California Integrated
Waste Management Board

Final
Gas Investigation Work- Plan
Disposal Gardens
Torrance, CA

SWIS 19-AA-5233

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1. Introduction

The California Integrated Waste Management Board (CIWMB) Closed, Illegal and Abandoned Site (CIA) program investigates solid waste disposal sites and provides site data and documentation to quantify requirements for both enforcement and potential clean-up activities by the CIWMB Solid Waste Cleanup Program (AB 2136). Depending on the types of wastes at the site, landfill gas sampling may be necessary to determine gas concentrations and lateral gas migration for the purpose of scoping enforcement and remediation work or referral to the local Air Quality Management District (AQMD).

Typically, landfill gas constituents contain, by volume, 50% methane gas (CH4), 0.2-1% oxygen(O2), 2-10% nitrogen(N), 50% carbon dioxide (CO2), 0-1% hydrogen and <1% Non-methane organic carbons (NMOCs). A landfill gas characterization study performed by the CIWMB, indicated that the most common NMOCs for landfill gas include: benzene, ethyl benzene, toluene, vinyl chloride, dichloromethane, trichloroethylene, 1,2, -cis-dichloroethylene and tetrachloroethylene.

Statutory authority for investigating solid waste disposal sites is in California Public Resources Code (PRC) Section 45013, et seq.

1.1 Site Location

Disposal Gardens also known as Torrance Sand and Gravel is located in the city of Torrance California. The approximate center of the site is at latitude N 33.79411 and longitude W 118.34404. The site is approximately 125 acres and extends northwest to Hawthorne Boulevard, and southeast to Crenshaw Boulevard The northeastern and southwestern boundaries are not clearly defined but at this time are assumed to extend northeast to Pacific Coast Highway and southwest to the city limits of Torrance (Figures 1 and 2)

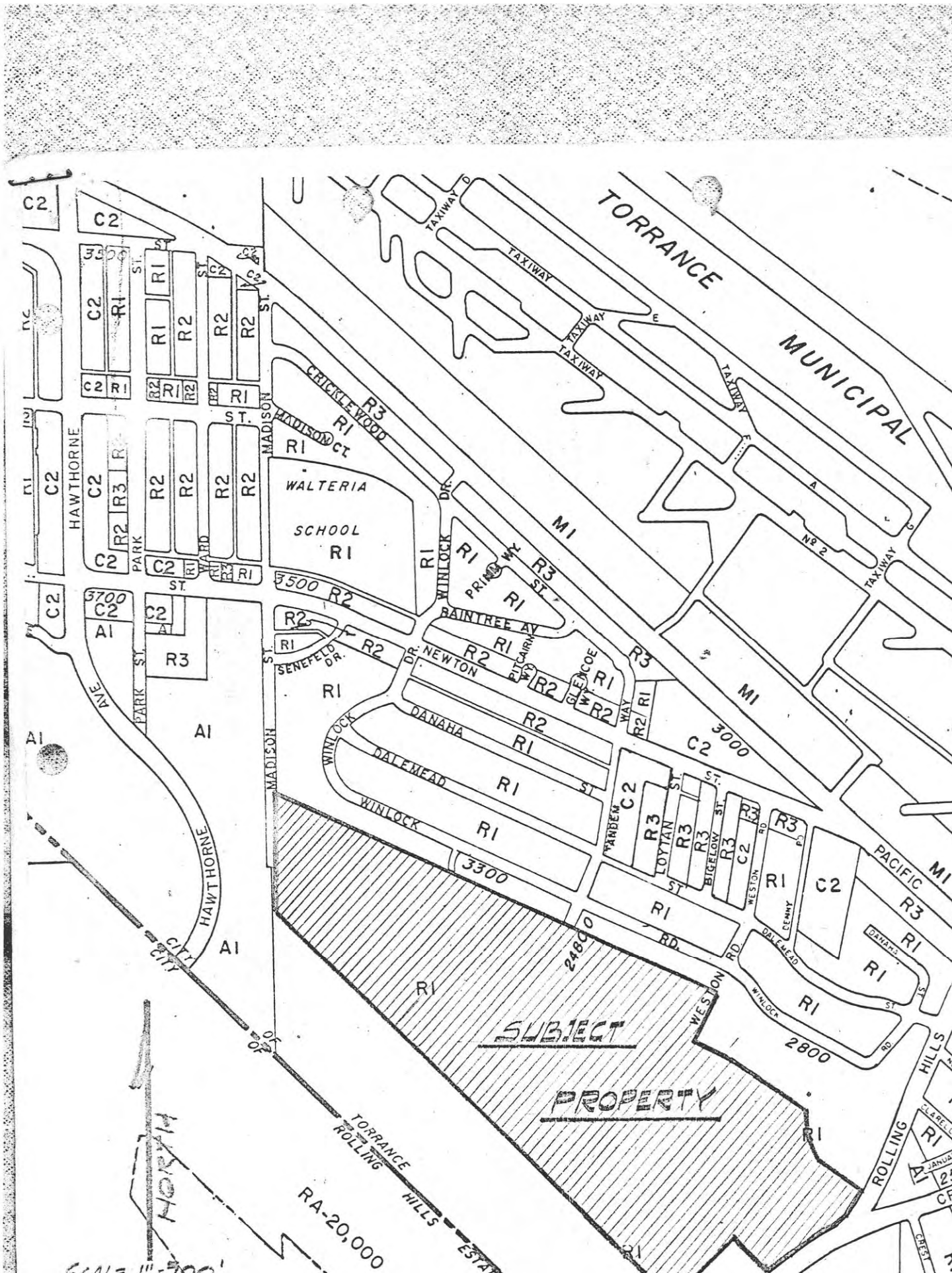
The site is located to the adjacent northeast of the Palos Verdes Landfill (PVLF) that operated as a Class I and Class II disposal site under permit by the County Sanitation Districts of Los Angeles (Sanitation District) from May 1957 to December 1980. The PVLF is under the jurisdiction of The Department of Toxic Substances Control (DTSC) and is not the focus of this investigation. However, the Sanitation District has constructed off site monitoring wells at the Disposal Gardens site to evaluate whether the PVLF has adversely impacted this area.

The Disposal Gardens site has been developed into a residential community, between Rolling Hills road and Newton. The site also includes a park and smaller open space/park areas. A commercial retail center is located north of the intersection of Crenshaw Boulevard and Rolling Hills Road.

Torrance, CA (Figure 1)

Figure 1 Site Location Maps

Figure 2 zoning map



1.2 Site History

The following abbreviated summary of the site is based on available background data, of which many documents were incomplete and other documents known to have existed in the past were not available for review. Available data indicated the site was initially utilized for sand and gravel operations that reportedly began in the early 1920's and continued sporadically until the early 1960's at which time Torrance Sand and Gravel Company began large scale mining operations that lasted until the early 1970's Reportedly, mining began just northeast of the PVLF and progressed in a northeastern direction with operations creating larger and deeper pits and stopping just short of the residences on Winlock Road in the city of Torrance. Reportedly the mine tailings were placed just beyond the PVLF boundary line and into the older pits as they were abandoned. The quarried pits immediately to the northeast of the PVLF were also used for the disposal of oil wastes and crude oil sludge associated with oil exploration drilling at the site and possibly at adjacent locations. The pits reportedly were up to 120 feet deep and at the time referred to as the large and small pits.

Reportedly, requests by Disposal Gardens Inc. to use the site as a dump in 1966 was denied, a similar 1967 request was withdrawn and a subsequent 1967 request was denied in 1969. A 1969 RWQCB letter indicated the site could be used as a disposal site for inert wastes only however, it is not known whether the site was used for disposal of inert wastes prior to plans to develop it for residential use in 1971.

In 1972, Sunnyglen Construction Company proposed to develop tentative tract 9765 lot 5, (Battram Tract, aka Disposal Gardens). The company proposed to mix the oil from the old sumps with sand to use as fill to for the existing pits. Background information indicates that some of the oil waste was mixed to a 10-20% sand and oil mixture and used as fill. However, it is not clear whether all of the oil sump waste was removed or utilized on site as fill It also is not known whether inert solid wastes were ever disposed of at the site (letter from Sunnyglen Construction Co. to LA Sanitation District January, 1973).

The following is a more comprehensive, generally chronological description of the background history of the site based on available documents and information provided by various knowledgeable persons.

Based on information obtained from the Los Angeles Regional Water Quality Control Board (RWQCB), their file FN 51-126 is identified as the South Torrance Dump [aka - Disposal Gardens, or Torrance Sand and Gravel] at the north flank of the Palos Verdes Hills). Reportedly in 1951, the RWQCB issued Waste Discharge Requirements (WDRs) for oil sump waste disposal for an existing sump area that had been operating for approximately 10 years (document not available for review). The WDRs reportedly were for consolidating sump wastes from the City of Torrance. According to the RWQCB, there is not additional information in their files to indicate whether the sump(s) continued to be operated after the WDRs were issued.

Fill was dumped around the north half of the pit to form dikes, increase the capacity and prevent spilling into lower areas. While excavating the sands and gravel around the pit, slides occurred weakening the dikes that were retaining the oils. In 1963, the slope of the large pit failed and the waste oil contaminated much of the property. An evaluation was propagated in 1963 by Michael Clements who wished to purchase 50 acres of the property to develop a cut and fill municipal dump. He felt that due to the contamination from the slope failure, the land was not usable for mining by Torrance Sand and Gravel.

In a document entitled *Proposal for the Selection of Subsurface Soil Boring Sites Northeasterly of the Palos Verdes Landfill*, (untitled, undated) information is summarized from a previous November 1963 Converse Foundation Engineers Report entitled *Geological and Soils Investigations, Torrance Sand and Gravel Pits Crenshaw Boulevard and Rolling Hills Road, Torrance, California*. Reportedly, there was a failure of the north and east sides of the large gravel pit in the summer of 1963. The report indicated the resulting release of oil and subsequent attempts to contain it spread the waste oil over large areas. Although recommendations were made at the time to investigate further containment of the waste oil, no additional information is available about the waste oil until the area was proposed for residential development

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In November 1966, Charles Praddy of Landfill Inc., filed an application with the RWQCB to construct a landfill on 85 of the 125 acres mined by Torrance Sand and Gravel. The application letter indicated that the land had been leased from private individuals named as Mrs. Elizabeth Senness, Peter Del Re, and Agnes Del Re and they have full knowledge of the proposal (letter dated November 7, 1966). In a February 28, 1967 city council session, addressing the request of a variance to create a landfill to dispose of household waste and rubbish, Mr. Henry, a representative of Landfill Inc. reported to the council *"A refuse fill is not new to the land. (In 1948 a variance for the extraction of sand by the Water Pollution Control Board on March 17, 1952, the residue of sumps in Torrance was deposited and still remains on this property. Through the early 1950's the property received more waste paid each year through 1966, although the property was not used as a dump that time (Council Minutes, February 28, 1967)".* Mr. Henry indicated that the site had been taking waste and paying for a permit.

The early documents and resolutions alluded to waste disposal but there is no indication that a permitted waste disposal company or solid waste site was ever developed for disposal of wastes on land for the property between Crenshaw Boulevard and Madison Street, southerly of Winlock Road in Torrance California (File 66-133). The document indicated that in November 1966 Land fill Incorporated filed a report on waste discharge with the RWQCB proposing to dispose of combustible and non combustible liquid and solid waste materials on approximately 85 acres of land in the City of Torrance described as a portion of lot 5, Tract 9765, lying between Crenshaw Boulevard and Madison Street, 500 feet northeasterly from the City boundary and 105 feet southerly of Winlock Road. The report was amended on February 6, 1967 to delete liquid wastes and to propose installation of a mudstone liner. In a May 10, 1969 letter, Disposal Gardens Incorporated proposed to utilize the same site for disposal of solid inert waste

materials, and to compact the filled area where possible to provide structural support for building construction.

The RWQCB found that the proposed site encompassed two major excavations producing sand and gravel and that the pits had been excavated to depths of about 100 feet bgs and had a combined void capacity in October 1966 of one million cubic yards. The RWQCB indicated the following requirements with respect to the proposed waste discharge by Disposal Gardens Incorporated to the subject site: Materials to be disposed of the site must consist of non-water soluble, non-decomposable inert solids of the following nature: earth, rock, gravel, brick and concrete, paving fragments, glass, plaster and plaster board, manufactured rubber products, steel mill slag, clay and clay products, asbestos fiber and products. . The City of Torrance denied the application to issue a permit to operate, due to public objections

A portion of an undated document (probably around 1972) that begins as section *IV The Existing Environment* provided information regarding the history of the site. Chandlers Palos Verdes Sand and Gravel Company were working an open pit sand extraction operation on the northern half of the proposed development site. The operation at the time reportedly consisted of two large pits, a three-acre settling pond, associated buildings, service roads and equipment. The lease for pit operations reportedly extended until 1984. Fill material associated with an old oil well sump was located next to the west pit and reportedly oil residue was at the surface. The southern half of the site had been covered with irregular hills scarred by previous fill-grading operations, and was traversed by service roads and trails. The permit to extract sand and gravel reportedly was granted in 1948. Requests in 1966 and 1967 to use the area as a dump site were denied by the RWQCB to protect groundwater quality.

A portion of a document, author unknown, prepared in what appears to be 1971, entitled *Outline ZC 71-8*, provided a chronological brief history of the site (property line between Rolling Hills Road and Crenshaw “Boulevard, the southerly City boundary line, Madison Street and its extension, and approximately 105 feet southerly of Winlock Road. Portions of the chronological site history relevant to this study were as follows:

- 1948 zone variance to permit extracting sand and gravel on 50 acres.
- 1953 variance to permit gravel extraction on another 15 acres.
- 1957 variance to permit oil and gas well drilling in a 150-foot strip on the southerly property line.
- 1966 request for use as a dump site (DENIED)
- 1967 request zone change to allow for dump site (WITHDRAWN)
- 1967 request to permit use as a disposal site (DENIED 1969)

In October, 1971, Sunnyglen Construction Company hired Western Laboratories to prepare an engineering geologic report for the area south of Winlock Road between Crenshaw Boulevard and Madison Street with regard to the proposed residential development. Mr. Emil DiMatteo was the registered geologist/certified engineering geologist that conducted the assessment. The investigation included drilling 19, 24-inch diameter borings referred to as B-1 through B-19 by Western Laboratories or Test Holes

by DiMatteo. The DiMatteo report indicated that he only prepared geologic logs for six (borings B-1, B-2, B-3, B-4, B-6, and B-9) of the 19 borings because they were the only ones that were logged or closely supervised by Mr. DiMatteo. Based on review and comparison of the available boring logs, it appears that Western Laboratories personnel prepared logs for all 19 borings. In addition, 10 rotary wash borings were drilled to greater depths and exploratory test pits were excavated using a backhoe or bulldozer. Test pit logs were not located; however the boring logs for the 10 rotary wash borings were available for review. The available boring logs will be included in the final report.

A comparison of boring logs B-1 through B-19 by Western Laboratories with the six test hole borings by DiMatteo suggests that the six borings logged by DiMatteo were part of the 19 drilled by Western Laboratories. This is based on the date's drilled and general correlation of depths drilled and subsurface materials encountered. There are however some inconsistencies in drilling depths and subsurface materials. Based on the available logs, Test Hole No. 6 (DiMatteo) encountered black clayey sludge to a depth of approximately 20 feet bgs and the boring was reported to have been drilled in an apparent former oil waste pond. DiMatteo reported a strong H_2S odor at about 59 feet bgs in bedrock in Test Hole B-9. Boring logs B-1 through B-19 by Western Laboratories indicated heavy caving at about 20 feet bgs in boring B-2 and in boring B-5 at about 8 feet bgs. Boring B-7 encountered uncompacted oil waste and debris from an old oil sump to 8 feet at which depth the boring was abandoned. Boring W-4 drilled in the same area encountered oil sump material and debris with some sand to a depth of about 40 feet bgs. Borings B-8 and B-9 also encountered oil sand with debris, oil sump materials, and mixed sand to depths of about 26 and 42 feet bgs, respectively. Both borings W-5 and W-7 encountered oil sump material and debris to depths of approximately 36 feet bgs.

The following information was obtained from the 1971 DiMatteo engineering report. At the time of the study, the site exhibited the rugged, constantly changing, topography of an active sand and gravel quarry. Reportedly at the time, the two pits were being mined and were about 100 feet deep, the locations of which were shown on the geologic map that accompanied the report. Reportedly, the mining resulted in extensive stripping in the higher southerly half of the site and very little of the native topographic forms survived. An uneven distribution of man-placed fill was present due to the backfilling of abandoned quarry pits and sumps, grading of temporary roads, earth-dam construction and stockpiling of mine tailings. The site was reported to be underlain by fill soil, unconsolidated recent and Pleistocene Deposits, and the Malaga mudstone and Valmonte diatomite members of the Monterey Shale. Reportedly, the Malaga mudstone at depth exhibits shears, slickensides and emits a strong gas odor which seemed to be H_2S. Evidence from oil wells, surface exposures, and boring logs indicated the presence of a shear zone in the Miocene-age rocks. The following conclusions applicable to this study were provided in the subject report. Other conclusions, more applicable to the geotechnical aspects of the proposed development were presented and the reader should refer to the report for additional information. Several conclusions in the report were as follows:

- the perched groundwater encountered in several borings will need to be engineer controlled,
- disposition of sediments in the waste water pond will require soil and engineering attention in the field since these materials could not be examined in the field. The east edge of the pond is known to be underlain by at least 59 feet of fill,
- the inferred shear zone does not appear to affect the proposed development,
- the planned PVLF slope along the southwest property line planned in excess of 100 feet could cause temporary runoff concentrated along the common property line and needs to be evaluated by a soil engineer.

The RWQCB issued Waste Discharge Requirements for Sunnyglen Construction Company, Inc. in association with the grading and development of tentative Tract No. 26507. (72-72) Grading was to begin January 1973 and take approximately 2 years to complete. The property at the time was under mining lease to Chandler's Palos Verdes Sand and Gravel Company. The northeasterly portion of the site was being utilized as a sand and gravel pit and southerly portion of the site was more or less stripped by previous mining operations. It was indicated that Sunnyglen Construction Company Inc. proposed to mix material from an oil oil sump on the proposed tract with on site cut materials and fill the existing pit. The mixture was to consist of approximately 10 percent straight crude oil and 90 percent sandy soils. The materials, after being brought to proper moisture content were to be compacted to not less than 90 percent of the maximum dry density. The oil sump was adjacent to and approximately 200 feet higher than the bottom of the existing pit. After compaction, the mixed fill was to be 20 to 100 feet below the finished grade and at least 100 feet above sea level. The groundwater table in the area was reported to be at approximately sea level.
The waste discharge requirements relevant to the subject study were as follows:

- waste materials were to be disposed of at the site were limited to the proposed oil-soil material from the site itself. No other wastes were to be imported to the site,
- the mixed on site oil sump material and onsite cut material shall not exceed 10 percent straight crude oil, as proposed,
- the bottom elevation of mixed soil and oil fill shall be at least 100 feet above sea level,
- no pollution of nuisance shall be caused by the handling, storage or disposal of these wastes.

A portion of the January 1972 document between the city of Torrance and Palos Verdes Sand & Gravel Company, discussed the interpretation of conditions and modifications of the gravel pit since there were some discrepancies regarding what the sand and gravel company was willing to promise and what the City of Torrance had prepared in the draft memorandum regarding the site. The document indicated that it was true that the city of Torrance made it a condition of the oil well drilling variance that the sumps were to be drained and backfilled. Aside from that no other conditions were imposed with regard to the oil soaked earth which would remain. There was never a requirement that the earth be moved from the site or that it be mixed in any certain way. The letter stated that the city was not seeking to require them to work that oil soaked earth to a considerable

extent over what they presently do. Reportedly, the company mixed the oil soaked earth with sand as they excavated it, but that material was then merely moved out of the quarrying site to unused portions of the property. The letter stated that therefore to require now that the oil soaked earth be mixed and spread so that it will dry was increasing the condition over what was originally required. The proposed modification was provided *"all soil soaked earth and earth containing other emulsions and residues form the original oil well drilling operations as they are uncovered in the routine excavations for sand and gravel, will be mixed with native earth in such proportions that it can be moved easily and it will be moved to unused portions of the 90+ acres. "*

A portion of a subsequent related document dated February 1972 regarding interpretation of conditions of Chandlers Palos Verdes Sand and Gravel Company indicated that the disposition of the oil soaked earth was now being handled and moved as part of the gravel pit operations; however, it was not entirely clear whether the oil sumps that were drained and backfilled were removed or covered up.

An August 28, 1972 letter from Western Laboratories to Sunnyglen Construction Company describes a blending proposal to mix waste oil and sand deposits, used extensively as an aquifer to dilute the concentrated pockets of the remaining pits. The concentration of oil to sand in the pit areas were reported to be 40 percent oil and 60 percent sand. The proposal and recommendation was to obtain a dilute mix of 10 percent oil with 90 percent sandy soils. These blended fills were to be placed to no more than 20 feet below the finished grade of the proposed residential development.

A February 1973 interoffice communication by the city of Torrance indicated Building and Safety Department concurs in the recommendation of their consultants Converse-Davis and Associates that the p[r0oposed development of Tract No. 26507 is conditionally approved for construction.

In a June 1975 letter from Emil DiMatteo to Watt Industries, Inc. it was indicated that the pre-grading environment left by the earlier mining of sand and gravel as applicable to tracts 31331, 31332, and 31333 for residential construction consisted largely of placing tested fill in the cavities and sculpting an artificial landscape of long rows of narrow level terraces, separated by small (mostly fill) slopes. The land upon which this process took place was underlain almost entirely by the so-called San Pedro Sand, a coarse-graded, marine deposit of Lower Pleistocene age, Prior to placement of tested fill, existing deleterious earth materials were removed: for example: an old oil well sump in Tract No. 31332; a deep wastewater pond in Tract No. 31333; a wide area of thin fill in the just mentioned tracts. The letter report concluded that grading of the subject tracts was therefore accomplished under appropriate geologic control and that geologic conditions disclosed during the work were not significantly different form those disclosed by the original investigation and that that in their opinion, the site is adequate for the intended use.

In June 1975 letter from Western Laboratories to Sunnyglen Construction Company, it was indicated that the site was previously used as sand and gravel pits, and also present were fills resulting from desilting ponds and foundations from buildings. Reportedly, prior to placement of fill soils, all vegetation and debris were stripped and removed from the site and existing fill soils were excavated to competent natural ground. The required removals ranged up to 102 feet in depth. Fill materials reportedly consisting of soil types 1-80 were placed in lifts not exceeding 6 inches and compacted in place to a minimum of 90 percent of the laboratory standard.

In a document entitled *Proposal for the Selection of Subsurface Soil Boring Sites Northeasterly of the Palos Verdes Landfill*, (author and date unknown, but probably prepared in the late 1980's for the PVLF on behalf of, or by the Sanitation District), a subsurface soil boring study was presented as an alternate to the installation of three, off-site down gradient monitoring wells associated with the PVLF. The document contained useful site history information as follows. During mining operations many of the tributaries and deeper canyon bottoms were either completely or partially filled with mine tailings with some canyons having multiple layers. Mining started just northeast of the PVLF property line and progressed in a northeastern direction with operations becoming larger and deeper until stopping just short of the residences on Winlock Road. Tailing were placed just beyond the landfill property line and in the older pits as they were abandoned. A review of various geologic reports by the author(s) indicated the quarried pit areas immediately northeast of the main landfill site were also used for the disposal of oil wastes and crude oil sludge and reportedly these operations continued until the early 1970's just prior to the area being constructed as a residential development. The document concluded that proposed monitoring wells M27A, M28A, and M29A that were to be drilled in the area northeasterly of the PVLF would not provide reliable down gradient monitoring points for the landfill because of the potential for in-place contamination from waste oil activities unrelated the to Sanitation Districts PVLF operations. The RWQCB did not necessary concur with the Sanitations Districts allegations regarding off site oil waste and sludge disposal activities but agreed that the Sanitation District could select alternate locations for the proposed detection monitoring wells by conducting a subsurface soil investigation to find locations which might be outside the influence of the [oil] disposal areas. After looking at available background data it was subsequently decided by the author(s) to proceed with the detection monitoring program as originally proposed and approved .On June 24, 1987, the Sanitation Districts contractor drilled an investigative boring at the proposed location of monitoring well M29A. This boring went to a depth of approximately 65 feet bgs and indicated the presence of oil waste based primarily on the detection of strong petroliferous odors emanating from the samples. This document also contained an August 1972 analytical report from Smith-Emery Company of two soil and oil mixture samples collected from the site. The report indicated oil at concentrations of 10.88 and 31.90 percent, volatile matter at 10.35 and 17.30 percent and elevated metal concentrations.

Historical aerial photographs were reviewed for the years 1927 to 2005. The earliest available photographs, from 1927 to 1972 generally show the site as a grave pit. Aerial

photos taken from 1928, show the large pit and a second smaller pit adjoining to the west. The smaller pit at the time contained water and there are remnant type deposits in the area of this pit. The large pit was still in operation in 1928. Aerial photos taken in 1945 indicate that both pits had been abandoned and the dumping of oil sludge had not begun. The largest pit on the site was utilized for the disposal of waste oil and drilling mud's. The pit became full and dikes were constructed to prevent spillage.
Photographs from 1960 to 1966 generally show the changing topography of the site as a result of the on-going sand and gravel mining activities. The photographs show two large pits and what appear to be settling ponds, mine tailings, access roads, conveyor belts, buildings and what may be oil sumps. Aerial photograph from 1975 to 1980 document the construction of the subject residential development as a result of mass grading and construction and changes to the adjacent PVLF. A Terra Server aerial photograph when over-laid on the historic aerials place the two major sand and gravel pits generally at the center of the Rolling Hills Estates community and De Portola Park. Based on information provided in the geologic engineering report (DiMatteo, 1971), it appears the pits underlay the area of Winlock Road, Whiffletree Lane, Candlewood Drive, Brandey Wine Way, Fallen Leaf Drive, Softwind and Windmill Road areas.

In summary, available background information does not clearly indicate that the site operated as a permitted landfill. If it did accept wastes, it appears that they were restricted to inert materials as required by the RWQCB Resolution 69-24. However, available data indicates previously prepared boring logs indicated the presence at some locations of some debris and oil laden fill, consistent with available background data and likely associated with the former gravel and mining operations as well as the previous oil exploration. It is likely based on the proximity to the PVLF, the presence of relatively large pits and ponds associated with mining, and the former oil exploration activities that there could have been some minor amounts of illegal dumping and therefore some buried wastes exist at the site. However, it appears that the majority of the buried wastes were probably generated on site.

1.3 Project Background

The Remediation, Closure & Technical Services (RCTS) Branch, was requested by Los Angeles County Local Enforcement Agency (LEA) to perform a phase I and II intrusive investigation and to install gas monitoring probes, collect soil samples during drilling, conduct analytical testing of select samples, and to evaluate appropriate remedial measures necessary to protect public health and safety and the environment.

1.4 Project Purpose

The main objective of this limited assessment is to generally evaluate by conducting investigative work at specific areas, whether this site is producing methane gas and if this gas is migrating up to the surface. The installed probes will be monitored monthly for a period of one year, giving ample time to go through all temporal seasons. The historic documentation indicates fill was placed at various times at the site in association

with sand and gravel mining activities and subsequent grading of the site for residential development. However, the composition of the fill is not entirely known and it is also not known if inert solid wastes were also disposed of at the site. From 1951-1963 the RWQCB permitted disposal of fill materials at the site, but there was little to no information describing the consistency of the fill and how much fill was placed at the site. A copy of the 1951 permit could not be located and, it appears that it may have been misfiled or lost. The second objective of this investigation is to conduct a limited characterization of this site by obtaining soil samples during drilling and submitting them for analytical testing. The samples will be sent to the CIWMB's contracted certified analytical testing laboratory, ExcelChem Laboratories, Inc. and analyzed for constituents of potential concern (COPC). The COPCs are discussed in more detail in the sampling portion of this plan. If the analytical results of the soil samples collected, indicates concentrations of COPCs above their respective regulatory levels, then the site will be referred to the DTSC as a hazardous substance site and it will be determined in a meeting with DTSC, RWQCB, CIWMB and LA County Environmental Health who will assume jurisdiction of this site.

1.5 Responsible Agency

The CIWMB will be responsible for preparing the gas sampling work plan, performing initial gas sampling (soil sampling will be performed at the time of probe installation), and preparing the limited landfill gas investigation work plan. The work plan will be submitted to the LEA, DTSC, RWQCB and as applicable, to the responsible parties. for their review and comment. CIWMB personnel upon completion of this limited gas investigation, prepare a report and place both the work plan and site investigation report in CIWMB files and update the site's Solid Waste Information System (SWIS) database. Monthly gas monitoring will be conducted by CIWMB and/or LEA personnel for at least one year utilizing a GEM 2000 and a GMI monitoring equipment or equivalent equipment. The CIWMB will take gas samples quarterly and have them sent to the laboratory for analysis.

1.6 Project Organization

The work plan and report preparation will be conducted by CIWMB's CIA Section staff. The CIA Section Senior Engineer, Mr. Glenn K. Young, P.E. will oversee aspects of the proposed work including preparation of this work plan, soil boring and gas probe installation locations and design, gas sampling, the analytical testing program, and preparation of the draft and final gas investigation reports. The CIWMB's Health and Safety Section will be responsible for preparing a site specific health and safety plan and monitoring onsite health and safety in the field while conducting the investigation. As lead on the project, Mr. Young may be reached at (916) 341-6696. The CIWMB will use its own gas sampling equipment and obtain tedlar bags or summa canisters, brass sleeves, labels, chain-of-custody forms and shipping containers from its environmental laboratory services contractor, ExcelChem Laboratories, Inc.

CIWMB staff will be responsible for selecting the proposed boring/gas sampling probe locations, gas probe design, selecting soil samples for analytical testing, sample packaging, shipping, and analysis, and producing a gas sampling and analysis report. Ninyo and Moore personnel will provide the necessary equipment and qualified personnel to drill and sample borings and construct the gas monitoring probes. The Ninyo & Moore project engineer or geologist will log the borings, oversee soil sampling during drilling, and provide a chronological field log/notes to the CIWMB project engineer. The sampling containers and laboratory analyses of the soil samples will be through CIWMB Contract IWM-C9037 with ExcelChem Environmental Laboratories, Inc. located in Roseville, California.

1.7 Previous Investigations

A report by Emil Dimatteo, Engineering Geologist for Western Laboratories was written in 1971, to address the 120 acres once owned by Torrance Sand and Gravel which was slated for a residential development. The investigation was conducted September 1971 and included the collection and interpretation of geological information. The site consists mainly of sands, mudstone and shale at varying depths. The investigation included test holes dug using a bucket auger from 28-81 feet. Several of the test pits that were dug consisted of man placed fill for the first 20 feet or so. Test hole number 6 encountered what appeared to be an old waste pond; the soil was black clay sludge and was found from 1-20 feet.

Boring logs from Western Laboratory showed fill from 0-30 feet in boring numbers, B-6, B-3, B-4, B-10, B-11, B-12, B-13, B-14, B-16, B-17, B-18, B-19, and W-6 consisting of clays and silts with layers of course sands and rock fragments and minor debris. Boring logs W-7, W-5, B-7, W-4, B-9, and B-8 consisted of sand, oil stained with debris- oil sump materials mixed with sand, some debris. Ground water appeared in borings B-1 and B-3 and high moisture content in B-9. The water that was found is believed to be perched and is unrelated to the water table which is at sea level. The waste oil pits have been evaluated to be 100-125 feet deep and are located on the east and western portions of the site. It appears that extensive grading and geotechnical testing was performed throughout the site to bring it up to a buildable grade and ensure the stability of the proposed residential community.

The report recommended that soil engineering was required to utilize the area where the waste water pond was located. The east end of the pond is known to be underlain with at least 59 feet of fill (Dimatteo, 1971). The fill was not sampled, nor analyzed. Emil Dimatteo determined that grading the site is feasible but future plans should be reviewed by an engineer geologist or a soils engineer.

In June 1975, Western Laboratories submitted a Supervised Compaction Report Phase III to Sunnyglen Construction Co. regarding the fill that had been placed. The report stated that the site was previously utilized as a sand and gravel pit. Also present were fills resulting from desilting ponds and foundations from previous buildings. It was also reported that the vegetation and debris were stripped and removed from the site. Existing fill soils were excavated to competent natural ground and some of the removal

was as much as 100 feet. The report states that no rocks or concrete were placed in the upper 25 feet of the fills and the boring logs indicated that there appeared to be some debris and some rock pieces in some of the borings. The report went over the compaction details and the slope designs, the consistency of the fill materials were not directly addressed.

On behalf of the Sanitation District, 12 groundwater monitoring wells were constructed on the subject site, hydrologically down gradient of the PVLF in order to evaluate groundwater quality in this area. Wells were constructed, by Kleinfelder and Associates (1988), Herzog Associates (1990), and Dames and Moore (1993). As previously indicated, initially there were concerns by the Sanitation District regarding the locations of these wells because at some locations, it was anticipated that it would be difficult to differentiate between potential contamination associated with the PVLF or that associated with buried oil laden fill at the subject site. There has been extensive site investigation on the Palos Verdes Landfill which is under the jurisdiction of DTSC since portions of the site were used for disposal of Class I wastes.

2. Project Objective

2.1 SCOPE OF WORK/PROJECT OBJECTIVES

The primary objectives of this limited investigation are to evaluate if landfill gas exists in and if present, whether it is migrating to the surface of the site at locations explored, and adversely affecting residences, schools and/or commercial buildings constructed in the area referred to as Disposal Gardens (site). The second objective is to conduct a limited characterization of the subsurface materials by drilling into the areas of the two major historical sand and gravel pits that reportedly were backfilled with mine tailings, an oil fill soil/sand mixture, and possibly some debris.

SCOPE OF WORK

In general, the project objectives will be accomplished by conducing the following scope of work:

- Drilling ten borings to maximum depths of 15 feet bgs and 3 borings to maximum depths of 50 feet bgs. The gas monitoring probes will be constructed in general accordance with applicable portions of CCR Title 27 to generally evaluate the vertical distribution of suspected landfill gas. However, the proposed probe locations are not intended to conform to spacing requirements as indicated in sections included in CCR Title 27.

- Collecting soil/waste samples during drilling from approximately 13 single-level borehole locations for laboratory analysis. Soil/waste samples will be analyzed for constituents of potential concern (COPC) to chemically characterize these subsurface materials.

- Preparing boring logs during drilling to evaluate the types/thicknesses of the fill/cover at locations drilled. Based on reviews of historical data, the proposed three deeper borings/probes will not extend to the assumed depths of the former sand and gravel pits reportedly backfilled with mine tailings, mixture of fill and oil, and reportedly debris because the former pits reportedly attained depths in excess of 100-120 feet bgs. The lateral extent of the pits is generally known as a result of information obtained from reviewing historical aerial photographs and previously prepared documents and reports.

- Collecting and analyzing selected soil gas samples from the 13 probes approximately 24 hours after their construction and conducting subsequent monitoring for a period of at least one year.,

2.2 Data Collection

A topographic map and sampling grid will be prepared by the CIWMB Project Engineer to determine the locations where boring and gas samples will be taken. Suggested gas sampling locations are provided on the site sampling location map (Appendix A). Ninyo and Moore will provide drilling equipment to provide subsurface access for gas sampling and installation of monitoring probes. Gas sampling will be conducted using both field screening equipment, a Gas Detection instrument (GEM 2000, capable of measuring methane, carbon dioxide, oxygen, hydrogen sulfide and organic vapor up to 1,000 ppm) and gas sampling containers (Summa Canisters and Tedlar Bags) provided by CIWMB's Environmental Laboratory Accreditation Program (ELAP)-certified laboratory contractor. Field screening will be conducted in accordance with the gas sampling and analysis plan and sample collection and analysis conducted in accordance with EPA technical order 15 (TO-15). The CIWMB will use regulatory limits established by both 27 CCR Section 20917 and local Air Quality Management District (AQMD) rules.

2.3 Project Tasks

A limited Phase I Investigation was conducted to obtain the following information and data, prior to finalizing objectives for the gas sampling and analysis plan:

a) Historical aerial photograph research was conducted to generally obtain information regarding the history of the site and the locations and aerial (horizontal) extent of the former sand and gravel pits and presence of oil sumps etc.

b) As-built drawings for site utility systems such as gas, electric, sewage, water, cable TV, storm drains, etc were requested and obtained from county planning offices, city of Torrance and the Sanitation District.

c) As-built drawings and/or construction plans were obtained for the residential community and the construction of DePortolla Park (city of Torrance Department of Parks)

d) Obtained and reviewed previous site investigations conducted by private consultants, city, county and state agencies; to obtain background site information and summaries of previous assessment work conducted a the site and at the adjacent PVLF.

e) Conducted a Property Title and Deed search to obtain Assessor Parcel Numbers, Parcel Maps prior to and after development, and property owner information.

Gas sampling locations were based on available historical information including: aerial photographs, background site history data, and previous work conducted at the site including construction of groundwater monitoring well boring logs and exploratory boring logs from previous site investigations. Since landfill gas production typically follows a temporal cycle (normally associated with local hydrologic conditions), up to 12 months of data collection may be required to determine peak gas production characteristics. Gas probes will be monitored monthly for at least 1 year. If gas concentrations exceed 1% or 10,000 ppm, a gas sample will be obtained for analysis using either a Tedlar Bag or Summa Canister.

Collected samples will be analyzed for typical landfill gas constituents such as methane, carbon dioxide, nitrogen and hydrogen sulfide. Trace gases (also referred to as Non-methane organic compounds NMOC) will be analyzed for a suite of Volatile Organic Compounds including trichloroethylene, perchloroethylene, dichloromethane, tetrachloroethane, benzene, toluene, xylene and ethyl benzene.

Soil samples will be taken during the construction of the gas monitoring probes and will be analyzed for CAM 17 metals, total petroleum hydro-carbons (TPH), dioxin and PCB's. There is no historical information that indicates the area was used for Agriculture, therefore, pesticides will not be analyzed.

Sample collection and analysis procedures for landfill gas will follow requirements as outlined in this gas sampling and analysis plan. Gas fingerprinting may be needed to determine the source of the methane due to old oil fields in the area. Analysis for all gas samples will be performed by CIWMB's contract laboratory, ExcelChem.

A non-intrusive investigation, e.g. electromagnetic survey (EM) or ground penetrating radar (GPR) survey, will be performed to located underground structures or define waste fill areas in comparison to native areas. A map showing anomalies and interpretations will be produced from this investigation and included in the final site investigation report.

Upon receipt of laboratory analysis reports for collected samples, CIWMB will compile and correlate data and prepared a report summarizing the results. CIWMB will also

provide a comparison of the results to regulatory thresholds and provide recommendations for remedial measures required to obtain compliance with applicable regulations.

2.4 Expected Data

Landfill gas constituent concentration data obtained during this investigation will be evaluated to determine if additional sampling is necessary. Additional sampling may be performed if it is found that specific constituent levels exceed regulatory thresholds specified by 27 CCR Section 20925, e.g. 1.25% in structures of 5% in perimeter monitoring probes. Based on information known about the site the following is expected:

a) Landfill gas production within the fill area is unknown and will be determined.

b) Landfill gas constituents include methane, carbon dioxide, nitrogen, hydrogen sulfide and trace VOCs (VC, TCE, PCE, BTEX) and likely some or all of these constituents may be present at various locations.

c) Water intrusion could be an issue when selecting gas monitoring probe locations. Therefore vapor monitoring points will be sited at locations on elevated areas.

d) Structures may be constructed on top of waste (direct conduits between landfill and structures.

e) Subsurface utilities and structures may provide potential migration paths to structures at some locations.

3. Gas Sampling Plan

This gas-sampling plan is intended to document the procedural and analytical requirements for this and any subsequent sampling events performed to collect gas samples and to characterize areas exceeding regulatory thresholds. This plan was compiled after reviewing the US Environmental Protection Agency's, Region 9, guidance document "Instructions for the One-time Sampling Event Sampling and Analysis Plan" dated March 1998. An estimated 13 gas monitoring probes will be constructed and then monitored on a monthly basis for a period of 1 year. Approximately 3 of theses borings will be advanced 40-50 feet bgs into the old pits to gather soil samples for analytical purposes. The probes will then be backfilled with bentonite and a probe set and completed between 12-15 feet bgs. Because information shows that the two large pits were used for oil sump waste disposal, 2-3 of theses

probes may be sampled and fingerprinted. The construction of the gas monitoring probes is found in Appendix A

3.1 FINGERPRINTING LANDFILL GAS

Characteristics of the Site and Adjacent Area

The City of Torrance is located in a historic oil producing area. Also, historic topo maps and site investigation information indicates that there is an abandoned well located within the foot print and the area of concern. Finger printing may be needed to determine the possible source of the methane gas (if any). The historic information tells of oil sump waste and the possibility of solid waste being disposed in the old pits due to the uncertainty of the information decisions on gas fingerprinting will be made in the field. However, gas fingerprinting will be discussed as information in this report. If fingerprinting is conducted, 2-3 samples will be taken at selected probes to fingerprint the gas using EPA TO3 (hydro- carbon speciation), EPA 15/16 (hydrogen sulfide) and EPA TIO-15 (VOC's).

3.2 Sampling Methodology

Discrete gas sampling will be performed 24 hours after the construction of the gas monitoring probes. Sampling locations will be predetermined based on available site information and data, although authoritative sampling may be performed and authoritative sampling locations will be documented in the final sampling and analysis plans (SAP) report. Gas sampling will initially be conducted using locations provided in (Appendix B). The authoritative protocol allows the investigator the flexibility to move sampling locations, as necessary, to accommodate unforeseen field conditions. Following authorative protocol, soil samples will be collected and analyzed for constituents of potential concern.
The following outline describes the proposed sampling:

- Gas sampling at newly constructed monitoring probes. A total of 13 gas monitoring probes will be screened using the GEM 2000 (see Sampling location map Appendix B). Probes will be connected to a pneumatic sampling pump and Tedlar Bag and a sample collected for laboratory analysis.

- Gas sampling of utility corridors. Utility corridors identified by Underground Service Alert will be screened using the GEM 2000. If greater than 5000 ppm is detected, a sample will be taken using a pneumatic sampling pump and Tedlar Bag.

- Gas sampling of enclosed structures or utility penetrations in foundations. Confined spaces will be screened using the GEM 2000. Concentrations in

confined spaces exceeding 5000 pm will be sampled using a Tedlar bag and pneumatic sampling pump.

- Soil samples will be collected through the drill rig authoritavley into a brass sleeve for laboratory analysis.

Each sample will be collected using decontaminated sampling equipment, Tedlar Bags and Summa Canisters. CIWMB will provide, the GEM 2000 and clean Tedlar Bags. ExcelChem will provide decontaminated Summa Canisters (provided under vacuum).

3.3 Gas Sampling Equipment

The following equipment and supplies are anticipated to be utilized as part of this limited assessment.

- GEM 2000 Gas Detection Instrument
- Tedlar Bags
- Summa Canisters
- Decontamination equipment (2-½ gallon sprayer, non-phosphate detergent, disposable brush, paper towels, cotton towels, polyethylene sheeting)
- Pneumatic Air Sampling Pump
- Digital Camera
- Level C health and safety equipment (Tyvex, tape, respirator with HEPA filter)
- GMI Gas Detection Equipment
  Scout with a PID
- Gas monitoring data log sheet
- First aid kit
- Chain of custody forms and seals
- Mailing labels and markers
- Cooler and ice or blue ice
- Packing and duct tape
- Tool Kit (screwdriver, wrench, pliers)

3.4 Drilling and Sampling Procedures

Drilling will be performed in general accordance this work plan, and the City of Torrance required permit. The borings will be advanced using a hollow stem auger drill rig operated by a bonded, C-57-licensed, drilling contractor with the appropriate current certificates, experience, and training.

Ten of the 13 locations will be drilled to depths of approximately 15 feet bgs and three locations will be initially drilled to approximately 50 feet bgs, and subsequently backfilled with bentonite to approximately 15 feet bgs. The borings will be drilled with 8-inch outside diameter hollow-stem augers and 1/2-inch gas monitoring probes will be installed. Clean augers will be used for each well in order to prevent potential cross-contamination between well locations. The investigative derived wastes (IDW) generated during drilling will be placed into Department of Transportation (DOT) approved; 55-gallon drums, labeled, and placed adjacent to each boring location.

Drilling records will be kept on individual logs for each boring. The information recorded on each field boring log will generally include the following:

- project name and number,
- unique boring identifier (such as “LFG-1”) and datum,
- drilling equipment used,
- dates the drilling started and finished,
- drilling method and boring diameter,
- initials of the logger and reviewer,
- soil descriptions in general accordance with the Unified Soil Classification System, as applicable,
- depths to strata/geologic formation changes, groundwater, and total depth of the boring, and
- the sampler blow count.

3.5 Landfill Gas Monitoring Well Installation

The LFG monitoring wells will be constructed pursuant to applicable portions of CCR Title 27, Section 20925 specifications. The well materials will be plastic wrapped or kept on plastic sheeting to avoid potential contamination until they are lowered down the boring. Monitoring well casing will be constructed of flush-jointed, threaded, 1/2-inch inside-diameter (I.D.), schedule 80, polyvinyl chloride (PVC) pipe. Well screens will be constructed of flush threaded, machine slotted (0.020-inch), ½ inch schedule 80., schedule 40, PVC casing. The wells will be drilled to depths. A copy of the proposed as built well construction schematic is provided in Appendix A of this plan.

Prior to constructing the well, the bottom of each borehole will be filled with approximately 1foot of sand. The screen/casing will be placed in the hollow-stem auger to center the well casing. The well slotted screen intervals are proposed to be approximately 10 feet in length and extend from about 3 to 13 feet bgs. Solid PVC will then be attached and extended to or above ground surface. After installation of the casing, the filter pack, consisting of No. 3 sized Monterey sand, will be placed in the annulus between the well casing and the boring wall to approximately 6 inches above the top of the screened interval. The filter pack will be measured to monitor the depth and to avoid bridging between the well casing and the boring wall. Before placing the bentonite seal, the depth to the filter pack will be confirmed and additional sand added, as necessary. After the filter pack is placed, a 2-foot thick bentonite seal (granular form) will be placed in the annulus above the filter pack. The bentonite will be saturated and allowed to hydrate; the remaining annulus will be filled with 1 foot of Class “A” cement. A 1-foot diameter area of cement will surround the flush-mounted well boxes.

Landfill gas monitoring wells are proposed to be constructed in the 13 borings, 10 of the borings will be drilled to depths of approximately 15 feet bgs. Three borings are proposed to be drilled to depths of approximately 50 feet bgs. Monitoring well casings will be constructed of flush-jointed, threaded, 1/2-inch inside-diameter (I.D.), schedule 40, polyvinylchloride (PVC) pipe. Well screens will be constructed of machine slotted (0.020"), 1/2-inch I.D., schedule 40 PVC casing. No cement will be used to bond the PVC joints together. The well screen intervals extend from 3 feet to 13 feet bgs. Clean, new screen and casing will be used to construct the wells. The screen/casing will be placed in the hollow-stem augers to center the well casing.

Soil samples will be collected with a standard penetration test sampler. The sampler will be driven approximately 18 inches in advance of the hollow-stem auger by a 140-pound hammer falling 30 inches. Upon retrieving the sampler from the borehole, the sampler will be opened and logged. The borings will be continuously logged by or under the direct supervision of the N&M registered geologist. Soil cuttings will be extruded onto Visqueen plastic sheeting, or placed into a 55-gallon steel drum. At the end of each day, the drilling subcontractor will move these cuttings (and fluids) to a location prearranged by CIWMB. Soil samples will be retrieved, capped, and labeled with project name, number, location and depth, collection date and time and other pertinent information. Soil samples will be screened with a photo- Ionization detector (PID). Borings will be back-filled with granular bentonite and hydrated, and the surface restored to approximate its original condition. Depending on actual boring depths, soil samples will be retained at a minimum of 5-foot intervals. Additional soil samples may be collected, as deemed appropriate, based on subsurface conditions.

Gas samples will be collected using pneumatic air pumps, GEM 2000, Tedlar Bags and Summa Canisters. All sampling equipment and containers will be decontaminated prior to use. Samples will be taken from gas monitoring probe sampling cocks or Tygon Tubing, or confined spaces. All sampling locations will be screened with a GEM 2000 and/or a GMI before obtaining sampling for analysis.

After each sample is collected it will be labeled, logged on the chain-of-custody document, sealed, and stored in an ice chest that is cooled to 4 degrees Fahrenheit.

At the completion of sampling activities, CIWMB staff will deliver the selected samples to a State of California certified ELAP accredited laboratory for analyses using strict chain-of-custody protocols.

3.6 Sampling and analysis procedures to the Gas Investigation

a. USA will clearly mark all subsurface utilities with survey markers/lathes or paint (orange or yellow)

b. Ninyo and Moore will survey in sampling location points in accordance with the Gas Investigation Work plan, and consider marked utility corridors. Sampling locations will be marked on the street painted white

c. 13 drilling locations, probe installation and soil sampling will be performed.

d. All sampling locations will be screened for fix gases (methane, CO2, CO, O2, H2S) using the GEM 2000 and a GMI. Gas instrument reading will be recorded and documented.

e. If sample exceeds 1% methane by volume, but contains less than 10 ppm H2S, a summa canister will be used to collect a gas sample for fixed gas and T.O. 15 analysis.

f. If sample exceeds 1% methane by volume, but contains greater than 10 ppm H2S, a Tedlar bag will be used to collect a gas sample for fixed gas and T.O. 15 analysis.

g. All boring locations will be screened for gas using the gas instrument, and a registered geologist will log all direct push cores. All but 3 locations will be a maximum of 15 feet in depth, the other 3 will be drilled to a depth of 40-50 feet bgs.

h. 13 samples of waste/soil material will be taken and analyzed for CAM 17 metals TPH, BTEX, PCBs,, Semi volatiles and flammability, reactivity, corrosivity and ignitability.

I. Project engineer will ensure that tedlar bags and suma canisters are available at the beginning of each day. ExcelChem will provide 30 Tedlar bags and 26 suma canisters to Ninyo & Moore prior to the start of the job. ExcelChem will need 3-days notice to deliver Summa Canisters or Tedlar bags to the site.

3.7 Gas Sample Locations

Although sampling locations are proposed in the sampling map (Appendix B), exact gas sampling locations will be determined in the field based on site conditions. Locations where gas samples are obtained will be recorded in the field logbook and annotated on a site map. The final sampling map will be provided in the final sample report. The Sampling locations were derived from a 1965 topo map and a site map from a 1971 investigation and onsite reconnaissance. These points were then transferred to a site map and named. The Latitude and Longitude for each point was taken using a Garmin Emap hand held GPS unit. See appendix C for Gas/Soil monitoring schedule.

3.8 Decontamination Procedures

All equipment that comes into contact with landfill gas will be decontaminated in a predesignated area. Decontamination will consist of operating the sampling equipment with nitrogen or ambient air for 2 minutes to purge residual gas.

3.9 Gas Sample Containers and Preservation

Decontaminated Summa Canisters and Tedlar Bags will be supplied by the laboratory and will not require decontamination before sample collection. No preservative will be added to the containers.

3.10 Disposal of Residual Materials

In the process of collecting gas samples at Disposal Gardens Disposal site, the CIWMB sampling team will generate different types of potentially contaminated investigation-derived waste (IDW) that may include:

- Used personal protective equipment (PPE)
- Disposable sampling equipment

The U.S. EPA's National Contingency Plan requires management of IDW generated during sampling to comply with all applicable or relevant and appropriate requirements to the extent practicable. Used personal protective equipment (PPE) and disposable equipment will be double bagged and placed in municipal refuse dumpster. Personal protective equipment (PPE) and disposable equipment that is to be disposed of, which can still be used, will be rendered inoperable before disposal

If hazardous or radioactive material is found during sampling screening activities, appropriate level of notification and response procedures will be implemented in accordance with the Site Specific Health and Safety Plan.

3.11 Management of Investigative Derived Waste

Soil cuttings generated during drilling of the gas monitoring probes will be generated and will be disposed of in the following way. The cuttings will be placed into an appropriately labeled, DOT-compliant, 55-gallon drum. Decontamination fluids will be placed in a separate properly labeled 55-gallon drum. Drums will be removed and stored offsite daily at the City of Torrance storage yard and will be disposed of at an appropriate facility pending review of the analytical data.

3.12 Analytes of Concern

Analytes of concern at this site for Landfill Gas are Methane, Hydrogen Sulfide and Trace Gases such as Vinyl Chloride, TCE, PCE, BTEX, etc. Analytes of concern for soils are Metals, PCB's, Semi-Volatiles, and TPH/BTX.

3.13 Analytical Procedures

Each sample will be screened for percent combustible gas (calibrated to methane using a GMI and a GEM 2000). Samples will be analyzed using Method TO-15, and VOC's.
A minimum of 13 soil samples will be screened from drilling locations.
Samples of waste/soil material will be taken and analyzed for CAM 17 metals, TPH, BTEX, PCBs, Semi volatiles.

The following testing methods will be used to determine the origins of the gas encountered in the native soils outside of the footprint of the landfill

Fixed Gases and Methane
Samples will be collected and analyzed for fixed gases (O_2, CO_2 and N_2) and methane to determine their concentrations.

Hydrogen Sulfide
Testing will be done on samples to determine H_2S concentrations.

Hydrocarbons Speciation
Speciation of hydrocarbons will be performed to determine concentrations of straight chain hydrocarbons in samples.

3.14 Anticipated Cost

Based on discussions with ExcelChem Analytical Laboratory the following sampling costs are presented:

EPA METHOD	PARAMETER	UNIT COST	# SAMPLES	COST
EPA TO-15	VOC's	$140	19	$2660
EPA TO-3	Hydrocarbon spec.	$210	9	$1890
EPA 15/16	Hydrogen Sulfide	$210	9	$1890
ASTM D1946	**Fixed gas (methane)**	$60	19	$1140
EPA 8280A	Dioxins & Furans	$600	6	$2720
EPA 8021	BTEX	$75	32	$2400
CAM 17	**Metals**	$85	32	$3600
EPA 8015m TPH (extraction)	**C6-C44 w/carbon chain breakdown**	$300	32	$9600
8080	**PCB's**	$80	32	$2560
8270C full list	**Semi-Volatiles**	$120	32	$3840

3.15 Field Quality Control

One field duplicate sample will be collected simultaneously with a standard sample from the same source under identical conditions into a separate sample container. The duplicated sample is treated independently of its counterpart in order to assess laboratory performance through comparison of the results.

The duplicate samples will be collected at a random location that demonstrates elevated levels of gas based on field screening results.

3.15 Laboratory Quality Control

The analytical laboratory will perform Quality Control (QC). The QC will include project specific QC, method blank results, laboratory control spike, and matrix spike results.

1. Project Specific QC – No project specific QC will be requested by the CIWMB

2. Method Blank Results – A method blank is a laboratory-generated sample that assesses the degree to which laboratory operations and procedures cause false-positive analytical results for the CIWMB samples. The method blank results associated with the samples will be included with the analytical results.

3. Laboratory Control Spike – A Laboratory Control Spike (LCS) is a sample that is spiked with known analyte concentrations, and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The LCS results associate with CIWMB samples will be attached on the LCS and LCS Duplicated Analysis Report.

4. Matrix Spike Results – A matrix spike is a sample that is spiked with known analyte concentrations and analyzed at approximately 10 percent of the sample load in order to establish method-specific control limits. The matrix spike results associated with CIWMB samples will be attached on the Matrix Spike and Matrix Spike Duplicate Analysis Report.

5. Accuracy – Accuracy will be measured by percent recovery as defined by:

$$\% \text{ recovery} = \frac{(\text{measured concentration}) \times 100}{(\text{actual concentration})}$$

4. Documenting and Reporting

4.1 Field Notes

A field logbook will be used to document the vital project and sample information. At a minimum, the following sample information will be recorded:

- Sample location and description
- Site or sample area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or discrete
- Type of sample
- Type of sampling equipment used
- Field instrument reading, if applicable
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions
- Sample preservation
- Sample identification numbers and explanatory code
- Name of recipient laboratory

In addition to the sampling information, the following specific information will also be recorded in the logbook:

- Team members and their responsibilities
- Time of arrival and departure
- Deviations from the sampling plan
- Level of health and safety protection

4.2 Photographs

Photographs will be taken at the sampling location and at surrounding areas. The photographs will verify information entered in the field logbook. Each photograph taken will be written in the logbook with the approximate time, date, and location.

4.3 Labeling

All samples collected will be labeled in a clear and precise way for proper identification for tracking in the laboratory. Each sample will reference the sample date, the type of sample and the sample point identification.

4.4 Chain-of-Custody

A chain-of-custody record will accompany all sample shipments. Shipped samples will have a custody seal placed across the lid of each sample container. All custody seals will be signed and dated.

4.5 Packaging and Shipment

All sample containers will be placed in a strong-outside shipping container and will have the drain plug sealed, if applicable, to prevent melted ice from leaking out of the cooler. If ice is used to cool the samples, the ice will be packed in a double “Ziploc” bag. Special care will be provided to secure and prevent damage to the sample containers.

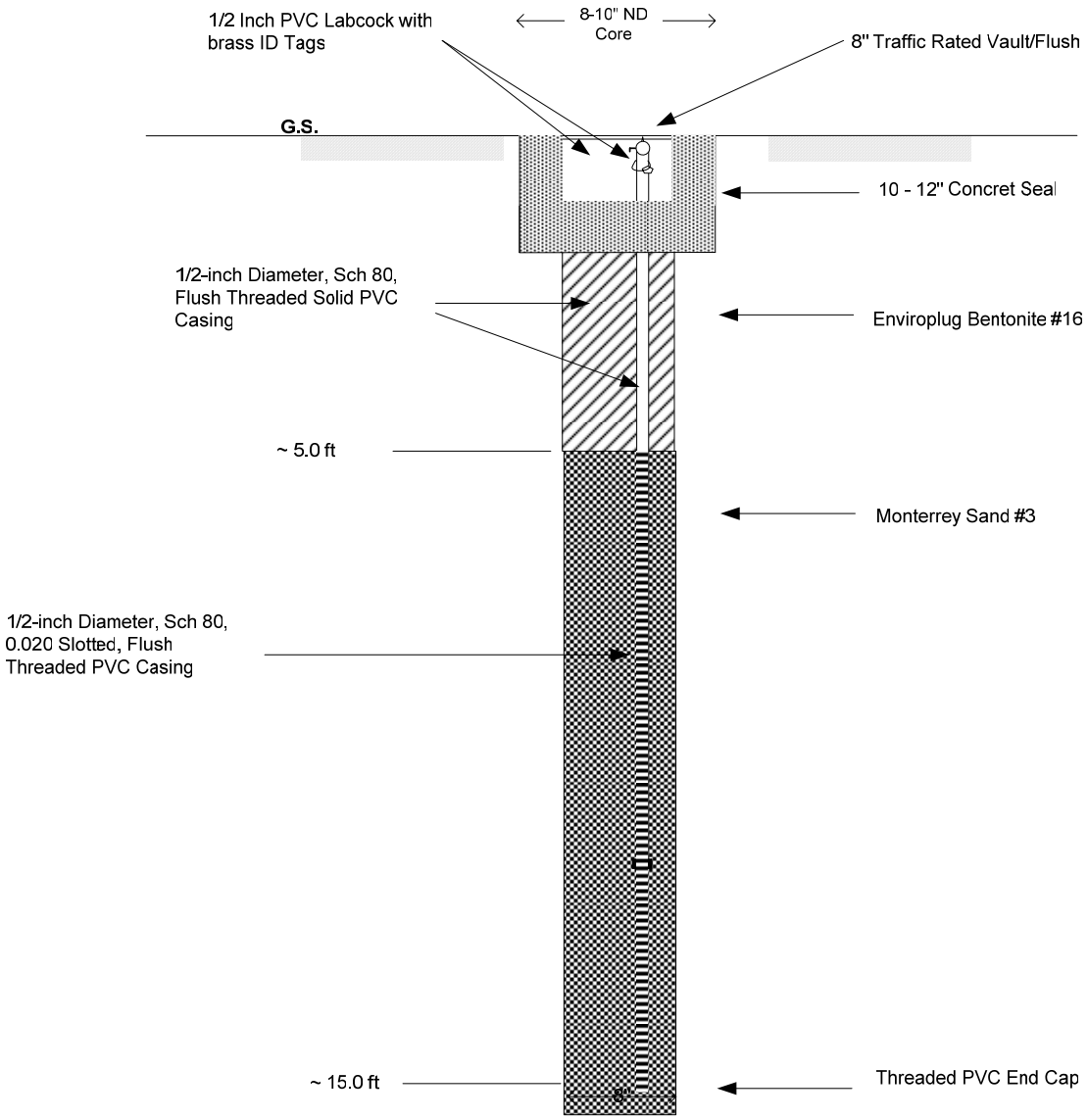
4.6 Reporting

Once the analytical results are received and evaluated, CIWMB will prepare a sampling report describing the nature of the waste and discuss the analytical results. The CIWMB anticipates submitting the sampling report to the LEA and Grossman Properties within 60 days after receipt of the analytical results.

Appendix A

Gas Monitoring Probe Construction

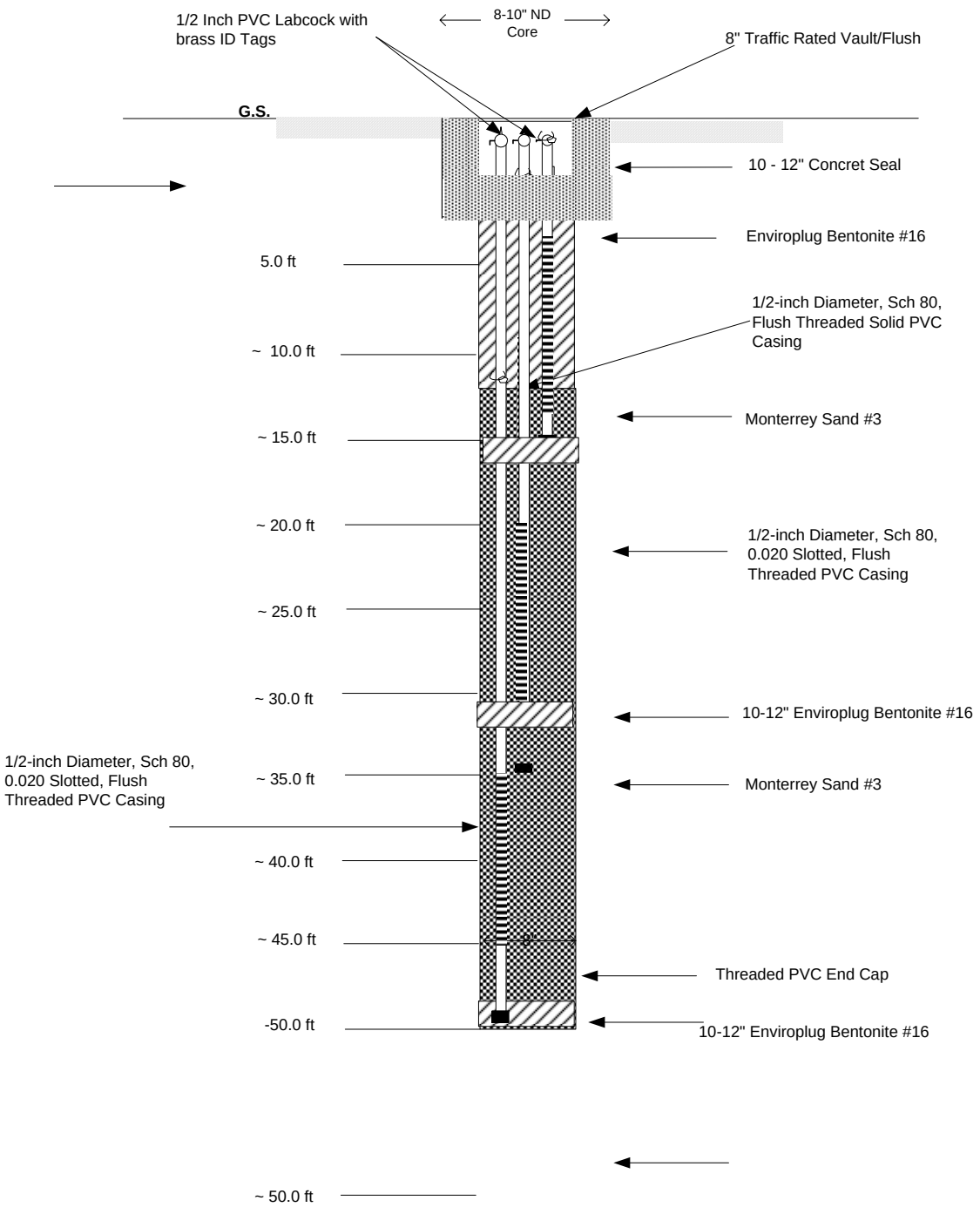
Landfill Gas Monitoring Well
Construction Schematic



Note:

1. Complete boreholes at 15 ft bgs
2. Not to Scale

Landfill Gas Monitoring Well
Construction Schematic



Note:

1. Complete boreholes at 15, 35 and 50 ft bgs with sealed bottom using 1-3 ft of Bentonite
2. Not to Scale

Appendix B

Sampling Location Map

California Integrated Waste Management Board

Disposal Gardens
AKA
Torrance Sand and Gravel
SWIS 19-AA-5233

By DAO

Notes:

1. Red color indicates single completion probe

2. 10 Single Completion Probes.
P1, P3, P4-P9, P12 and P13, (drilled to 15 feet)

3. Green color indicates a triple completion probe

4. Triple Depth Probes
P2, P10, P11 (selected due to the close proximity of the oil pits will be drilled to 50 feet)

Appendix C

Gas and Soil Monitoring and sampling schedule

Disposal Gardens Torrance Calif

Gas and Soil Monitoring and Sampling Schedule

			Gas			Laboratory Analysis	Soil					
			VOC			CH4/Fixed Gases	Metals	TPH (ext)	PCB's	Semi-Voc	BTEX	Dioxin
			TO15	C2-C5 TO3	H2S	ASTM D1946	CAM 17	8015m	EPA 8080	EPA 8270c	EPA 8021	EPA 8280a
Probe ID	Monitored	Container			EPA15/16							
back ground			XS	XS		XS	XB	XB	XB	XB	XB	
P1			XS	XS		XS	XB (7)	XB (7)	XB (7)	XB (7)	XB (7)	
P2			XS	XS	XT (3)	XS	X B	XB	XB	XB	XB	XG (2)
P3			XS	XS		XS	XB	XB	XB	XB	XB	
P4			XS	XS		XS	XB	XB	XB	XB	XB	
P5			XS	XS		XS	XB	XB	XB	XB	XB	
P6			XS	XS		XS	XB	XB	XB	XB	XB	
P7			XS	XS		XS	XB	XB	XB	XB	XB	
P8			XS	XS		XS	XB	XB	XB	XB	XB	
P9			XS	XS		XS	XB	XB	XB		XB	
P10			XS	XS	XT (3)	XS	XB (7)	XB (7)	XB (7)	XB (7)	XB (7)	XG (2)
P11			XS	XS	XT (3)	XS	XB (7)	XB (7)	XB (7)	XB (7)	XB (7)	XG (2)
P12			XS	XS		XS	XB	XB	XB	XB	XB	
P13			XS	XS		XS	XB	XB	XB	XB	XB	
Duplicate			XS	XS		XS	XB	XB	XB	XB	XB	
Brass Sleeve (B)							32	0	0	0	0	0
Summa Cannister (S)			19	0		0						
Tedlar Bags (T)					9							
Glass Jar (G)												6

Total number of Suma Canisters needed are: 22
Total number of Tedlar Bags needed are: 9
Total number of Brass Sleeves are: 32
With brass sleeves, 64 caps and Teflon tape will be needed

CIWMB