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P.O. Box 4755 Syracuse, NY 13221-4755 315 432-2000

March 29, 1996

Mr. Charles Branagh, P.E.
Regional Engineer, Hazardous Waste Remediation
New York State Department of
Environmental Protection
615 Erie Boulevard West
Syracuse, New York 13204

Re: Kirkville Site
Kirkville, New York

File: 2874.033 #2

Dear Mr. Branagh:

We are in receipt of your letter dated February 28,1996 regarding your comments to our p... water monitoring plan for the Kirkville, New York Site ("Site"). As discussed during our March . meeting, we shall meet the Operation and Maintenance requirements of a proposed Class 4 listing of .. referenced site by implementing a ground water and sediment sampling program ("Sampling Program") which reflects the following points in your February 28, 1996 letter:

- Item 1 - We agree to perform quarterly groundwater sampling for one year, followed by semi-annual groundwater sampling for four years, as presented in Section I.B. of the attached Sampling Program. Reporting of the results of this periodic monitoring shall be as provided in Section V of the Sampling Program.

- Item 2 - We agree to include sediment sampling and analysis in the wetland/stream both up gradient and down gradient of the Site as presented in Section I.B. of the attached Sampling Program. A narrative discussion of the results will be presented in the first quarterly report together with conclusions and recommendations regarding the need for additional sampling.

- Item 3 - We agree to prepare a five-year report to summarize the ground water monitoring data base, and present a ground water concentration trend analysis. The report will also discuss the possibility of achieving an appropriate endpoint goal (which could include risk-based standards that are protective of human health and the environment) and will present conclusions and recommendations regarding the need for additional sampling, and/or delisting. Section V of the attached Sampling Program presents the contents of a five-year report.

We feel strongly, based upon our response efforts and the data presented to the New York State Department of Environmental Conservation (NYSDEC) that a Class 4 listing is justified for the Site for the following reasons:

- The potential VOC contaminant source (657 drums) was promptly removed from the Site upon our discovery.
- Field studies, including extensive soil and ground water investigations (monitoring well installations and ground water, residential well, hydro punch, surface water and sediment sampling) concluded that there was no significant impact to the Site and that two small, localized plumes exist.
- An evaluation of the hydrogeology concluded that due to the low hydraulic gradient at the Site, the plumes are stagnant. Therefore, no impact to down gradient receptors is anticipated.

We are committed to perform the aforementioned activities at this Site upon your written notification that it has been listed as Class 4 on the Registry. If NYSDEC should have any questions, please feel free to call me at 432-2224. We would also appreciate your confirming the timing of the placement of the Site on the Registry and the Site classification so that we can alert Mr. Krutulis.

Very truly yours,

BRISTOL-MYERS SQUIBB COMPANY
PHARMACEUTICAL GROUP -
TECHNICAL OPERATIONS

William J Sivak/DCB

William J. Sivak
Associate Director, EHS Business Support

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cc: C. Borgongnoni - Bristol-Myers Squibb Company
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W. McGarry - Bristol-Myers Squibb Company
L. Leatherman - Bristol-Myers Squibb Company
T. Madden - O'Brien & Gere Engineers, Inc.
S. G. Voigt - Bristol-Myers Squibb Company

Ground Water Monitoring and Sediment Sampling Program

I. SAMPLING LOCATION AND FREQUENCY

A. Ground Water Elevation Monitoring

Ground water elevations will be obtained from monitoring wells MW-1 through MW-5 quarterly for one year, then semiannually for four years. The monitoring well locations are shown on Figure 1. A ground water flow map will be prepared to show the ground water flow map direction and hydraulic gradient.

B. Ground Water and Sediment Sampling and Analysis

Ground water samples will be obtained from monitoring wells MW-1 through MW-5 quarterly for one year, then semiannually for four years. The ground water samples will be obtained in accordance with the Ground Water Sampling Protocol presented in Appendix A. A sediment sample will be obtained from the wetland/stream at the up gradient and down gradient property boundaries as part of the first sampling event. Locations of the sediment samples are shown on Figure 1. The sediment samples will be obtained in accordance with the Sediment Sampling Protocol presented in Appendix B.

Each ground water and sediment sample will be analyzed for VOC parameters (which were previously detected at the site) utilizing USEPA Method 8010/8020. The VOC parameters are as follows:

- Acetone
- 1,1-Dichloroethene
- 1,2-Dichloroethene (total)
- 4-Methyl-2-Pentanone
- Tetrachloroethene
- Trichloroethene
- Toluene
- Vinyl Chloride
- Xylene
- Benzene
- Chloroform

The samples will be accompanied by a trip blank and will be submitted to O'Brien & Gere Laboratories, Inc. utilizing chain-of-custody protocol. A standard chain-of-custody form is shown in Appendix C. As possession of the sample is relinquished by one technician and transferred to another, the chain-of-custody document will be so revised.

II. SAMPLE DESIGNATION

Ground water samples will be labeled using "MW" followed by the well number and sampling round. A sample collected during the first round from well number 1 will be labeled MW-1-1. The second sample would be MW-1-2, and so on. Sediment samples will be labeled using "SED" followed by the sample number. This labeling system will allow for easy identification of the sample location and round of sampling.

III. SAMPLING EQUIPMENT AND PROCEDURES

A. Ground Water Elevation Monitoring

Ground water elevations will be obtained by a water interface probe relative to the surveyed point on the monitoring well riser pipe. The water interface probe will be decontaminated prior to use at each well as discussed in the Sampling Equipment Decontamination Protocol included in Appendix D.

B. Ground Water Sampling

During collection of the ground water samples, the sampler will sample up gradient monitoring well MW-1 first, then proceed with sampling the remaining wells. Ground water samples will be obtained in accordance with Appendix A. Field tests will be conducted on the ground water samples. These tests will consist of measurements of temperature, turbidity, pH and specific conductivity. As described in the sampling protocol, field analysis will be used to guide the appropriate amount of water to be removed from each well. The ground water sampling equipment will be decontaminated in accordance with Appendix D.

C. Sediment Sampling

During collection of the sediment samples, the sampler will obtain the upgradient sample first. Sediment samples will be obtained in accordance with Appendix B. The sediment sampling equipment will be decontaminated in accordance with Appendix D, unless dedicated sampling equipment is used.

IV. FIELD DOCUMENTATION

Field documentation is an essential part of the monitoring program. The field crew will have an assigned team leader who is responsible for written documentation. Field log books will serve as permanent documentation for the ground water monitoring and sediment sampling work. In addition, the field investigator will summarize events and conditions of the work in the log book.

A bound field log book will be maintained by the assigned sampling team leader, or a designee, for documentation purposes. The log book will contain information such as names of workers and other staff members, weather conditions, samples collected, measurements, and significant events, observations, or other pertinent data - notable, unusual occurrences during field investigations. Pages will be numbered, signed, and dated. Field log books will be kept neat and organized. Original data recorded in the field log books will be written in ink. Entries will be legible, factual, detailed and objective.

If an error is made on an entry, corrections will be made by crossing a single line through the error and entering the correct information above. Erroneous information will not be erased, obliterated, or torn out. Errors in the field log book will be corrected by the person who made the entry. Corrections will be initialed and dated.

The following items will be included in the field log book:

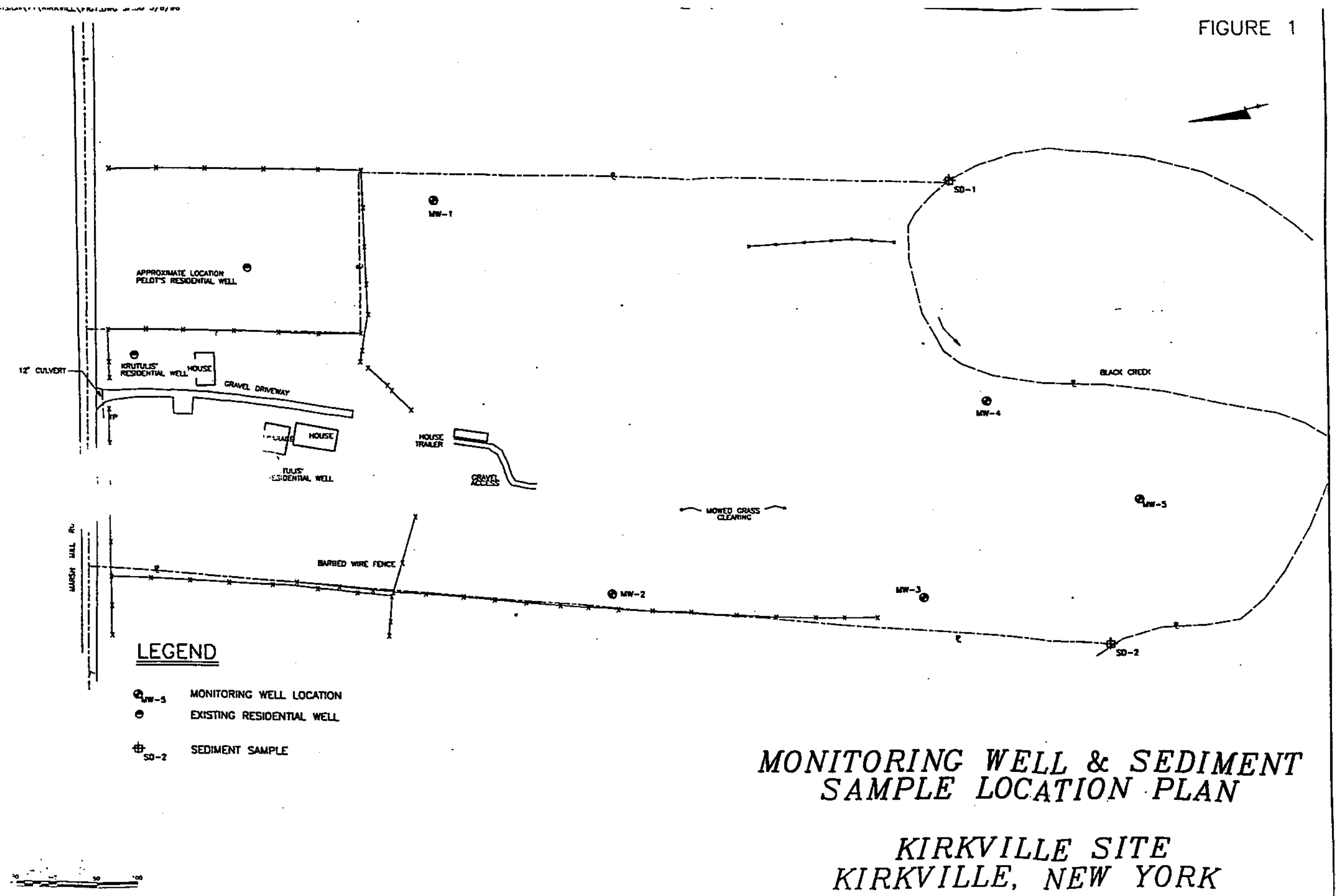
- Name, address and phone number of the sampling team leader;
- Owner and client information;
- Names and affiliations of the personnel on site;
- General description of the day's field activities;
- Documentation of weather conditions during sampling;
- Location of sampling (monitoring well number, sediment sample number and description);
- Name and address of field contact (in cover of log book);
- Description of any accidents involving personnel on site;
- Records of field equipment malfunction and repair;
- Records of site visitations;
- Matrix type and sample description;
- Date and time of sample collection;
- Collector's sample identification number;
- Sample distribution (e.g., laboratory);
- Observations of sample collection environment, if required;
- Field measurements made;
- Sampler's name;
- Sample type (composite, split, etc.); and
- Source and types of preservatives used.

At the end of the sampling day, the sampling team leader or a designee will collect and store the log book in a safe location.

V. REPORTING

Results of each quarterly and semiannual sampling event will be submitted to the New York State Department of Environmental Conservation. Analytical results will be summarized in tabular form. Ground water flow maps will also be presented. A narrative discussion of the methods used, approved deviations (if any), field results, and other pertinent findings will be presented. The five-year report will summarize the ground water monitoring data base, present a ground water concentration trend analysis, discuss the possibility of achieving an appropriate endpoint goal (which could include risk-based standards that are protective of human health and the environment) and present conclusions and recommendations regarding the need for additional sampling, and/or delisting.

FIGURE 1



MONITORING WELL & SEDIMENT SAMPLE LOCATION PLAN

KIRKVILLE SITE
KIRKVILLE, NEW YORK

APPENDIX A

Appendix A. Ground water sampling protocol

This TPPI provides methods and procedures for the collection of representative ground water samples using a bailer or pump. Individuals who implement this TPPI must have been trained in ground water sampling.

A.1. Objective

This TPPI is designed to reduce variability and to encourage continuity in sample collection among samplers who collect ground water samples for O'Brien & Gere. The objectives of this TPPI are the following:

- To enable personnel to collect representative samples of ground water for laboratory analysis.
- To assess the horizontal and vertical distribution of pollutants in a water-bearing unit.

A.2. Technical basis

The sampler must follow correct procedures in order to collect samples that are representative of the ground water. It is the responsibility of the sampler to see that the sample is neither altered nor contaminated by the sampling and handling procedures.

The existing ground water in the casing of the well and near the well may not be representative because of the influence of the well installation. Therefore, well is purged to remove the water within the well casing and to draw ground water that is representative of the formation.

The hydrogeological environment in the subsurface is different from that at the surface. The water's temperature, gas content, reduction-oxidation potential, and other physical, biological, and chemical conditions usually vary between the subsurface and the surface. When the sampler follows appropriate procedures, the sample will typify subsurface ground water conditions.

Before collecting the sample, the common practice is to purge the well (with pump or bailer) until three or more well-volumes have been removed. The pump should not be lowered to the bottom of the well before the well is purged because it will inhibit the complete purging of the well.

The following methods may be used to evaluate the purging of a well:

- Monitor the water level in the well while pumping it. When the level has stabilized, most of the water being pumped will be coming from the aquifer.

- Monitor the temperature, specific conductivity, and pH of the water while pumping it. When they are stable, little or no water should be coming from the casing's storage.

Effective purging is also possible by initially pumping or removing water from the top of the water column and then slowly moving the pump through the water column.

Sampling systems can alter the physical, chemical, and biological conditions of the ground water. Equipment that constricts the flow of the water can change the pH of the sample simply because it changes the partial pressure of the sample's dissolved gases. Equipment that introduces dissolved oxygen in the sample can alter organic and inorganic constituents. Turbulence and reduction of pressure can change the levels of dissolved oxygen, carbon dioxide, and volatile organic compounds.

The sampling equipment should not be allowed to affect the sample. The sampling system used depends on several factors, including the type and size of the well, pumping level, type of contaminant, analytical procedures, and the presence or absence of permanent pumping fixtures.

A.3. Method

To obtain representative samples from wells containing only a few gallons of ground water, the bailing procedure is preferred. To obtain representative samples from wells containing more than a few gallons of ground water, evacuation by pumping is generally more efficient. The procedures below are divided into four subsections:

1. Collection of descriptive data

2. Bailing

3. Pumping

4. Procedure after collecting sample.

When sampling, determine the objectives of the project, the extent of the sampling effort, the sampling methods to be used, and the equipment and supplies that are needed. Obtain the appropriate sampling, filtering, and monitoring equipment. Decontaminate or pre-clean the equipment. Check to see that it is in working order. Prepare the sampling schedule and check the schedule with staff, clients, and regulatory agencies as required.

A.3.1. Collection of descriptive data

Before collecting a sample with either a bailer or pump, data are compiled about the well and the ground water in the well. Before collecting the sample, measure the water level to ascertain the volume of ground water to be removed from the well. This datum also is used for other hydrogeological evaluations. Where appropriate, measure the thickness of NAPL. Follow these steps to measure the water level:

1. Survey the site to locate wells.
2. Check that the water level measuring equipment is operating correctly.
3. As feasible, begin measuring at wells with the least amount of contamination and proceed to those that are more contaminated.
4. Record in field book changes in the well such as erosion or cracks in protective concrete pad or the integrity of the well.
5. Don a new pair of disposable gloves.
6. Slit the center of a plastic sheet, and slip sheet over the well. This creates a clean surface on which the sampling equipment can be positioned.
7. Clean meters, tools, and sampling equipment before placing them on the plastic sheet.
8. Using a pre-cleaned electric water level probe, measure the depth to the ground water and the depth to the bottom of the well twice. Note the measuring points on the well's casing. If Non-aqueous Phase Liquid (NAPL) is present, use an oil-water interface probe to estimate its thickness. Record this information in the Ground Water Sampling Field Log.
9. Decontaminate the well probe. Rinse it with distilled water after use.
10. Compute the volume of water in the well. Use the following equation for the calculation:

well volume = $\pi r^2 h (7.48)$

r = radius of well
h = height of water column

The measures for *r* and *h* are in feet; the well volume is in gallons. Table A-1 shows the volume of water found in wells of typical sizes.

Table A-1. *Examples: volume* of wells per length

diameter (inch)	volume (gal/ft)
2	0.1632
3	0.3672
4	0.6528
6	1.4688

To find the total volume of water, multiply the values in the second column of Table A-1 by the total length of the water column in the well. Record this volume on the Ground Water Field Sampling Log. For low permeable formations, the water in the sand pack must also be purged. Calculate the purge volume based on the borehole's radius.

Having completed those steps, you proceed to collect the sample. Follow these steps to collect the sample:

a. Attach a bailer to a length of clean polypropylene rope to reach the bottom of the well. Lower the bailer slowly into the well. Submerge it only far enough to fill it one-half full. The purpose of this initial bail is to ascertain the presence of Light Non-aqueous Phase Liquid (LNAPL).

b. Collect a sample to assess appearance:

   i. Remove the bailer from the well. Keep the polypropylene rope on the plastic sheet.

   ii. Transfer the recovered ground water from the bailer to a clean glass container.

   iii. On the Ground Water Sampling Field Log, record the appearance of the sample, including the presence of a sheen, odor, and turbidity.

Note: This sample will not undergo laboratory analysis. It is collected to observe the appearance of the ground water only.

c. Collect a sample to assess the presence of a Dense Non-aqueous

Phase Liquid (DNAPL):

i. Lower the bailer slowly to the bottom of the well.

ii. Retrieve a sample of water at the base of the well.

iii. Transfer the recovered ground water from the bailer into a clean glass container.

iv. On the Ground Water Sampling Field Log, record the appearance, including the presence of a separate-phase liquid, odor, and turbidity.

Note: This sample will not undergo laboratory analysis and is collected to ascertain the presence of NAPL.

The subsequent steps of the sampling depend on whether you are using a bailer or pump to collect the sample. Follow the instructions in the appropriate subsection below.

A.3.2. Bailing
Use the following steps to withdraw ground water from a well with a bailer:

a. To bail the well, follow these steps:

i. Lower the bailer to the bottom of the well. Move the bailer up and down to resuspend any material that may have settled to the bottom of the well.

ii. Initiate bailing of the well from the bottom. Keep the polypropylene rope on the plastic sheet. Pour the ground water from the bailer into a container of known volume to measure the volume withdrawn from the well.

iii. Continue bailing the well through the water column and from the bottom until a sufficient volume (at least three well volumes) has been removed or until the well is dry. If the well is dry, allow sufficient time for the well to recover before proceeding.

During the removal of successive well volumes, measure the water temperature, pH, and conductivity with calibrated meters. Record the data on the Ground Water Sampling Field Log.

b. Keep sample bottles cool and with their caps on until they are ready to receive samples. The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement. Samples are transferred directly from the sampler to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it.

When you are ready to fill the bottles, remove them from their transport containers. Prepare them to receive the samples:

i. Inspect labels to see that the samples are properly identified.

ii. Arrange the sampling containers to allow for convenient filling:

- Fill the containers that will undergo analysis for volatile organic compounds (VOC) first.
- If necessary, collect both a filtered and unfiltered sample for ground water that will be analyzed for metals.

c. Examine the sample containers and verify they are labeled. Collect the samples in the following way:

i. Minimize agitation of the water in the well; begin sampling by lowering the bailer slowly into the well. Lower it only far enough to fill it completely.

ii. Fill each sample container in accordance with the QAPP or other sampling outline.

iii. Return each sample bottle to its proper transport container.

iv. Record the appearance of the ground water on the Ground Water Sampling Field Log.

Keep these considerations in mind:

- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- The VOC containers should be filled first, from one bailer, then securely capped.
- **Samples must not be allowed to freeze.**

d. Take these actions after the last sample has been collected:

   i. Record the date and time.

   ii. Place a sample of well water in a beaker. Measure and record the pH, specific conductivity, turbidity, and temperature on the Ground Water Sampling Field Log.

   iii. Rinse the beaker with distilled water before reuse.

Continue with the procedures described below in subsection A.3.4., "Procedure after collecting sample."

A.3.3. Pumping

Use the following steps to withdraw ground water from a well with a pump:

a. Prepare the pump for operation. Follow the manufacturer's directions.

b. To withdraw water from the well, follow these steps:

   i. Lower the pump to just below the top of the water column.

   ii. Pump the ground water into a graduated pail. Continue pumping until sufficient well volumes (at least three) have been removed or the well is pumped dry. Lower the pump's intake as necessary.

   iii. If the well is pumped dry, allow sufficient time for the well to recover before proceeding. Record this information on the Ground Water Field Sampling Log.

c. Arrange the sampling containers to allow for convenient filling:

   The type of analysis for which a sample is collected determines the type of container, preservative, holding time, and filtering requirement. Samples are transferred directly from the sampler to the container. The container should hold any necessary preservative and should be correctly labeled before the sample is transferred to it.

   - Fill the containers that will undergo analysis for volatile organic compounds (VOC) first.

- If necessary, collect both a filtered and unfiltered sample for ground water that will be analyzed for metals.

d. Collect the samples that will be analyzed in the following way:

i. With the pump raised to a level just below the surface of the water in the well, fill each sample container in accordance with requirements of the QAPP or other sampling outline.

ii. Return each sample bottle to its proper transport container.

iii. Record the appearance of the ground water on the Ground Water Sampling Field Log.

e. Perform the following tasks after the last sample has been collected:

i. Record the date and time.

ii. Place a sample of well water in a beaker. Measure and record the pH, specific conductivity, turbidity, and temperature on the Ground Water Sampling Field Log.

iii. Rinse the beaker with distilled water before reuse.

Keep these considerations in mind:

- If the sample bottle cannot be filled quickly, keep them cool with the caps on until they are filled.
- The containers labeled VOCs should be filled first from one bailer then securely capped.
- **Samples must not be allowed to freeze.**

f. Remove the pump from the well.

A.3.4. Procedure after collecting sample

After you have collected the sample, follow these practices to complete the documentation and leave the well intact and secure:

a. Pack and log the sample. Put the samples in a cooler containing ice or coolant pack. Ship samples within 24 hrs or as specified in the work plan or QAPP, whichever is shorter. Include adequate packing and coolant with the samples so that the samples arrive unimpaired.

b. Begin the chain of custody.

c. Replace the well cap, and lock the well protection assembly before leaving the well location.

d. Put the polypropylene rope, gloves, and plastic sheet in a plastic bag for disposal.

e. Decontaminate the equipment:

Bailer. Follow decontamination procedures discussed in the work plan, or QAPP. Wrap the decontaminated bailer in aluminum foil.

Pump. Clean the pump and associated tubing both internally and externally:

i. Rinse with wash water and distilled water using disposable towels and separate wash basins.

ii. Return the pump to its covered storage box.

f. Place the polypropylene rope, gloves, and plastic sheet into a plastic bag for disposal.

A.4. References

ASTM. 1993. "Standard guide to the selection of purging and sampling devices for ground water monitoring wells." Committee D-18.

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USEPA. 1991. *Compendium of ERT groundwater sampling procedures*.

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APPENDIX B

Appendix B. Sediment sampling protocol

B.1. Objective

The objective of sediment sampling will be to collect representative sediment samples for laboratory analysis from within surface water bodies.

B.2. Procedure

1. The sampler will don a new pair of disposable gloves.

2. The sampling bottles will be removed from their transport containers and prepared for filling. Bottles will be checked for complete and proper sample identification and labeling. Sample bottles will be kept cool with their caps on until they are ready to fill.

3. A precleaned stainless steel sampling utensil, such as a trowel, spoon, or similar instrument, or lexan tubing will be used to collect sediment samples from shallow, low velocity surface water bodies.

4. Collect a sufficient volume of sediment from the bottom of the water body to a depth of approximately 6 inches using the sampling utensil. If the sediment sample is being collected from a flowing water body such as a stream, the sampler will face upstream during collection activities.

5. Subsequent to collection the sample will be transferred to a pre-cleaned laboratory container. Adequate sediment will be collected to fill the appropriate container. Once collected, the samples will

be labeled with the sample identification number, site name, samplers initials, date, and time and stored in an ice-filled cooler. Chain-of custody documentation will be initiated and will accompany the samples from the point of collection to laboratory delivery.

6. Sample collection equipment will be cleaned between sampling locations in accordance with the decontamination protocol.

APPENDIX C

CHAIN OF CUSTODY RECORD

O'BRIEN & GERE
LABORATORIES, INC.

SURVEY:

LOCATION:

SAMPLED BY:

ORGANIZATION:

STATION NUMBER	SAMPLE LOCATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	COMP. OR GRAB	NO. OF CONTAINERS	ANALYSIS REQUIRED

Relinquished By:	DATE	TIME	Received By:	DATE
Relinquished By:	DATE	TIME	Received By:	DATE
Relinquished By:	DATE	TIME	Received by Laboratory:	DATE

COMMENTS:

METHOD OF SHIPMENT:

APPENDIX D

Appendix D. Sampling equipment decontamination protocol

This TPPI documents the procedure O'Brien & Gere Engineers, Inc. (O'Brien & Gere) uses to decontaminate equipment and materials used to sample or otherwise handle water, soil, soil gas, sediment, sludge, water, or other media that is being sampled for chemical quality. The procedures discussed here apply to sites where organic and inorganic parameters are the contaminants of concern. This TPPI does not apply to radioactive waste or mixed waste.

Sampling equipment must be decontaminated before each use and before it is removed from a site. Decontamination is an essential step in the quality assurance of a sampling protocol. Improperly cleaned or prepared sampling equipment can lead to misinterpretation of environmental data due to cross contamination. Cross contamination can result when contaminants are introduced to a location by equipment which has either been cleaned improperly or not cleaned at all. Since laboratories will be analyzing the samples with sensitive instruments, the quality control that decontamination contributes to is critical.

Sampling equipment is decontaminated before it reaches the field. If the equipment is reused and if laboratory cleaning is not an option, a decontamination station must be established in the field, and the decontamination procedures are conducted there.

D.1 Objective

Decontamination procedures are designed to remove particles and compounds which could affect the integrity and, thus, the interpretation of environmental sampling data. O'Brien & Gere decontaminates materials and equipment used in field sampling work for the following reasons:

- Maintain the acceptability of field samples for the data they will generate

- Prevent cross-contamination of samples
- Minimize the spread of contaminants
- Reduce the potential for workers to be exposed to contaminants

D.2. Method

To establish decontamination methods for a particular site, the project manager must have an understanding of the conditions of the site and the expected type and concentrations of the contaminants. An awareness of site contaminants aids in the selection of reagents for decontamination. For example, if acetone is a contaminant of concern it cannot be used in the solvent rinse step of decontamination.

Decontamination methods and materials are selected based upon the type of contamination and the decontamination method's ability to remove the contaminants. The following are the basic elements of the decontamination procedure:

- Equipment which has the potential to contact the environmental medium to be sampled should be washed with a detergent solution and rinsed with control water before it is used. Control water is clean water from a supply with a known chemical composition.
- A solvent, acetone for example, is used to remove contamination from organic compounds. The solvent causes the contaminant to enter the decontamination solution. Acetone, which is identified as a VOC parameter previously detected, will not be used as the solvent at this site.
- Acid is used when sampling for inorganic contaminants. It provides a low pH solution and causes the inorganic contaminant to withdraw from the equipment and enter solution.
- The materials used to contain solutions and scrub the equipment must be resistant to attack from the solvent and acid solutions.

Specific limitations to field decontamination include the following items:

Weather. Cold temperatures reduce the potential of solvents to volatilize.

Space requirements. Decontamination requires space both for the decontamination process itself and for the storage of equipment and materials after decontamination. This space must be available at the site of the work and must be away from the area of contamination.

Disposal issues. Materials generated by the decontamination process, such as rinse waters, must be properly disposed.

D.3. Field equipment decontamination

A field decontamination station should be located away from the source of contamination (to prevent potential cross contamination) but close enough to the sampling team to facilitate equipment handling. The decontamination station should be set up in a way to not affect clean areas of the site. Whenever possible, field sampling should be initiated in that area of the site with the lowest known contamination and proceed to the area of highest known or suspected contamination.

The use of multiple sampling units allows decontamination teams to rotate sampling equipment effectively. The following is a step-by-step procedure for field equipment decontamination:

1. Using a laboratory grade detergent and control water, remove visible particles and residuals. Note the following:
   - This step may be preceded by a stream or high pressure wash in order to facilitate residual removal
   - For equipment that cannot be adequately cleaned with a brush due to internal mechanisms or tubing, the decontamination solution should be circulated through the equipment
2. Rinse the equipment thoroughly with control water or distilled

deionized water to remove the detergents.

3. If the samples are to be analyzed for inorganic compounds, apply an acid rinse to remove trace metals. The acid solution can be made with 10% nitric or hydrochloric acid solution made from reagent grade or nitric or hydrochloric acid and deionized water: that is, one part acid to 10 parts water.

4. Thoroughly rinse the equipment with control water or distilled deionized water.

5. Rinse the equipment with a high purity solvent (pesticide grade) to remove traces of organic compounds. Acetone, methanol, and other water soluble solvents are acceptable for the solvent rinse step. Methanol will be used in this program.

6. Allow the solvent rinse to evaporate and the equipment to air dry.

7. Give the equipment a thorough rinse with distilled deionized water rinse to remove any residual traces of solvent.

8. Wrap the sampling equipment with a clean inert material such as aluminum foil for transport to the sample collection area. Note that household aluminum foil often has a coating of oil and should not be used for this purpose.

The decontamination process should be well documented. Each step, materials used, and the disposition of waste should be recorded in a field notebook. Miscellaneous items such as weather conditions, nearby activities, and other issues which could affect results should also be recorded.

D.4. Decontamination of heavy equipment

Equipment and materials associated with sampling must be cleaned before and after use at a site. Items such as drill rigs, auger flights, backhoes, and miscellaneous heavy equipment all present potential sources of interference to environmental samples. These items may contact the materials to be sampled and may retain contaminants from other sources such as roadways or storage areas. They may also hold soil material from previous sites that have not been removed. Field decontamination of heavy equipment requires a large area of ground which, if applicable, should be covered by plastic to control liquid discharge to the ground.

Two options are available to clean heavy materials:

Steam cleaning. A steam generator uses high pressure to remove visible debris and residuals. Steam generators are typically easy to handle, and they generate low volumes of waste water. This method also has disadvantages. It requires a fixed or portable power source, and they may not be economical for use on small pieces of equipment or for sampling events that are of short duration.

Manual scrubbing. This procedure can be as effective as steam cleaning, or it can be preferred in situations where stem cleaning fails to remove visible material. The field technician scrubs the equipment with a laboratory grade detergent solution to remove material. After the scrubbing, the technician rinses the equipment with water. Manual scrubbing is labor-intensive, and it generates large volumes of wash and rinse solutions.

D.5. References

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