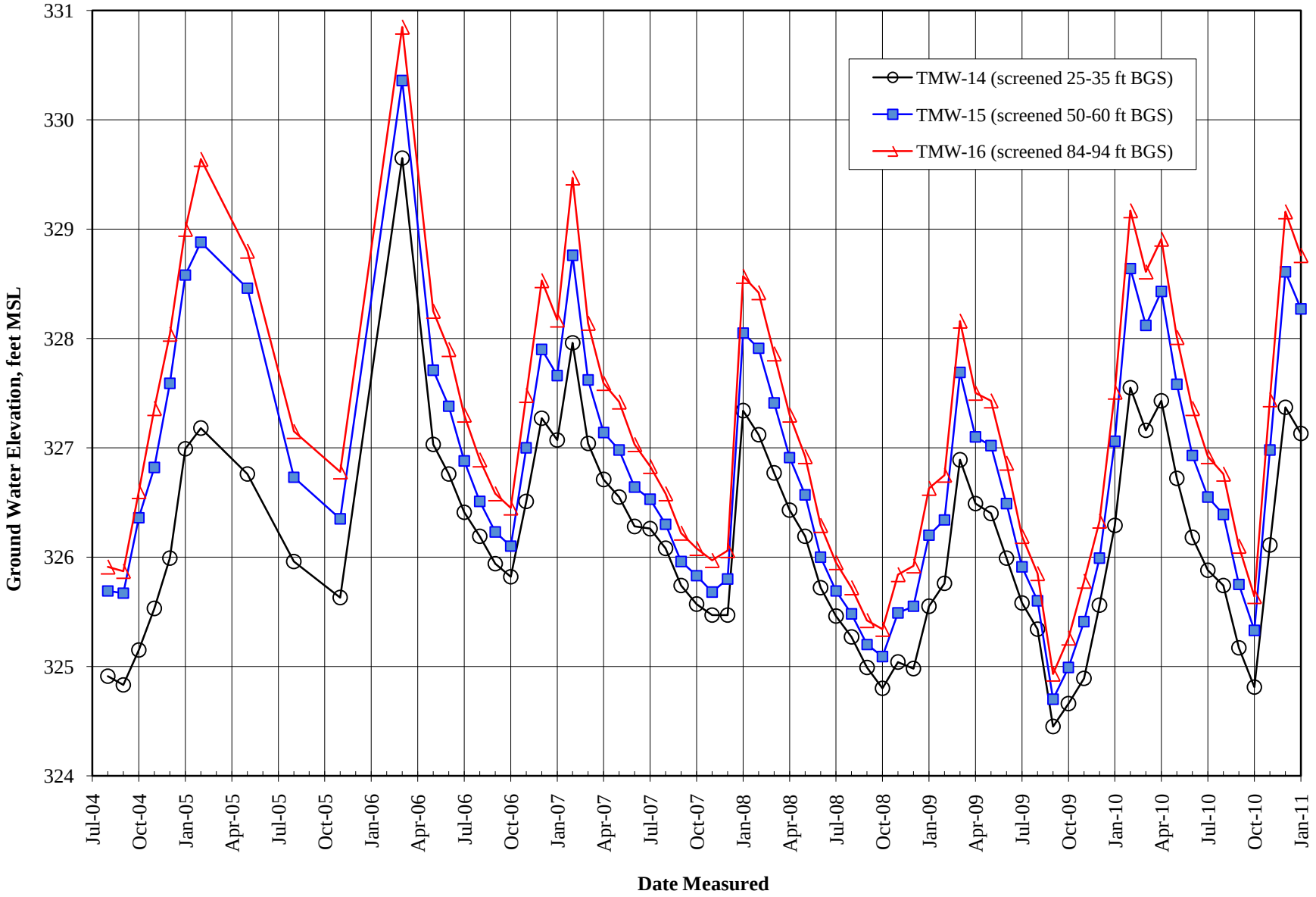
Pacific GeoScience

Proposed Limits of Waste and Monitoring Locations

Central Landfill, Petaluma, CA

Figure 3

Figure 4. Well TMW-14, 15, 16 Hydrographs, Central Landfill, Sonoma County, CA



Wells screened in deeper water-bearing zones have higher ground water elevations.

Pacific GeoScience

APPENDIX A

Monitoring and Reporting Program No. R1-2004-0040

California Regional Water Quality Control Board
North Coast Region

MONITORING AND REPORTING PROGRAM NO. R1-2004-0040

FOR

CONTINUED OPERATION AND CORRECTIVE ACTION AT THE
COUNTY OF SONOMA
CENTRAL LANDFILL
AND
EAST CANYON EXPANSION UNIT
SOLID WASTE DISPOSAL SITE

CLASS III LANDFILLS

The Discharger shall maintain water quality monitoring systems that are appropriate for detection monitoring and corrective action, and that comply with Subchapter 3, Chapter 3, Subdivision 1, Division 2, Title 27, CCR, and any other applicable provisions therein.

Compliance with this Monitoring and Reporting Program (MRP), and with the companion Standard Provisions and Reporting Requirements, is ordered by Waste Discharge Requirements (WDRs) Order No.R1-2004-40. Failure to comply with this MRP, or with the General Monitoring and Reporting Requirements, constitutes non-compliance with the WDRs and with Division 7 of the California Water Code, which can result in the imposition of civil monetary liability.

I. REPORTING

The Discharger shall report monitoring data and information as required in this Monitoring and Reporting Program and as required in the General Monitoring and Reporting Requirements. Reports which do not comply with the required format will be rejected and the Discharger shall be deemed to be in noncompliance with the WDRs.

A narrative discussion of the monitoring results, including notations of any water quality violations shall precede tabular summaries of the water quality data. In reporting the monitoring data required by this program, the Discharger shall arrange the data in tabular form so that the date, the constituents, the concentrations, and the units are readily discernible. The data shall be summarized in such a manner so as to illustrate clearly the compliance with waste discharge requirements or the lack thereof. Historical and current monitoring data shall be graphed at least once annually and submitted within the Annual Report. Graphs for the same constituent shall be plotted at the same scale to facilitate visual comparison of monitoring data.

The results of any monitoring done more frequently than required at the locations specified herein shall be reported to the Regional Water Board in the monitoring report(s) for that period.

A. REQUIRED REPORTS

1. Detection Monitoring Report

Detection Monitoring Reports (DMRs) shall be prepared and submitted to the Regional Water Board quarterly by the 15th day of the month following the end of each calendar quarter. The reports shall include the results of all monitoring programs listed herein. The established monitoring and reporting period is as follows:

QUARTER	QUARTER No.	REPORTING DATE	
February, March, April	1	May 15	
May, June, July	2	August 15	
August, September, October	3	November 15	
November, December, January	4	February 15	Annual Report date

2. Annual Report

An Annual Report, which summarizes the monitoring results for the prior four quarters, shall be submitted to the Regional Water Board **by February 15, annually**. The report shall contain both tabular and graphical summaries of the detection and corrective action monitoring data and a discussion of the progress toward re-establishment of compliance with WDRs and the Water Quality Protection Standard (WQPS). In lieu of submitting a separate report, the Annual Report information may instead be included with the first quarter Detection Monitoring Report. The Annual Report shall also include the results of the soil gas monitoring program.

3. Wetlands Mitigation and Monitoring

The results of monitoring conducted pursuant to the Wetlands Mitigation and Monitoring Plan (WMMP), as approved by Regional Water Board staff, shall be submitted **by December 31, annually**. In addition to reporting the monitoring results, the report shall include narrative descriptions, summaries of mitigation and preservation activities, and any maps, as needed, showing areas of remedial activities. Final wetlands delineation maps shall be provided in accordance with the WMMP and the outlined 5-year completion schedule.

4. Water Quality Protection Standard Report

As noted above, any changes to the water quality protection standard are to be included in the Annual Report.

5. Constituents-of-Concern (COC)

The results of COC monitoring shall be submitted with, or reported in, the Annual Report for that year.

6. Notification of Release and Re-test

For any WMU, if the results of a detection monitoring program show that there is a measurably significant increase in an indicator parameter or waste constituents over the WQPS at or beyond the points of compliance (i.e., measurably significant evidence of an exceedance or release), the Discharger shall:

a. immediately notify the Regional Water Board by telephone or fax of the exceedance,

b. within seven days of the initial findings, follow up with written notification (or acknowledgment of the Regional Water Board's finding),

c. within 30 days of the initial finding, re-sample for the constituent(s) or parameter(s) at the point where the standard was exceeded, and

d. within 60 days of the initial finding, submit the results of the re-sampling and statistical analysis, indicating whether or not an exceedance or release was confirmed by the re-test.

7. Existing Release - Amended Programs

Within 30 days of confirmation of an exceedance from an existing release, the Discharger shall submit, for Regional Water Board staff approval, an amendment to the Corrective Action Program, describing measures planned or taken to mitigate the exceedance. The Discharger shall also note any necessary changes to the DMP and Corrective Action Monitoring Program monitoring locations as a result of the exceedance.

8. Responding to a Release Discovery

Upon verifying a measurably significant evidence of a release from a WMU according to Section 20420(j) of Title 27 and Section A.6 of this MRP, the Discharger shall follow the procedures and timeline described in Section 20420(k) of Title 27.

II. MONITORING PROGRAMS

A. SOLID WASTE MONITORING

The Discharger shall monitor monthly all wastes discharged to each WMU in Landfills 1 and 2 and report quarterly as follows:

Table II.A: Nonhazardous Solid Waste Monitoring

Parameter	Units	Monitoring Frequency	Reporting Frequency
Quantity discharged	cubic yards or tons	Monthly	Quarterly
Type of material discharged	---	Monthly	Quarterly
Cell sequencing plan	---	Monthly	Quarterly
Capacity of each landfill/phase remaining	Percent	Monthly	Annually

B. ROUTINE MAINTENANCE

The disposal site shall be inspected weekly. At a minimum, the integrity of the cover material, drainage structures, potential erosion areas, and leachate piping and storage facilities shall be inspected. Inspection logs, problem areas, special occurrences, and corrective actions taken shall be included in quarterly monitoring reports**.**

C. CONSTITUENTS OF CONCERN

Except as otherwise indicated in this Order, the Discharger shall monitor each media of each new and existing landfill unit for applicable Constituents of Concern (per federal Subtitle D, Appendix II and State Water Resources Control Board Resolution 93-62). The monitoring locations, analytical methods, and frequency of analyses are as follows:

1. Monitoring Locations

a. Leachate - Landfill 1 LCRS Sump, Landfill 2 LCRS sump, Landfill 2 underdrain discharge, Leachate Pond 1(LP1) and Leachate Pond 2 (LP2), as identified in Table II.C.1

b. Groundwater – All groundwater monitoring wells

c. Unsaturated zone – Landfill gas - a representative gas probe for Landfill 1, Landfill 2, and temporary probes- TMP-1, TMP-1A, TMP-2 and TMP-3/R, and all East Canyon Perimeter Probes as per Table II.B, below, and as shown on Attachments “E” and “F”.

2. Monitoring Schedule

TABLE II.B
CONSTITUENTS OF CONCERN MONITORING

Constituents of Concern	Units	Frequency
Carbonate	mg/l	**Every 5 years**
Bicarbonate Alkalinity	mg/l	**Every 5 years**
Volatile Organic Compounds (EPA Method 8260)	ug/l	**Every 5 years**
Semi-Volatile Organic Compounds (EPA Method 8270)	ug/l	**Every 5 years**
Organochlorine Pesticide, PCBs (EPA Method 8080)	ug/l	**Every 5 years**
Chlorophenoxy Herbicides (EPA Method 8150)	ug/l	**Every 5 years**
Organophosphorus Compounds (EPA Method 8141)	ug/l	**Every 5 years**
Inorganics (dissolved)	mg/l	**Every 5 years**
MTBE	ug/l	**Every 5 years**
UNSATURATED ZONE		
Volatile Organic Compounds (EPA Method TO14)	ppb/v	**Every 5 years**
Methane	ppb/v	**Every 5 years**

D. LEACHATE MONITORING

1. Monitoring Locations

The leachate monitoring locations within each Waste Management Unit (WMU) shall be as follows:

TABLE II.C.1
LEACHATE MONITORING LOCATIONS

WMU	Location
Landfill 1	Well/Sump
Landfill 1	LEW-1
Landfill 1	LEW-2
Landfill 1	Well 60
Landfill 1	Well 9
Landfill 1	Well 66
Leachate Pond 1	LP1
Leachate Pond 1	LCRS-Sump
Leachate Pond 2	LP2
Leachate Pond 2	LCRS-Sump
Landfill 2	Underdrain

2. Monitoring Schedule

Leachate monitoring shall be conducted as specified in Table II.C.2.

TABLE II.C.2
LEACHATE MONITORING PROGRAM

Parameter	Units	Frequency	Reporting
Field Parameters			
Freeboard in Leachate Ponds	Feet/tenths	Daily	Monthly
LCRS - Sumps	Presence of liquid	Monthly	Monthly
Landfill 2 underdrain	gpm	Monthly	Monthly
Volume outhauled	Gallons	Daily	Monthly
Specific Conductance	mhos/cm	Quarterly	Quarterly
PH	pH units	Quarterly	Quarterly
Monitoring Parameters			
Total Dissolved Solids (TDS)	mg/l	Quarterly	Quarterly
Chlorides	mg/l	Quarterly	Quarterly
Fluoride	mg/l	Quarterly	Quarterly
COD	mg/l	Quarterly	Quarterly
Sodium	mg/l	Quarterly	Quarterly
Mineral series	mg/l	Quarterly	Quarterly
Nitrogen series	mg/l	Quarterly	Quarterly
CAM metals	mg/l	Quarterly	Quarterly
Sulfates	mg/l	Quarterly	Quarterly

Parameter	Units	Frequency	Reporting
Volatile Organic Compounds	ug/l	Quarterly	Quarterly
Constituents of Concern			
Table II.B constituents	ug/l	Annually	Annually

Upon detection of leachate in a previously dry LCRS sump, the leachate shall be sampled in accordance with the above schedule and the results included in the monitoring report. If COC constituents are detected that are not already Monitoring Parameters, then the leachate must be re-sampled for those constituents. If confirmed by re-test, then these constituents must be added to the Monitoring Parameter list and analyzed on a quarterly basis.

All visible portions of synthetic liners shall be inspected on a monthly basis. Each LCRS shall be hydraulically tested annually to demonstrate that it is still operating in conformance with the WDRs. The results shall be reported to the Regional Water Board in the Annual Report and shall include comparison with earlier tests made under comparable conditions.

E. GROUNDWATER ELEVATION MONITORING

Groundwater elevations taken prior to purging the well and sampling for Monitoring Parameters shall be used to fulfill the groundwater gradient/direction analyses required. For each monitored groundwater body, the Discharger shall measure the water level in each well and shall determine groundwater gradient and direction at least quarterly, including the times of expected highest and lowest elevations of the water level for the respective groundwater body. Groundwater elevations for all upgradient and downgradient wells for a given groundwater body shall be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater gradient and direction. This information shall be included in the quarterly monitoring reports.

F. WETLANDS MITIGATION AND MONITORING

The Discharger shall monitor wetlands in accordance with the Wetlands Mitigation and Monitoring Plan (WMMP), as approved by Regional Water Board staff and included in the Joint Technical Document and Final Environmental Impact Report. Monitoring shall be conducted for a sufficient number of years to ensure that all wetlands created on-site survive for the long term, and shall be discontinued only upon revision of this MRP. The results of monitoring shall be submitted by **December 31, Annually**.

III. DETECTION MONITORING

A. GENERAL

The Discharger shall perform Detection Monitoring on all media potentially affected by a release, including surface water, groundwater, and the unsaturated zone. For any given monitored medium, a sufficient number of samples shall be taken from all Monitoring Points and Background Monitoring Points to satisfy the data analysis requirements for a given Reporting Period, and shall be taken in a manner that ensures sample independence to the greatest extent feasible.

The Discharger shall use a Regional Water Board-approved statistical (or non-statistical) procedure to determine whether there has been a measurably significant increase in a constituent over the water quality protection standard, as set forth in Section 20415(e)(5) of Title 27.

B. UNSATURATED ZONE

The Landfill Gas Monitoring Reports conducted quarterly for the CIWMB and LEA shall be copied to this agency on a quarterly basis. Temporary Landfill Gas Probes TMP-1, TMP-1A, TMP-2, and TMP-3/R and East Canyon Perimeter Probes and Cleanout Riser shall be added to the quarterly monitoring program until such time as they are no longer needed and written concurrence is obtained from Regional Water Board staff.

C. GROUNDWATER

The groundwater surface elevation (in feet and hundredths, M.S.L.) in all wells shall be measured on a quarterly basis and used to determine the velocity and direction of groundwater flow. This information shall be displayed on a water table contour map and/or groundwater flow net for the site and included in the quarterly monitoring reports. Additional monitoring wells shall be added to the program as needed.

1. Monitoring Locations

The groundwater detection monitoring points for Landfill 1 and Landfill 2, shown in Attachment E, are as follows:

Background Monitoring Wells:

Landfill 1	MW-1, F-12, DW-1R, DW-3A, and DW-3B
Landfill 2	F-14, F-15, F-16, and DW-4B

Downgradient Monitoring Wells:

Landfill 1	A-2, A-3, HA-1, HA-2, F-2N, F-3, F-8, F-11, F-13, ST1W-1, ST1W-2, ST1W-3, DW-7, F-29, and F-30
Landfill 2	A1 A7, A8, F-11, F-17, F-18, F-19, F31 and F32

Groundwater Interception and Diversion Systems:

Landfill 2	Underdrain
Surface Impoundment LP1	Underdrain
Surface Impoundment LP2	Underdrain

Points of Compliance Wells:

Landfill 1	A-2, A-3, HA-II, HA-I, F-2, F-3, F-8, F-11, F-13, ST1W-1, ST1W-2, and ST1W-3
Landfill 2	A1, A7, A8, F11, F-17, F-18 and F-19

Any additional monitoring wells or stations constructed at the site shall be added to the monitoring network. Samples shall be collected from all installed wells or stations at the frequency and for the parameters specified in Table IIA and IIB, respectively.

2. Monitoring Schedule

The analytes and frequency of groundwater monitoring is as follows:

TABLE III.C.1
GROUNDWATER DETECTION MONITORING PROGRAM

Parameter	Units	Frequency
Field Parameters		
pH	pH units	Quarterly
Specific Conductance	Mhos/cm	Quarterly
Temperature	°C	Quarterly
Groundwater Elevations	Ft./tenths TOC	Quarterly
Dissolved Oxygen	mg/L	Quarterly
Turbidity	Turbidity units	Quarterly
Monitoring Parameters		
Sodium	mg/l	Quarterly
Magnesium	mg/l	Quarterly
Calcium	mg/l	Quarterly
Iron	mg/l	Quarterly
Speciated Alkalinity	mg/l	Quarterly
Floride	mg/l	Quarterly
Manganese	mg/l	Quarterly
Total Dissolved Solids (TDS)	mg/l	Quarterly
Chlorides	mg/l	Quarterly
Sulfates	mg/l	Quarterly
Nitrogen Series	mg/l	Quarterly
Halogenated VOC's	ug/l	Quarterly
Aromatic VOC's	ug/l	Quarterly
CAM Metals	mg/l	Annually
Constituents of Concern		
Table II.B constituents	ug/l	Every 5 years

D. SURFACE WATER MONITORING

1. Monitoring Locations

Both unnamed tributaries flowing into Stemple Creek shall be sampled at the property boundary at locations SW1, SW6, and SW7 in addition to background station "Ditch". Locations SW-1, SW-6 and SW7, as shown in Attachment E, constitute the points of compliance for surface waters for both landfill units.

2. Monitoring Schedule

Surface water monitoring shall be conducted as specified in Table III.D. below. Sampling shall begin with the first surface runoff in the fall of each year and shall continue monthly until surface runoff ceases in the dry season.

TABLE III.D.
SURFACE WATER MONITORING PROGRAM

Parameter	Units	Frequency
Field Parameters		
Flow	MGD	Continuous
Dissolved Oxygen	mg/l	Monthly
Hardness (as $CaC0_3$)	mg/l	Monthly
Specific Conductance	Mhos/cm	Monthly
pH	pH units	Weekly
Temperature	°C	Weekly
Ammonia	mg/l-grab	Weekly
Unionized Ammonia	mg/l-grab	Weekly
Turbidity	Turbidity Units	Monthly
Total Precipitation	In/days	Monthly
Monitoring Parameters		
Total Dissolved Solids (TDS)	mg/l	Monthly
Total Settable Solids	mg/l	Monthly
Total Suspended Solids	mg/l	Monthly
Ammonia	mg/l	Monthly
Bicarbonate	mg/l	Monthly
Chlorides	mg/l	Quarterly
Sulfates	mg/l	Quarterly
Nitrogen Series	mg/l	Quarterly
Carbonate	mg/l	Quarterly
Chemical Oxygen Demand (COD)	mg/l	Annually
Total Organic Carbon (TOC)	mg/l	Annually
Biological Oxygen Demand (BOD)	mg/l	Annually
Bioassay Test (96 hr.)	percent survival	Annually
CAM Metals	mg/l	Annually
Constituents of Concern		
Table II.B constituents	mg/l	Every 5 years

The Discharger shall determine at each sampling whether there is either a statistically or non-statistically significant increase over water quality protection standards for each parameter and constituent analyzed. If a release is detected at the downstream sampling point, the Discharger shall proceed with an Evaluation Monitoring Program to determine the source(s) and extent of the release.

IV. CORRECTIVE ACTION

The following information shall be gathered annually as to the progress of groundwater remediation, leachate extraction and landfill gas control and shall be reported in the format of Table IV.A.2 below:

A. CORRECTIVE ACTION MONITORING

1. Monitoring Locations

The corrective action monitoring points for Landfill 1 and Landfill 2, shown in Attachment E, are as follows:

TABLE IV.B.1
CORRECTIVE ACTION MONITORING LOCATIONS

WMU	Source Area	Monitoring Locations
Landfill 1	Upper Canyon	F5
Landfill 1	East Canyon Area	F3, F8, F30
Landfill 1	Cut-Off Trench	Discharge Pipe to Leachate Pond 2
Landfill 1	Toe Area	F10, MW3A, MW3R,
Landfill 2	Toe Area	Underdrain, A7, A8, F31, F32
Landfill 2	Perimeter Gas Probes	ECP1U/EPC1L, ECP2U, ECP3U/3L, ECSP3U/3L, ECSP3U/3L, ECP4U/ECP4L, ECP5U/ECP5L,ECP6U/ECP6L and Cleanout Riser

List includes former detection monitoring wells impacted by the spread of contaminants. Additional well(s) may be needed.

2. Monitoring Schedule

The monitoring schedule for the corrective action wells is as follows:

TABLE IV.B.2
CORRECTIVE ACTION MONITORING PROGRAM

Parameter	Units	Frequency
Field Parameters		
pH	pH units	Quarterly
Specific Conductance	mhos/cm	Quarterly
Temperature	°C	Quarterly
Turbidity	Turbidity units	Quarterly
Monitoring Parameters		
Total Dissolved Solids (TDS)	mg/l	Quarterly
Chlorides	mg/l	Quarterly
Sulfates	mg/l	Quarterly
Nitrate – Nitrogen	mg/l	Quarterly
Tritium	mg/l	Quarterly
Volatile Organic Compounds	ug/l	Quarterly
Constituents of Concern		
Table II.B constituents	ug/l	Annually

2. Leachate Monitoring Locations

Landfill 1

The Discharger shall monitor effective drawdown of leachate from the leachate peizomteres established within the Compliance Time Schedule Order Requirements of the Waste Discharge Requirements Order. Drawdown isoheyetal contour maps shall be reported monthly along with individual rates of pumping from each extraction location.

Landfill 2

The Discharger shall monitor and report the volume and rates of flow into the East Canyon liner sump. The volume of leachate within the sump shall not exceed two thirds of the design capacity.

V. WATER QUALITY PROTECTION STANDARD

The Water Quality Protection Standard (Standard) consists of the following elements:

A. Constituents of Concern;
B. Concentration Limits;
C. Monitoring Points;
D. Points of Compliance; and
E. Compliance Period.

Each of these is described as follows:

A. Constituents of Concern

The Constituents of Concern (COCs) required under Section 20395 of Title 27 shall include all constituent groups identified in Table II.B and specifically listed in Appendix II Subtitle D. The Discharger shall monitor all COCs every five years or more frequently as required under the corrective action monitoring program.

B. Concentration Limits

1. General

The Concentration Limit for any given Constituent of Concern or Monitoring Parameter in a given monitored medium (i.e., the uppermost aquifer) at a landfill shall be as follows, and shall be used as the basis of comparison with data from the Monitoring Points in that monitored medium:

a. The background value established in the WDRs by the Regional Water Board for that constituent and medium;

b. The constituent's background value, from the Background Monitoring Points for that monitored medium. Either:

1) The mean (or median, as appropriate) and standard deviation (or other measure of central tendency, as appropriate) of the constituent's background data; or

2) The constituent's MDL, in cases where less than 10 percent of the background samples exceed the constituent's MDL; or

c. A concentration limit greater than background, as approved by the Regional Water Board for use during or after corrective action.

2. Groundwater - background values established by monitoring.

3. Surface Water - Concentration limits for SW-1 and SW-6 and SW-7 shall be calculated for the background monitoring point, "Ditch".

These values, and the statistical or non-statistical methods upon which they are based, are subject to ongoing review and approval by Regional Water Board staff. In addition, they shall be updated as necessary to provide ongoing definition of background water quality.

C. Monitoring Points

1. Unsaturated Zone - The discharger shall submit copies of quarterly gas monitoring reports for all landfill gas probes monitored in accordance with the Solid Waste Facilities Permit issued by the CIWMB.

2. Groundwater - As listed in Tables III.C. for Landfill's 1 and 2, respectively.

3. Surface Water- As described in Section III.D.

Upon confirmation of an exceedance from an existing release, the Discharger shall transfer the impacted monitoring point(s) from the Detection Monitoring Program (DMP) to the Corrective Action Monitoring Program (CAMP). Upon confirmation that levels in a previously impacted monitoring point has been reduced below concentration limits, the Discharger may, with Regional Water Board staff approval, transfer that monitoring point from the CAMP to the DMP.

D. Points of Compliance

The point(s) of compliance at each groundwater monitoring point is the vertical surface located at the downgradient limit of the WMU that extends through the uppermost aquifer underlying the WMU. These points correspond to the corrective action wells on the southern and southwestern periphery of the landfill along Hammel Road. The points of compliance for surface water monitoring shall be SW-1, SW-6, and SW-7.

E. Compliance Period

The Compliance period is the number of years equal to the active life of the landfill plus the closure period. Each time the Standard is exceeded (i.e., a release is discovered), the landfill begins a Compliance Period on the date the Regional Water Board directs the Discharger to begin an Evaluation Monitoring Program. If the Discharger's Corrective Action Program has not achieved compliance with the Standard by the scheduled end of the Compliance Period, the Compliance Period is automatically extended until the landfill has been in continuous compliance for at least three consecutive years.

The Discharger shall implement the above monitoring program on the effective date of this Order.

Ordered by: _____

Catherine E. Kuhlman,
Executive Officer

June 23, 2004

(centralm&r0404revised)

APPENDIX B

Water Monitoring Procedures

WATER MONITORING PROCEDURES

The primary objective of the field monitoring program is to collect representative samples of ground water, surface water, soil pore liquid, and leachate (as applicable to the monitoring program) for field and laboratory analyses. The sampling and analysis procedures presented herein were developed to provide consistent and reproducible sampling methods, with proper application of analytical methods, so that the overall objectives of the monitoring program are achieved for each of the sampled media. The following document was used as a guideline for the development of these procedures:

- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods,* EPA SW-846, 3rd edition, November 1986 (Revised November 1990).

Sampling procedures generally consist of equipment cleaning, water-level and total well-depth measurements, well purging (applicable to ground water only) and sample collection and preservation. The sampling sequence generally started with upgradient locations. Downgradient samples were collected from locations of increasing contamination, as applicable.

EQUIPMENT CLEANING

Sample containers, caps, and septa used in sampling were provided by the laboratory ready for use. Sample containers were provided pre-preserved as applicable to the suite of analyses to be performed. The sample containers, caps, and septa were used only once and discarded after laboratory analysis was complete.

Before starting the sampling event, all non-dedicated purging and sampling equipment that would come in contact with the sampled media were disassembled and cleaned thoroughly with a non-phosphate detergent water, then steam cleaned or rinsed with distilled water. Any parts that would absorb contaminants, such as plastic pump bladders, check vales, etc., were cleaned as described above, or replaced. Once the sampling equipment was cleaned and reassembled, an equipment blank was collected (using distilled water) when the sample suite of analyses included volatile organic compounds (VOCs). The effluent was sampled and analyzed by EPA Method 601/602 or EPA 8260 as applicable to the site's monitoring requirements. The resulting equipment blank data were used in evaluation of VOC data collected during the monitoring event. Sampling equipment that is dedicated for use at each monitoring location did not require decontamination prior to each use.

LEACHATE AND GROUND WATER ELEVATION MEASUREMENTS

Prior to each sampling event, leachate (if applicable) and ground water levels in site monitoring wells were measured to evaluate the depth of the static water surface. Water levels were converted to elevations (referenced to mean sea level or an assumed referenced datum) and were tabulated and graphically displayed on a potentiometric surface map. The leachate and ground water monitoring wells were sampled after the water-level measurement was completed.

Water levels were measured with an electronic water level indicator (sounder). The electric sounder is a transistor-based instrument that uses a reel-mounted, two-conductor, coaxial

cable that connects the control panel to the sensor. The cable is marked at 0.01-foot increments. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit is completed when the sensor contacts the water, which serves as an electrolyte. The current is amplified and fed into an indicator light and audible buzzer, signaling when water has been contacted. A sensitivity control will compensate for highly saline or conductive water. The electric sounder shall be decontaminated by rinsing with distilled water after each use.

Depth to the water surface was measured to the nearest 0.01 foot relative to the top of well casing (TOC). This value was recorded on the field data sheets and/or logbook. The leachate or ground water elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of well casing. The total depth of the well was then measured in the monitoring wells scheduled for sampling by lowering the sensor to the bottom of the well. The total depth of the well (relative to TOC) was recorded to the nearest 0.01 foot on the field data sheet and/or logbook and used to calculate purge volumes and to determine whether the well screen is partially obstructed by silt. Wells with dedicated sampling pumps were exempt from total depth measurements prior to purging.

GROUND WATER MONITORING WELL PURGING

Prior to sampling, standing water in the casing and sand pack was purged from the monitoring well using either a bladder pump, pneumatic displacement pump, electric submersible pump, or bailer. During purging, ground water stabilization indicator parameters (pH, specific conductance, and temperature) were monitored and recorded at intervals of one casing volume. Ground water turbidity was also monitored. For wells that do not purge dry, the final 2 sets of stabilization parameter measurements met the following criteria:

- pH: ± 0.1 pH units
- Specific Conductance: ± 10 percent
- Temperature: ± 1.0 ºF

A minimum of 3 casing volumes was purged prior to commencing sample collection. When evacuating low-yield wells (those incapable of yielding 3 casing volumes) the wells were purged "dry" (with minimal amounts of water remaining in the well, as practical). These low-yield monitoring wells were allowed to recharge until sufficient water was available to fill the laboratory bottle set. If the recharge volume was insufficient to perform all the required analyses, sample collection and laboratory testing was prioritized in the following order: 1) organic constituents; 2) metals; 3) minerals; and 4) general chemistry, or as approved by the appropriate regulatory agency. In order to minimize aeration a well was not pumped dry if the recharge rate caused the formation water to vigorously cascade down the sides of the well screen.

All field measurements were recorded on a field data sheet and/or logbook and reported with the certified analytical results in the technical monitoring report prepared for the site. The pH, specific conductance, turbidity, and temperature meters were calibrated before the start of the day's field activities. The calibration was checked at least once during each sampling day to verify meter performance. Meter calibration followed the manufacturer's specifications.

SAMPLE COLLECTION

Ground Water Sampling

A bladder pump, electric submersible pump, or bailer are acceptable equipment for ground water sampling. When samples for VOCs were being collected into the sample container, flow was regulated to approximately 100 milliliters (mL) per minute to minimize sample turbulence and

aeration. VOC samples collected using a bailer were obtained from the first bailer load after purging by lowering the bailer slowly into the well to minimize water aeration. A bottom emptying device was used to control and direct sample flow when using bailers. Ground water samples to be analyzed for dissolved metals were collected in unpreserved containers and filtered and acidified by the laboratory prior to analysis.

Surface Water Sampling

If sufficient flow was observed, surface water samples were collected with a precleaned container then transferred to individual sample containers. If low-flow conditions are encountered, either a disposable syringe or a stainless steel scoop was used to collect samples. A disposable plastic syringe was used for collecting samples without disturbing bottom sediment in very shallow water conditions. In low-flow conditions, the flat bottom of a stainless steel scoop was pressed against the bank and the water flowed with minimum disturbance into the scoop. Surface water samples collected were transferred into the appropriate sample containers. Surface water samples were filtered by the laboratory as required for the applicable analysis.

Leachate Sampling

Because leachate wells are typically low yielding, they were not purged prior to sampling. Sampling procedures were consistent with those described for ground water monitoring well sampling. Leachate samples collected from leachate containment ponds were collected from the leachate outfall, as appropriate.

Soil Pore Liquid Sampling (Lysimeters)

The collection of soil pore-liquids from lysimeters was conducted using a pressure-vacuum hand pump equipped with dial gauges (Model No. 2006G2 Pressure-Vacuum Hand Pump manufactured by Soilmoisture Equipment Corporation). The dial gauges are graduated from 0 to 100 centibars (vacuum) and 0 to 100 pounds per square inch (psi pressure). The vacuum side of the hand pump was connected to the pressure-vacuum lead and the ring clamp removed to record to the ambient vacuum pressure (if any). A vacuum pressure of approximately 80-85 centibars was set on the lysimeter. The vacuum pressure placed on the lysimeter was recorded. The lysimeter was allowed to set for approximately 8 to 24 hours prior to sample collection (referred to as the sampling period), as applicable to the moisture conditions at the site. After the sampling period has elapsed, the hand pump was connected to the pressure-vacuum lead, and the ring clamp removed to record to the vacuum pressure prior to sampling. Prior to sample collection, the sample lead was washed with distilled water an precautionary measure against sample contamination. The pressure-vacuum lead was attached to the hand pump and sufficient pressure will then be applied (via the hand pump) to move the liquid from the lysimeter sample cup into a clean container at the ground surface. The volume of soil pore liquid was estimated using the container and the sample was poured into the various sample containers. Once the entire sample had been evacuated, the sample and pressure-vacuum leads were doubled over and the ring clamps reset. No vacuum was set on the lysimeter between quarterly or biannual sampling events.

SAMPLE CONTAINERS AND PRESERVATION

Sample containers vary with each type of analytical parameter. Container types and materials selected are non-reactive with the particular analytical parameter tested. Specific sample volume, container types, and preservation requirements were identified and provided by the laboratory conducting the analyses. Sample containers were provided pre-preserved whenever possible. Care was taken not to overfill these containers during sample collection. Glass bottles of at least

40 mL volume and fitted with Teflon-lined septa were used in sampling for VOCs. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus forms when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles.

Sample containers were labeled prior to collection. Samples were kept cool with cold packs or water ice and stored out of direct sunlight in ice chests until received at the laboratory. Cold packs were replaced each day to maintain refrigeration. All samples were transported under Chain-of-Custody Record protocols as discussed below. Further details regarding these protocols are presented in the following section.

SAMPLE DOCUMENTATION

The following procedures were used during sampling and analysis to provide Chain-of-Custody control during sample handling from collection through storage.

Chain-of-Custody Records

All samples were accompanied by a Chain-of-Custody Record. When transferring samples, the individuals relinquishing and receiving the samples sign, date, and note the time on the record. This record was used to document sample custody transfer from the sampler to another team member, to a shipper, or to the laboratory.

Samples were packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment. The method-of-shipment, courier name(s), and other pertinent information were entered on the Chain-of-Custody Record. If samples were split with another party, it was noted on the Chain-of-Custody Record. The note indicated with whom the samples are being split and was signed by both the sampler and recipient. All shipments were accompanied by the Chain-of-Custody Record identifying its contents and the laboratory's list of analyses for the site specific monitoring program.

If sent by mail, the package was registered with return receipt requested. If sent by common carrier, a bill of lading was used. Freight bills, Postal Service receipts, and bills of lading were retained as part of the permanent documentation.

Field Records

In the field, the sampler recorded the following information for each sample collected:

Client's name
Location of sampling activity
Date and time
Names of field personnel
Type of samples media (for example, soil, sediment, and ground water)
Sample collection method
Number and volume of sample(s) taken
Description of sampling point(s)
Sample identification number(s)
Field observations
Field measurements such as pH, specific conductance, temperature, water level, etc.

Labels
Sample labels contained the following information:

Sample identification
Sampler's initials
Date and time of collection
Requested analyses
Sample preservation method, if any

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Quality Assurance/Quality Control measures were taken to confirm the integrity of the field and laboratory data generated during the monitoring program. The procedures used to assess data quality are described in this section.

Field QA/QC
Quality Assurance/Quality Control procedures for the sampling program consisted of collecting field equipment blanks (if necessary) and trip blanks. Details regarding the purpose and collection methods for these QA/QC samples are summarized below.

- Equipment Blank: An equipment blank was collected if non-dedicated sampling equipment was used. The equipment blank is used to assess the influence of non-dedicated sampling equipment on sample quality (potential cross-contamination). This blank was prepared by pouring laboratory-grade organic-free water through the precleaned sampling equipment and collecting the water in the sample container. The equipment blanks are analyzed for VOCs by EPA 601/602 or EPA 8260, as applicable to the site monitoring requirements. One equipment blank was collected per event to assess the thoroughness of equipment decontamination. If dedicated or disposable sampling equipment are used, the collection of equipment blanks is not required.

- Trip Blank: One trip blank, provided by the laboratory, was submitted and analyzed for each day of sampling during the event. The trip blank remained with the filled sample containers until they were submitted to the laboratory for analysis, and at no time was the trip blank opened. The trip blank provided a check on bottle cleaning procedures and sample transport conditions. The scope of analytical testing for the trip blank sample was limited to VOCs, therefore, trip blanks were used only when samples were analyzed for VOCs.

Laboratory QA/QC
The QA/QC protocols used by the analytical laboratory provide information of known accuracy and reliability. This information must be adequate for its intended use and procedures must show absolute impartiality. Information and data generated were technically sound, statistically valid, and fully documented. To meet this objective, the chosen laboratory has developed a comprehensive quality assurance program which governed all operations of the laboratory. The laboratory possesses current certification with the State of California.