gettler — ryan inc.
general contractors

July 26, 1989

Mr. Rick Mueller
City of Pleasanton
Pleasanton Fire Department
Post Office Box 520
Pleasanton, California 94566-0802

Reference: Shell Service Station
3790 Hopyard Road
Pleasanton, California

Gentlemen:

Enclosed is a copy of the work plan prepared by GeoStrategies Inc., dated July 18, 1989, for the above referenced location. The work plan recommends the performance of the following tasks.

- Conduct quarterly water sampling of the Arroyo Mocho Canal in conjunction with the current groundwater sampling program.
- Install one 6-inch diameter recovery well at the site.
- Conduct aquifer testing on the proposed recovery well.
- Conduct time series groundwater sampling on the proposed recovery well.
- Install one groundwater monitoring well to further evaluate the extent of the dissolved hydrocarbon plume.

The installation of the proposed groundwater monitoring well and recovery well will be completed in August 1989 provided that the necessary encroachment permit can be secured in a timely manner.

Please do not hesitate to call should you have any questions or comments regarding this project.

Sincerely,

John P. Werfal
Project Manager

enclosure

cc: Ms. Diane Lundquist, Shell Oil Company
Mr. Tom Callaghan, Regional Water Quality Control Board

1992 national avenue • hayward, california 94545-1787 • 783-7500

GeoStrategies Inc.

WORK PLAN

Shell Service Station
3790 Hopyard Road
Pleasanton, California

Report No. 7632-1

July 18, 1989

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(415) 352-4800

July 18, 1989

Gettler-Ryan Inc.
1992 National Avenue
Hayward, California 94545

Attn: Mr. John Werfal

Re: WORK PLAN
Shell Service Station
3790 Hopyard Road
Pleasanton, California

Gentlemen:

This work plan has been prepared for the Shell Service Station at the above referenced location (Plate 1). The work plan addresses the need to further assess the horizontal extent of petroleum hydrocarbon contamination in the groundwater, and propose remedial action.

BACKGROUND

In March 1986, EMCON Associates (EMCON) issued a report documenting the installation of five borings (S-A through S-E) drilled in tank backfill prior to tank replacement. Soil samples collected from these borings ranged from not detected to 5,100 parts per million (ppm) Total Petroleum Hydrocarbons (TPH) calculated as gasoline. A temporary well was installed in boring S-C.

Ground-water monitoring wells S-1 and S-2 and two tank complex monitoring wells ST-1 and ST-2 were installed in October 1987, in response to a letter dated October 15, 1987, from the City of Pleasanton Fire Department. Pacific Environmental Group, Inc. (PEG) prepared a report documenting the well installations and subsequent sampling (dated December 4, 1987). Results of this sampling detected TPH at concentrations of 16 ppm and Benzene at 0.87 ppm in Well S-2. This report was forwarded to the San Francisco Regional Water Quality Control Board (RWQCB) on December 17, 1987.

In response to the October 1987, investigation results, Alameda County Zone 7 issued a letter to Shell Oil Company dated January 25, 1988, requiring an additional investigation due to the close proximity of an active municipal well to the site.

In January 1988, three additional monitoring wells were installed, S-3, S-4, and S-5. The highest concentrations of TPH ranged from 1.80 ppm to 5.10 ppm. PEG issued a report documenting these findings. This report was dated March 10, 1988, and was forwarded to the RWQCB on March 25, 1988.

A soil investigation was performed on March 21, 1988, prior to tank removal. Borings S-A and S-B adjacent to the existing tank complex, and boring S-C in the proposed tank complex area. TPH as gasoline was detected at 980 ppm and 5,600 ppm in borings S-A and S-B, respectively. Boring S-C also contained TPH at 6 ppm. Woodward-Clyde Consultants (WCC) prepared a report dated April 22, 1988.

Ground-water monitoring well S-1 was properly destroyed on August 6, 1988, due to the tank replacement project. Contaminated soils in the areas adjacent to the former tanks and the product piping was removed by others.

Two monitoring wells were installed off-site on Hopyard Road on October 4, 1988. Soil samples from S-6 collected during drilling contained 10 ppm TPH. TPH was detected in Well S-6 at 1.1 ppm and benzene was detected at 0.013 ppm. These results were documented in a report prepared by WCC dated January 18, 1989.

Two additional soil borings were drilled by WCC and converted to monitoring wells on February 24, 1989 (S-8 and S-9). TPH was not detected in any soil samples collected from these borings, however ground-water samples collected after well installation detected benzene and toluene in Well S-8.

TECHNICAL APPROACH

GeoStrategies has reviewed the EMCON, PEG, and WCC reports and general site information including previous investigations and site monitoring data. The surface soils consist of the Clear Lake clay, a dark gray, very deep soil that occurs in large bodies in nearly level basins. The soil appears to possess low permeability and when it is dry and deeply fractured, it absorbs water readily. Locally, this unit is a highly plastic dark gray clay with occasional laminae of silt, sand and peat.

Based on our review of available data for the site, we are in general agreement with WCC in their opinion that the significance of the Arroyo Mocho Canal in providing a ground-water barrier needs to be evaluated further. Ground-water flow direction appears to be to the southeast of the site. Due to the close proximity of water-supply wells located downgradient, it is important to determine the role played by the Arroyo Mocho Canal.

Benzene concentrations have been detected above current State of California Department of Health Services (DHS) action levels in Wells S-2, S-4, S-5, S-6, and S-8 during this quarter (sampled March 7, 1989). Benzene concentrations ranged from 0.52 ppm in Well S-5 to 0.0012 ppm in S-8. (See Plate 2) We recommend the installation of one interim recovery/test well in the vicinity of existing Well S-5. The purpose of the interim recovery well is to begin hydraulic control of on-site hydrocarbons from the shallow groundwater.

Aquifer characteristics need to be evaluated to estimate hydraulic properties and ground-water flow rates. These data will be used to assess contaminant migration potential, enable calculation of ground-water flow rates in the area, as well as provide information which will assist in designing a remedial plan for the site.

Downgradient Wells S-9 and S-7 historically have not detected contaminants. However, available chemical data may indicate plume movement is in this area. Therefore, another downgradient well is needed to evaluate the extent of the plume and provide a significant monitoring point for defining the eastern extent of the plume.

WORK TASKS RECOMMENDED

TASK 1. Sampling will be performed to further evaluate the effectiveness of Arroyo Mocho Canal as a possible shallow ground-water discharge area. Surface water samples will be collected from the Arroyo Mocho Canal to monitor the water quality in the canal. The samples will be analyzed for TPH using EPA Method 8015 (Modified) and BTEX using EPA Method 8020. Samples will be taken from a specified monitoring point located along an assumed transport line. The initial frequency of sampling will be in conjunction with the quarterly ground-water monitoring program. Future sampling intervals will be determined based on the results obtained.

TASK 2. Install one recovery well near existing Well S-5. The proposed well will be drilled to a maximum depth of 35 feet or to the bottom of the first encountered saturated zone. Soil samples will be collected at five-foot intervals as a minimum to describe subsurface lithology, perform head-space analysis for volatile organic presence, and for the selection of samples for chemical analysis. Additional samples may be collected for geologic descriptions and/or chemical analysis. The well will be constructed using a minimum six-inch diameter casing and designed according to standard well design methodology. The well screen will extend a minimum of 2 feet above the encountered water level to accommodate for separate-phase product (if present) and potential diurnal and seasonal fluctuations in water levels. The proposed location of the recovery well is shown on Plate 1.

TASK 3. After installation the recovery well will be properly developed. Following well development, a step-drawdown and a 24-hour constant rate pumping test will be performed. The purpose of these tests is to assess the potential effectiveness of the interim recovery system and assist in defining aquifer characteristics so that an appropriate long-term remedial system can be selected and implemented, if necessary. During the pumping tests, water-level drawdown and recovery measurements will be recorded in the interim recovery well and existing wells. Water-levels will be measured prior to beginning each test to establish background data for comparison to the test measurements. The field data collected will be evaluated and aquifer characteristics will be calculated. Hydraulic properties will be evaluated to estimate the system effectiveness.

TASK 4. Time series ground-water samples will be collected from the recovery well. The well will be sampled prior to testing, 15 days after testing, and 30 days after testing. The samples will be analyzed for TPH using EPA Method 8015 (Modified) and BTEX using EPA Method 8020. This data will also be used to evaluate system performance in terms of plume concentration changes.

TASK 5. Install one additional monitoring well downgradient of Well S-6. This well will provide information in defining the eastern edge of the plume. The design of this well will be similar to those previously installed, using available aquifer gradation data. The proposed location is shown on Plate 1.

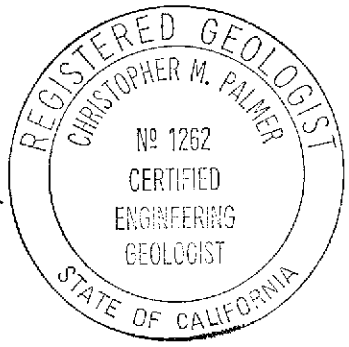
TASK 6. Install one monitoring well further downgradient of Well S-7. This well would only be installed if Wells S-7 and S-9 detected contamination in the future. The design and location of this well will be addressed in a separate addendum, if appropriate.

Attached to this work plan are the methods, procedures and protocols that will be used to investigate this site. Additional scopes of work, if necessary, will follow the procedures outlined in this work plan, or shall be added as an appropriate addendum.

If you have any questions, please call.

GeoStrategies Inc. by,

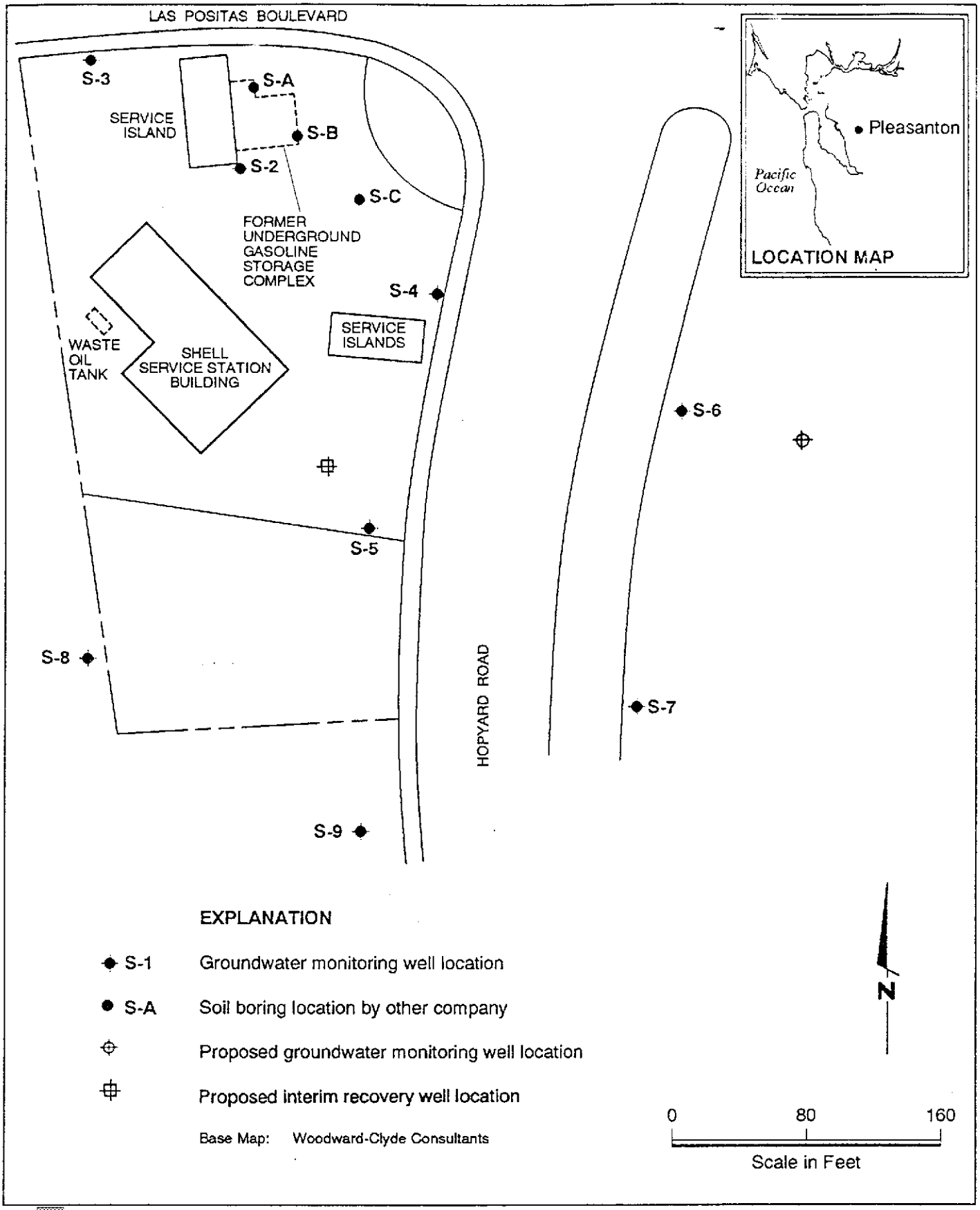
Melissa L. Wann
Project Geologist



Christopher M. Palmer
Senior Geologist
C.E.G. 1262, R.E.A. 285

MLW/CMP/kj

Attachments: Plate 1. Proposed Well Location Map
Plate 2. TPH/Benzene Concentration Map
Field Methods and Procedures
Pump Test Procedures (Addendum)

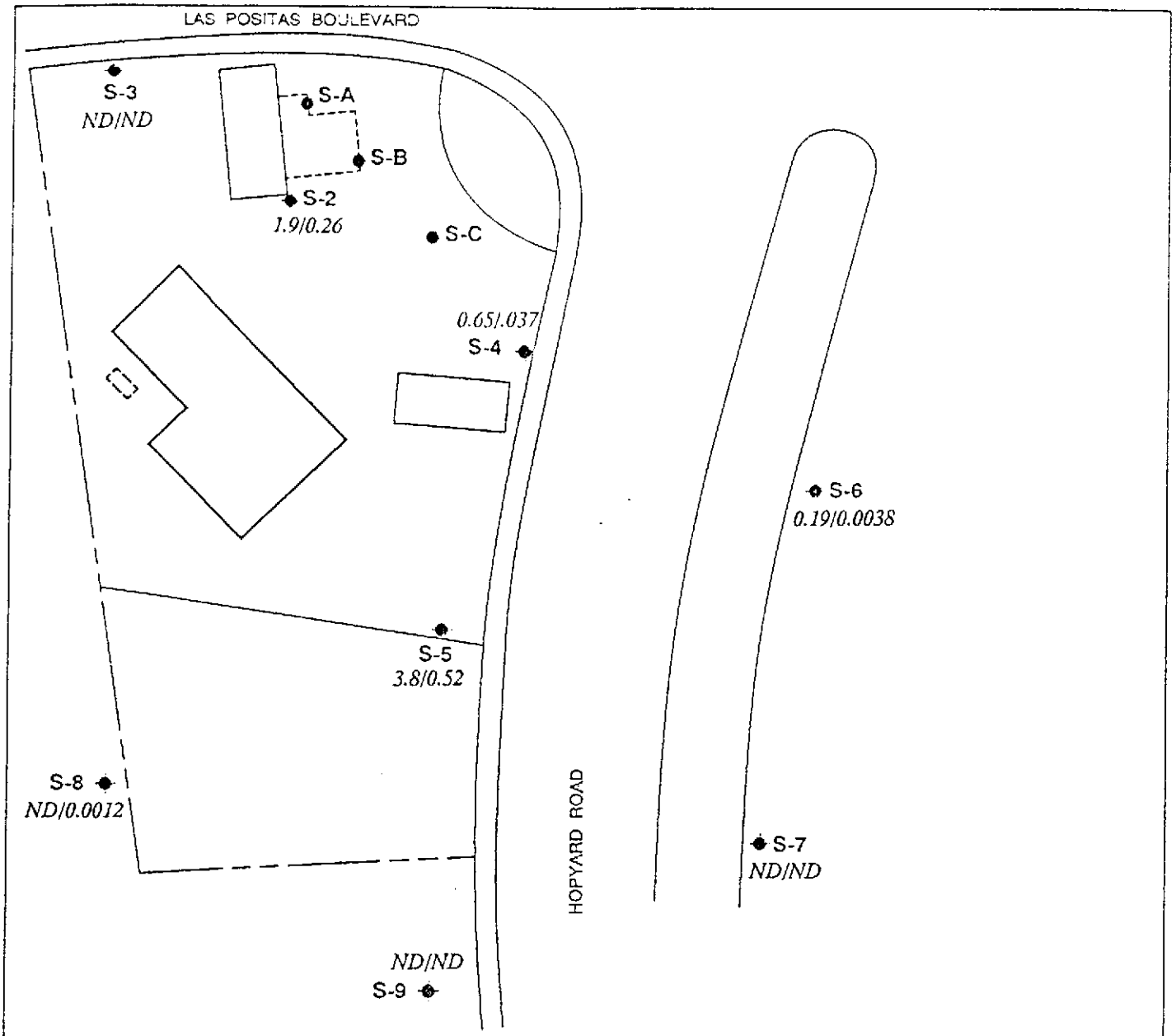


GeoStrategies Inc.

Proposed Well Location Map
Shell Service Station
3790 Hopyard Road
Pleasanton, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7632	CWP COG 12/6/L	7/89		



EXPLANATION

S-1	Groundwater monitoring well location
S-A	Soil boring location by other company
0.19/0.0038	TPH (Total Petroleum Hydrocarbon)/Benzene concentrations measured on March 7, 1989 in ppm (parts per million)
ND	Not Detected (see laboratory reports for detection limits

N

0 80 160

Scale in Feet

GeoStrategies Inc.

TPH/Benzene Concentration Map
Shell Service Station
3790 Hopyard Road
Pleasanton, California

PLATE
2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7632	CWP CEG 1262	7/89		

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GSI will verify necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a quarter-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be properly inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and ground water. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Soil Sampling

Shallow soil borings will be drilled using a truck-mounted hollow-stem auger drilling rig, unless site conditions favor a different drilling method. Drilling and sampling methods will be consistent with ASTM Method D-1452-80. The auger size will be a minimum 6-inch nominal outside-diameter O.D. No drilling fluids will be used during this drilling method. The augers and other tools used in the bore hole will be steam cleaned before use and between borings to minimize the possibilities of cross-contamination between borings.

Soil Sampling (continued)

Soil samples are typically collected at 5-foot intervals as a minimum from ground surface to total depth of boring. Additional soil samples may be collected based on significant lithologic changes and/or potential chemical content. Soil samples from each sampling interval will be lithologically described by a GSI geologist.

Head-space analyses will be performed to check for the presence of volatile organic compounds. Head-space analyses will be performed using an organic vapor analyzer; either an OVA, HNu, or OVM. Organic vapor concentrations will be recorded on the GSI field log of boring (Figure 1). The selection of soil samples for chemical analysis are typically based on the following criteria:

1) Soil discoloration
2) Soil odors
3) Visual confirmation of chemical in soil
4) Depth with respect to underground tanks
5) Depth with respect to ground water
6) OVA reading

Soil samples (full brass liners) selected for chemical analysis are covered with aluminum foil and the ends are capped to prevent volatilization. The samples are labeled and entered onto a Chain-of-Custody form, and placed in a cooler on blue ice for transport to a State-certified analytical laboratory.

Soil cuttings are stock-piled on-site. A composite sample is collected and analyzed for site-specific chemical parameters. Disposition of soils is dependent of chemical analytical results of the composite sample.

Soil borings are backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture.

Exploratory boring logs are prepared under the direction of registered geologist.

Monitor Well Installation

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques.

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that creates hydraulic interconnection of two or more aquifer units. Screen slot size will be compatible with encountered aquifer materials.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be tremied pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be placed from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment will consist of steam cleaning, and/or Alconox wash.

Well Development

Monitoring wells will be developed using a submersible pump, bladder pump or bailer. All well developing equipment will be decontaminated prior to development using a steam cleaner and/or Alconox detergent wash. Wells will be developed until discharge water is visibly clear and free of sediment. The adequacy of well development will be assessed by the GSI geologist. Indicator parameters (pH, specific conductance, and temperature) will be monitored and recorded during well development. Field instrument calibrations will be performed according to manufacturer's specifications.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ±0.01 foot. Water level measurements will be recorded to the nearest ±0.01 foot and referenced to either a project site datum or mean sea level (MSL). A project site datum is typically used for the initial three wells installed at a site to obtain ground-water flow direction and gradient. If additional wells are required, existing and newly installed wells are surveyed relative to MSL.

PUMP TEST PROCEDURES
(addendum)

Aquifer properties will be calculated by measuring water-level drawdowns and recoveries in selected wells and matching graphed data plots to type-curves or use in numerical formulas based on theoretical predictions. Background information will be obtained and reviewed to achieve the best possible data before a test is scheduled. Data review will include the construction details and location of the proposed pumping well(s) and observation wells, subsurface lithology, suspected or known aquifer extent and thickness, aquifer/aquitard relationships, and the anticipated degree of homogeneity and isotrophy of the aquifer to be tested.

SLUG-TEST

Slug tests are performed to estimate the transmissivity of an aquifer with a low hydraulic conductivity. Therefore, the transmissivity (T) values obtained from a slug test are valid for the aquifer material adjacent to the test well only. Slug tests are conducted by introducing or removing a known volume of water into or out of the test well. The introduction or removal of a known water volume is instantaneous. Water-level increases or decreases must be measured rapidly, therefore measurements are taken using a pressure transducer and datalogger. Typically, slug tests are repeated in each test well to obtain an average T-value. Slug test data will be evaluated using either the Papadopulos, Bredehoeft, and Cooper Analytical Method (1973), and/or the Bouwer and Rice Analytical Method (1976).

STEP-DRAWDOWN TEST

The purpose of performing a step-drawdown test (step-test) is to 1) approximate hydraulic characteristics of the pumping well and use these characteristics to estimate well efficiency, and 2) derive a preliminary sustained-yield capacity for the pumping well so that an optimum constant-rate discharge test can be conducted.

Before the step-test is begun, background water-levels will be measured in all wells to be included in the test. After pump activation, drawdown measurements will be made primarily in the pumping well. Water level measurements will be made by using an electric sounder, weighted steel tape, or pressure transducer. Initial measurements will be taken over short time intervals and time between readings and measurements will increase as the test progresses. Even though data from observation wells cannot be used to quantify aquifer properties, these data are useful in qualitatively evaluating the radius of influence of the pumping wells. The initial pumping rate (Q1) will be conservative to assess drawdown in the pumping well and surrounding observation wells at higher pumping rates. Ideally, a minimum of three pumping steps (Q1, Q2, and Q3) will be the goal, with each step incrementally increasing the pumping discharge rate.

STEP-DRAWDOWN TEST (continued)

Each step of the pump test will be allowed to run until equilibrium within the step is indicated. Equilibrium is defined as a minimum of 20 minutes where little to no change in drawdown in the pumping well is observed. The target time interval per step is 60-120 minutes. Drawdown data will be continually collected during each test step and plotted on semi-logarithmic graph paper. The semi-logarithmic plot will be drawdown versus time. The semi-logarithmic data plot will be used to confirm the completion of a step, and will be used to estimate the increase in the discharge rate for the next step. Field data plots will be evaluated using graphical and theoretical analysis techniques developed by Rohrbaugh (1953).

Following the completion of a step-test, the aquifer being pumped will be allowed to recover for a period of no less than 12 hours or aquifer recovery has been achieved before a constant-rate pump test is begun. This recovery period is particularly important because the cone of depression recovery may not be complete for outlying wells if a test is initiated immediately after the step-test. Consequently, the data may be invalid or difficult to evaluate.

CONSTANT-RATE DISCHARGE TEST

Prior to starting a constant-rate discharge test, background water-level measurements will be made in all wells to be included in the test. After pump activation, drawdown measurements will be made primarily in the pumping well. The pumping rate will be constant throughout the test. Selection of the pumping rate shall be made from assessment of step-drawdown test data. Water-level measurements may be made by using an electric sounder, weighted steel tape, or pressure transducer. Initial measurements will be taken over short time intervals and time between readings and measurements will increase as the test progresses.

Drawdown and well recovery data will be plotted for the pumping well and selected observation wells on semi-logarithmic graph paper. Data plots will be maintained throughout the duration of a test. The semi-logarithmic plots will be drawdown versus time. The field data plots will be used to calculate specific aquifer characteristics using the Jacob's Method. Additional data interpretations may be performed based on the requirements of the test results. Examples of additional data analyses may include use of the the residual drawdown method (Theis, 1935), leaky aquifer type curve method (Walton, 1970), and the distance drawdown method. Computer models may be used to estimate hydraulic properties and aid in the selection of remedial action for a site.

PUMP TEST EQUIPMENT

Slug tests will be performed by introducing or abstracting a slug of known volume in or out of a test well. Typically, slugs are made of PVC or steel piping filled with sand and sealed on both ends. Slug volumes are calculated after they are constructed, therefore, their volumes are known prior to use in the field.

Step-drawdown and constant-rate discharge pump tests will be performed by lowering and securing a submersible pump in the test well. Typically, the pump intake will be placed within the screened interval of the test well. The size of the pump and diameter of discharge piping will be sufficient to accommodate expected pump rates. Flow rates during the tests will be controlled and measured using the in-line portable hydrotest manifold system. Pump discharge rates will be regulated using a main-flow adjustable valve located ahead of the flowmeter system. Flow rates are monitored frequently during a test.

Whenever possible, data from the test well, and selected observation wells will be collected using data loggers and pressure transducers. Water levels in wells not equipped with pressure transducers will be measured using either an electric well sounder or an incremented steel tape.

Discharge of pumped water will be to an approved location. All necessary permits for discharge to a sanitary or storm sewer will be obtained before a test is scheduled. If present, discharge may be routed through an on-site remedial system.

All pump test equipment will be decontaminated prior to use using either Alconox or an equivalent detergent, and/or a steam cleaner. If more than one well is to be tested, all equipment will be decontaminated between wells. Maintenance of pump test equipment will be performed on a routine basis. Any required calibrations of equipment will be performed to manufacturer's specifications.