Federal Correction Institution - Dublin
5701 8th Street
Dublin, California

March 31, 2009

Mr. Paresh Kharti
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: FCI - Dublin
5701 8th Street
Dublin, California
ACHCSA Case No. 2977

Dear Mr.Kharti:

I, Armando Ledezma, of Federal Correction Institution – Dublin have retained MARCOR Environmental Remediation and their subcontractor Pangea Environmental Services, Inc. (Pangea) for the project referenced above. Pangea is submitting the attached report on my behalf.

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

Sincerely,

Armando Ledezma

March 31, 2009

VIA ALAMEDA COUNTY FTP SITE

Mr. Paresh Khatri
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: **Soil and Groundwater Investigation Workplan with Preferential Pathway Evaluation**
Federal Correctional Institution
5701 8th St. – Camp Parks, Dublin, CA
SLIC Case No. RO0002977

Dear Mr. Khatri:

The Federal Correctional Institution – Dublin (FCI-Dublin) retained MARCOR Environmental Remediation (MARCOR) and its subcontractor, Pangea Environmental Services, Inc. (Pangea), to prepare this *Soil and Groundwater Investigation Workplan with Preferential Pathway Evaluation* for the subject site as requested by your agency letter dated December 5, 2008 (Appendix A). The following sections describe the site background, preferential pathway evaluation, and the proposed investigation of subsurface conditions.

SITE BACKGROUND

Site Description

The Federal Correctional Institution (FCI) is located approximately 200 feet north of 8th Street in the Camp Parks military reserve area of Dublin, California. The site is a correctional facility and has several onsite buildings associated with these operations. The site is largely unpaved, with asphalt roads and concrete sidewalks interwoven through the buildings. Land use surrounding the site is a mix of commercial, residential and reserve land utilized by the military. The site is located in a valley and local topography slopes gently to the south/southwest.

Release and Soil Excavation

On April 25, 2008 during routine testing of the generator, the 3,000-gallon aboveground diesel storage tank that supplies fuel to the emergency backup generator system overflowed, releasing approximately 100 gallons of diesel fuel to the surrounding area (McElligot, 2008a). The tank is located near the southwest corner of the site and is housed in a concrete masonry unit (CMU) block building with a concrete slab on grade floor. The diesel fuel flowed into the CMU block building and through the door sill on the north side of the building and the ventilation opening on the west side. The flow then continued along the asphalt pathway, which is located to the northwest and southwest of the generator building, and into the unpaved "cold joints" located between the building foundation and the walkway. The fuel was absorbed into the underlying soil in these areas. The release extended out along the walkway located to the south of the generator building and to the adjacent loading dock, absorbing through the pavement in these areas.

FCI Dublin personnel responded to the release within 30 minutes, shutting down the generator and fuel pump and applying absorbent material to the areas impacted by the released diesel fuel. It was reported that the flow switch on the emergency backup generator failed and the refill pump continued to pump the diesel fuel from the 3,000-gallon tank, causing the overflow.

MARCOR responded to the release the same day and removed diesel-impacted soil and asphalt from around the generator building to a depth of approximately four feet below ground surface (bgs), or until the limit of the buildings slab foundation was reached. MARCOR removed additional soil from the north and west sides of the generator building and a small amount from beneath the foundation on the north side in May 2008. A trenched area was left exposed along the north side of the generator building to allow for visual and olfactory inspection of the soil in this area. Diesel contamination was visible and fresh hydrocarbon odor was present in the trenched area and the area excavated beneath the building foundation.

Groundwater Beneficial Use

Groundwater at the site is presumed to be used for drinking water purposes and the site may be located within a groundwater recharge area, according to the *Soil and Water Investigation Report* performed by Pangea in September 2008. The Environmental Screening Levels (ESLs) for residential site use (due to use by inmates) where groundwater is considered a current or potential source of drinking water (RWQCB, 2008) were used to evaluate the impacts of the release to the groundwater beneath the site.

Site Characterization and Contaminant Distribution

To initially characterize the hydrocarbon impact to the site subsurface, a soil and groundwater investigation was performed by MARCOR and Pangea in September 2008. On September 25, 2008, MARCOR and Pangea conducted shallow sampling using hand tools and deeper sampling using direct-push drilling techniques. The sampling was conducted in general accordance with the approved *Preliminary Site Assessment Phase Workplan* dated August 18, 2008 and prepared by McElligot Consulting (McElligot, 2008b). A total of twenty one (21) soil samples and three (3) grab groundwater samples were analyzed during this investigation. Select soil and groundwater samples were analyzed for Total Petroleum Hydrocarbons as Diesel (TPHd) by modified EPA Method 8015C; benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020 and EPA Method 8260B; and MTBE and naphthalene by EPA Method 8260B.

TPHd was detected at elevated concentrations. No naphthalene, benzene, or other compounds were detected in analyzed soil samples. Regarding the lateral extent of TPHd, the diesel (TPHd) impact to soil that exceeded the ESL of 83 milligrams per kilogram (mg/kg) was located primarily near the western corner of the generator building. This primary impact area is where diesel product exited the building and was initially contained by the retaining wall and sorbent material. The highest TPHd concentrations were near or beneath the building at depths ranging from approximately 5 to 11 ft bgs, and the maximum detected TPHd concentration was 4,000 milligrams per kilogram (mg/kg) in sample B-2 from a depth of 10.5-11 ft bgs. Soil analytical results are summarized on Table 1 and Figure 3.

The primary compound detected in site groundwater was TPHd, although lower concentrations of naphthalene and/or benzene were also detected in all three grab groundwater samples. The TPHd groundwater impact that exceeded the ESL for TPHd (100 µg/L) was located primarily near the western corner of the generator building. Groundwater analytical results are summarized on Table 2 and Figure 4.

Site Geology and Soil Type

Soil encountered during site investigation primarily consisted of a few feet of baserock and fill underlain by clay with small percentage of fine-grain sand to a depth of approximately 20 ft bgs. A unit of clayey sand with gravel was present between 20 ft bgs and the maximum explored depth of 22.5 ft bgs.

Groundwater Depth and Flow

During the soil and groundwater investigation in September 2008, groundwater was first encountered at a depth of 14.5 ft bgs, but rose to a depth of approximately 13.5 ft bgs at hand-

augered boring B-2. During direct-push drilling at D-5, groundwater was first encountered 22.5 ft bgs and rose to approximately 16.5 ft bgs, and groundwater was present in the screen interval of 20 to 25 ft bgs during Hydropunch-type sampling at location I. The depth to the potentiometric groundwater surface is estimated to be approximately 14.5 ft at the site.

Based on soil lithology and analytical results presented below, the primary water-bearing materials appear to be the sand unit present at approximately 20 to 22.5 ft bgs and possibly deeper. Given the overlying clayey soil and rising water during drilling, groundwater may be under semi-confined or confined conditions.

Due to the slight sloping of the site to the south/southwest and the presence of an intermittent stream running down the adjacent hillside and south through the property, the groundwater flow direction is presumed to be to the south. By 1980 the intermittent stream that formerly flowed through the property just east of the generator building (where the spill occurred) was rerouted through culverts during site development. The intermittent stream is currently routed along the west property boundary approximately 250 ft west of the spill location, where it turns east and then south approximately 250 ft south of the spill location. The presumed depth of the bottom of the former intermittent stream is approximately 8 ft bgs. The presence of the intermittent stream may affect groundwater elevation and flow direction at the site, but primarily during the winter rainy season. The base of the former intermittent stream is apparently below the presumably semi-confined groundwater at the site. The approximate location of the former intermittent stream channel near the spill location is shown on Figure 2.

PREFERENTIAL PATHWAY EVALUATION & POTENTIAL RECEPTOR SURVEY

As requested, Pangea conducted a survey to identify any water-producing wells within 2,000 feet of the site, to assess the potential for conduits to exist between the shallow and deeper water-bearing zones, and to identify surface water bodies in the site vicinity.

History of Site Usage

Pangea evaluated historical uses of the site to determine the existence of unrecorded/unknown (abandoned) wells potentially acting as pathways for contaminant migration. For this evaluation, Pangea reviewed historical aerial photographs from 1939, 1946, 1958, 1965, 1982, 1993, 1998 and 2005. Sanborn insurance maps were not available for the site's vicinity. Our review is summarized below and the aerial photographs are provided in Appendix B.

Based on the review of the aerial photographs, the site and adjacent properties were undeveloped land possibly used for agriculture from at least 1939 to approximately 1946, when the first

indications of the development of the Camp Parks military reserve are visible. The intermittent stream running through the site is visible in the 1939, 1946, 1958 and 1965 aerial photographs. By 1982, the Federal Correctional Institution was constructed and the site appeared similar to its current condition. The intermittent stream was no longer visible through the property in the 1982 aerial photograph and appeared to be rerouted along the western border of the site. No significant changes in the usage of the site or adjacent properties from 1982 were apparent in the subsequent reviewed aerial photographs.

No wells or other possible conduits were noted on the site or nearby properties in the reviewed aerial photographs.

Well Documentation Review

Pangea requested information on known wells located within 2,000 feet of the site from the California Department of Water Resources (DWR) and the Alameda County Flood Control District – Zone 7 (Zone 7). Pangea reviewed the information provided by the DWR and Zone 7 for permitted wells in the vicinity of the site. Figure 1 shows the approximate locations of wells identified by DWR and Zone 7 information. Specifications for wells identified within ½-mile of the site are shown on Table 3.

The data provided by Zone 7 and DWR indicates that nine existing wells are located within 2,000 feet of the site. Only one of the nine wells is a non-monitoring well; it is a test well owned by the Parks Reserve Forces Training Area and is located approximately 1,400 feet southwest of the site. This well is installed to total depth of 185 feet. This well is identified as 2S/1E31J1 on Figure 1. Given the relatively small amount of diesel spilled and the distance to the test well, it is unlikely that the diesel release would impact this well.

Three monitoring wells are located approximately 1,750 southeast of the site at 7051 Dublin Boulevard, four monitoring wells are located between 1,500 and 2,000 feet south/southwest of the site at 6973 Village Parkway, and one monitoring well is located approximately 500 feet east of the site at 6700 Dublin Boulevard. In addition to the existing wells, there are four destroyed wells located approximately 1,500 ft southeast of the spill location. Due to the significant distance from the spill location to the monitoring wells, it is unlikely that these wells would be impacted by the release at the site.

Surface Water Bodies

To identify surface water bodies in the site vicinity, Pangea reviewed the USGS topographic maps for the site vicinity and conducted a site reconnaissance visit. According to USGS topographic maps and historic aerial photographs, an intermittent stream, which connects to

Chabot Canal south of the site, formerly flowed through the site east of the generator building. This stream was rerouted through culverts to the west property boundary when the site was developed sometime between 1973 and 1980 (see USGS Topographic Maps, Appendix C). The stream is currently located approximately 250 ft west of the spill location, but the stream heads east until turning south approximately 250 ft south of the spill location. The approximate location of the former intermittent stream channel near the spill location is shown on Figure 2. The presumed depth of the bottom of the former intermittent stream is approximately 8 ft bgs. The presence of the intermittent stream may affect groundwater elevation and flow direction at the site, but primarily during the winter rainy season. The base of the former intermittent stream is apparently below the presumably semi-confined groundwater at the site.

A reservoir is visible in historical aerial photographs and is located at the top of the hills which border the north side of the site. The intermittent stream connects to this reservoir to the north of the site. The reservoir is not expected to be impacted by the release due to its upgradient and uphill location relative to the site.

Land Use

Pangea visited the site on March 25, 2009 to perform a brief survey of the site and nearby properties to assess their current use. Land use near the spill area is entirely associated with the correctional institution. This includes inmate housing approximately 100 ft northeast of the spill location and staff residential housing located approximately 600 ft north of the spill location. The institution contains offices, workshops, a cafeteria, laundry room, indoor and outdoor recreation areas and other facilities associated with supporting a prison population. According to FCI Dublin personnel there are no basements or subgrade structures designed for human occupation at the facility.

Subsurface Utilities

To evaluate the potential for contaminant migration via subsurface conduits, Pangea surveyed subsurface utilities near the spill location and compared utility depths to groundwater depth. A site plan indicating the location and estimated depth of identified subsurface utilities is shown as Figure 2. To conduct the conduit study, Pangea first requested construction diagrams and blueprints from FCI Dublin. The provided diagrams are included in Appendix D. Pangea then retained an underground line locator to survey the location and depth of subsurface utilities, and measured conduit depths within nearby manholes.

The conduit study identified several subsurface utilities at or near the spill location (Figure 2). Given the depth to first-encountered groundwater during drilling activities (13.5 ft bgs) and depth of the primary water-bearing zone (approximately 20 to 22.5 ft bgs), all identified subsurface

utilities near the spill location are significantly shallower than site groundwater and do not likely act as preferential pathways for contaminated groundwater migration. However, the surface spill could have migrated preferentially within site soil via the subsurface utility trenches. Although released hydrocarbons would tend to sorb into site soil and limit migration, Pangea has proposed sampling to evaluate potential migration within these utility trenches.

The subsurface utilities near the spill location include three electrical conduits at approximately 2 to 3 ft bgs, one water line at approximately 4 to 5 ft bgs, one water line at unknown depth, one gas line at unknown depth, and a sanitary sewer at approximately 5 to 6 ft bgs. Shallow soil samples from proposed boring SB-1 and proposed well MW-1 will evaluate potential migration along the electrical conduits. The sanitary sewer line commences beneath the distribution building, and proceeds east-southeast towards the 10" main sanitary sewer line for the facility. Soil samples from proposed boring G will evaluate potential migration along the 4-inch diameter sanitary sewer line and parallel water line. The conduit study also identified a storm drain that begins near the catch basins along the loading dock at a depth of approximately 6" bgs and reaches approximately 2 to 3 ft bgs beneath the mounded planter area east of the loading dock. The storm drain flows south beneath the rear gate of the facility and then into the intermittent stream channel southwest of the rear gate. Shallow soil samples from proposed well MW-3 will evaluate potential contaminant migration along the storm drain and water line near the loading dock.

Potential Receptor Survey Conclusions

Based on the information above Pangea offers the following conclusions regarding potential sensitive receptors:

- The nearest potential receptors include the nearby intermittent stream and the staff/inmates in the nearby buildings.
- There are no basements or subgrade structures designed for human occupation at the facility.
- No non-groundwater monitoring wells were identified within 1,000 ft of the site.
- Soil and groundwater impact was detected at the site. Additional subsurface sampling will help assess if the limited residual hydrocarbon impact in soil and/or groundwater pose a significant risk to identified potential receptors. Note that the prevalent shallow clayey soil would help limit hydrocarbon volatilization into indoor air and migration to the nearby intermittent stream.

INVESTIGATION WORK PLAN

The objectives of the workplan are to provide additional delineation of the lateral and vertical extent of soil and groundwater contamination and to determine the groundwater flow direction. The proposed scope of work to accomplish these investigation objectives, involves collecting soil samples from near the excavated area using hand tools (locations E, G and H), completing three borings (SB-1, SB-2 and SB-3), and installing three groundwater monitoring wells (MW-1, MW-2 and MW-3). Proposed sampling locations are shown on Figures 3 and 4. All field activities are detailed below and will be conducted in accordance with the Standard Operating Procedures (SOPs) detailed in Appendix E.

Pre-Field Activities

Prior to initiating field activities, Pangea will conduct the following tasks:

- Obtain drilling permits from Alameda County Public Works Agency as necessary;
- Pre-mark the boring locations with white paint, notify Underground Service Alert (USA) of the drilling and sampling activities at least 72 hours before work begins;
- Prepare a site-specific health and safety plan to educate personnel and minimize their exposure to potential hazards related to site activities; and
- Coordinate with drilling and laboratory subcontractors and other involved parties.

Soil Borings and Grab Groundwater Sampling

Shallow Sampling within Excavation Area using Hand Tools

Soil sampling locations E, G and H were proposed in the *Preliminary Site Assessment Phase Workplan* (Workplan) prepared by McElligot Consulting and dated August 18, 2008, but could not be completed during the September 2008 investigation due to time constraints and sampling difficulties. Pangea plans to collect these remaining soil samples during this investigation.

The purpose of soil sample location E is to evaluate the extent of TPHd impact between location D (where elevated concentrations of TPHd were detected) and F (where no TPHd concentrations were detected). Consistent with the August 2008 Workplan, soil samples at location E will be collected from the middle of the trench and from beneath the building and retaining wall foundations at approximately 5 to 6 ft bgs. The purpose of borings G and H is to evaluate the extent of contamination beneath the 2 to 3-inch depth excavation area. Additionally, boring G will evaluate potential contaminant migration along the 4-inch diameter sanitary sewer line and

parallel water line. Soil samples at location H will be collected from approximately 0.5 and 1 ft depth, while samples at location G will be collected from approximately 0.5, 1, 3, 5 and 6 ft depth. The depth and number of samples at each location may be altered based on field observations of hydrocarbon staining or odors.

Soil Borings using Hand Tools and Direct-Push Techniques

The purpose of borings SB-1 and SB-2 is to further evaluate the extent of soil and/or groundwater contamination near the primary impact and release area. Boring SB-3 is located downhill from the primary impact area. Boring SB-3 will primarily help determine if the groundwater impact detected in downgradient location I is the result of contaminant migration in groundwater from the upgradient spill source area, or if the dissolved hydrocarbons at location I are essentially isolated and the result of contaminant migration through soil to site groundwater near the loading dock (Figure 3).

Due to limited access, boring SB-2 will be advanced with a hand auger to approximately 16 ft depth or refusal. Soil samples from boring SB-2 will be collected within new brass or stainless steel liners driven into undisturbed soil with a slide-hammer.

Borings SB-1 and SB-3 will be advanced to approximately 24 ft bgs or first encountered groundwater using direct-push drilling methods. The direct-push sampling rig will be equipped with a hydraulic hammer and steel drive rods to advance the borings to total depth. With hydraulic-push drilling, continuous soil collection is conducted using acetate liners and samples are typically collected on four foot intervals. Soil samples will be obtained by cutting 6-inch subsections, trimming the excess soil from the ends, and capping the ends with Teflon® tape and plastic caps. Samples/cuttings will be geologically logged and classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Engineer (PE) or a California Professional Geologist (PG). At each boring location, soil samples will be collected every four (4) feet and/or at changes in soil type. Field personnel will look for field indications (odor, discoloration) of petroleum hydrocarbons.

Groundwater samples from borings SB-1 and SB-3 will be collected from temporary PVC casing installed in the open borehole. Completed borings will be tremmie-grouted from the bottom of the hole to the surface. Additional soil boring procedures are presented in our Standard Operating Procedures (Appendix E).

Monitoring Well Installation

Pangea proposes to install three groundwater monitoring wells (MW-1, MW-2 and MW-3) to help determine the groundwater flow direction and further evaluate the lateral extent of groundwater contamination. As shown on Figure 3, proposed well MW-1 is located immediately downgradient of the primary impact area and adjacent to boring D-5, which contained the highest detected concentration of TPHd in grab groundwater during the September 2008 investigation. Proposed well MW-2 is located south-southwest of the primary impact area, in the assumed downgradient direction. Proposed well MW-3 is located south-southeast of the primary impact area and near the most southern extent of the spill/excavation at the loading dock. MW-3 will also help evaluate the downgradient extent of groundwater impact. MW-3 will also assess conditions between the source area and the former intermittent stream, where relatively higher soil permeability may be present within the former stream bed down to a depth of approximately 8 ft bgs. The proposed well locations provide well triangulation to help estimate the groundwater flow direction.

To control cost, Pangea proposes to conduct the soil sampling and well installation with direct-push drilling techniques. Soil sampling will be conducted during the well installation. Pangea anticipates analyzing soil from 4, 8, 12, 16, 20 and 24 ft bgs to evaluate conditions in both vadose and saturated zone soil. All site investigation will be performed under the supervision of a California Registered Civil Professional Engineer (P.E.), Professional Geologist (P.G.), or Certified Hydrogeologist (C.Hg.). Additional soil and assessment procedures are presented in our Standard Operating Procedures (Appendix E).

The boring log from D-5 suggests that site subsurface soil consists of baserock and fill to approximately 5 ft bgs, with clay to approximately 20 ft bgs underlain by clayey sand to the maximum explored depth of 22.5 ft. Pangea anticipates screening the wells from approximately 20 to 25 ft bgs. Final well screen intervals will be determined in the field based on lithology. The wells will be pre-pack wells installed with the direct-push rig. The pre-pack wells will consist of 1.0-inch Schedule 40 polyvinyl chloride (PVC) casing, 0.01-inch factory-slotted PVC screen and #2-12 sand, with a bentonite seal and grout to the surface. Pre-pack well information is included in Appendix F. The well will be protected by a traffic-rated well vault.

Well Development and Sampling

The monitoring wells will be developed approximately 72 hours after installation has been completed. The wells will be intermittently surged with a surge block, and groundwater will be evacuated using a bailer, hand pump, peristaltic pump or submersible pump until the well dewaters repeatedly or groundwater is visibly clear and/or has a low turbidity. During purging,

measurements of temperature, pH, conductivity, and turbidity will be recorded on monitoring well development forms. At least 48 hours following development, three casing volumes will be purged from the wells and groundwater samples will be collected. Further details of well installation, development and sampling procedures are presented in Pangea's Standard Operating Procedures (Appendix E), modified for use of pre-pack well materials.

Sample Analysis

Groundwater and select soil samples collected during this investigation will be analyzed for total petroleum hydrocarbons as diesel (TPHd) with silica gel cleanup by U.S. Environmental Protection Agency (EPA) Method 8015C; and for benzene, toluene, ethylbenzene, xylenes (BTEX) by EPA Method 8021B and naphthalene by EPA Method 8260B. All samples will be analyzed by a laboratory certified by the California Department of Health Services.

Waste Management and Disposal

Soil cuttings, monitoring well purge water, and other investigation-derived waste will be stored onsite in Department of Transportation (DOT)-approved 55-gallon drums. The drums and their contents will be held onsite pending laboratory analytical results. Upon receipt of the analytical reports, the waste will be transported to an appropriate disposal/recycling facility.

Surveying

Upon completing all drilling activities, Pangea will retain a licensed surveyor to survey the coordinates and elevations of the new monitoring wells for uploading to the state Geotracker database.

Report Preparation

Upon completion of assessment activities, Pangea will prepare a technical report. The report will describe the investigation activities, present tabulated analytical data, and offer conclusions and recommendations.

CLOSING

MARCOR and Pangea appreciate this opportunity to assist FCI Dublin. If you have any questions or comments, please contact me at (510) 435-8664 or briddell@pangeaenv.com.

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
ROBERT G. CLARK-RIDDELL
No. C 049629
Exp. SEPT 2010
CIVIL
STATE OF CALIFORNIA

cc: Mr. Armando Ledezma, Federal Correstions Institution Dublin, 5701 8th Street, Dublin, CA, 94568
Noah Ceteras, Marcor Remediation, Inc., 6644 Sierra Lane, Dublin, CA, 94568
SWRCB Geotracker (electronic copy)

REFERENCES

California Regional Water Quality Control Board – San Francisco Bay Region (RWQCB), 2008, *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*, Interim Final, November 2007 (Revised May 2008).

McElligot Consulting, (2008a), *Report of Release and Interim Remedial Actions Report for Diesel Fuel Release*, FCI Dublin Federal Correctional Institution, 5701 8th Street- Camp Parks, Dublin, CA, June 10.

McElligot Consulting, (2008b), *Preliminary Site Assessment Phase Workplan*, FCI Dublin Federal Correctional Institution, 5701 8th Street- Camp Parks, Dublin, CA, August 18 (Revised September 23).

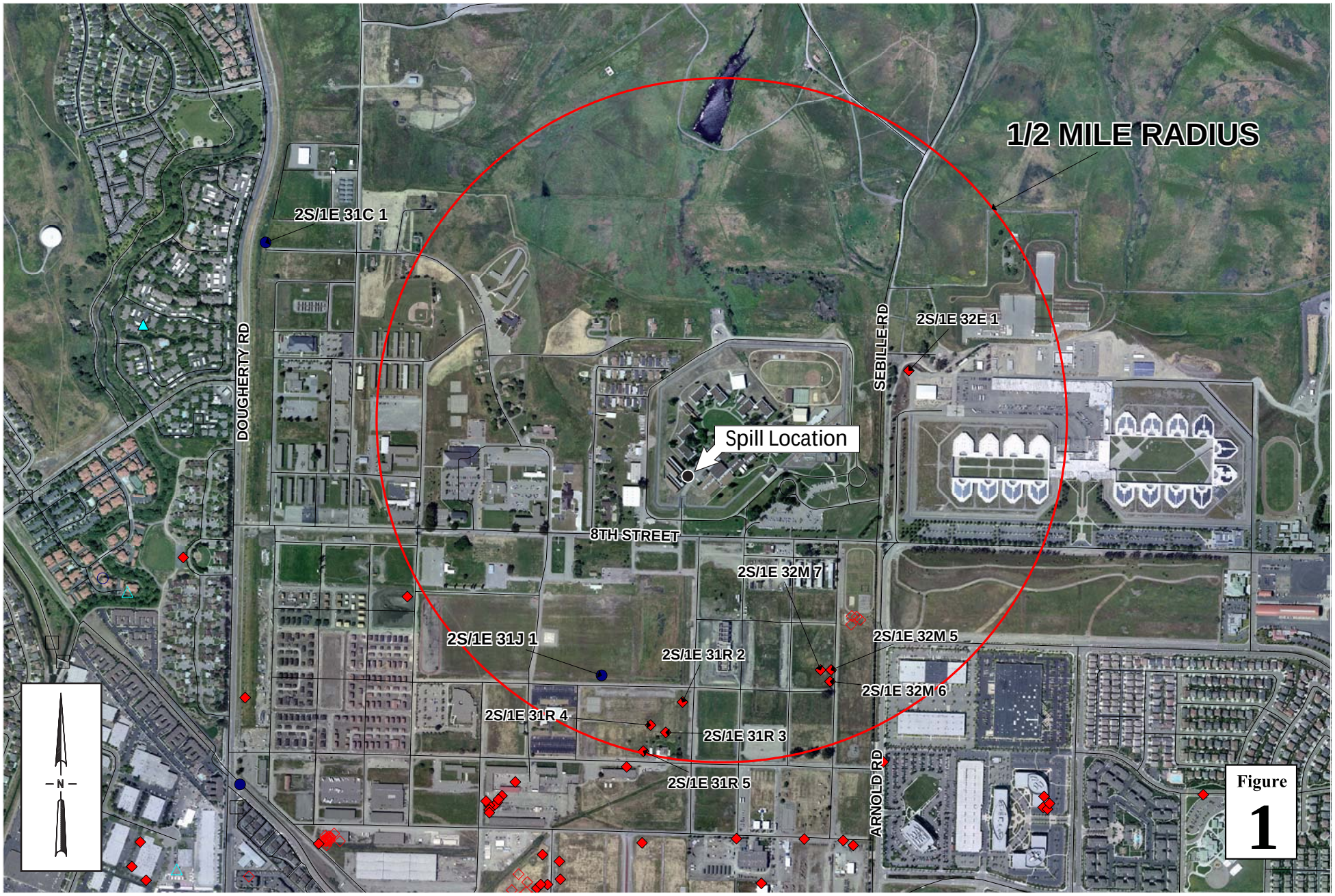
Pangea Environmental Services, Inc., (2008), *Soil and Water Investigation Report*, Federal Correction Institution, 5701 8th Street-Camp Parks, Dublin, CA, November 10.

ATTACHMENTS

Figure 1 – Well Location Map
Figure 2 – Subsurface Utility Map
Figure 3 – Soil Sample Location Map
Figure 4 – Groundwater Sample Location Map

Table 1 – Soil Analytical Data
Table 2 – Groundwater Analytical Data
Table 3 – Well Survey Summary

Appendix A – Regulatory Letter
Appendix B – Aerial Photographs
Appendix C – USGS Topographic Maps
Appendix D – Subsurface Utility Diagram
Appendix E – Standard Operating Procedures
Appendix F – Pre-Pack Monitoring Well Information



	ZONE 7 WATER AGENCY **100 NORTH CANYONS PARKWAY** **LIVERMORE, CA 94551**	**WELL LOCATION MAP**	**SCALE: 1"= 1000 ft** **DATE: 2/26/09** **5701 - 8TH ST. DUBLIN**

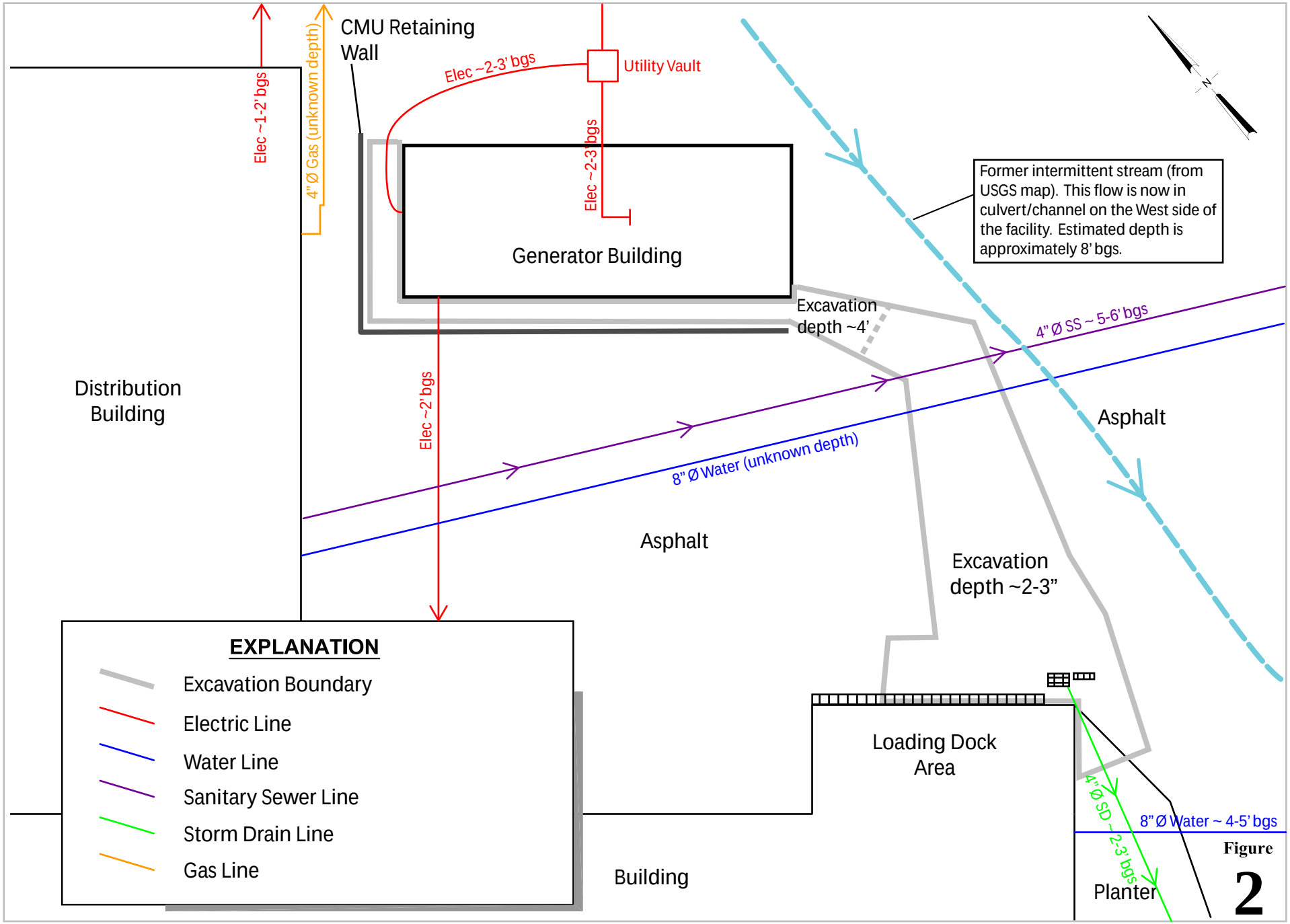
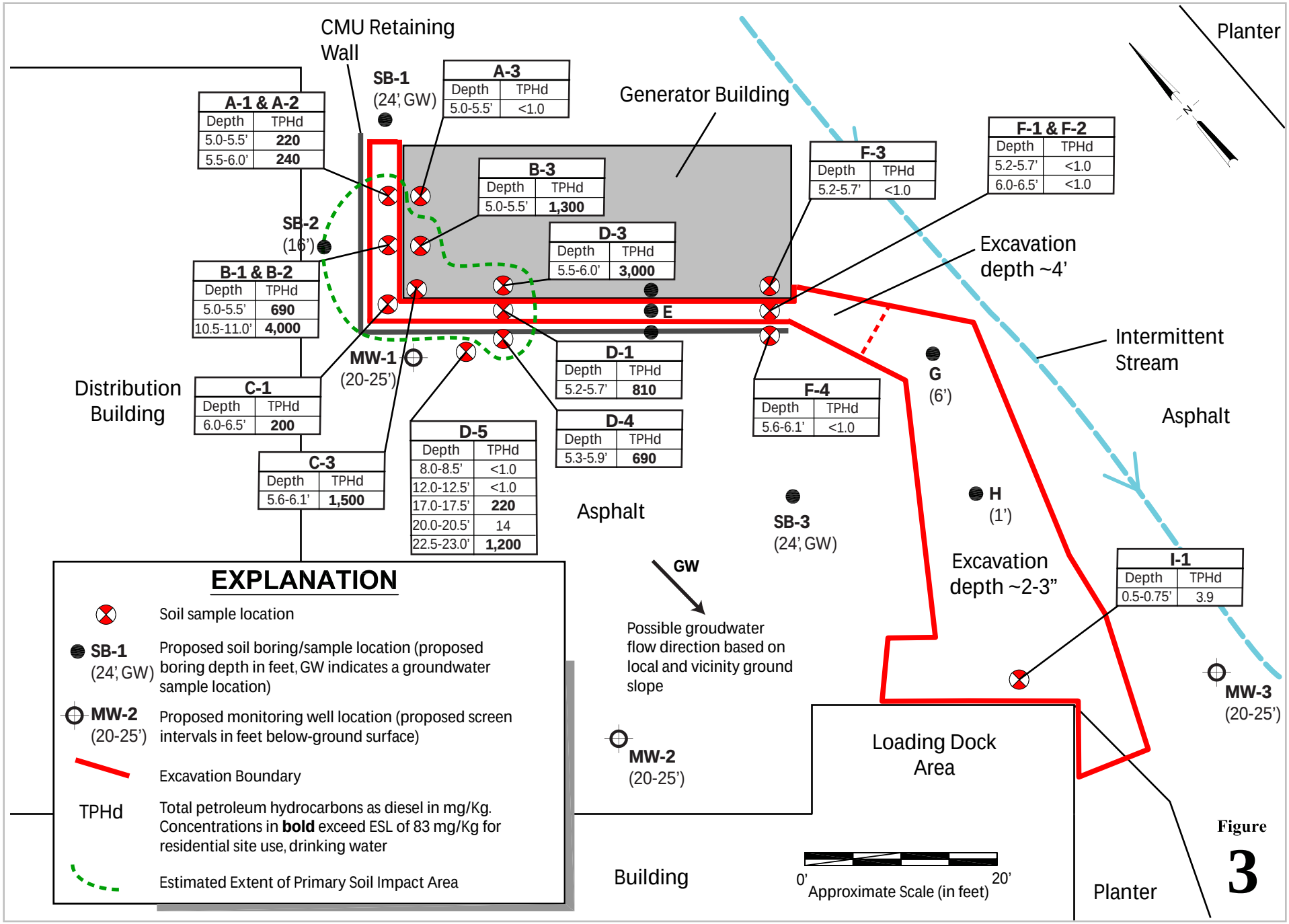


Figure 2

Dublin FCI
5701 8th Street
Dublin, California

PANGEA

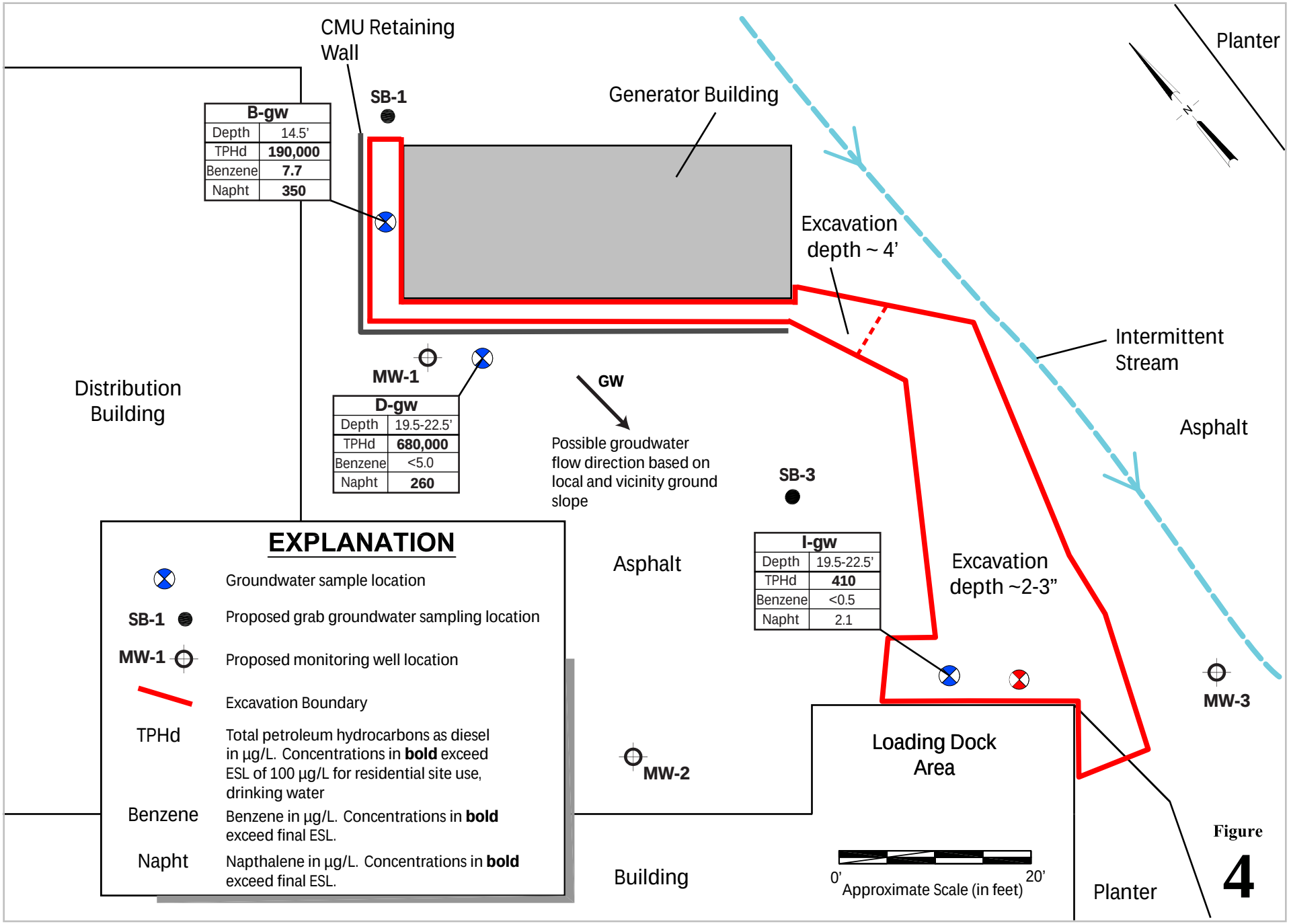
Subsurface Utility Map



Dublin FCI
5701 8th Street
Dublin, California

PANGEA

Soil Sample Location Map



Dublin FCI
5701 8th Street
Dublin, California

PANGEA

Groundwater Sample Location Map

Pangea

Table 1. Soil Analytical Data - Camp Parks Federal Correctional Institution, 5701 8th Street, Dublin, California

Boring/ Sample ID	Date Sampled	Sample Depth Interval (feet bgs)	TPHd	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene
			← mg/kg →						
Gross Contamination on Ceiling Value			100	500	500	400	420	100	500
Urban Area Ecotoxicity Criteria			--	25	--	--	--	--	40
Direct Exposure			110	0.12	63	2.3	31	30	1.3
Protection (Soil Leaching)			83	0.044	2.9	3.3	2.3	0.023	3.4
Final ESL - Residential, Non-Drinking Water Resource			100	0.12	9.3	2.3	11	8.4	1.3
Final ESL - Residential, Drinking Water Resource			**83**	**0.044**	**2.9**	**2.3**	**2.3**	**0.023**	**1.3**
SOIL INVESTIGATION - SEPTEMBER 2008									
A-1	9/25/2008	5.0-5.5	**220**	<0.005	<0.005	<0.005	<0.005	--	--
A-2	9/25/2008	5.5-6.0	**240**	--	--	--	--	--	--
A-3*	9/25/2008	5.0-5.5	<1.0	--	--	--	--	--	--
B-1	9/25/2008	5.0-5.5	**690**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
B-2	9/25/2008	10.5-11.0	**4,000**	--	--	--	--	--	--
B-3*	9/25/2008	5.0-5.5	**1,300**	--	--	--	--	--	--
C-1	9/25/2008	6.0-6.5	**200**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
C-3*	9/25/2008	5.6-6.1	**1,500**	--	--	--	--	--	--
D-1	9/25/2008	5.2-5.7	**810**	<0.10	<0.10	<0.10	<0.10	--	--
D-3*	9/25/2008	5.5-6.0	**3,000**	--	--	--	--	--	--
D-4*	9/25/2008	5.3-5.9	**690**	--	--	--	--	--	--
D-5**	9/25/2008	8.0-8.5	<1.0	--	--	--	--	--	--
D-5**	9/25/2008	12.0-12.5	<1.0	--	--	--	--	--	--
D-5**	9/25/2008	17.0-17.5	**220**	--	--	--	--	--	--
D-5**	9/25/2008	20.0-20.5	14	--	--	--	--	--	--
D-5**	9/25/2008	22.5-23.0	**1,200**	--	--	--	--	--	--
F-1	9/25/2008	5.2-5.7	<1.0	<0.005	<0.005	<0.005	<0.005	--	--
F-2	9/25/2008	6.0-6.5	<1.0	--	--	--	--	--	--
F-3*	9/25/2008	5.2-5.7	<1.0	--	--	--	--	--	--
F-4*	9/25/2008	5.6-6.1	<1.0	--	--	--	--	--	--
I-1	9/25/2008	0.5-0.75	3.9	--	--	--	--	--	--

mg/Kg = milligrams per Kilogram

ft bgs = Depth below ground surface (bgs) in feet.

< n = Chemical not present at a concentration in excess of detection limit shown.

ESL = Environmental Screening Level for Shallow Soil with Residential Land Use, Groundwater is/is not a current or potential source of ESL established by the SFBRWQCB, Interim Final - February 2005, and amended in November 2006 and May 2008.

Bold = Concentration above ESLs for Residential Land Use, potential drinking water resource

TPHd = Total Petroleum Hydrocarbons as diesel by EPA Method 8015C

Benzene, Toluene, Ethylbenzene and Xylenes by EPA Method 8021B

Naphthalene and MTBE by EPA Method 8260B

ND = Chemical not present in a concentration in excess of the reporting limit.

* = Sample collected from the sidewall of the excavation

** = Sample collected using geoprobe combo rig dual tube direct puch techniques

Table 2. Groundwater Analytical Data - Camp Parks Federal Correctional Institution, 5701 8th Street, Dublin, California

Boring/ Sample ID	Date Sampled	Sample Depth/Screening Interval (ft bgs)	TPHd	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Naphthalene
			← ug/L →						
Ceiling Value (Taste, Odors, etc.)			100	170	40	30	20	5.0	21
Drinking Water (Toxicity)			210	1.0	150	300	1,800	13	17
Vapor Intrusion Into Buildings			84	540	380,000	170,000	160,000	24,000	3,200
Aquatic Habitat Goal (Chronic)			210	46	130	43	100	8,000	24
Final Groundwater ESL - Residential, Non- Drinking Water Resource			210	46	130	43	100	1,800	24
Final Groundwater ESL - Residential, Drinking Water Resource			**100**	**1.0**	**40**	**30**	**20**	**5.0**	**17**
GRAB GROUNDWATER SAMPLING - SEPTEMBER 2008									
B-gw*	9/25/2008	14.5	**190,000**	**7.7**	<5.0	<5.0	<5.0	<5.0	**350**
D-gw	9/25/2008	19.5-22.5	**680,000**	<5.0	<5.0	<5.0	<5.0	<5.0	**260**
I-gw	9/25/2008	20-25	**410**	<0.5	<0.5	<0.5	<0.5	1.0	2.1

ug/L = micrograms per liter

ft bgs = Depth below ground surface (bgs) in feet.

< n = Chemical not present at a concentration in excess of detection limit shown.

ESL = Environmental Screening Level for Shallow Soil with Residential Land Use, Groundwater is a current or potential source of drinking water. (Table A-1, Table B-1, Table H-2, Table K-1, Table E-1b and Table G).

ESL established by the SFBRWQCB, Interim Final - February 2005, and amended in November 2006 and May 2008.

Bold = Concentration above final ESL.

TPHd = Total Petroleum Hydrocarbons as diesel by EPA Method 8015C

Benzene, Toluene, Ethylbenzene and Xylenes by EPA Method 8021B

Naphthalene and MTBE by EPA Method 8260B

* = Groundwater sample was collected by lowering a disposable bailer into the open borehole.

Table 3. Well Survey Summary - Water wells/borings within one-half mile radius -Federal Correctional Institution, 5701 8th Street, Dublin, California

Well No.	Owners Well ID	Owner	Use	Total Depth (ft)	Well Location	Well Location Description	Approximate Distance from site (ft)
2S/1E 31 C 1	TW-L3	Parks Reserve Forces Training Area	Test Well	90.5	West End of 12th Street, West of Cromwell, Dublin	See Figure 1	3,100
2S/1E 31 J 1	TW-L1	Parks Reserve Forces Training Area	Test Well	185	North of 6th Street, Southeast Corner of Parade Ground	See Figure 1	1,400
2S/1E 32 E 1	NA	NA	MON	70	Arnold Road, Extended at Santa Rita Rehab	See Figure 1	500
2S/1E 32 M 5	NA	NA	NA	NA	NA	See Figure 1	1,650
2S/1E 32 M 6	NA	NA	NA	NA	NA	See Figure 1	1,650
2S/1E 32 M 7	NA	NA	NA	NA	NA	See Figure 1	1,650
2S/1E 31 R 2	2F-88-6 and 2F-88-7	US Army Corps of Engineers	Exploratory Boring	52.5	Borings are Located 60-200 ft South of 4th Street and 140 ft East of Keppler Ave	See Figure 1	1,500
2S/1E 31 R 3	2F-88-6 and 2F-88-7	US Army Corps of Engineers	Exploratory Boring	52.5	Borings are Located 60-200 ft South of 4th Street and 140 ft East of Keppler Ave	See Figure 1	1,600
2S/1E 31 R 4	2F-88-6 and 2F-88-7	US Army Corps of Engineers	Exploratory Boring	52.5	Borings are Located 60-200 ft South of 4th Street and 140 ft East of Keppler Ave	See Figure 1	1,650
2S/1E 31 R 5	2F-88-6 and 2F-88-7	US Army Corps of Engineers	Exploratory Boring	52.5	Borings are Located 60-200 ft South of 4th Street and 140 ft East of Keppler Ave	See Figure 1	1,900

Abbreviations:

MON = Monitoring Well
NA = Not available

APPENDIX A

Regulatory Letter

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

December 5, 2008

Mr. Armando Ledezma
Federal Corrections Institution Dublin
5701 8th Street
Dublin, CA 94568

Subject: SLIC Case No. RO0002977 and Geotracker Global ID SLT19749067, FCI Dublin, 5701 8th Street, Dublin, CA 94568

Dear Mr. Ledezma:

Alameda County Environmental Health (ACEH) staff has reviewed the case file for the above-referenced site including the recently submitted document entitled, "Soil and Water Investigation Report," dated November 10, 2008, which was prepared by Pangea Environmental Services, Inc. (Pangea) for the subject site. The report documents the analysis of soil and groundwater samples collected to delineate the extent of diesel fuel impact to the subsurface. Most soil samples collected during the investigation detected elevated concentrations of total petroleum hydrocarbons (TPH) as diesel (d) ranging from 3.9 milligrams per kilogram (mg/kg) to 4,000 mg/kg indicating that a release has occurred at the site. Three "grab" groundwater samples, also collected during the investigation, detected concentrations of TPH-d and naphthalene at maximum concentrations of 680,000 µg/L and 350 µg/L, respectively, indicating that the groundwater has also been impacted with diesel fuel. Pangea recommends that a soil and groundwater investigation work plan be prepared to delineate the vertical and lateral extent of soil and groundwater contamination.

ACEH generally concurs with the Pangea's conclusions and recommendations and requests that you address the following technical comments, perform the proposed work, and send us the technical work plan and report described below.

TECHNICAL COMMENTS

1. **Preferential Pathway Study** – Since groundwater is relatively shallow at the site, a preferential pathway evaluation appears prudent. The purpose of the preferential pathway study is to locate potential migration pathways and conduits and determine the probability of the NAPL and/or plume encountering preferential pathways and conduits that could spread contamination. We request that you perform a preferential pathway study that details the potential migration pathways and potential conduits (wells, utilities, pipelines, etc.) for vertical and lateral migration that may be present in the vicinity of the site.

   Discuss your analysis and interpretation of the results of the preferential pathway study (including the detailed well survey and utility survey requested below) and report your results in the Soil and Groundwater Investigation Work Plan (Work Plan) requested below. The

results of your study shall contain all information required by California Code of Regulations, Title 23, Division 3, Chapter 16, §2654(b).

a. Utility Survey

An evaluation of all utility lines and trenches (including sewers, storm drains, pipelines, trench backfill, etc.) within and near the site and plume area(s) is required as part of your study. Please include maps and cross-sections illustrating the location and depth of all utility lines and trenches within and near the site and plume areas(s) as part of your study.

b. Well Survey

The preferential pathway study shall include a detailed well survey of all wells (monitoring and production wells: active, inactive, standby, decommissioned (sealed with concrete), abandoned (improperly decommissioned or lost); and dewatering, drainage, and cathodic protection wells) within a ¼ mile radius of the subject site. As part of your detailed well survey, please perform a background study of the historical land uses of the site and properties in the vicinity of the site. Use the results of your background study to determine the existence of unrecorded/unknown (abandoned) wells, which can act as contaminant migration pathways at or from your site. Please review and submit copies of historical maps, such as Sanborn maps, aerial photographs, etc., when conducting the background study.

2. **GeoTracker Requirements & Compliance** – A review of the case file and the State Water Resources Control Board's (SWRCB) GeoTracker website indicate that electronic copies of analytical data have not been submitted, rendering the site to non-compliance status. As stated in our September 4, 2008 directive letter, beginning September 1, 2001, all analytical data, including monitoring well samples, submitted in a report to a regulatory agency as part of the UST or LUST program, must be transmitted electronically to the SWRCB GeoTracker system via the internet, pursuant to California Code of Regulations, Title 23, Division 3, Chapter 16, Article 12, Sections 2729 and 2729.1. Also, beginning January 1, 2002, all permanent monitoring points utilized to collect groundwater samples (i.e. monitoring wells) and submitted in a report to a regulatory agency, must be surveyed (top of casing) to mean sea level and latitude and longitude to sub-meter accuracy using NAD 83. A California licensed surveyor may be required to perform this work. Additionally, pursuant to California Code of Regulations, Title 23, Division 3, Chapter 30, Articles 1 and 2, Sections 3893, 3894, and 3895, beginning July 1, 2005, the successful submittal of electronic information (i.e. report in PDF format) shall replace the requirement for the submittal of a paper copy. Please upload all applicable electronic submittal types such as the analytical data (EDF), survey data (GEO_XY and GEO_Z), boring logs, Site Maps, and PDF reports from July 1, 2005 to current to GeoTracker by the date specified below. Also note that the GeoTracker requirements are in addition to ACEH's requirement for electronic uploads to ACEH's website. Electronic reporting is described below.

TECHNICAL REPORT REQUEST

Please submit technical reports to ACEH (Attention: Paresh Khatri), according to the following schedule:

- **February 3, 2009** – Soil and Water Investigation Report (with Preferential Pathway Evaluation)

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program FTP site are provided on the attached "Electronic Report Upload Instructions." Submission of reports to the Alameda County FTP site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) GeoTracker website. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitoring wells, and other data to the GeoTracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in GeoTracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/electronic_submittal/report_rqmts.shtml.

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

If you have any questions, please call me at (510) 777-2478 or send me an electronic mail message at paresh.khatri@acgov.org.

Sincerely,

Paresh C. Khatri
Hazardous Materials Specialist

Donna L. Drogos, PE
Supervising Hazardous Materials Specialist

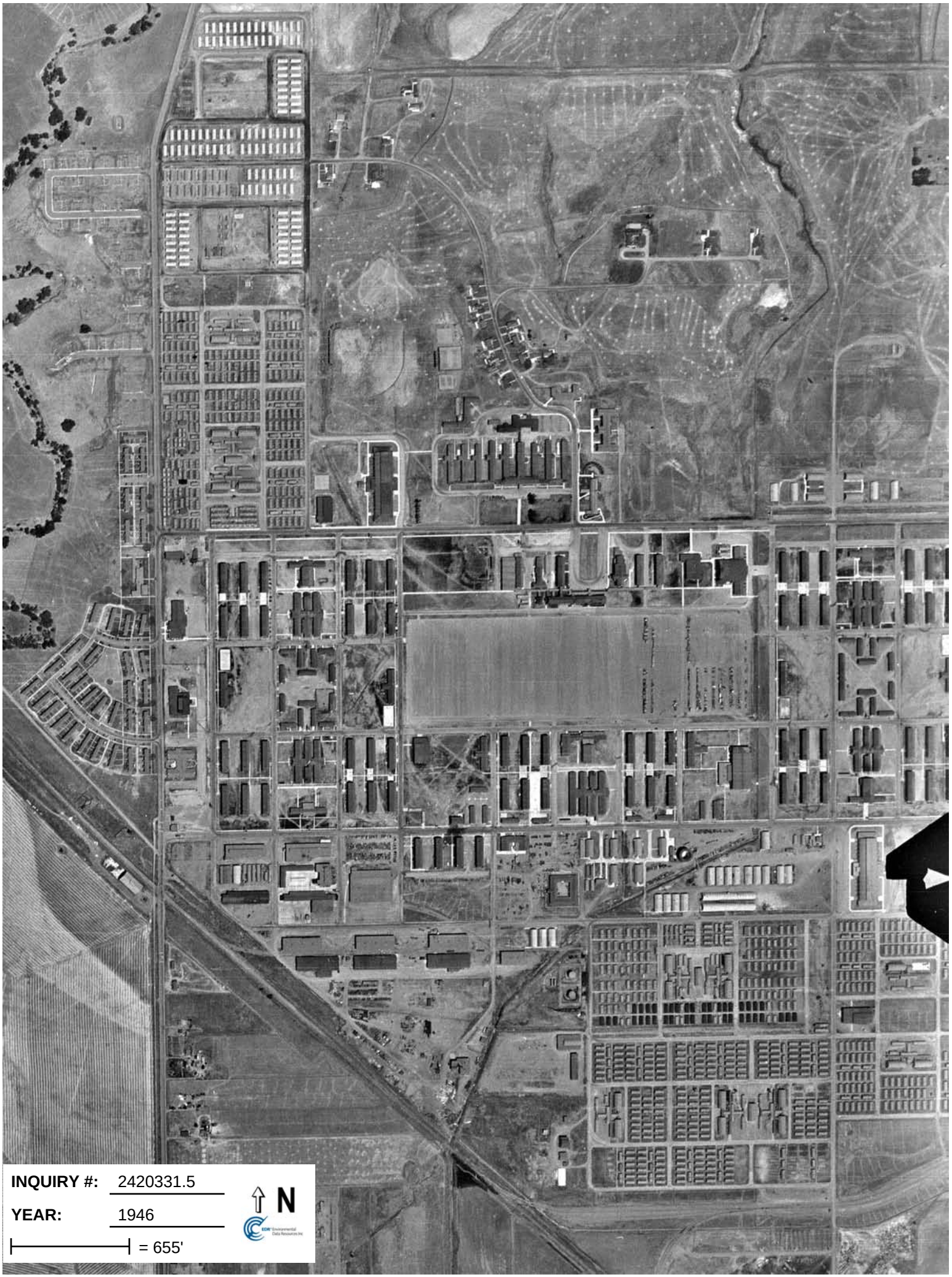
Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Noah Ceteras, Marcor Remediation, Inc., 6644 Sierra Lane, Dublin, CA 94568
Bob Clark-Riddell, Pangea Environmental Services, Inc., 1710 Franklin Street, Suite 200, Oakland, CA 94612
Cheryl Dizon (QIC 8021), Zone 7 Water Agency, 100 North Canyons Pkwy, Livermore, CA 94551
Donna Drogos, ACEH
Paresh Khatri, ACEH
File

APPENDIX B

Aerial Photographs


INQUIRY #: 2420331.5
YEAR: 1939
= 555'
N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YEAR: 1946
= 655'
N


INQUIRY #: 2420331.5
YEAR: 1958
= 555'
N


INQUIRY #: 2420331.5
YEAR: 1965
= 333'
N


INQUIRY #: 2420331.5
YEAR: 1982
= 690'
N


INQUIRY #: 2420331.5
YEAR: 1993
= 666'
N


INQUIRY #: 2420331.5
YEAR: 1998
= 666'
N


INQUIRY #: 2420331.5
YEAR: 2005
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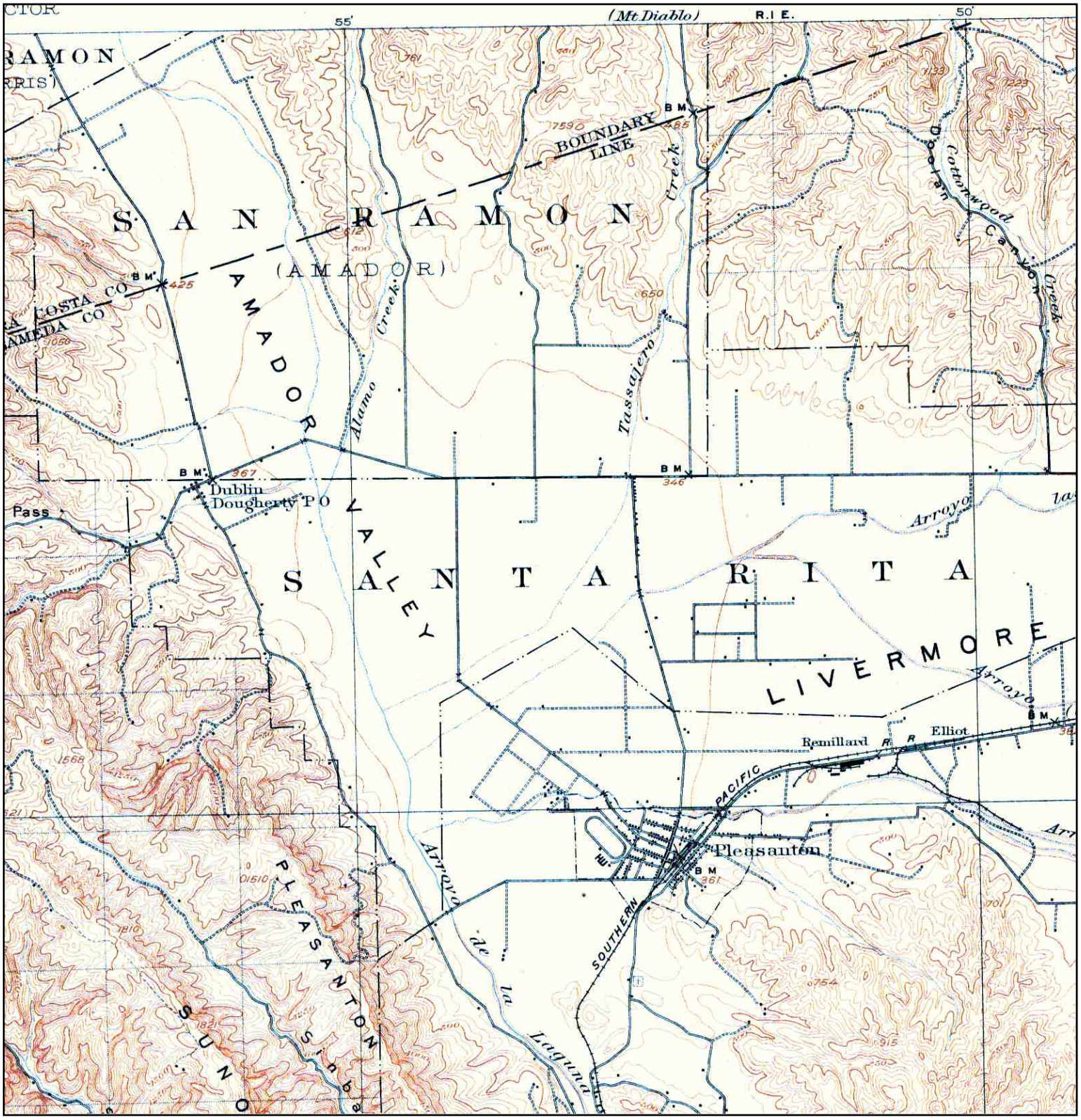
N

APPENDIX C

USGS Topographic Maps

Historical Topographic Map

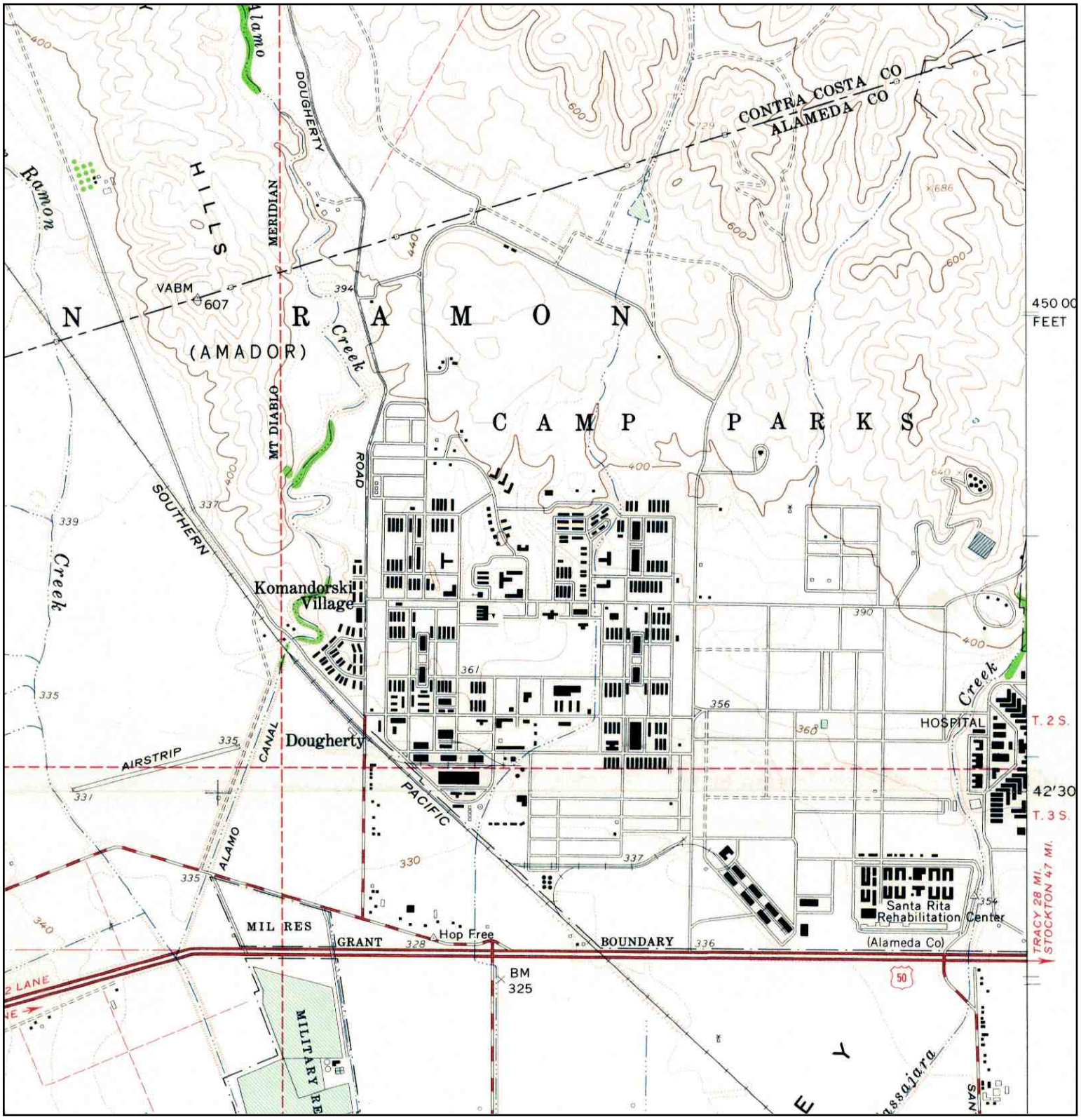


N	TARGET QUAD NAME: PLEASANTON MAP YEAR: 1906 SERIES: 15 SCALE: 1:62500	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

Historical Topographic Map

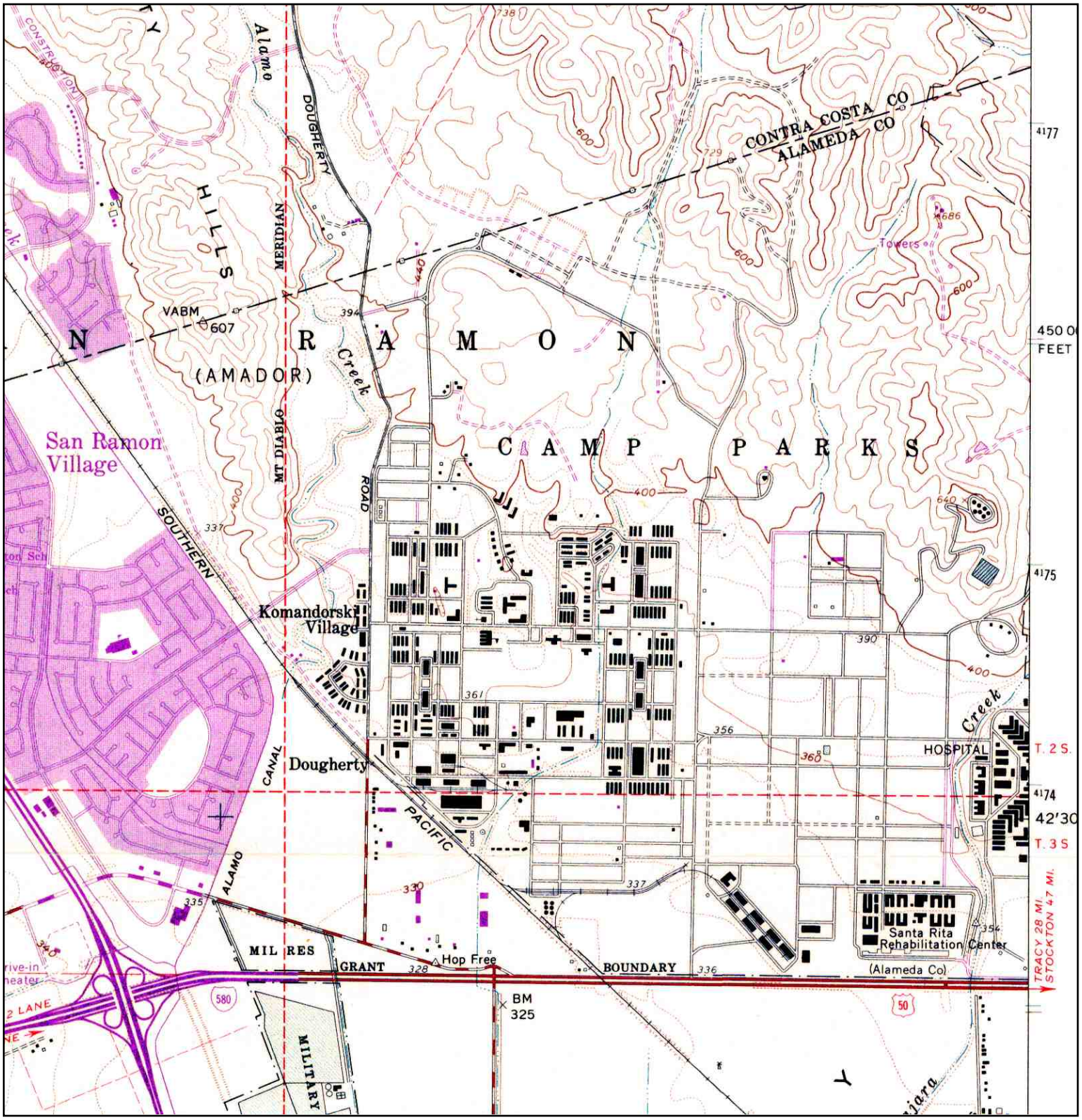
N	TARGET QUAD NAME: PLEASANTON MAP YEAR: 1947 SERIES: 15 SCALE: 1:50000	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

Historical Topographic Map



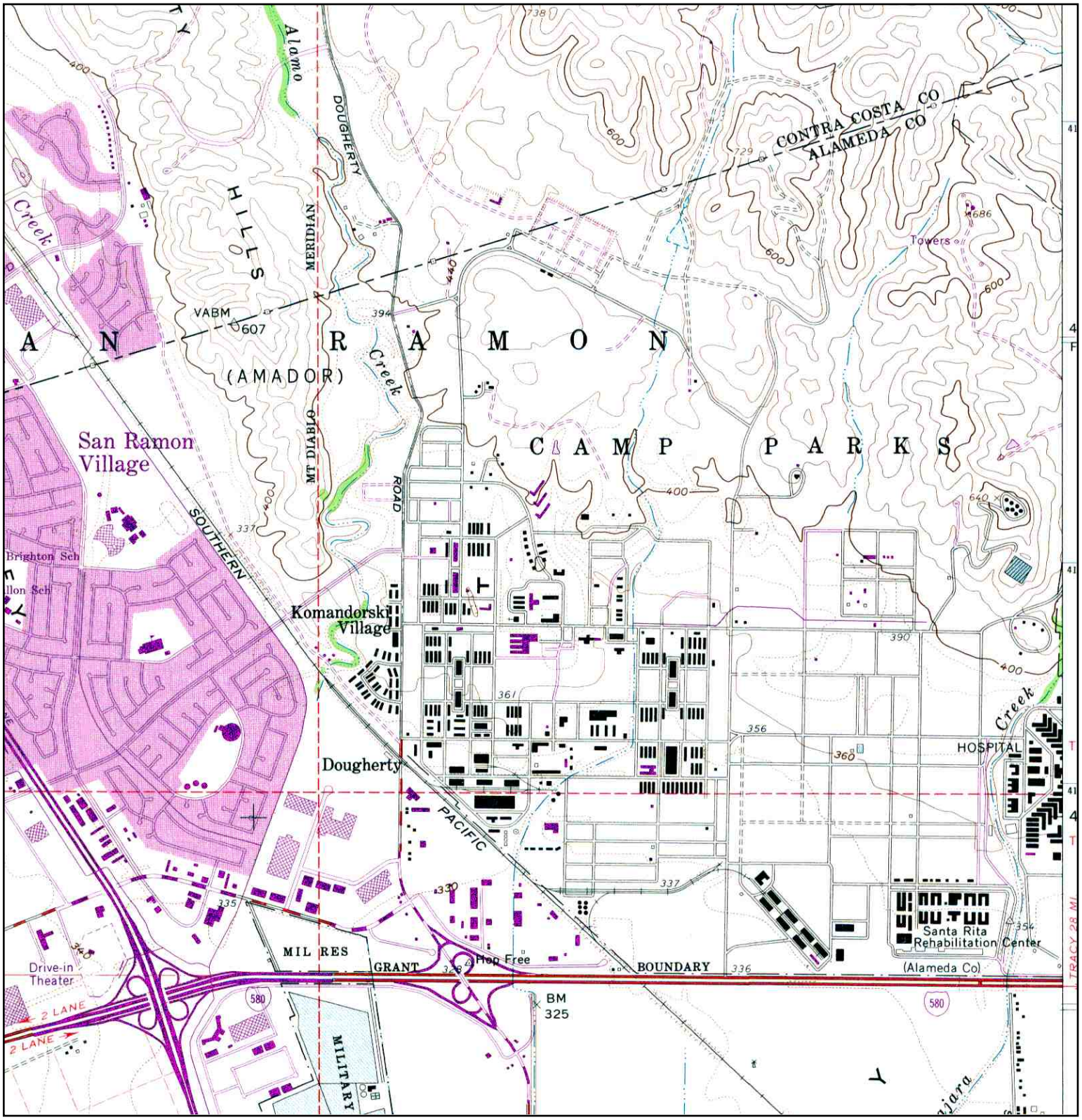
N	TARGET QUAD NAME: DUBLIN MAP YEAR: 1961 SERIES: 7.5 SCALE: 1:24000	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

Historical Topographic Map



N	TARGET QUAD NAME: DUBLIN MAP YEAR: 1968 PHOTOREVISED FROM:1961 SERIES: 7.5 SCALE: 1:24000	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

Historical Topographic Map



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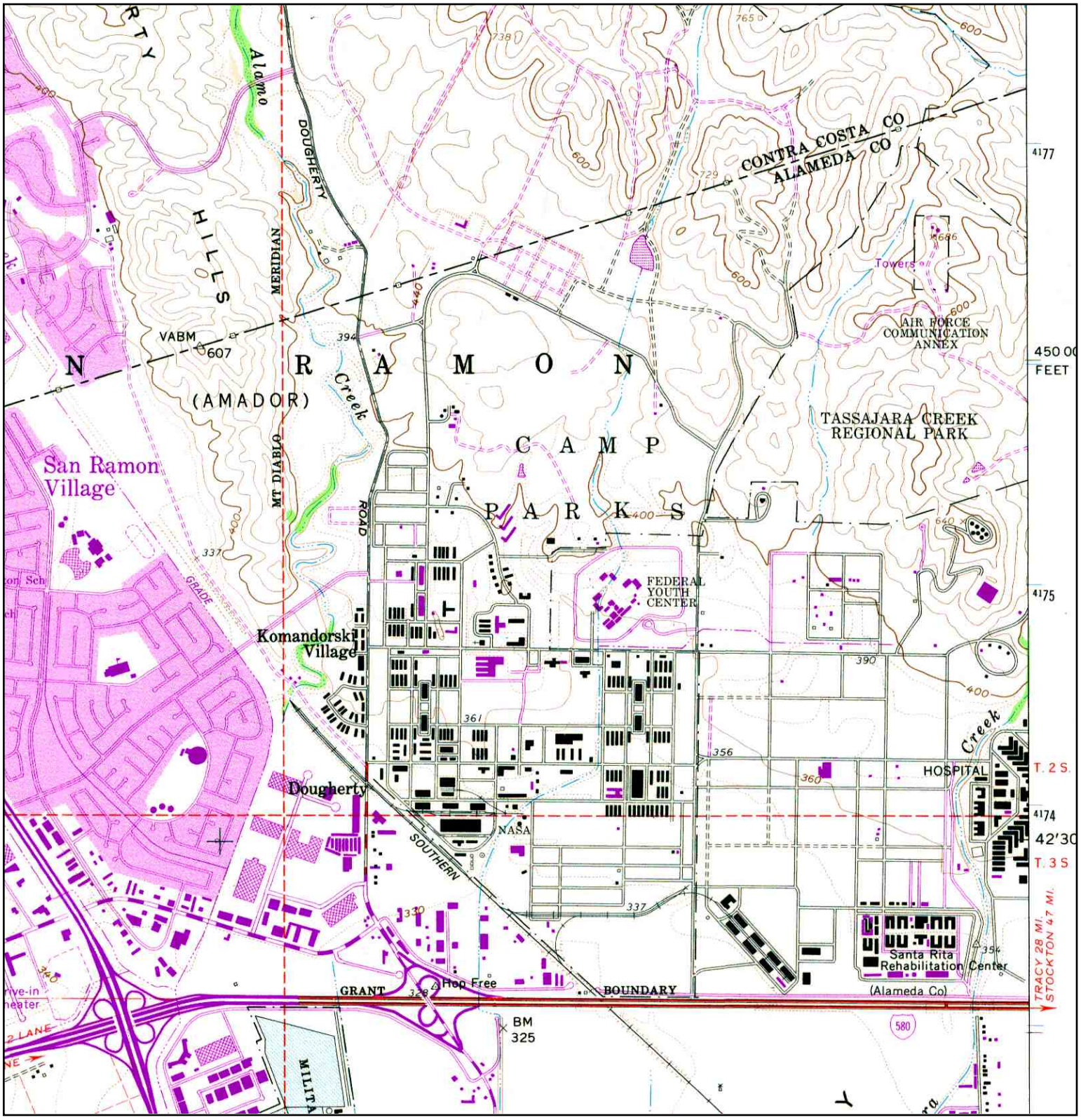
	TARGET QUAD NAME: DUBLIN MAP YEAR: 1973 PHOTOREVISED FROM:1961 SERIES: 7.5 SCALE: 1:24000	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

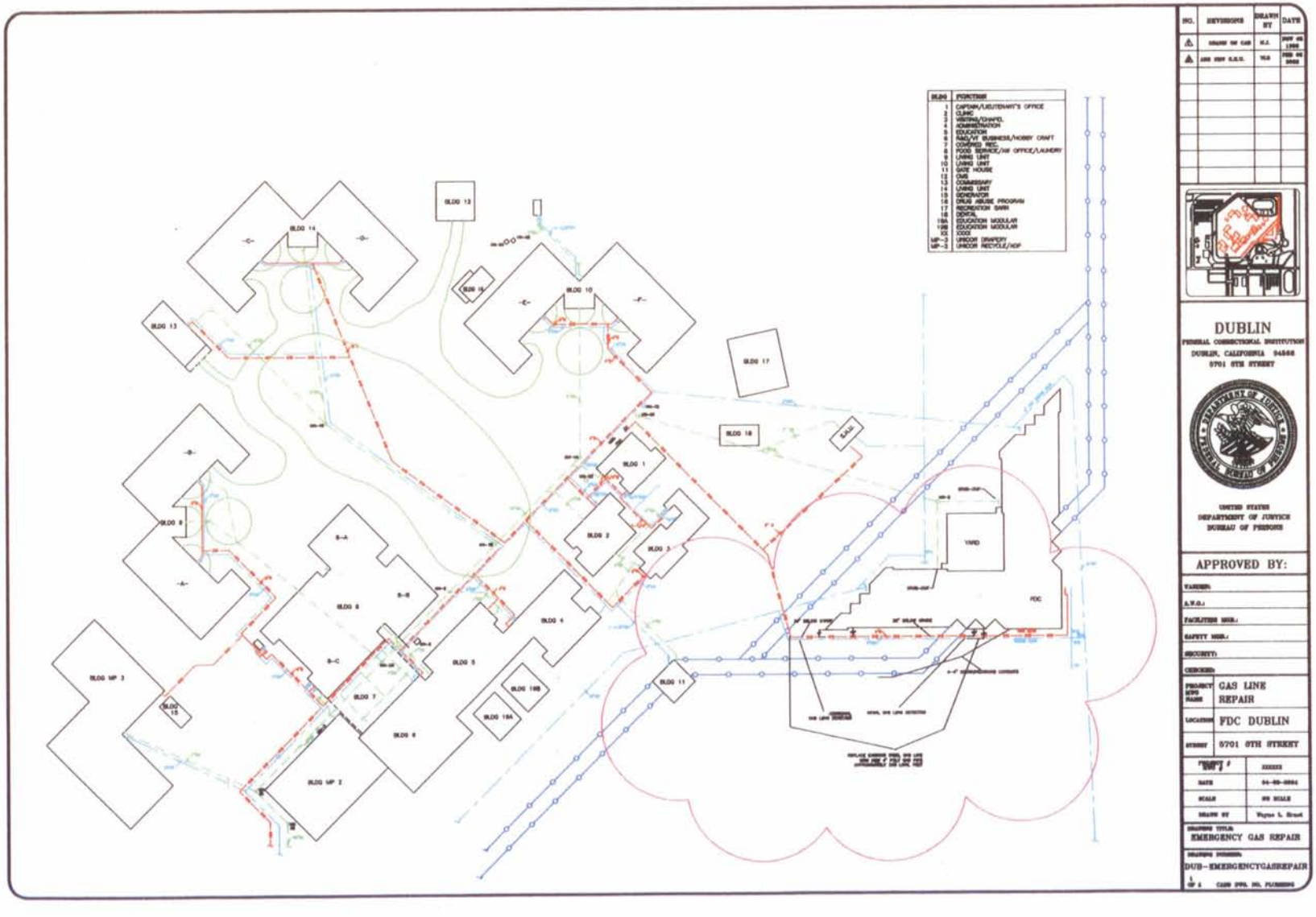
Historical Topographic Map



N	TARGET QUAD NAME: DUBLIN MAP YEAR: 1980 PHOTOREVISED FROM:1961 SERIES: 7.5 SCALE: 1:24000	SITE NAME: FCI Dublin ADDRESS: 5701 8th Street Dublin, CA 94568 LAT/LONG: 37.7161 / 121.9	CLIENT: Pangea Environmental Services INc. CONTACT: Morgan Gillies INQUIRY#: 2420331.4 RESEARCH DATE: 02/13/2009

APPENDIX D

Subsurface Utility Construction Diagrams



BLDG	FUNCTION
1	CAPTAIN/LIEUTENANT'S OFFICE
2	CLINIC
3	VISITING/CHAPEL
4	ADMINISTRATION
5	EDUCATION
6	R&D/VT BUSINESS/HOBBY CRAFT
7	COVERED REC.
8	FOOD SERVICE/INM OFFICE/LAUNDRY
9	LIVING UNIT
10	LIVING UNIT
11	GATE HOUSE
13	CMS
13	COMMISSARY
14	LIVING UNIT
15	GENERATOR
16	DRUG ABUSE PROGRAM
17	RECREATION BARN
18	DENTAL
18A	EDUCATION MODULAR
19B	EDUCATION MODULAR
XX	XXXX
MP-1	UNICOR DRAPERY
MP-3	UNICOR RECYCLE/HOF

NO.	REVISIONS	DRAWN BY	DATE
1	DRAWN IN CAD	M.J.	SEP 05 1995
2	ADD SEP E.M.U.	TLS	FEB 05 2002

DUBLIN
FEDERAL CORRECTIONAL INSTITUTION
DUBLIN, CALIFORNIA 94568
5701 8TH STREET

UNITED STATES
DEPARTMENT OF JUSTICE
BUREAU OF PRISONS

APPROVED BY:

WARDEN:
A.W.O.:
FACILITIES MGR.:
SAFETY MGR.:
SECURITY:
CHECKED:

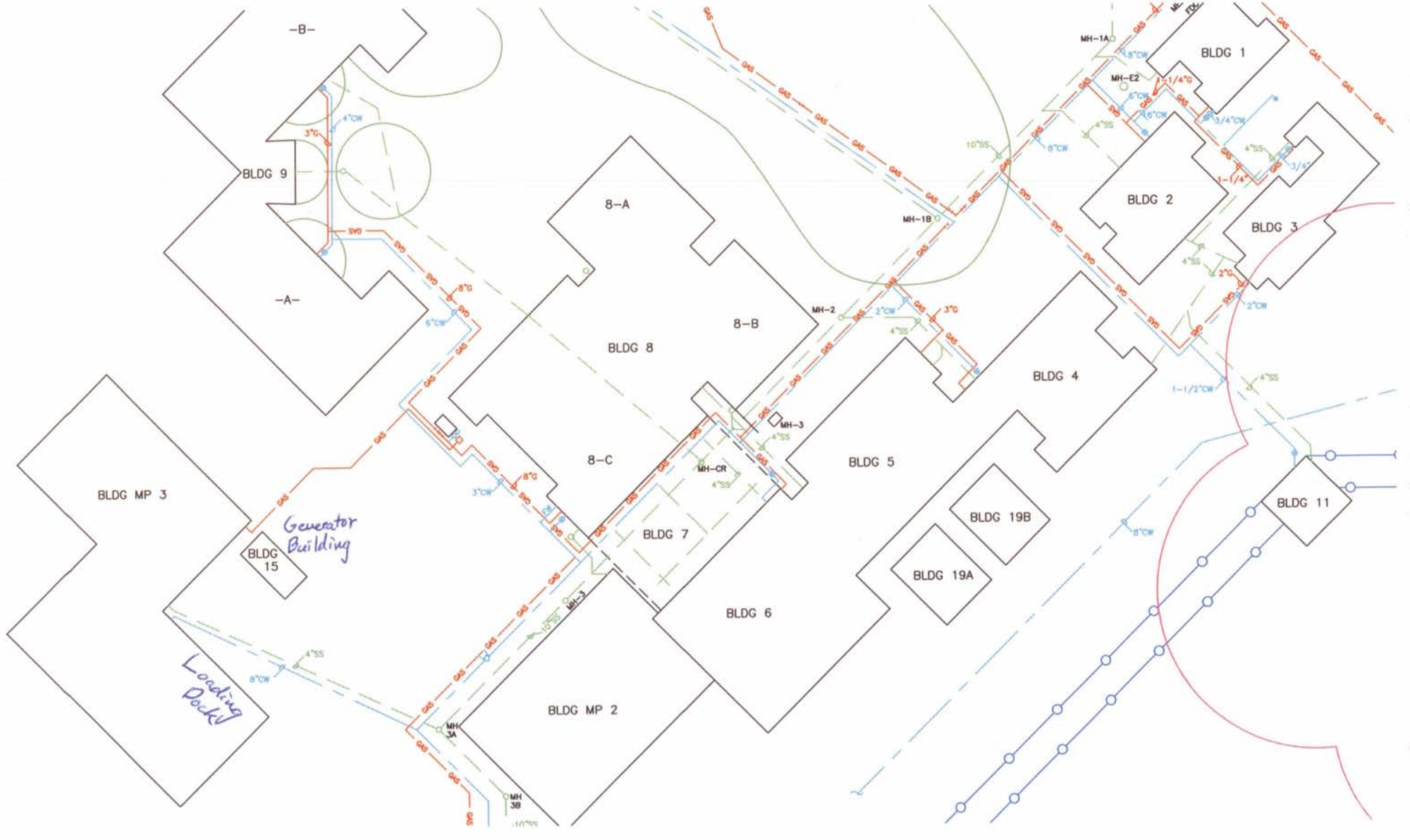
PROJECT DESCRIPTION	GAS LINE REPAIR
LOCATION	FDC DUBLIN
STREET	5701 8TH STREET
SHEET #	XXXXX
DATE	04-09-2004
SCALE	NO SCALE
DRAWN BY	Wayne L. Strat

DRAWING TITLE
EMERGENCY GAS REPAIR

DRAWING NUMBER
DUB-EMERGENCYGASREPAIR

SF # CADD DWG. NO. FLMXXXXX

Expanded View



APPENDIX E

Standard Operating Procedures

STANDARD FIELD PROCEDURES FOR HAND-AUGER SOIL BORINGS

This document describes Pangea Environmental Services' standard field methods for drilling and sampling soil borings using a hand-auger. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality, and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Registered Geologist (RG), Certified Engineering Geologist (CEG), or Professional Engineer. The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Hand-auger borings are typically drilled using a hand-held bucket auger to remove soil to the desired sampling depth. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the augered hole. The vertical location of each soil sample is determined using a tape measure. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Augering and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are collected from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are collected usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

The borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55-gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

This document describes Pangea Environmental Services' standard field methods for drilling and sampling soil borings. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality, and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist, scientist or engineer working under the supervision of a California Registered Engineer, California Registered Geologist (RG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or hydraulic-push technologies. At least one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples are collected near the water table and at lithologic changes. With hollow-stem drilling, samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the borehole. With hydraulic-push drilling, samples are typically collected using acetate liners. The vertical location of each soil sample is determined by measuring the distance from the middle of the soil sample tube to the end of the drive rod used to advance the split barrel sampler. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes or cut acetate liners chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

Soil samples collected during drilling will be analyzed in the field for ionizable organic compounds using a photo-ionization detector (PID) with a 10.2 eV lamp. The screening procedure will involve placing an undisturbed soil sample in a sealed container (either a zip-lock bag, glass jar, or a capped soil tube). The container will be set aside, preferably in the sun or warm location. After approximately fifteen minutes, the head space within the container will be tested for total organic vapor, measured in parts per million on a volume to volume basis (ppmv) by the PID. The PID instrument will be calibrated prior to boring using hexane or isobutylene. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples collected from borings are either collected from the open borehole, from within screened PVC inserted into the borehole, or from a driven Hydropunch-type sampler. Groundwater is typically extracted using a bailer, check valve and/or a peristaltic pump. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Pangea often performs electrical conductivity (EC) logging and/or continuous coring to identify potential water-bearing zones. Hydropunch-type sampling is then performed to provide discrete-depth grab groundwater sampling within potential water-bearing zones for vertical contaminant delineation. Hydropunch-type sampling typically involves driving a cylindrical sheath of hardened steel with an expendable drive point to the desired depth within undisturbed soil. The sheath is retracted to expose a stainless steel or PVC screen that is sealed inside the sheath with Neoprene O-rings to prevent infiltration of formation fluids until the desired depth is attained. The groundwater is extracted using tubing inserted down the center of the rods into the screened sampler.

Duplicates and Blanks

Blind duplicate water samples are collected usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55 gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

STANDARD FIELD PROCEDURES FOR PRE-PACK GEOPROBE® MONITORING WELLS

This document describes Pangea Environmental Services' standard field methods for drilling, installing, developing and sampling pre-pack Geoprobe® groundwater monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Well Construction and Surveying

Monitoring wells are installed in soil borings to monitor groundwater quality and determine the groundwater elevation, flow direction and gradient. Well depths and screen lengths are based on groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 5 to 10 feet below and up to 5 feet above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three feet thick.

Pre-pack Geoprobe® groundwater monitoring wells are usually installed with 3.25-inch or 3.5-inch diameter direct-push dual wall tooling with an expendable drive point. The outer casing and inner sampler are advanced to the desired depth and after the inner sampler is removed the pre-packed well is constructed with the desired screen length and lowered into the open outer casing. Pre-pack wells can range from ¾-inch inner diameter (ID) to 2-inch ID and are supplied with a rinsed and graded sand pack wrapped around the screened section. At the top of the screened interval additional sand may be added to prevent bentonite from entering the filter pack and 1 to 2 ft of bentonite is added to seal the well. A surface seal of Portland type I, II cement is poured into the open borehole or through a tremmi-pipe to complete the annular seal. As each section of the annular space is filled the outer casing is incrementally removed from the borehole. Well casing and screen are typically flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security. The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

Well Development

Wells are generally developed using a combination of groundwater surging and extraction. Surging agitates the groundwater and dislodges fine sediments from the sand pack. Wells may be surged prior to installation of the well seal to ensure that there are no voids in the sand pack. Development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly. After about ten minutes of surging, groundwater is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible. All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Groundwater Sampling

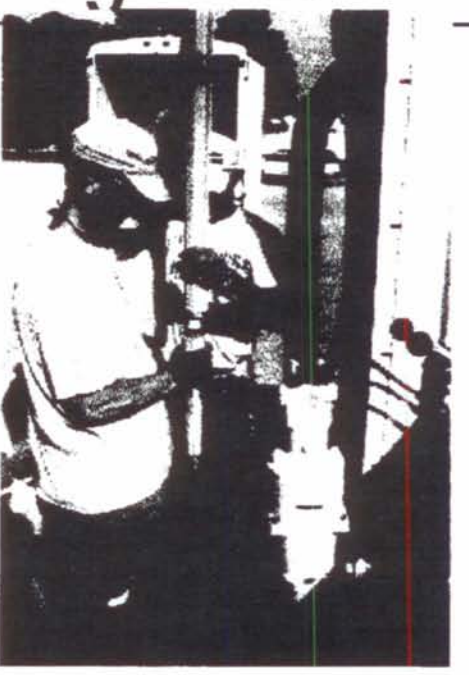
Depending on local regulatory guidelines, three to four well-casing volumes of groundwater are purged prior to sampling. Purging continues until groundwater pH, conductivity, and temperature have stabilized. Groundwater samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves or sealed plastic bags, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

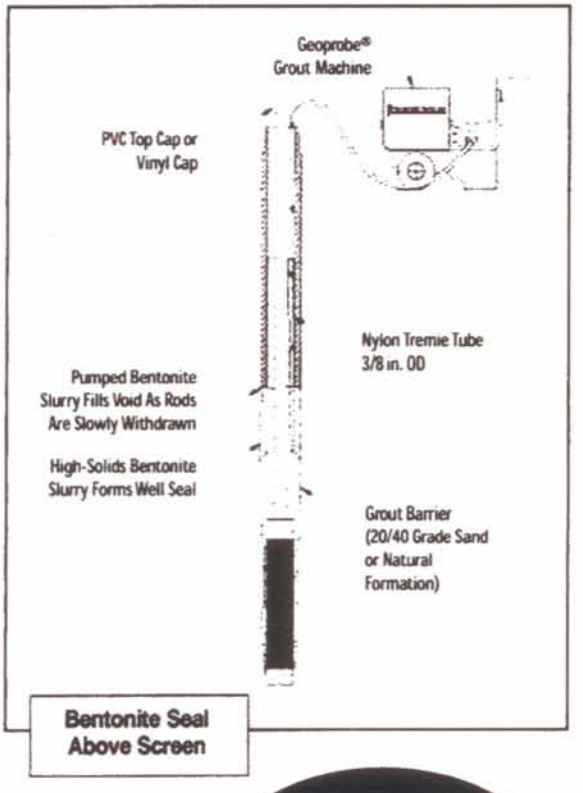
APPENDIX F

Pre-Pack Well Information

Prepack Screen Monitoring Wells

Well covers and locking and non-locking well plugs are available to "cap" off monitoring well projects.

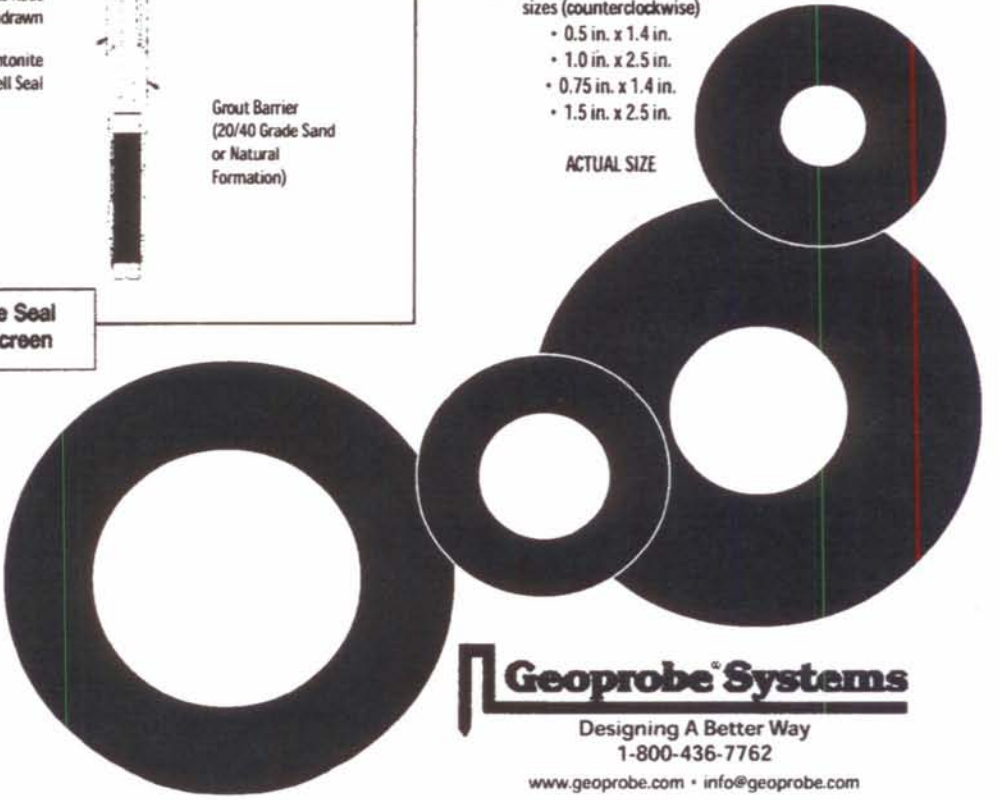




Geoprobe® Prepack Screen Monitoring Wells are available in the following sizes (counterclockwise)

- 0.5 in. x 1.4 in.
- 1.0 in. x 2.5 in.
- 0.75 in. x 1.4 in.
- 1.5 in. x 2.5 in.

ACTUAL SIZE



Geoprobe® Systems

Designing A Better Way

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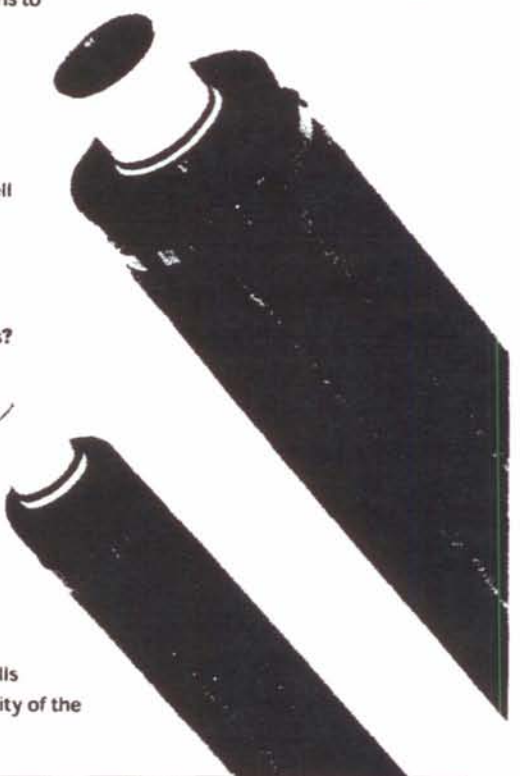
Prepack Screen Monitoring Wells

The environmental industry relies on Geoprobe® prepacks!

Look for the new ASTM Practice (D 6725) for installation of direct push prepack screen monitoring wells published by the American Society for Testing and Materials (ASTM).

The most cost effective method for installing permanent monitoring wells!

- Available in sizes ranging from 0.5-inch through 1.5-inch ID.
- Manufactured using PVC and high quality stainless steel screens to assure high integrity samples.
- Assures accurate placement of filter media across desired interval.
- Fully groutable design protects the environment.
- Installation through cased borehole provides high integrity well construction and sample quality.
- Use with Geoprobe® Pneumatic Bladder Pump for collection of high integrity water quality samples.



What are the advantages of Geoprobe® prepack monitoring wells?

- Meets new ASTM Standard D6725 for Direct Push Monitoring Well Installation.
- Meets basic EPA and RCRA construction requirements.
- Direct push (DP) methods for installing monitoring wells are being accepted by many state regulatory agencies.
- DOD and EPA studies reveal no statistically significant difference between water quality samples collected from paired DP and conventionally drilled wells.
- Recently published research shows even small diameter DP wells can be slug tested to accurately determine hydraulic conductivity of the formation.

	SLOTTED PIPE min. I.D.	SAND PACK	LENGTH	ROD SIZE O.D.	ROD SIZE I.D.	PART NO.
1.4 in. OD Prepack Screens	0.5 in. Sch. 80 PVC 0.010 in. slots	20/40 grade sand factory packed	3 feet 1 m	2.125 in. 54 mm	1.5 in. 38 mm	GW2010
	0.5 in. Sch. 80 PVC 0.010 in. slots	20/40 grade sand factory packed	5 feet 1.5 m	2.125 in. 54 mm	1.5 in. 38 mm	GW2020
	0.75 in. Sch. 40 PVC 0.010 in. slots	20/40 grade sand factory packed	3 feet 1 m	2.125 in. 54 mm	1.5 in. 38 mm	11678
	0.75 in. Sch. 40 PVC 0.010 in. slots	20/40 grade sand factory packed	5 feet 1.5 m	2.125 in. 54 mm	1.5 in. 38 mm	17466
2.5 in. OD Prepack Screens	1.0 in. Sch. 40 PVC 0.010 in. slots	20/40 grade sand factory packed	5 feet 1.5 m	3.25 in. 83 mm	2.625 in. 67 mm	17467
	1.0 in. Sch. 40 PVC 0.010 in. slots	20/40 grade sand field packed	5 feet 1.5 m	3.25 in. 83 mm	2.625 in. 67 mm	11679
	1.5 in. Sch. 40 PVC 0.010 in. slots	20/40 grade sand factory packed	5 feet 1.5 m	3.25 in. 83 mm	2.625 in. 67 mm	17401