Detterman, Mark, Env. Health

From: Detterman, Mark, Env. Health
Sent: Friday, October 14, 2016 10:50 AM
To: Yoo, James
Subject: RE: Drilling Permit Application at 4709, 4715, and 4719 Tidewater Avenue, Oakland

Hi James,
Should be fine to proceed; however, if you could request / require an electronic copy of the report be submitted to ACDEH as a condition of the permit it would be good.
Thanks!

Mark Detterman
Senior Hazardous Materials Specialist, PG, CEG
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502
Direct: 510.567.6876
Fax: 510.337.9335
Email: mark.detterman@acgov.org

PDF copies of case files can be downloaded at:

http://www.acgov.org/aceh/lop/ust.htm

From: Yoo, James
Sent: Wednesday, October 12, 2016 12:10 PM
To: Detterman, Mark, Env. Health
Subject: FW: Drilling Permit Application at 4709, 4715, and 4719 Tidewater Avenue, Oakland

FYI:

From: Darcie Maffioli [mailto:damaffioli@rockridgegeo.com]
Sent: Wednesday, October 12, 2016 10:51 AM
To: Wells <wells@acpwa.org>
Cc: Linda Liang <lhliang@rockridgegeo.com>
Subject: RE: Permit Application 1476137417958

Hi James,

Thank you for the update. If this helps, the specific APNs for our work are 34-2300-21, 34-2300-22, and 34-2300-23.

If requested by the County Environmental Health caseworker for this site, Middle Earth can follow their standard decon of the probe and rods to prevent cross contamination between CPTs. Attached are Middle Earth's Job Safety Analysis and Standard Operating Procedures for review. We plan to tremie grout the hole with cement grout after completion of a CPT. No soil or groundwater will be collected during our investigation.

The purpose of our investigation is to collect subsurface soil data for a due diligence evaluation of the site. Specifically, we are evaluating whether there are any adverse geotechnical or geological conditions that may affect site development and to provide preliminary information regarding foundation type and design for proposed building.

Please forward this information to the County Environmental Health caseworker.

Thank you,
Darcie

Darcie Maffioli
Office: (510) 420-5738 Mobile: (530) 514-4889

From: Yoo, James
Sent: Tuesday, October 11, 2016 10:39 AM
To: 'Mark Detterman (mark.detterman@acgov.org)' <mark.detterman@acgov.org>
Subject: Drilling Permit Application at 4709, 4715, and 4719 Tidewater Avenue, Oakland

Hi Mark,

2 CPT to 50ft. in depth for geotechnical investigation.

STATE WATER RESOURCES CONT

GEOTRAC

Tools | Reports | UST Case

TIDEWATER BUSINESS PARK (T06019709293) - (MAP)

4703 - 4723 TIDEWATER
OAKLAND, CA 94601
ALAMEDA COUNTY
CLEANUP PROGRAM SITE

PRINTABLE CASE SUMMARY / CSM REPORT

Summary | Cleanup Action Report | Regulatory Activities | *Environmental Data (ESI)* | Site Maps / Documents | Co

Regulatory Profile

CLEANUP STATUS - DEFINITIONS

OPEN - SITE ASSESSMENT AS OF 9/14/1986 - CLEANUP STATUS HISTORY

POTENTIAL CONTAMINANTS OF CONCERN | **POTENTI**

OTHER METAL, WASTE OIL / MOTOR / HYDRAULIC / LUBRICATING | UNDER IN

FILE LOCATION

ALL FILES ARE ON GEOTRACKER OR IN THE LOCAL AGENCY DATABASE

USER DEFINED BENEFICIAL USE

GW - MUNICIPAL AND DOMESTIC SUPPLY

DWR GROUNDWATER SUB-BASIN NAME

Santa Clara Valley - East Bay Plain (2-9.04)

RB WATE

South Bay

Site History

Surficial soil sampling event in June 1988 for proposed development indicated historic contamination to be present in

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Online Wells Permit Application System - PROCESS APPLICATIONS

Application Detail for Application ID 1476137417958

Application ID: 1476137417958

Submitted On: 10/10/2016 15:11:22 By: INTERNET

Approval Status

Sitemap	Conditions
Sitemap Received 10/10/2016 Edit Sitemap File Received	Pending Conditions Apply Conditions

Project Information

Project Site City: Oakland

Project Start Date: 10/21/2016

Property Owner: Tidewater Group LLC

Owner Address: 1840 Embarcadero
Oakland, CA 94606

Client: Alan Spiegel

Client Address: 1275 Hall Avenue, Suite D
Richmond, CA 94804

Applicant Information

Applicant: Rockridge Geotechncial - Darcie Maffioli

Address: 270 Grand Ave
Oakland, CA 94610

Contact Name: Linda Liang

Contact Phone: 510-420-5738

Site Hazard Information

MIDDLE EARTH GEO TESTIG, INC.'S, (MEGT'S)
CONE PENETROMETER TESTING PROCEDURES

MEGT's cone penetrometer testing (CPT) procedures include the following:

1. lithology and stratigraphy;
2. downhole soil vapor sampler;
3. laser induced fluorescence for hydrocarbon field screening and quantification;
4. soil sampling;
5. groundwater sampling;
6. groundwater depth and gradient determination;
7. geotechnical evaluation;
8. well point installation; and
9. hole abandonment.

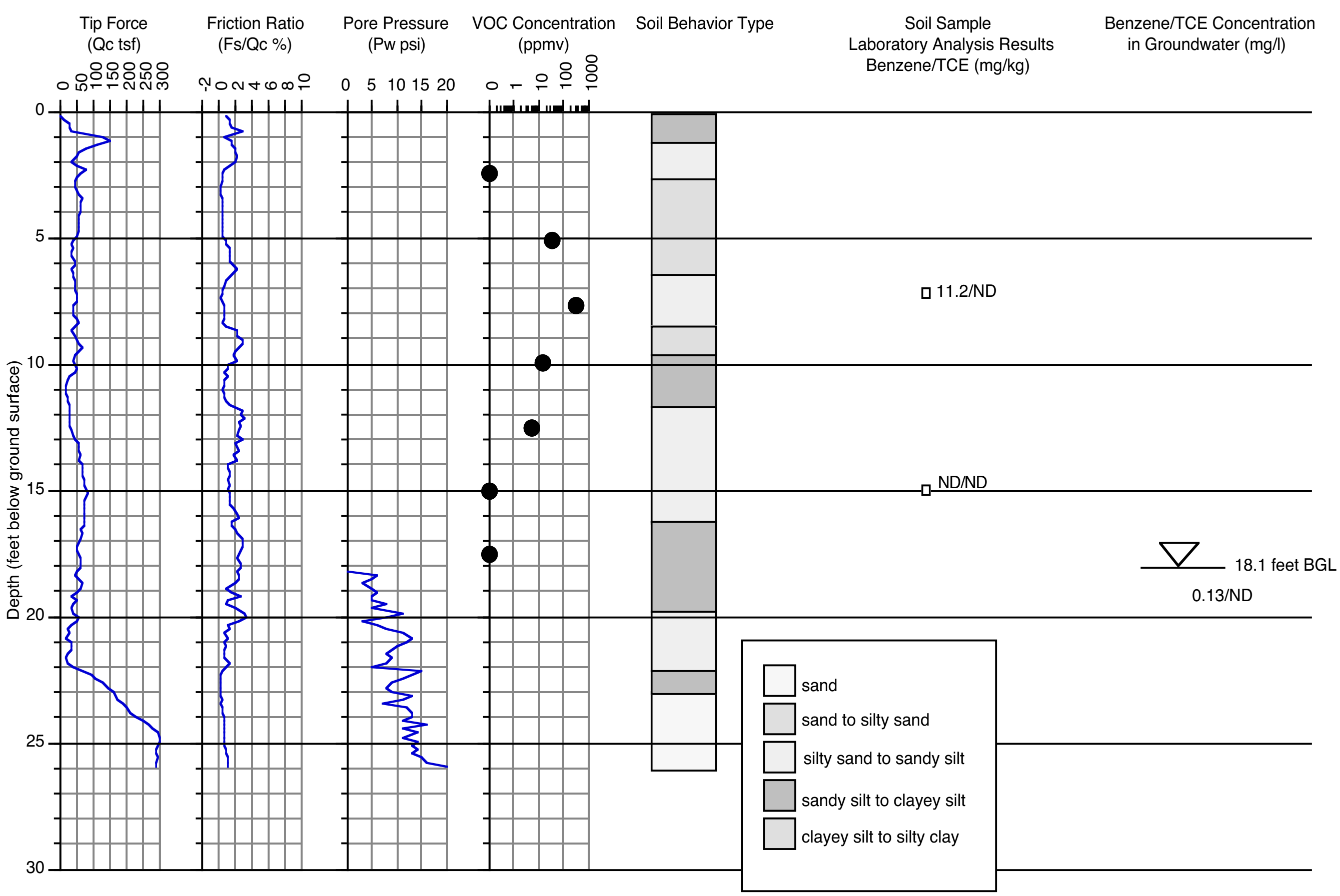
Some or all of these procedures were used on this project. Please refer to the report for those elements that were/will be used. Various data that can be collected using the CPT rig are shown in Figure 1 - Diagram Summarizing CPT Data.

1. LITHOLOGY AND STRATIGRAPHY

1.1 STANDARD CONE PENETROMETER TESTING

Site lithology and stratigraphy are determined using Middle Earth Geo Testing,Inc.'s, CPT equipment. Basically, CPT consists of pushing a cone-tipped, steel rod into the subsurface soils at a constant velocity and measuring the stresses on the cone tip and friction sleeve during advancement (see Figure 2 - Schematic Diagram of CPT). The measured stress values are correlated to specific soil types based on empirical data. Note that the term "cone penetrometer testing" (or CPT) refers strictly to this measurement of cone stresses, which is the subject discussed in this section. However, the term is also used loosely

FIGURE 1 - DIAGRAM SUMMARIZING CPT DATA



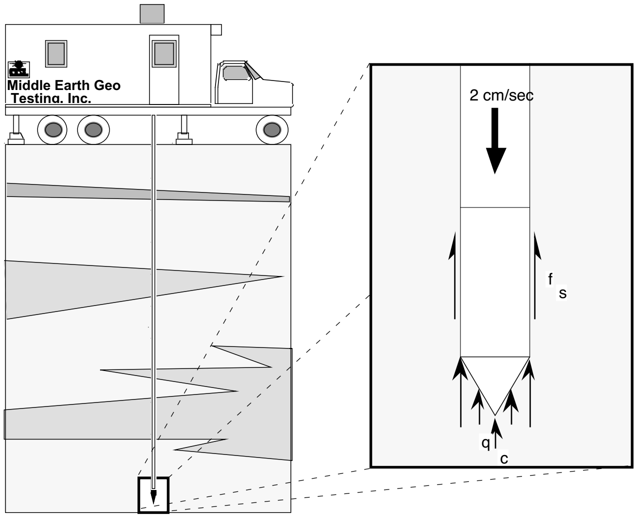


FIGURE 2 - SCHEMATIC DIAGRAM OF CPT
(qc = tip stress, fs = friction stress)

describe all probes pushed into the subsurface with the same equipment, such as soil and groundwater samplers.

The basic components of a CPT system are a hydraulic ram, which consists of a steel rod that is pushed into the ground with the ram, and a cone-tipped probe at the tip of the rod. A standard cone has a 10 cm^2 area with an apical angle of 60°, as specified by ASTM Standard D 3441-86. The hydraulic ram advances the rod and cone at a rate of 2 cm/sec. The maximum depth to which the cone can be advanced is determined by the power of the hydraulic ram, the effective weight of the rig upon which the ram is mounted, and the strength of the rod and cone.

Middle Earth Geo Testing, Inc., maintains two types of CPT rigs. The larger of the two is a 25-ton, push-and-dead weight rig. The smaller is a 10-ton rig with two anchoring augers, each of which is capable of 10 tons of anchoring reaction weight. With both anchors in place, the smaller rig is capable of 30 tons of reaction force. Both rigs have the same assessment capabilities.

The CPT probe is mechanically separated into two parts, the cone tip and the friction sleeve (see Figure 2). The cone tip consists of the entire conical part of the probe, and the friction sleeve consists of the cylindrical area above the tip. A standard friction sleeve has a surface area of 150 cm^2. The tip and sleeve are each connected to strain-gauged load cells mounted in the probe body to measure the vertical components of stress as the probe is advanced downward through the soil. The vertical components of stress on the tip and sleeve are a bearing stress (q_c), or normal stress, on

DEPTH meters	DEPTH feet	TIP Qc tsf	FRIC-TION Fs tsf	FR RATIO Fs/Qc %	INC I deq	INTERPRETED SOIL TYPE	N SPT
7.05	23.1	195.5	2.425	1.24	0.1	sand to silty sand	43
7.10	23.3	185.9	2.078	1.12	0.1	sand to silty sand	45
7.15	23.5	179.4	2.450	1.37	0.1	sand to silty sand	43
7.20	23.6	174.2	2.609	1.50	0.1	sand to silty sand	42
7.25	23.8	168.2	2.784	1.66	0.1	sand to silty sand	41
7.30	23.9	170.3	2.928	1.72	0.1	sand to silty sand	41
7.35	24.1	179.0	3.188	1.78	0.1	sand to silty sand	43
7.40	24.3	185.8	2.814	1.51	0.1	sand to silty sand	42
7.45	24.4	162.9	2.630	1.62	0.1	silty sand to sandy silt	50
7.50	24.6	118.7	3.710	3.13	0.1	silty sand to sandy silt	36
7.55	24.8	59.1	2.345	3.97	0.2	clayey silt to silty clay	35
7.60	24.9	40.6	2.061	5.08	0.2	clayey silt to silty clay	28
7.65	25.1	74.8	2.188	2.92	0.2	clayey silt to silty clay	38
7.70	25.3	71.7	3.059	4.27	0.2	clayey silt to silty clay	32
7.75	25.4	54.5	2.847	5.23	0.2	clayey silt to silty clay	38
7.80	25.6	62.4	2.174	3.48	0.2	clayey silt to silty clay	28
7.85	25.8	59.1	2.094	3.55	0.2	clayey silt to silty clay	32
7.90	25.9	77.9	2.641	3.39	0.2	sandy silt to clayey silt	32
7.95	26.1	113.0	3.521	3.11	0.2	sandy silt to clayey silt	41
8.00	26.2	128.8	4.165	3.23	0.2	sandy silt to clayey silt	43
8.05	26.4	94.5	3.953	4.18	0.2	clayey silt to silty clay	50
8.10	26.6	87.0	3.866	4.44	0.2	very stiff fine grained	82
8.15	26.7	74.9	3.709	4.95	0.2	clayey silt to silty clay	42
8.20	26.9	99.9	3.604	3.61	0.3	clayey silt to silty clay	44
8.25	27.1	102.3	4.445	4.35	0.3	clayey silt to silty clay	46
8.30	27.2	83.6	3.696	4.42	0.3	clayey silt to silty clay	38
8.35	27.4	49.5	2.224	4.49	0.3	clayey silt to silty clay	30
8.40	27.6	53.2	2.246	4.22	0.3	clayey silt to silty clay	38
8.45	27.7	83.2	2.402	2.89	0.3	clayey silt to silty clay	32
8.50	27.9	67.2	2.685	4.00	0.3	clayey silt to silty clay	38

Soil interpretation reference: Robertson & Campanella-1983, based on 60% hammer efficiency and .15 sliding data average.

FIGURE 3 - EXAMPLE OF COMPUTER PRINTOUT OF CPT DATA

the 10 cm^2 tip of the cone, and a frictional stress (f_s), which is measured along the 150 cm^2 sleeve. The stress values measured by the load cells are transmitted electronically to an on-board computer, which logs these values at specified intervals (typically 2 to 5 cm). This produces a computer-generated CPT read-out that shows the measured cone resistance components (q_c and f_s) as a function of depth (see Figure 3 - Example of Computer Printout of CPT Data).

Advancement of the cone into soil induces a complex field of stresses and strains. Theoretical relationships between q_c and soil rheology have to date proven to be intractable. Therefore, soil classifications using CPT are empirically based. Standard CPT sampling utilizes the tip and friction sleeve stress values to determine soil type. Empirical classification systems have been presented by several workers; the system presented by Robertson (1990) is currently the most popular. This classification system

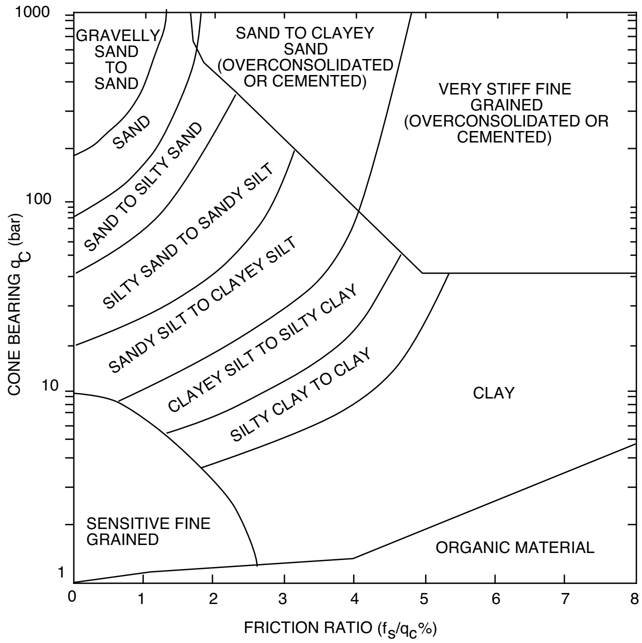


FIGURE 4 - SIMPLIFIED SOIL BEHAVIOR TYPE CLASSIFICATION FOR STANDARD CONE (ROBERTSON, 1990)

differentiates gravel, sand, silt, clay, some intermediate soil types, and some overconsolidated soils in a graph of q_C versus f_S/q_C (see Figure 4 - Simplified Soil Behavior Type Classification for Standard Cone). The empirical classification schemes are established through numerous side-by-side CPT and conventional borehole samples. These correlations have been extensively verified and are widely accepted to be applicable to a wide range of natural soils. The basic soil behavior observations are that sands display relatively high q_C and low f_S/q_C, whereas clays display relatively high f_S/q_C and low q_C.

The CPT probe produces continuous measurements of q_C and f_S as the cone is advanced. These values are logged at 5-cm intervals (see Figure 3). However, the actual vertical resolution of the CPT log (i.e., the uncertainty in identifying the location of a stratigraphic interface) is somewhat greater. The reason for this is that the stress field around the advancing cone is dependent on the properties of soils 5 to 10 cone diameters ahead and behind the cone tip in typical soils, and 10 to 20 diameters in very stiff soils. The thinnest, very stiff layer in which q_C can reach full value is

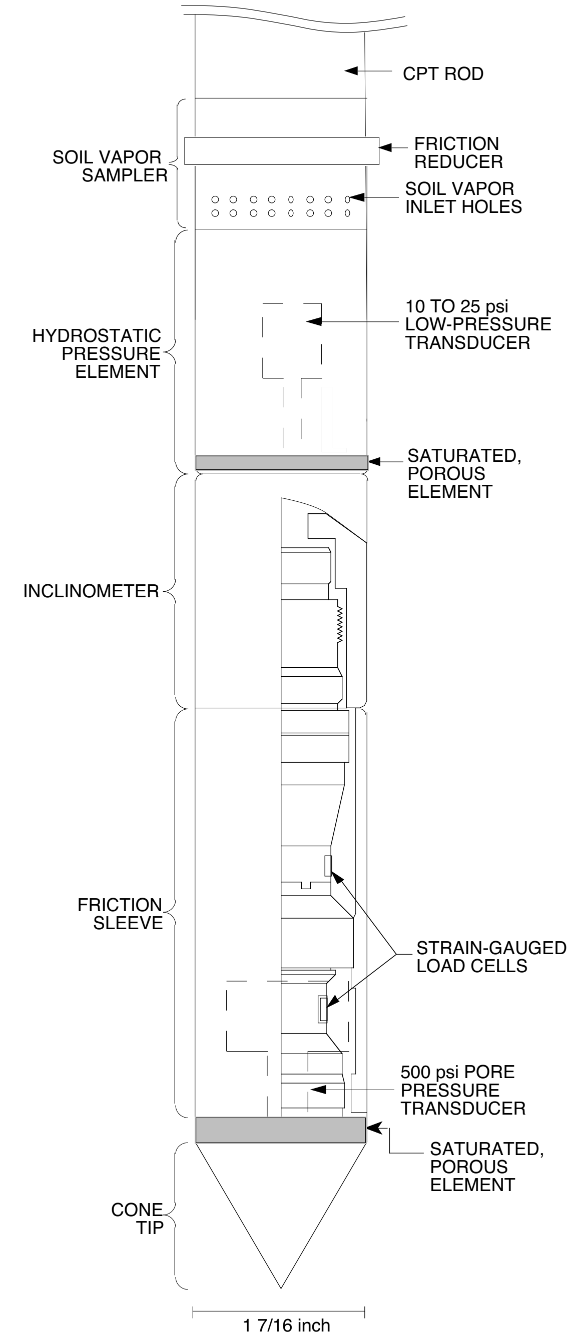


FIGURE 5 - MIDDLE EARTH GEO TESTING, INC.'S, INTEGRATED CPT PROBE

72 cm (20 diameters); however, q_C may reach full value in thinner, soft soils (Campanella and Robertson, 1988).

1.2 PIEZOCONE

A recent development in CPT is the capability to measure dynamic pore pressure (u). A standard CPT cone with the addition of the pore pressure element is called the piezocone, or CPTu. The pore pressure measurement is made using a CPT probe equipped with a saturated, porous

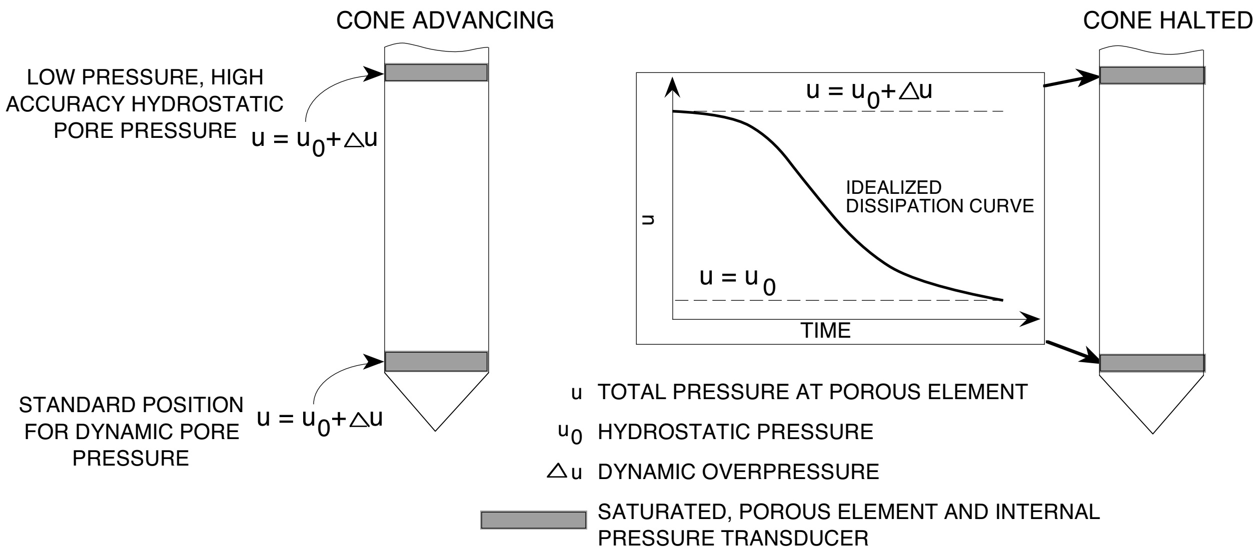


FIGURE 6 - PORE PRESSURE DISSIPATION TEST

element and an internal, saturated chamber with a 500 pounds per square inch (psi) pressure transducer (see Figure 5 - Middle Earth Geo Testing, Inc.'s, Integrated CPT Probe).

Penetration of the cone causes displacement of water in saturated soils. Depending on the soil properties, the displacement may cause a change, usually an increase, in the pore water pressure (see Figure 6 - Pore Pressure Dissipation Test). The dynamic pore pressure varies from the tip to the upper part of the probe, so the measured value of u is dependent on the location of the porous element (Campanella and Robertson, 1988). The element in most modern probes is located immediately behind the tip (see Figure 5). The pore pressure measurement, u, has many uses, including the determination of hydrostatic head, independent soil classifications, soil permeability measurements, and detailed stratigraphic analysis.

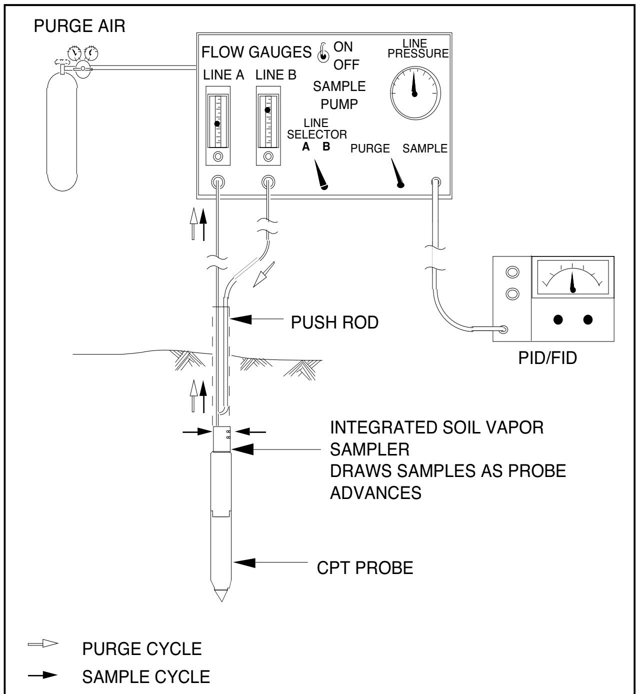


FIGURE 7 - DIAGRAM OF TWO-LINE VAPOR SAMPLING SYSTEM

2. DOWNHOLE SOIL VAPOR SAMPLER

Continual downhole sampling of volatile organic vapors as the probe is advanced into the subsurface is accomplished using a two-line vapor sampling system designed by Middle Earth Geo Testing, Inc. This design allows for purging of the vapor collection lines between vapor samples (see Figure 7 - Diagram of Two-Line Vapor Sampling System). Purging of the lines between samples allows continual collection of vapor samples with depth without having to withdraw the line for replacement or purging at the surface, as is the case with single-line samplers. Soil vapor samples are collected at selected intervals during advancement of the CPT probe, depending upon the investigator's needs. Standard practice is to collect vapor samples at 5-foot intervals.

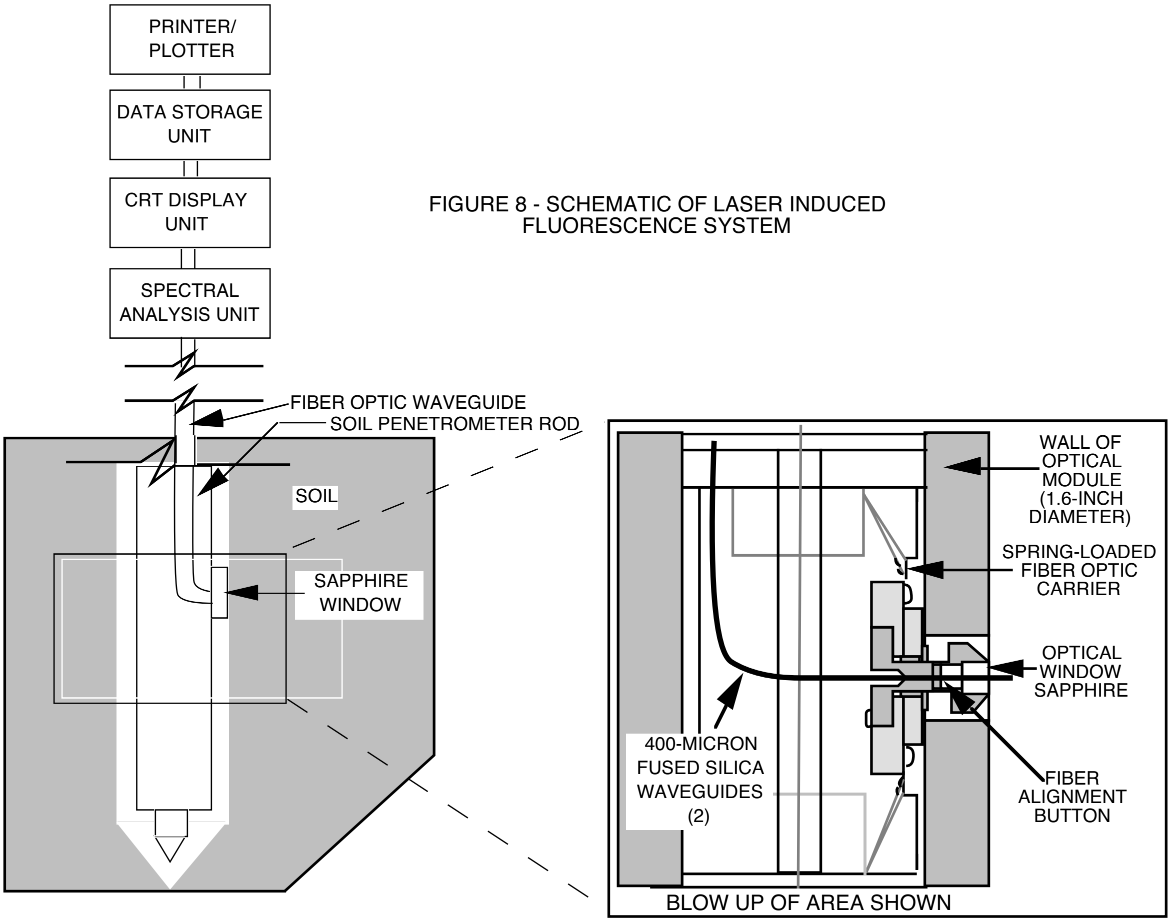
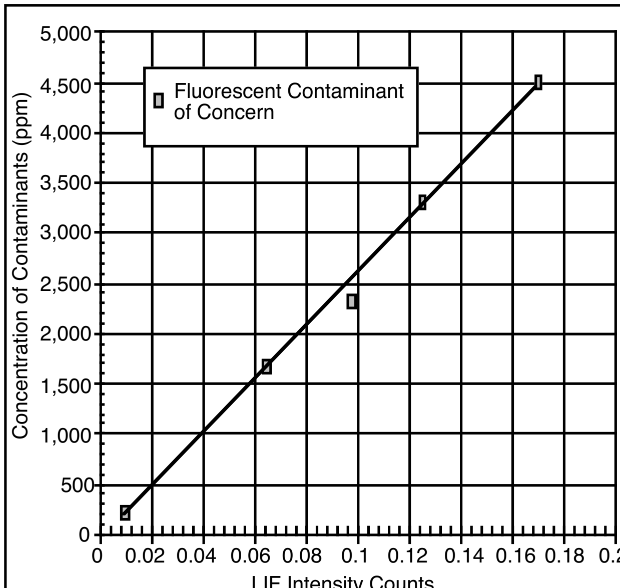


FIGURE 8 - SCHEMATIC OF LASER INDUCED FLUORESCENCE SYSTEM

The vapor sample is analyzed with an integrated flame ionization detector, photoionization detector, or on-board gas chromatograph. This capability replaces and improves upon headspace monitoring of soil samples and cuttings while drilling. The advantage of this technique over headspace monitoring of soil samples is that the sampling method is less subjective and more precise (reproducible) than the measurement of vapors at the ends of soil samples in brass sleeves using a hand-held vapor analyzer.

3. LASER INDUCED FLUORESCENCE FOR HYDROCARBON FIELD SCREENING AND QUANTIFICATION

In-situ hydrocarbon screening can be conducted using downhole, laser induced fluorescence (LIF) coupled with the CPT (see Figure 8 - Schematic of Laser Induced Fluorescence System). LIF is utilized for continuous screening for select organic compounds with depth. In making a measurement, excitation radiation is produced by firing a pulsed (tunable) nitrogen laser. The laser is coupled into two fiber optic cables. The fiber optics are coupled into a 400-micron fiber optic cable that passes down the center



LIF LASER INDUCED FLUORESCENCE
ppm PARTS PER MILLION

FIGURE 9 - SOIL CALIBRATION STUDY
(laser intesity counts versus laboratory results)

of the penetrometer rod. The fiber ends at a 6.35-mm sapphire window that passes the light onto the soil surface adjacent to the window. The fluorescence signal that is a response to the ultra violet excitation is collected by a second 400-micron fiber and is carried back up through the penetrometer rod to a polychromator. In the polychromator, the fluorescent signal is dispersed and the energy distribution at the wavelengths of interest is measured using a linear photodiode array.

Quantification of the contaminants in the field is accomplished via a Standard Curve. Prior to arrival of the LIF equipment, representative samples of the contaminated material are obtained. The samples are analyzed in a laboratory for the contaminants of concern, and each sample is investigated with the LIF system to determine the associated intensity counts. The samples are then mixed to determine ratios of "clean" to "dirty" at ratios of 25:75, 50:50, and 75:25, respectively. The new samples are then analyzed as described above to produce a set of points for each test. The results of the laboratory analysis and fluorescence data are then graphed with concentration of contaminants on the y axis and LIF intensity counts on the x axis (see typical graph in Figure 9 - Soil Calibration Study). This Standard Curve is then used to convert intensity counts in the field to concentrations of contaminants.

4. SOIL SAMPLING

Middle Earth Geo Testing, Inc.'s, CPT equipment is capable of direct-push soil sampling. The hydraulic equipment on the CPT rig is used to advance soil sampling probes similar to other direct-push

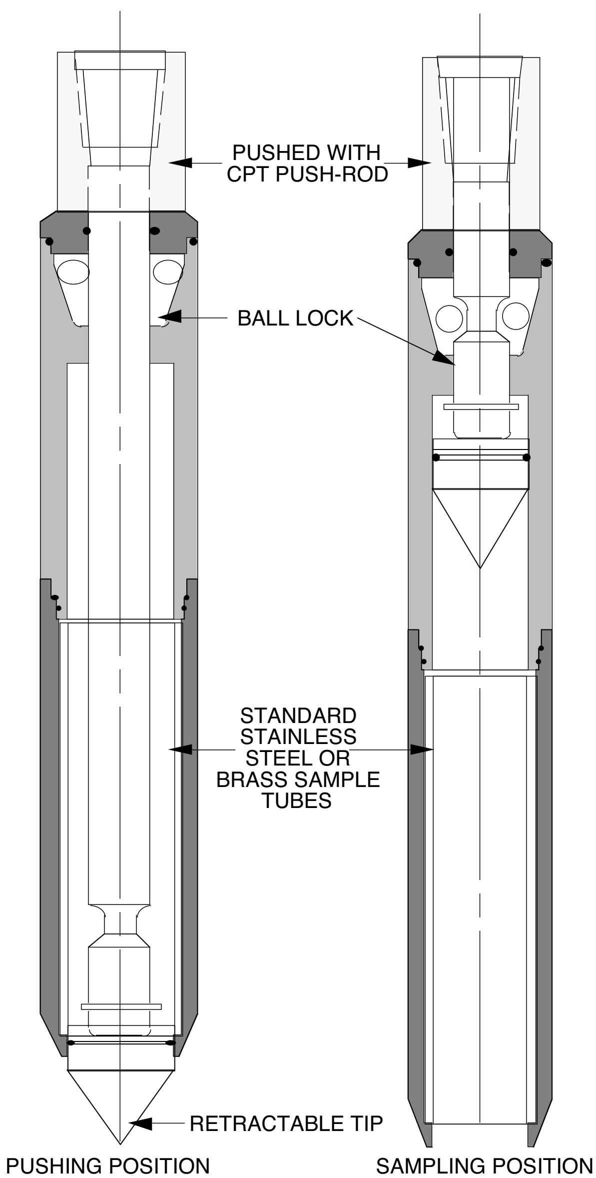


FIGURE 10 - DIAGRAM OF SOIL SAMPLER

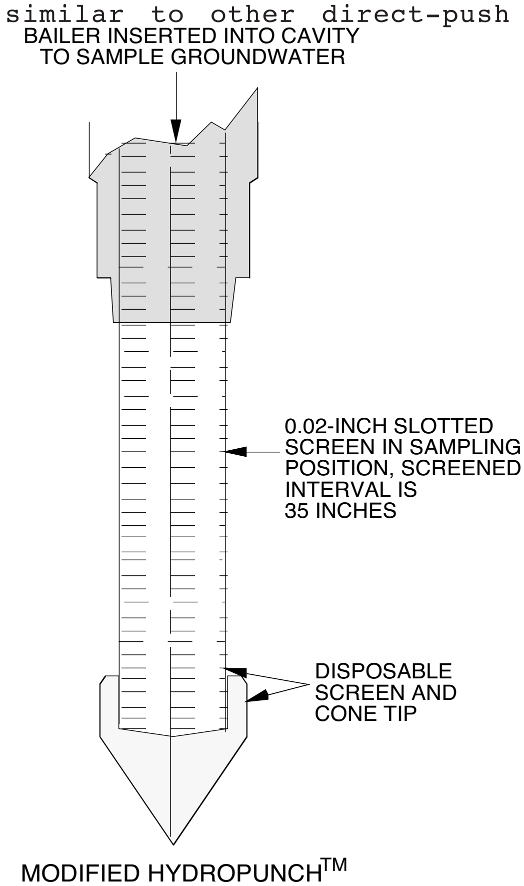


FIGURE 11 - DIAGRAM OF GROUNDWATER SAMPLER

technologies. Undisturbed soil samples are collected just as they would be with a hollow-stem, flight-auger drill rig.

Soil samples are retrieved using a probe with a retractable tip and standard brass sampling rings (see Figure 10 - Diagram of Soil Sampler). Soil sampling is performed without site disturbance, generation of soil cuttings, waste disposal requirements, or the health and safety problems that accompany conventional drilling methods.

5. GROUNDWATER SAMPLING

Middle Earth Geo Testing, Inc.'s, CPT equipment is capable of direct-push groundwater sampling. The hydraulic equipment on the CPT rig is used to advance groundwater sampling probes, similar to other direct-push technologies. Hydropunch™-type groundwater samples are collected just as they would be with a hollow-stem, flight-auger drill rig.

Groundwater samples are typically collected by means of Hydropunch™-type samplers (see Figure 11 - Diagram of Groundwater Sampler). These probes all operate by being pushed in a closed position, i.e., with the screen protected. When the correct depth is reached, the rod is pulled back, exposing the screen, and groundwater samples are collected. It is also possible to collect groundwater samples from various depths within an aquifer, allowing for vertical profiling as well as lateral delineation of contaminant plume boundaries. If the hole remains open after a CPT sounding or soil sampling, a temporary casing may be placed in the hole for collection of a groundwater sample, which is useful in low yield aquifers.

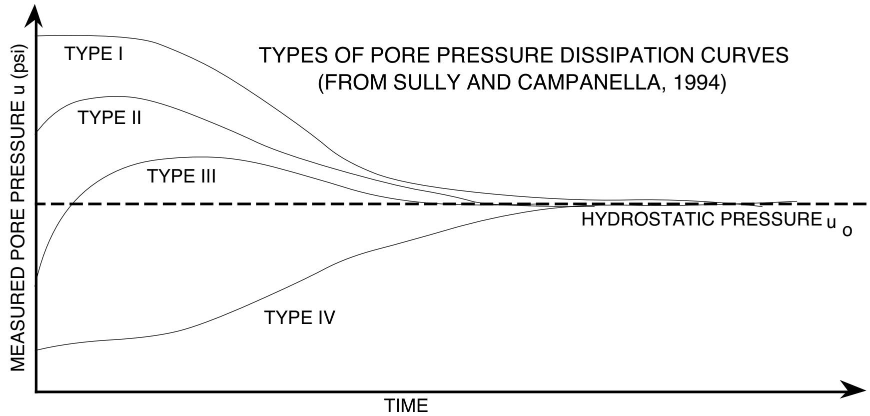
All of these methods are for one-time sampling events and are typically used to determine the extent of the groundwater plume. This information is then used to install the minimum number of optimally placed monitoring wells for long-term contaminant and hydrogeologic monitoring.

6. GROUNDWATER DEPTH AND GRADIENT DETERMINATION

Typical CPTu probes have pore pressure transducers used for determining dynamic pore pressure (u). In principle, the hydrostatic head at some point in an aquifer can be determined by halting the probe advancement and allowing the dynamic pressure, u, to dissipate to u_o. However, these probes generally have a pressure range of 500 psi because of the high pressures generated while the probe is advanced. Uncertainty in a transducer measurement is a function of its pressure range, usually 0.5 to 1.0 percent of full scale. Thus, standard CPTu probes have a 2.5 to 5 psi uncertainty associated with any measurement, or approximately 5 to 10 feet of hydraulic head. This is greater than the total vertical relief of the potentiometric surface at many contaminated groundwater sites.

Usable, accurate determination of in-situ hydrostatic head can be made using a low pressure (10psi) transducer developed by Middle Earth Geo Testing, Inc. This transducer is integrated into the cone-tipped probe body. The low pressure element is mounted approximately 2 feet behind the cone tip, where dynamic pore pressures are not as great as in the tip area (see Figure 5). The measurement is made by advancing the probe until it is below the water table, halting the probe, allowing the dynamic pore pressure to dissipate, and directly measuring the hydrostatic pressure head using the transducer (see Figure 12 - Groundwater Potentiometric Surface from CPT Dissipation Test). The 10 psi transducer allows collection of hydraulic head measurements with an accuracy of 0.05 to 0.1 psi, or 0.1 to 0.2 foot of head (potentiometric surface elevation) (see Figure 12).

Utilization of the low pressure transducer and surveying ground surface elevations at three or more locations at a site can provide a good estimate of the horizontal hydraulic gradient and direction of groundwater flow. Because the low pressure transducer measures hydraulic head at discrete points, similar to a piezometer, measurements at several depths at a single location can yield vertical hydraulic head gradients for detailed hydrogeologic characterization. This allows for identification of perched and/or confined



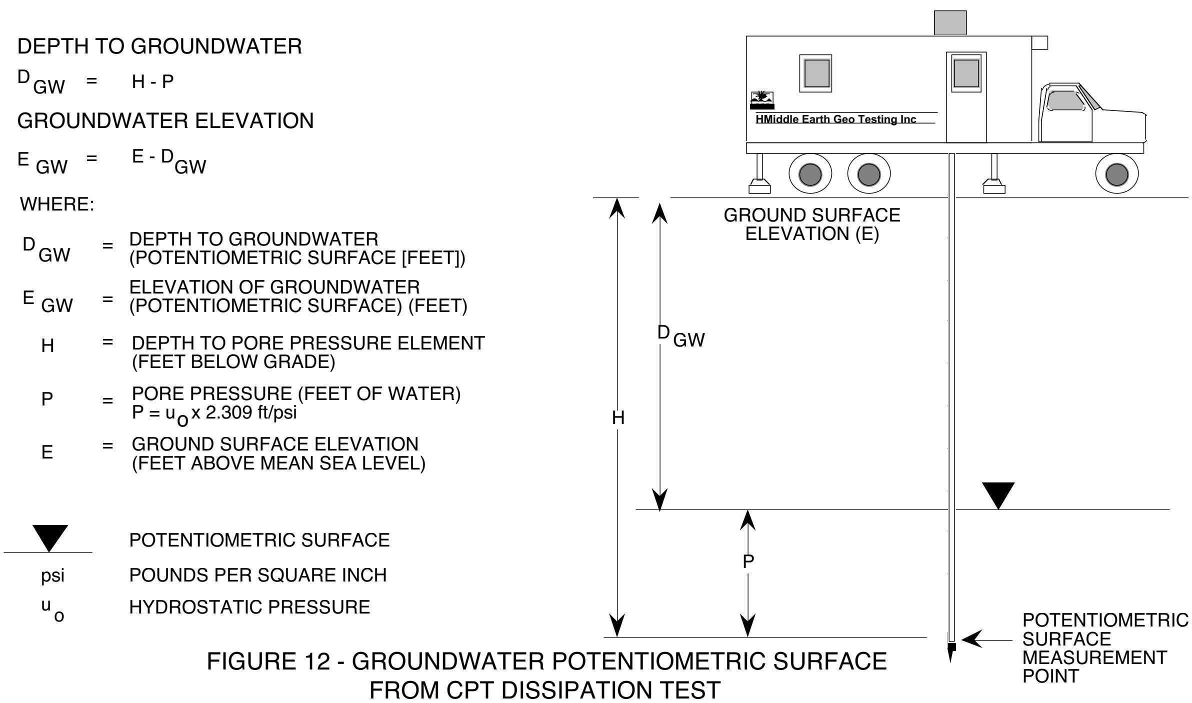


FIGURE 12 - GROUNDWATER POTENTIOMETRIC SURFACE FROM CPT DISSIPATION TEST

aquifer zones and vertical hydraulic gradients.

7. GEOTECHNICAL EVALUATION

Middle Earth Geo Testing, Inc.'s, CPT rig is capable of determining the following geotechnical parameters:

1. soil behavior type;
2. relative density;
3. angle of internal friction;
4. undrained shear strength;
5. standard penetration test (SPT) value;
6. corrected SPT value; and
7. cyclic stress ratio (CSR).

Geotechnical parameters are based on cone results averaged over a depth range that is specified by the user, depending on project needs. Additionally, several of the parameters can be calculated based on more than one data evaluation scheme, depending on site-specific information or project requirements.

7.1 SOIL BEHAVIOR TYPE

The soil behavior type is determined using the empirical classification chart discussed in a previous section (see Figure 4).

7.2 RELATIVE DENSITY

For drained soils (sands), the measured value of q_c is dependent chiefly upon relative density and compressibility. Relative density is determined from q_c by choosing a relative density versus q_c curve for a previously tested sand that appears to have a similar compressibility (Ticino sand: Bellotti, et al., 1985; Hokksund sand: Bellotti, et al., 1985; or

Ottawa/Hilton Mines sands: Schmertmann, 1976) or using a curve for average sand (Jamiolkowski, 1985). In general, compressibility increases with increasing uniformity of grading, increasing grain angularity, increasing mica content, and increasing carbonate content, so visual inspection of the soil can help in choosing a data interpretation scheme. Calculation of relative density is also dependent on effective stress, so a user-defined soil density is input; the default value is 120 pounds per cubic foot. A value of relative density based on CPT data is sometimes referred to as "equivalent relative density."

7.3 ANGLE OF INTERNAL FRICTION

For drained soils (sands), the measured value of q_c can be used with empirical data to estimate the angle of internal friction. Calculation of angle of internal friction is also dependent on effective stress, so a user-defined soil density is input; the default value is 120 pounds per cubic foot. The data can be reduced using the methods of Robertson and Campanella (1983a), Durgunoglu and Mitchell (1975), or Janbu and Senneset (1974).

7.4 UNDRAINED SHEAR STRENGTH

For undrained soils (silts and clays), the measured value of q_c can be used to estimate the undrained shear strength of the soil using the following equation:

$$s_u = (q_c - s_v)/N_k$$

Where s_u = undrained shear strength, s_v = overburden stress, N_k = cone factor, which is usually set at 15 for Middle Earth Geo Testing's, cones.

7.5 STANDARD PENETRATION TEST VALUE

The SPT is the most commonly used geotechnical test in North America and is commonly denoted as N. The ratio of tip resistance to SPT value (q_c/N) is found empirically to be fairly constant for a given soil type, and q_c/N increases with increasing mean grain size D_{50} (Robertson, et al., 1983). The determined soil behavior type is used to determine D_{50}, which is correlated to q_c/N. Then, the measured value of q_c is used to calculate N. A SPT value based on CPT data is sometimes referred to as "equivalent SPT."

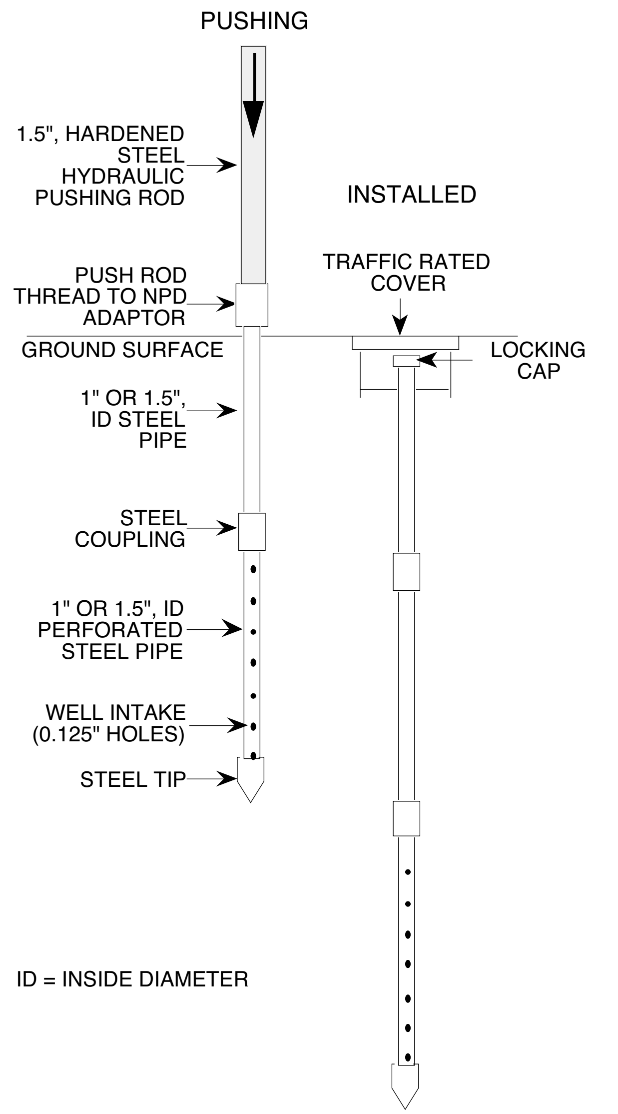


FIGURE 13 - WELL POINT CONSTRUCTION DIAGRAM

7.6 CORRECTED STANDARD PENETRATION TEST VALUE

The corrected SPT takes into account the effect of overburden stress on SPT value. A user-defined soil density is input, or the default value of 120 pounds per cubic foot is used.

7.7 CYCLIC STRESS RATIO

CPT data is used to calculate CSR to cause liquefaction using an assumed earthquake magnitude of M = 7.5 (Seed, et al., 1983).

8. WELL POINT INSTALLATION AND MONITORING PROCEDURES

Monitoring wells are traditionally installed with a hollow-stem auger or other drilling equipment. Alternatively, narrow diameter (0.75 to 1.5 inches) monitoring wells can be hydraulically installed with direct-push equipment. Hydraulically installed "well points" differ from conventionally installed monitoring wells in that well points have a minimal

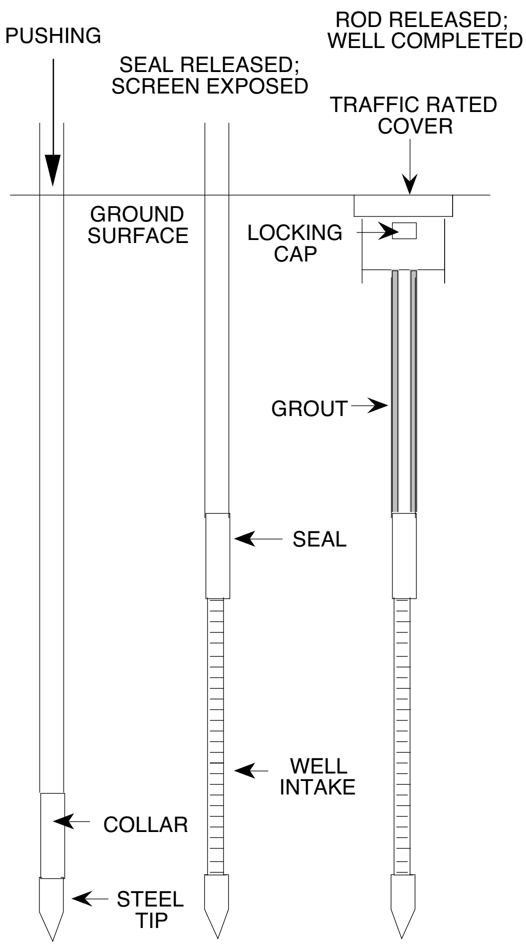


FIGURE 14 - WELL POINT: POWERPUNCH™

engineered gravel pack or a "native soil gravel pack." Narrow diameter well points have lower well yields than conventional wells and are generally not useful as groundwater extraction wells for pump and treat remediation.

Because of their low cost and ease of installation, well points have advantages over conventional wells in several environmental applications, including:

- low cost monitoring wells (if accepted by the regulatory agency);
- one-time monitoring (screening) of groundwater in low yield formations where hydropunch sampling would be excessively time-consuming;
- one-time monitoring (screening) of groundwater where measurement of floating product (LNAPL) thickness is needed;
- long-term groundwater monitoring where a conventional monitoring well is not required;
- long-term hydrogeologic (water level) monitoring;
- vapor extraction test observation wells;
- vapor extraction wells;
- pumping test observation wells; and
- sparge points.

Middle Earth Geo Testing, Inc., is familiar with two types of well point designs. One is a simple driven steel rod using standard 1-inch or 1.5-inch diameter pipe (see Figure 13 - Well Point Construction Diagram). The other is the Powerpunch™, which is constructed of 0.75-inch diameter PVC pipe that is driven within a 1.9-inch diameter steel rod that is removed after installation (see Figure 14 - Well Point: Powerpunch™). The annular space above the perforated interval may be grouted in the Powerpunch™.

8.1 INSTALLATION PROCEDURES

Middle Earth Geo Testing, Inc.'s, well points are constructed of steel pipes that are hydraulically pushed into the subsurface. The pipe is constructed of 1-inch or 1.5-inch, inside diameter, standard or galvanized pipe that is steam cleaned inside and outside before installation. A friction reducer behind the conical tip and couplings at each pipe joint prevent soil from entering the perforated pipe during installation. The well intake consists of 0.125-inch diameter holes in the pipe (see Figure 13).
A specially designed steel tip is threaded to the bottom of the pipe, and an adaptor is used to connect the hydraulic pushing

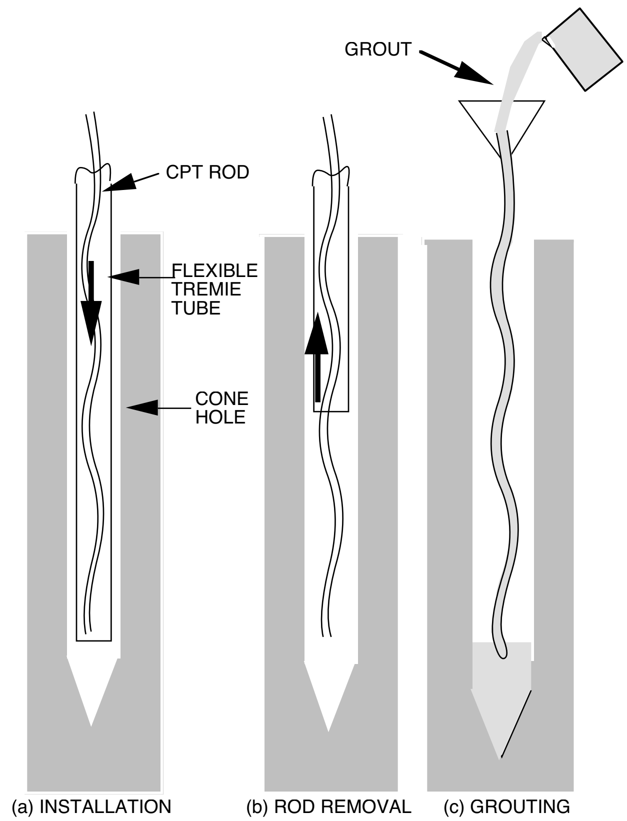


FIGURE 15 - GROUTING BY RIGID PIPE WITH INTERNAL FLEXIBLE TREMIE TUBE

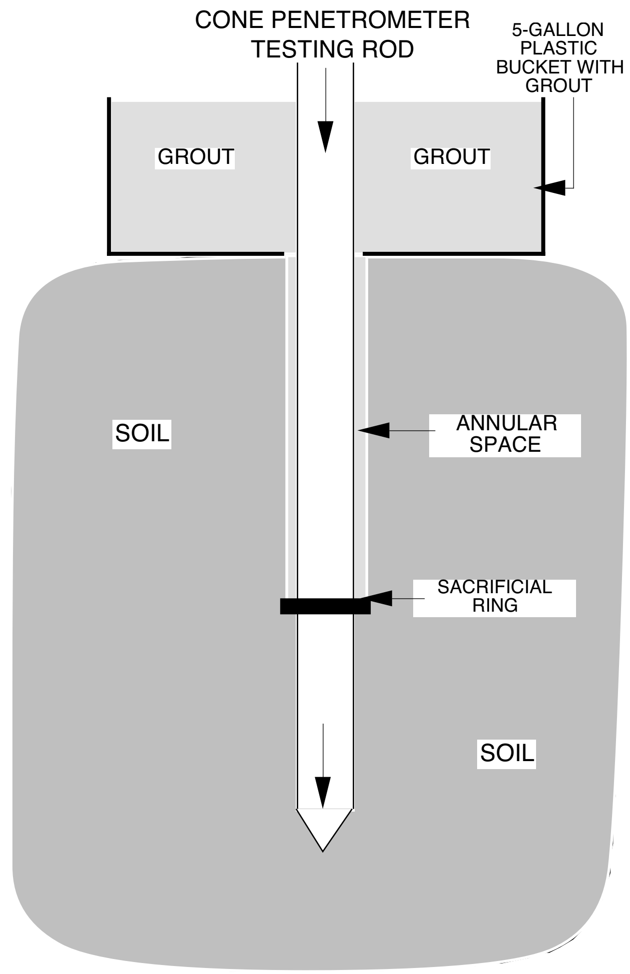


FIGURE 16 - GROUTING USING SACRIFICIAL RING METHOD

rods to the well point pipe. The top of the installed well point can be left as a pipe protruding out of the ground covered with a traffic rated well cover or a monument well cover.

8.2 MONITORING PROCEDURES

Because of the small diameter of the well points, insertion of electric probes such as water level and oil-water interface meters could cause sufficient displacement of the water level or interface to result in inaccurate readings. Monitoring is therefore performed using a graduated tape and reactive pastes that change color when immersed in water or free product. Water and product levels are measured to an accuracy of ±0.01 foot and are referenced to the surveyed datum (well cover or top of casing). All measurements are reproduced to assure validity.

For sampling of groundwater for laboratory analysis, well points are purged using a 0.75-inch or 1-inch diameter bailer. During the purging process, groundwater is monitored constantly for temperature, pH, conductivity, turbidity, odor, and color. These parameters are recorded on a water sample log and are collected in conformance with the Environmental Protection Agency's publication "A Compendium of Superfund Field Operations Methods." Purging continues until all stagnant water within the wells is replaced by fresh formation water, as indicated by removal of a minimum number of well volumes and/or stabilization of the above parameters. Produced groundwater is stored on site in 55-gallon, Department of Transportation-approved drums, pending receipt of analytical results. Sampling is performed after the well recharges to at least 80 percent of hydrostatic. Groundwater sampling is accomplished with a 0.75-inch or 1-inch diameter bailer that is lowered and partially submerged into the well. For volatile organic analyses, groundwater samples are collected in chilled, 40-milliliter, VOA vials having Teflon™-lined caps. Hydrochloric acid preservative is added to all vials by the laboratory to lower sample pH to 2.

Samples are held at 4°C while in the field and in transit to the laboratory. Other appropriate containers, preservatives, and holding protocols are used for non-volatile analyses.

9. HOLE ABANDONMENT

Middle Earth Geo Testing, Inc., utilizes two hole abandonment techniques: re-entry grouting and vacuum-assisted grouting. These methods are described below.

9.1 RE-ENTRY GROUTING METHOD

In the re-entry grouting method, the test rod is completely withdrawn from the hole and a secondary rod is re-inserted to the final depth of the hole. If the hole remains open after retraction of the test rod, it may be possible to insert flexible tubing or small diameter PVC pipe into the hole by hand. In this case, the re-inserted grout line will be close to the original depth of the hole. In cases where the hole does not stay open, the reaction equipment is utilized to push the secondary rod back down to the original depth. A flexible tubing is then inserted through the rod once it has reached the original depth. The rigid rod is then withdrawn leaving the flexible tube in place (see Figure 15 - Grouting by Rigid Pipe with Internal Flexible Tremie Tube). Grout is then pumped down the flexible tube as it is withdrawn from the subsurface, leaving behind a completely grouted hole.

9.2 VACUUM-ASSISTED GROUTING METHOD

In the vacuum-assisted grouting method, a sacrificial ring with a radius at least 0.5 inch larger than that of the rod is pushed during the initial sounding. Prior to entry into the subsurface, the rod punctures a reservoir of grout at the surface. The annular space that has been formed by the sacrificial ring causes a suction to be formed as the rod is pushed into the subsurface. The pumping action, in addition to gravity, causes the grout to be carried along with the rod into the subsurface. Once depth is reached, the rod is retracted and the ring falls off. As the rod is removed, a cavity is temporarily formed immediately below it, causing additional grout to be sucked into the subsurface, filling the hole. When the rod is totally withdrawn, the hole is completely filled with grout (see Figure 16 - Grouting Using Sacrificial Ring Method).

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Job Safety Analysis — Cone Penetrometer Testing

DRAFT

JSA Type: ☒ SAR Operations ☐ Transport ☐Office ☐ Construction	☒ New ☐ Revised	Date: 05/25/2016
MEGT Office: Orange/Fremont Client General Location: General		
Work Type: **Cone Penetrometer Rig Operations**	Work Activity: Cone Penetrometer Testing	

Personal Protective Equipment (PPE):

Minimum PPE is Level D including: Nomex Suit (as needed), safety glasses or goggles, steel-toed boots, hearing protection (as needed), hard hat and gloves.

Additional PPE may be required in the Health & Safety Plan (HSP).

Development Team	Position/Title	Reviewed By	Position/Title	Date
Bobby Hancock	CPT Operations Manager	Amanda Hancock	Administrative Manager	12/15/2015

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g. site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. Safe Performance Self Assessment (SPSA) procedures must be used during field activities. Also consider weather conditions (heat, cold, rain, lightning).

❶ Job Steps	❷ Potential Hazard	❸ Critical Actions
1. Vehicle Parking	• Property Damage, Physical Injury, Disruption to Traffic Flow	• Avoid all overhead structures when entering the site. • Assess the site for suitable safe parking. • Utilize personnel to assist with vehicle maneuvering on site. • Verify all vertical clearances if vehicles must be driven under a structure. • **Verify trucks have wheels chocked**

2. Site Safety Communication	• General Site Safety	• Conduct/Participate in site safety meeting with all parties prior to commencing work at the site. Review the following:
		  • JSA
		  • Site H&S plan
		  • Hospital Location
		  • Emergency equipment shut off
		  • First Aid Kit Location
		  • Eye Wash Station
		  • Fire Extinguisher Location
		  • Spill Containment Location
		  • Exclusion Zone Delineation
		  • Minimum PPE Requirement
		  • Site Traffic Plan
		  • Emergency plan w/contacts
		  • Review SPSA protocols
		  • Evacuation Area and Route
		  • Additional site safety issues
		• Minimum PPE as defined above

		REQUIRED for all site work.

3. Equipment Location Determination	• Impaired Vehicle / Tanker Traffic Routes or Refinery Operations	• Verify critical traffic routes for subcontractor activity and site traffic.
4. Equipment Setup	• Collisions (structures, vehicles, pedestrians)	• Exit vehicle and verify physical structures prior to maneuvering. • Utilize site personnel to assist with clearance for vehicle maneuvering. .
5. Prepare job site	• Injury or Exposure to Public or Other Onsite Personnel • Slip/Fall Hazards • Back Injury from Heavy Lifting • Heat Stress, Exhaustion, or Stroke	• Set up work/exclusion zone. • Post appropriate signs prohibiting unauthorized entry. • Set up clear walking paths between workstations and keep work area clear of any trash or unnecessary equipment. • Use proper lifting posture when unloading and moving equipment and buckets. . • Setup temporary shade for work area if needed. • Maintain drinking water at job site.
6. Lifting of CPT Rig	• Area is clear & stable	• Visually check area to make sure the rig is over a secure surface and no obstructions are in the way of the outriggers

7. CPT operations	• Aware of moving equipment	• Make sure there are no obstructions in the way of the hydraulic push and everyone is clear. Communicate to everyone the dangers of the Hydraulic push Keep hands clear of cog wheel Do not put hands between the top rods and the ceiling during a CPT test.
7. Deconing Equipment	• Cross Contamination & having contact with contamination.	• Use decon housing that mounted under the CPT rig, this will wipe off 99% of soil off the rods. • Wipe rods with a cleaning agent, example would be Simple Green or Alconox . • After wiping rods with cleaning agent wipe a second time with clean water. • Use proper PPE, Nitrile gloves should be worn. • No eating or drinking in the proximity of contaminated equipment. • Make sure to wash before eating or drinking.