February 3, 2017

To: Ms. Kit Soo, P.G., Senior Hazardous Materials Specialist
Alameda County Environmental Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Re: Perjury Statement
Vapor Intrusion Assessment Work Plan
Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California 94501
SLIC # RO0382
Geotracker Global ID # T0600100980

I declare, under penalty of perjury, that the information or recommendations contained in the attached plan are true and correct to best of my knowledge.

Carolyn C. Fong, Trustee

Carolyn C. Fong, Trustee
Claimant: Lily Angela Chun 1991 Living Trust
711 E. Hermosa Drive
San Gabriel, California 91775

February 3, 2017
Project No. 401896004

Ms. Kit Soo
Alameda County Environmental Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Subject: Vapor Intrusion Assessment Work Plan
Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California
Fuel Leak Case #RO0382
GeoTracker Global ID #T0600100980

Dear Ms. Soo:

On behalf of Ms. Carolyn C. Fong, Trustee, Lily A. Chun 1991 Trust, Ninyo & Moore has prepared this Vapor Intrusion Assessment Work Plan (Work Plan) for the Bill Chun Service Station located at 2301 Santa Clara Avenue in Alameda, California (site; Figure 1). The immediate site vicinity is shown on Figure 2 and the site plan including well locations and remediation system location is shown on Figure 3. This Work Plan was prepared in accordance with the Alameda County Department of Environmental Health (ACDEH) email dated October 31, 2016, and includes a survey of sensitive receptors and an evaluation of underground utilities in the site vicinity. ACDEH's January 4, 2017 email extended the due date for this Work Plan to February 4, 2017. Presented below for your review are our proposed activities for performing this soil vapor investigation.

1. SENSITIVE RECEPTOR SURVEY

A survey for sensitive receptors was conducted for features including water supply wells, surface waters, daycare/preschool facilities, eldercare facilities, schools and hospitals located within a ½-mile radius of the site. Our findings are discussed in the following subsections.

1.1. Water Supply Wells

To locate water supply wells within a ½-mile radius of the site, Ninyo & Moore contacted the California Department of Water Resources (DWR) and the Alameda Public Works Agency, Water Resources (ACPWA). One domestic water well is present within the search radius. The well is located approximately 850 feet southwest of the site at 2200 Central Avenue in Alameda, California, at Alameda High School. A Well Data sheet provided by ACPWA dated April 11, 1974, stated that the well had been numbered 2S4W12R, had a total depth of 325 feet below ground surface (bgs), was not operable, and that the well would be kept for monitoring only. The Well Data sheet is included in the Attachments. Water levels were last measured in the well in 1994 according to the DWR Water Data Library website. According to Mr. James Yoo at ACPWA, the well is owned by Alameda High School and is currently covered by a portable classroom. Based on the well's location and depth, distance from the site and the site's groundwater monitoring results, it is unlikely that groundwater contamination resulting from the site's historical chemical release has negatively impacted the well.

1.2. Surface Water Bodies

The nearest surface water body is the Oakland Estuary, approximately 0.5 miles northeast of the site. Given the distance to this surface water body from the site and the site's groundwater monitoring results, it is unlikely that groundwater contamination resulting from the site's historical chemical release has migrated into the surface water body.

1.3. Potential Sensitive Receptors

To locate potential sensitive receptors such as schools, hospitals, daycare/preschool facilities, and eldercare facilities within a ¼-mile radius of the site, Ninyo & Moore searched online mapping services. Potential sensitive receptors located within the search radius are: Alameda High School and Happy Little World Childcare. Alameda High School is located approximately 600 feet southwest of the site. Happy Little World Childcare is located approximately 430 feet south-southwest of the site. Based on the potential sensitive receptors' locations, distances from the site and the site's groundwater monitoring results, it

is unlikely that they have been negatively impacted by vapor intrusion related to groundwater contamination resulting from the site's historical chemical release.

2. UNDERGROUND UTILITY EVALUATION

The vapor intrusion assessment requires gaining an understanding of the underground utilities present in the vicinity of the site that may act as conduits potentially contributing to the migration of impacted groundwater and/or soil vapor. Major underground utilities in the site's vicinity include:

- Natural gas, operated by Pacific Gas & Electric (PG&E);
- Electricity, operated by Alameda Municipal Power (AMP);
- Sanitary sewer and storm drains, operated by City of Alameda Public Works Department (APWD); and
- Drinking water mains, operated by East Bay Municipal Utility District (EBMUD).

Ninyo & Moore reviewed underground utility information provided by the utility owners' mapping departments. The underground utilities identified in this study are presented in the attachments.[1] The electric utilities are approximately 2 to 3 feet bgs and located beneath the sidewalks adjacent to the site on the east side of Oak Street and the north side of Santa Clara Avenue. The sanitary sewer located in Oak Street is approximately 10 feet bgs and flows to the northeast. The sanitary sewer in Santa Clara Avenue is approximately 3.5 feet bgs and flows to the east-southeast. The storm drains in the site vicinity are sidewalk culverts or street culverts that have been installed just under the sidewalk or street paving. Drinking water utilities are

[1] Ninyo & Moore contacted PG&E, AMP, APWD, and EBMUD to request information on utilities within the site vicinity. Ninyo & Moore received utility maps from AMP, APWD, and EBMUD and is awaiting a reply from PG&E. EBMUD maps did not include depth information for water mains, depth information has been requested from EBMUD. EBMUD requires that maps not be reproduced, so the map provided by EBMUD is not included in the attachments.

located in Oak Street and Santa Clara Avenue, but depth information was not provided at the time of this writing by EBMUD.

Underground utilities in the site vicinity represent potential conduits for migration of impacted groundwater and/or soil vapor. However, groundwater and soil vapor monitoring performed in the past do not provide evidence that the utilities have significantly contributed to the migration of impacted groundwater and soil vapor. This is likely because the areas of highest concentrations of impacted groundwater and soil vapor are not crossed by underground utilities. Implementation of this Work Plan and continued implementation of the groundwater monitoring detailed in the Operations and Maintenance Plan dated December 24, 2013, will provide additional information that will allow Ninyo & Moore to continue to evaluate whether underground utilities are acting as conduits for migration of impacted groundwater or soil vapor.

3. PROPOSED SOIL VAPOR INVESTIGATION

Ninyo & Moore's proposed soil vapor investigation includes the installation and sampling of semi-permanent soil vapor probes, and preparation of a letter report presenting the findings. The soil vapor investigation activities will be performed following the California Department of Toxic Substances and Control (DTSC) *Advisory Active Soil Gas Investigation*, dated July 2015 (Advisory). Soil sampling and soil vapor sampling will be performed in order to evaluate vapor intrusion per the State Water Resources Control Board Low-Threat Underground Storage Tank (UST) Case Closure Policy, media-specific criteria 2 (petroleum vapor intrusion to indoor air), scenario 4.

3.1. Pre-Field Activities

Ninyo & Moore will conduct the following pre-field activities:

- Update the existing site-specific health and safety plan specifying concerns associated with soil vapor investigations.
- Conduct a site visit to inspect and mark-out the boring locations for the proposed soil vapor probes, and provide Underground Service Alert (USA) notification as required by California law.

- Subcontract a private utility locator to clear the boring locations for the proposed soil vapor probes.
- Submit and obtain a drilling permit from ACPWA.

3.2. Soil Vapor Probe Installations and Soil Sampling

Ninyo & Moore will oversee a California C-57 licensed driller advance borings by hand auger, collect soil samples and install soil vapor probes at six separate locations shown on Figure 4. Location NMB-3B will evaluate impacts near the northern site boundary. Locations NMB-6B and NMB-9B will evaluate impacts near the eastern site boundary adjacent to the building at 2309 Santa Clara Avenue which has a slab on grade foundation. Location NMB-11B will evaluate impacts on the eastern side of the building at 2309 Santa Clara Avenue which has a slab on grade foundation. Location NMB-13 will evaluate impacts beneath the north-adjacent building at 1510 Oak Street and will be advanced in the building's basement which has a concrete slab foundation. Location NMB-14 will be advanced on the east side of the 2309 Santa Clara Avenue property to evaluate impacts at the boundary of the 2309 Santa Clara Avenue and 2305 Santa Clara Avenue properties, both of which have slab on grade foundations. The locations of NMB-3B, NMB-6B, NMB-9B and NMB-11B correspond to locations where soil vapor samples have been collected in the past.

Soil samples will be collected from each boring location at 2.5 and 5 feet bgs, or below the bottom of building foundation, whichever is deepest. Soil samples will be collected in United States Environmental Protection Agency (USEPA) Method 5035 sample containers, labeled, recorded on a chain-of-custody, placed in a cooler on ice, and delivered to a laboratory for analysis.

After total depth is reached in the soil borings, soil vapor probes will be installed following the DTSC Advisory. A typical construction diagram of the soil gas probe is provided as Figure 5. Each soil gas probe will include a 1-inch stainless steel vapor screen placed at 5 feet bgs, or 5 feet below the bottom of building foundation, whichever is deeper, and connected to ¼-inch Teflon tubing. The soil borings will be backfilled according to Figure 5 and completed with a flush mounted well lid.

3.3. Soil Vapor Sampling

Ninyo & Moore will collect one round of soil vapor samples from each of the probe locations (for a total of 6 samples) per the DTSC Advisory. A minimum of 48 hours will be allowed to elapse between soil vapor probe installation and soil vapor sample collection. Sampling of soil vapor probes will not be conducted during, or within 5 days after a significant rain event (0.5 inch or greater). The sampling equipment and methods are discussed in detail below.

- ***Sampling Equipment:*** Stainless steel sampling manifolds and sorbent tubes will be connected to the soil vapor probe tubing using Teflon tubing and Swagelok® fittings. The stainless steel manifold will consist of stainless steel tubing, a moisture filter, a flow controller, pressure gauges, valves, and Swagelok® fittings, and will be connected to two Summa® vacuum canisters (one for purging and one for sampling). Purging will be performed using a 6-liter Summa® vacuum canister and the samples will be collected in 1-liter Summa® vacuum canisters. The manifolds and Summa® canisters will be supplied by a state-certified laboratory. A different manifold will be used for each sample and manifolds will not be re-used at multiple sample locations. The flow controller will be pre-set by the laboratory to allow approximately 150 milliliters per minute (mL/min) of flow.

- ***Manifold Shut-In Test:*** Before the manifold is connected to the soil vapor probe tubing, a Swagelok® cap will be fitted on the tubing connection side of the manifold and a shut-in test will be performed by opening the purge canister. At the onset of the shut-in test the initial vacuum and time will be recorded on a field data sheet. The shut-in test will continue for at least 1 minute. If the vacuum pressure remains constant for the duration of the shut-in test, the test will be considered successful, the manifold will be connected to the soil vapor probe using Teflon tubing, and purging and sampling will commence. If the vacuum pressure changes, the shut-in test will be discontinued, the manifold fittings will be double checked and tightened, and the shut-in test will be repeated until the vacuum pressure remains constant. Extra manifolds and Summa canisters will be available in case one of the laboratory supplied manifolds is faulty.

- ***Leak Detection:*** Leak detection is important because leaks in the sampling system could cause the dilution of analytical samples with ambient air. The leak detection compound isopropyl alcohol (IPA) will be used to evaluate whether leaks are present in the sampling equipment. After a successful manifold shut-in test, the manifold will be connected to the soil vapor probe using Teflon tubing. With the exception of the Teflon tubing connections and soil vapor probe seals, all of the manifold connections will have been successfully shut-in tested prior to sampling; therefore, only the tubing connections and vapor probe seals will be possible sources of leakage. IPA will be

introduced to the soil vapor probe sampling shroud throughout the duration of purging and sample collection. IPA will be included in the list of analyzed compounds from the samples and the results will be included in the laboratory analytical report.

- ***Purge Volume:*** A combined tubing and manifold length of 8 feet was assumed for the purge volume calculation of the approximately 5 feet bgs soil vapor probes, respectively. The purge volume was calculated to be approximately 478 mL which is equivalent to a drop in Summa® canister vacuum pressure of approximately 2.39 inches of mercury (in. Hg) for the approximately 5 feet bgs vapor monitoring probes. The purge volume calculations are included as an Attachment to this Work Plan.

- ***Purging:*** Prior to sample collection, purging of the appropriate volume will be performed in order to collect representative samples. The purge volume will be monitored by change in vacuum pressure, not time. The purging start time, initial purge canister vacuum, ending time, and final vacuum will be recorded on the field data sheets.

- ***Sample Collection:*** Subsequent to purging, the purge canister valve will be closed and the sample canister valve opened to begin sample collection. The sampling will be monitored by change in vacuum pressure, not time. The sampling start time, initial sample canister vacuum, end time, and final vacuum will be recorded on the field data sheets. Sample canister valves will be closed when the remaining vacuum is below 5 inches Hg. Sample canisters will not be allowed to reach 0 inch Hg, which would indicate that no vacuum remains in the canister.

- ***Quality Control:*** As discussed above, a manifold shut-in test will be performed and a leak detection compound (IPA) will be used during sample collection and included in the analytical suite.

- ***Sample Handling:*** Upon collection, each sample will be labeled with the sample identification, date and time of collection, sampler's initials, and analytical method requested. This information will also be recorded on a chain-of-custody supplied by the laboratory. Samples will be delivered to a state-certified analytical laboratory either the same day or no later than the day following sampling. Samples will be protected from exposure to direct sunlight or significant changes in temperature during storage and transportation to the laboratory.

Following sampling, Ninyo & Moore will leave the soil vapor probes in place so that additional sampling can be performed in the future, if needed.

3.4. Sample Analysis

Soil samples will be analyzed for total petroleum hydrocarbons as gasoline by USEPA Method 8260B.

Soil vapor samples will be analyzed for oxygen and methane by ASTM Method 1946D, benzene ethylbenzene and naphthalene by USEPA Method TO-15. In addition, the leak detection agent, IPA will be analyzed by USEPA Method TO-15.

3.5. Reporting

Ninyo & Moore will prepare a letter report documenting the Vapor Intrusion Assessment findings. This report will describe the completed field activities, provide construction logs of the soil vapor probes, include a map showing the soil vapor probe locations, tabulate data and provide the analytical laboratory reports. The soil vapor analytical results will be evaluated against the State's Low-Threat UST Case Closure Policy, media-specific criteria 2 (petroleum vapor intrusion to indoor air), scenario 4. The soil vapor analytical results will also be compared to the results of previous soil vapor sampling performed in 2012 and 2013. Ninyo & Moore will additionally prepare DWR forms required for the installation of the soil vapor probes.

Ninyo & Moore has prepared this Work Plan on behalf of Ms. Carolyn C. Fong, Trustee, Lily A. Chun 1991 Trust in order to comply with the ACDEH request in their email dated October 31, 2016. Please contact us at (510) 343-3000 should you have any questions.

Sincerely,
NINYO & MOORE

Peter D. Sims
Project Environmental Geologist

Aubrey K. Cool, PG
Senior Environmental Geologist

PDS/AKC/vmp

Attachments: Figure 1 – Site Location
Figure 2 – Site Vicinity
Figure 3 – Site Plan
Figure 4 – Benzene Concentrations in Groundwater 5/16/16 - 5/17/16 and Proposed Boring Locations
Figure 5 – Soil Gas Probe Construction Diagram

Department of Water Resources Well Data Sheet
Alameda Municipal Power Service Map
Alameda Public Works Department Storm Drain System Map
Alameda Public Works Department Sanitary Sewer System Map
Soil Vapor Probe Purge Calculations

REFERENCE: METRO AREAS OF ALAMEDA, CONTRA COSTA, MARIN, SAN FRANCISCO, SAN MATEO, AND SANTA CLARA COUNTIES, THOMAS GUIDE, 2008.

N

SCALE IN FEET

0 2000 4000

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	SITE LOCATION	FIGURE
PROJECT NO. 401896004	DATE 2/17	2301 SANTA CLARA AVENUE ALAMEDA, CALIFORNIA	1

401896004-FIG1.dwg, Oct 07, 2016, 9:06am, AOB

REFERENCE: GOOGLE EARTH, 2012.

N

SCALE IN FEET

0 40 80

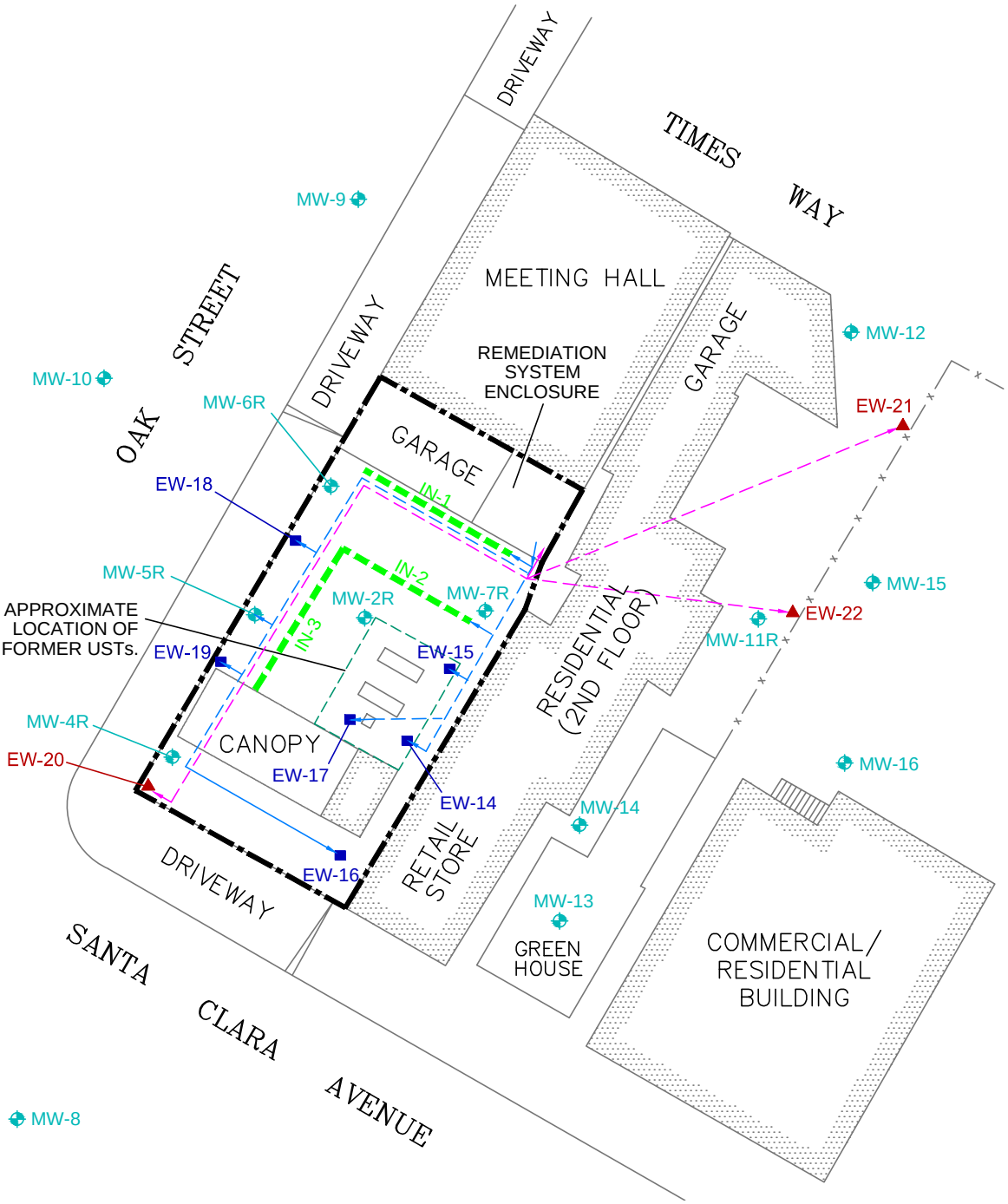
NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

LEGEND

APPROXIMATE SITE BOUNDARY

Ninyo & Moore		**SITE VICINITY**	FIGURE
PROJECT NO.	DATE	2301 SANTA CLARA AVENUE ALAMEDA, CALIFORNIA	**2**
401896004	2/17		

401896004-FIG2.dwg, Oct 07, 2016, 9:08am, AOB



N

SCALE IN FEET

0 30 60

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

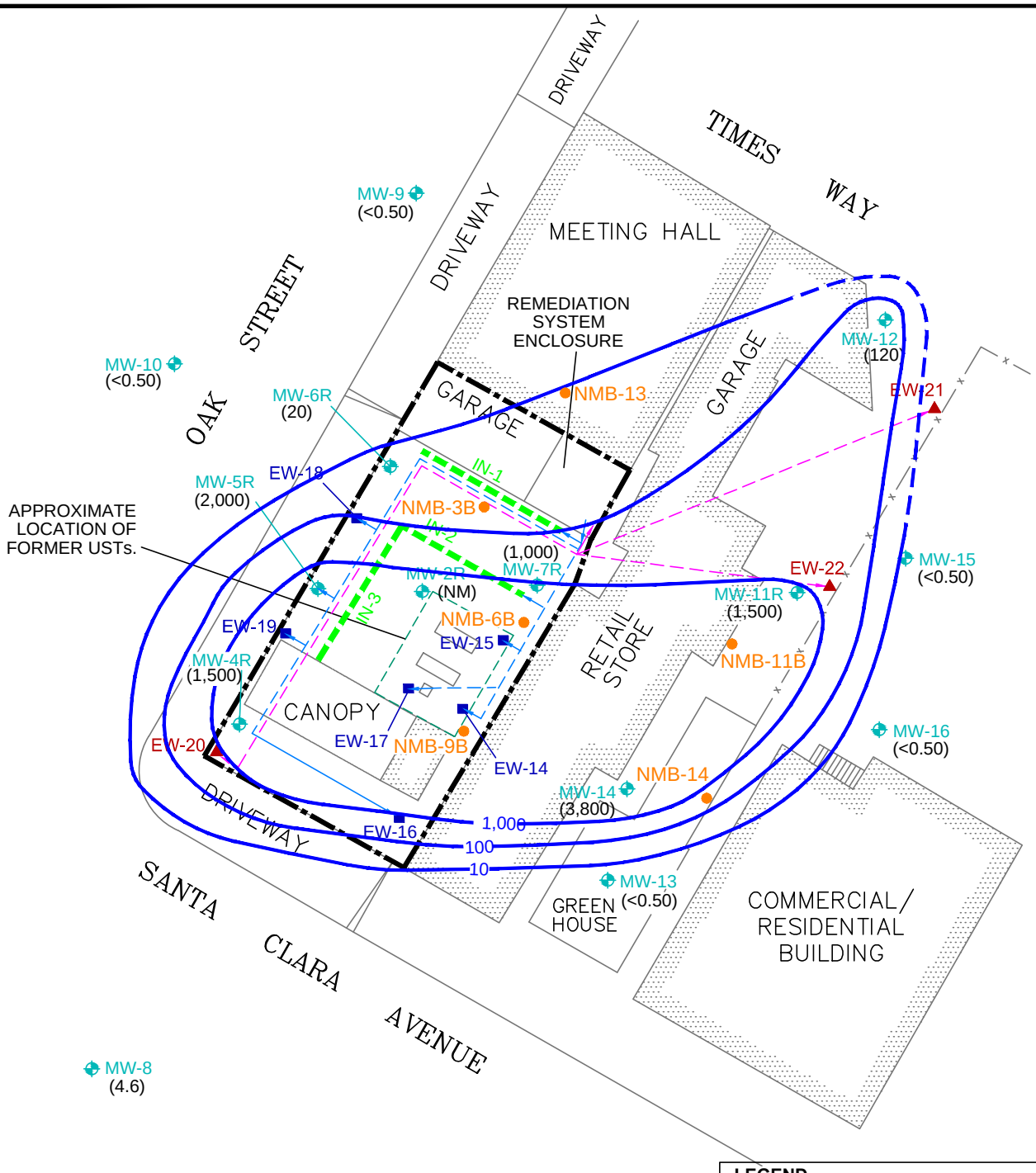
LEGEND

- APPROXIMATE SITE BOUNDARY
- FENCE
- EXTRACTION WATER SUPPLY LINE AND POWER CONDUIT
- INJECTION WATER SUPPLY LINE
- SLOTTED HORIZONTAL INJECTION PIPING
- MW-16 GROUNDWATER MONITORING WELL
- EW-22 GROUNDWATER EXTRACTION WELL
- EW-19 GROUNDWATER INJECTION WELL

REFERENCE: VIRGIL CHAVEZ LAND SURVEYING, 2012.

Ninyo & Moore	SITE PLAN	FIGURE
PROJECT NO. 401896004 / DATE 2/17	2301 SANTA CLARA AVENUE ALAMEDA, CALIFORNIA	3

401896004-FIG3.dwg, Oct 07, 2016, 9:13am AOB



LEGEND

- NMB-14 ● PROPOSED BORING LOCATION
- APPROXIMATE SITE BOUNDARY
- FENCE
- EXTRACTION WATER SUPPLY LINE AND POWER CONDUIT
- INJECTION WATER SUPPLY LINE
- SLOTTED HORIZONTAL INJECTION PIPING
- CONTOUR
- MW-16 GROUNDWATER MONITORING WELL
- EW-22 ▲ GROUNDWATER EXTRACTION WELL
- EW-19 ■ GROUNDWATER INJECTION WELL

N

SCALE IN FEET

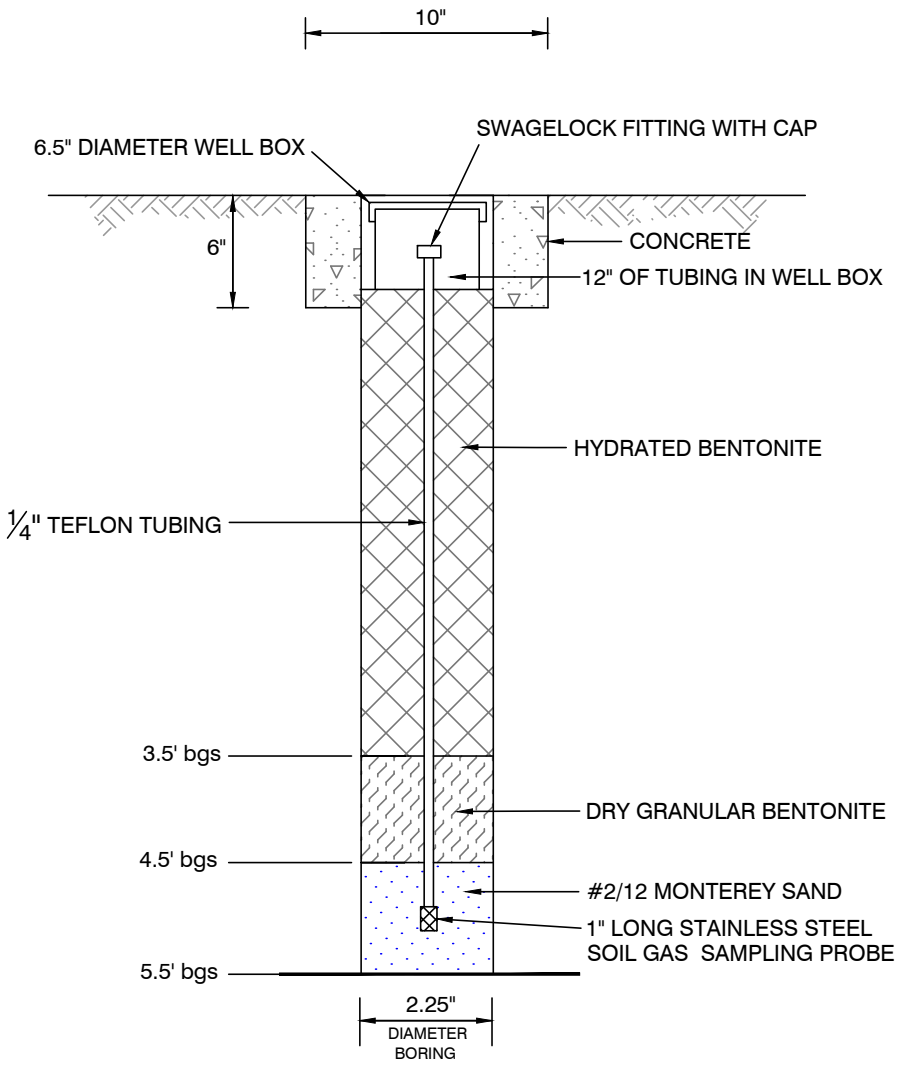
0 30 60

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: VIRGIL CHAVEZ LAND SURVEYING, 2012.

Ninyo & Moore	BENZENE CONCENTRATIONS IN GROUNDWATER 5/16/16 - 5/17/16 AND PROPOSED BORING LOCATIONS	FIGURE
PROJECT NO. 401896004 / DATE 2/17	2301 SANTA CLARA AVENUE ALAMEDA, CALIFORNIA	4

401896004-FIG8.dwg, Oct 07, 2016, 9:36am, AOB



NOT TO SCALE

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	SOIL GAS PROBE CONSTRUCTION DIAGRAM	FIGURE
PROJECT NO. 401896004 / DATE 2/17	2301 SANTA CLARA AVENUE ALAMEDA, CALIFORNIA	5

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

State No. 2S/4W 12 R

WELL DATA

BRANCH _____

Owner ALAMEDA HIGH SCHOOL
Address CENTRAL AVE & OAK ST., ALAMEDA
Tenant 2200 CENTRAL
Address _____

State No. _____
Other No. _____

Type of Well: Hydrograph ☐ Key ☐ Index ☐ Semiannual ☒
Location: County ALAMEDA Basin BAY PLAIN No. _____
U.S.G.S. Quad. _____ Quad. No. _____
_____ ¼ _____ ¼ Section 12, Twp. 2S, Rge. 4W MD SB H Base & Meridian
Description SEE SKETCH

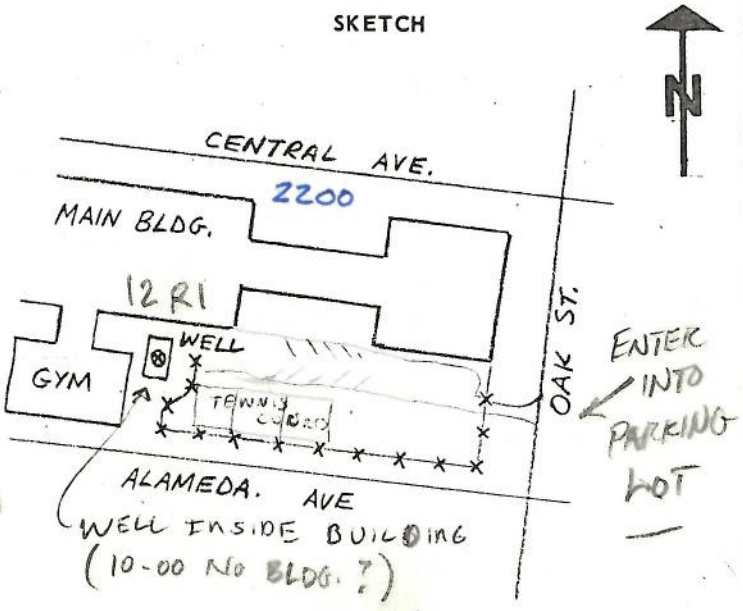
Reference Point description DISCHARGE PIPE

which is 1.0 ft. (above) below land surface. Ground Elevation 30 ft.
Reference Point Elev. 31.0 ft. Determined from QUAD
Well: Use DOMESTIC Condition INOPERABLE, MEASURABLE Depth 325 ft.
Casing, size 16" in., perforations _____

Measurements By: DWR ☐ USGS ☐ USBR ☐ County ☒ Irr. Dist. ☐ Water Dist. ☐ Cons. Dist. ☐
Chief Aquifer: Name _____ Depth to Top Aq. _____ Depth to Bot. Aq. _____
Type of Material _____ Perm. Rating _____ Thickness _____
Gravel Packed? Yes ☐ No ☐ Depth to Top Gr. _____ Depth to Bot. Gr. _____
Supp. Aquifer _____ Depth to Top Aq. _____ Depth to Bot. Aq. _____
Driller _____
Date drilled _____ Log, filed _____ open (1) _____ confidential (2) _____
Equipment: Pump, type _____ make _____
Serial No. _____ Size of discharge pipe _____ in.
Power, Kind ELECT. Make U.S.
H. P. 10 Motor Serial No. 84525
Elec. Meter No. _____ Transformer No. _____
Yield _____ G.P.M. Pumping level _____ ft.

Water Analysis: Min. (1) _____ San. (2) _____ H.M. (3) _____
Water Levels available: Yes (1) _____ No _____
Period of Record: Begin _____ End _____
Collecting Agency: _____
Prod. Rec. (1) _____ Pump Test (2) _____ Yield (3) _____

SKETCH



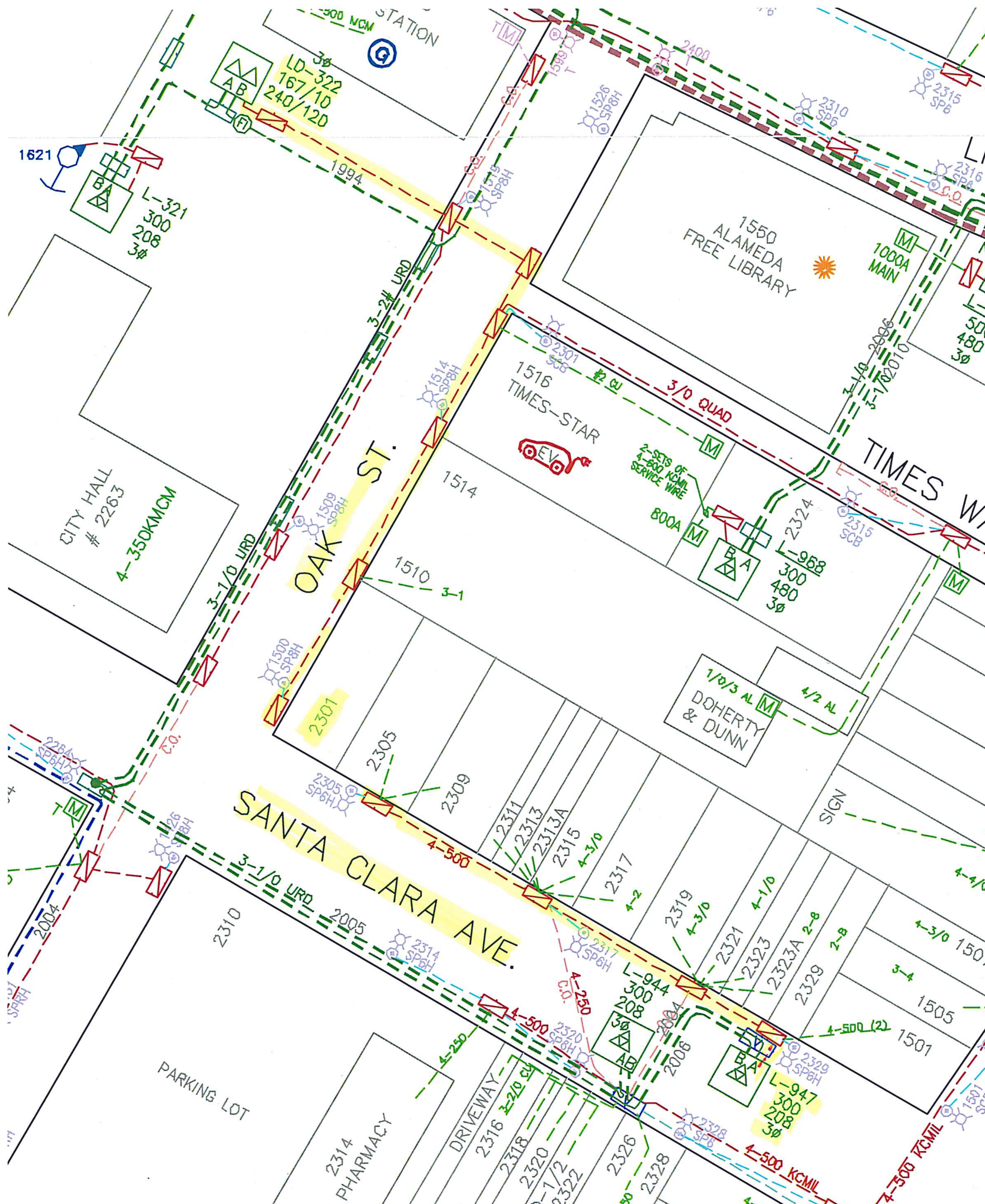
REMARKS

ELEV. FROM QUAD

Get Key from Main Office Room 214

5/93 → GO TO M.O.F., 3RD FLOOR, WELL BLDG GONE, NEW GYM UNDER CONSTRUCTION – WELL WILL BE KEPT FOR MONITORING ONLY – IN CHRISTY BOX.

Recorded by: JM
Date 4-11-74



STATION
LD-322
3Ø
167/10
240/120
1621
1994
L-321
300
208
3Ø
1550
ALAMEDA
FREE LIBRARY
1000A
MAIN
CITY HALL
2263
4-350KMCM
3-2# URD
3-1/0 URD
OAK ST.
1516
TIMES-STAR
#2 CU
3/0 QUAD
TIMES WA
2-SETS OF
4-500 KCMIL
SERVICE WIRE
800A
L-968
300
480
3Ø
1514
1510
3-1
2301
1/0/3 AL
4/2 AL
DOHERTY
& DUNN
SIGN
2305
2309
SANTA CLARA AVE.
4-500
2311
2313
2313A
2315
2317
2319
2321
2323
2323A
2329
1505
1501
3-1/0 URD
2005
2004
2006
2310
L-944
300
208
3Ø
L-947
300
208
3Ø
4-250
4-500
4-500 (2)
4-500 KCMIL
PARKING LOT
2314
PHARMACY
DRIVEWAY
2316
2318
2320
2326
2328

City of
Alameda
California

Storm drain
System Network

NORTH

0 50 100 ft

Legend

Node Type
- Cleanout
- Handhole
- Manhole
- Manhole: Abandoned
- Connect
- Inlet
- Outlet
- Plug
- Pump Station
- SDAP: Access Port
- SDAR: Air Relief Valve
- Weir
- Catch Basin
- Drain Inlet
- Drain Outlet
- Grate
- Outfall

Pipe Network
- Storm Pipe
- Storm Pipe: Abandoned
- Lateral
- Lateral: Private
- Sidewalk Culvert
- Street Culvert

Storm Flow
- Storm Flow Direction
- Property Line Setback from Face of Curb

Landbase
- Edge of Pavement
- Land Parcel
- Map Page Boundary

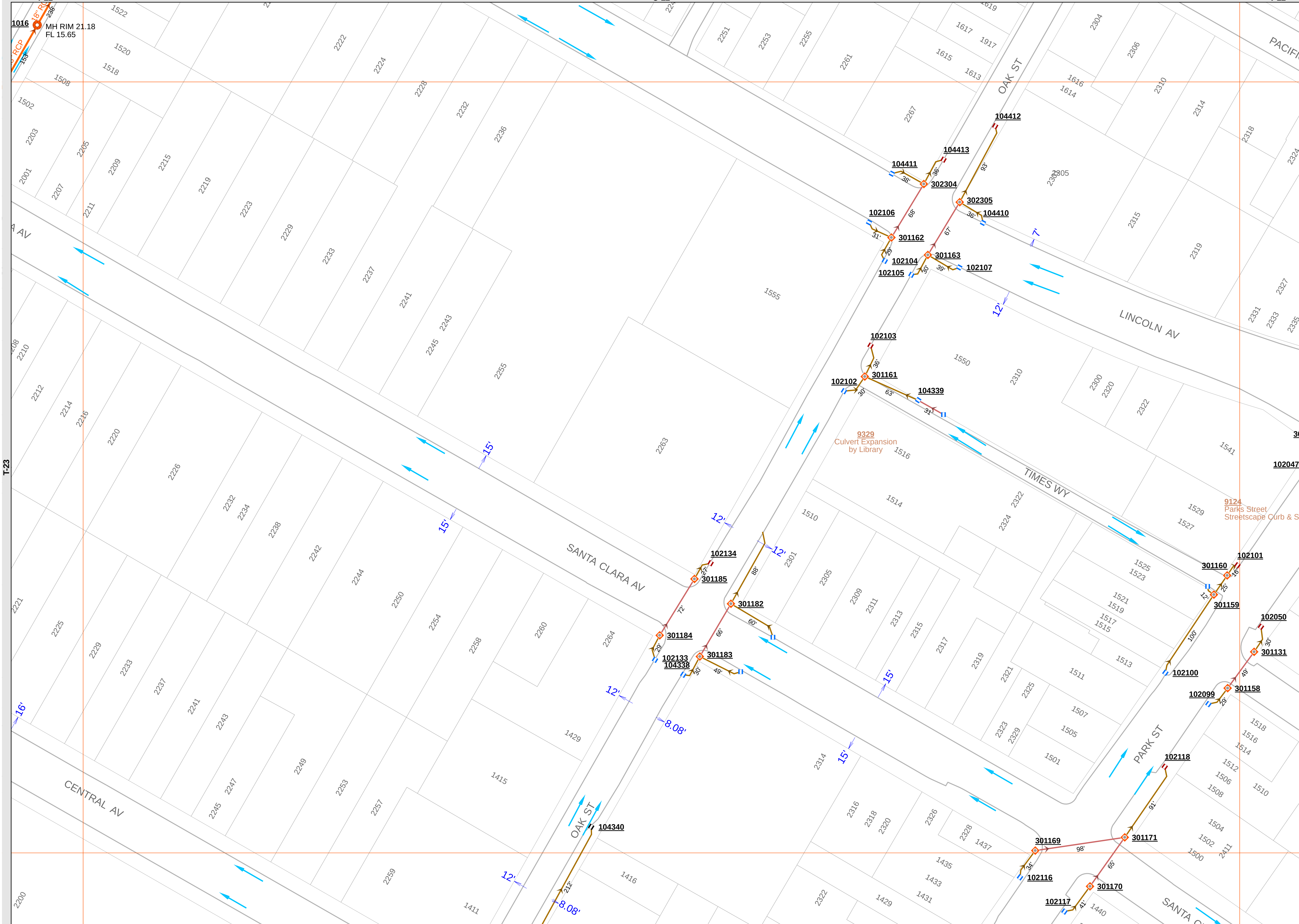
Storm facility locations and elevations shown on these maps reflect a combination of field and file data and are for maintenance purposes only. The accuracy of the information shown cannot be guaranteed. The City of Alameda assumes no responsibility for the location and elevation indicated. Data required for connection to or extension of the City system shall be based on actual field survey.

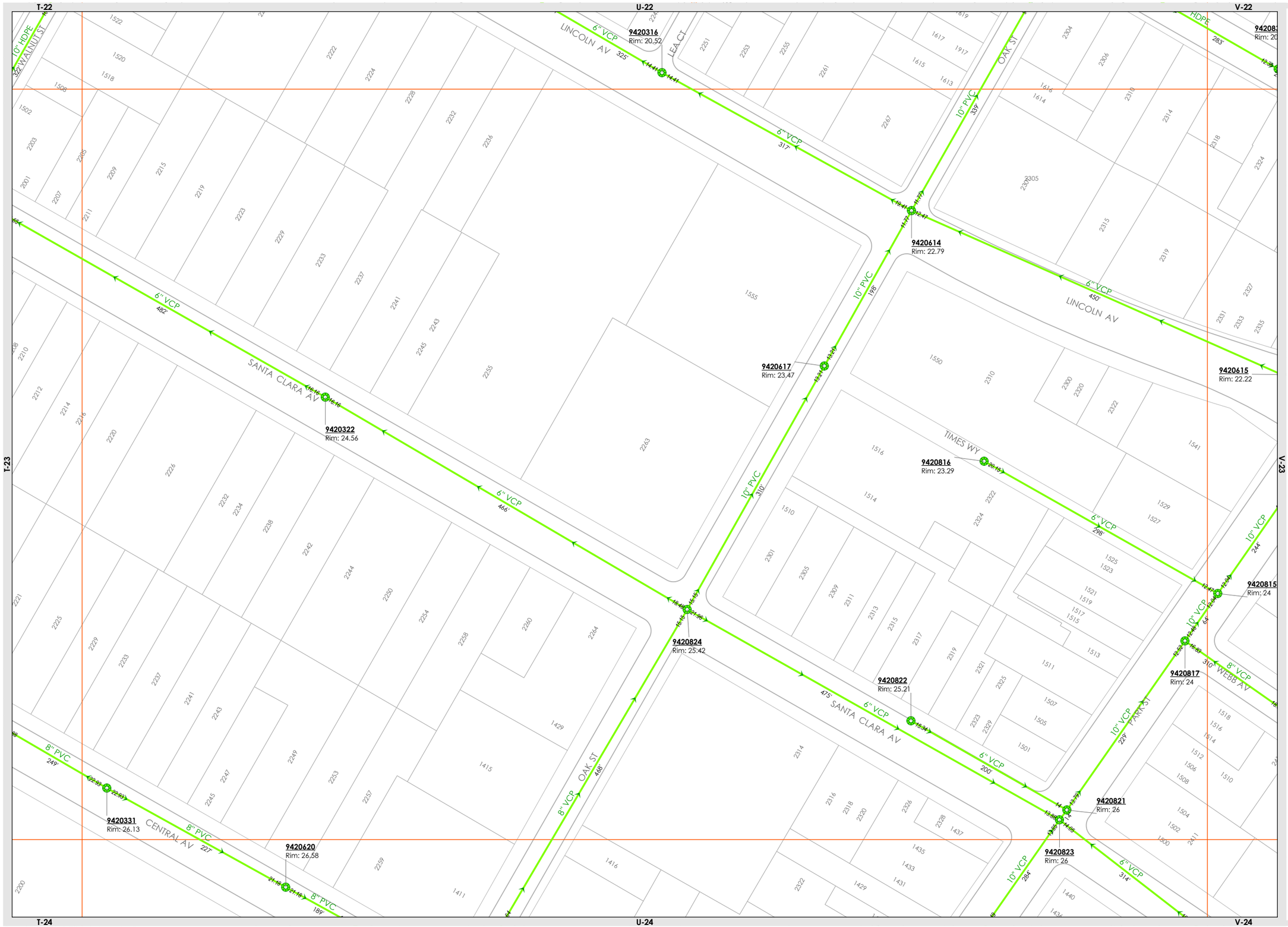
Coordinate Information

Horizontal Datum:
NAD 83 California StatePlane Coordinate System, Zone III, US Feet

Vertical Datum:
-3.41 of NGVD29 US FEET
(To obtain the City of Alameda elevation, subtract 3.41 feet from NGVD29 elevations.)

T-22	U-22	V-22
T-23	**U-23**	V-23
T-24	U-24	V-24





City of Alameda California

Sanitary Sewer System Network

NORTH

0 50 100 ft

Legend

SS Node

- City: Lift Station
- City: Manhole
- City: Cleanout; CO
- City: MH or CO
- City: Node
- City: StubOut
- EBMUD: Lift Station
- EBMUD: Manhole
- EBMUD: MH or CO
- Private: Lift Station
- Private: Manhole
- Private: Cleanout; CO
- Private: MH or CO
- Private: Node
- Private: StubOut
- Abandoned: Lift Station
- Abandoned: Manhole
- Abandoned: Cleanout

SS Pipe Network

- City: Gravity Main
- City: Force Main
- EBMUD: Gravity Main
- EBMUD: Force Main
- Private: Gravity Main
- Private: Force Main
- Abandoned
- Edge of Pavement
- Land Parcel
- Map Page Boundary

Sanitary sewer locations and elevations shown on these maps reflect a combination of field and file data and are for maintenance purposes only. The accuracy of the information shown cannot be guaranteed. The City of Alameda assumes no responsibility for the location and elevation indicated. Data required for connection to or extension of the City system shall be based on actual field survey.

Coordinate Information

Horizontal Datum:
NAD 83 California StatePlane Coordinate System, Zone III, US Feet

Vertical Datum:
-3.41 of NGVD29 US FEET
(To obtain the City of Alameda elevation, subtract 3.41 feet from NGVD29 elevations.)

T-22	U-22	V-22
T-23	**U-23**	V-23
T-24	U-24	V-24

print date: 6/29/2015

Purge Volume Calculation - 5 Foot Deep Soil Gas Probe

1. Determine the <u>tubing volume</u> in milliliters

$V_{TUBING}=\pi r^2 h$

r = inside radius of tubing*

ENTER INSIDE RADIUS OF TUBING*: 2.38125 MILLIMETERS

h = length of tubing + length of sampling manifold

ENTER LENGTH OF TUBING + SAMPLING MANIFOLD: 8 FEET

$V_{TUBING}=\pi r^2 h$

V_{TUBING}= 43.43746196 mL

2. Determine the <u>filter pack air void volume</u> in milliliters

$V_{filter\ pack}=\pi r^2 h$

r = radius of drill rod

DRILL ROD **DIAMETER*****: 2.5 INCHES

h = hight of filter pack

HEIGHT OF FILTER PACK (SAND AND DRY BENTONITE): 18 INCHES

$V_{filter\ pack}$ = 1447.915399 mL

Porosity of sand/bentonite = approximately 30 %

$V_{air\ voids\ in\ filter\ pack}$ = 0.3 x $V_{filter\ pack}$ = 434.3746196 mL

3. Determine the value of <u>*one* purge volume</u> by adding the tubing volume to the probe tip volume

$V_{PURGE} = V_{TUBING} + V_{PROBE\ TIP}$

V_{PURGE} = 477.8120815 mL

4. Convert from mL to in. Hg for a 6 liter Summa purge cannister

V_{PURGE} = 2.39 in. Hg for 6 Liter Summa

Notes and Conversions

*diameter of standard teflon vapor sampling tubing is 1/4" OD = 3/16" ID = 4.7625 mm ID

*inside radius of tubing for standard 1/4" OD tubing = **2.38125** mm

** diameter of standard geoprobe rod is 1.5 "

*** spreadsheet converts drill rod diameter in inches to drill rod radius in mm

1 in =	**25.4**	mm
1 ft =	**304.8**	mm
1 mm^3 =	**0.001**	mL