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l a b o r a t o r y

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STEP-BY-STEP FIELD PROCEDURES AND RECOMMENDATIONS

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AVOIDING CROSS CONTAMINATION

Contamination is the most detrimental factor to a successful dye trace. Fluorescent dyes used in leak detection and groundwater tracing are prepared from high-purity powders. Highly concentrated aqueous solutions of dye are then injected into the flow path to be studied. After injection, key points are monitored using activated charcoal receptors analyzed for fluorescence using a delicate and precise instrument, the scanning spectrofluorophotometer, which can detect dyes at part per trillion levels.

Due to the concentration of dye used for injection and the sensitivity of methods used for analysis, contamination of materials, personnel, and equipment is of great concern. When concentrated dyes are injected into the flow path, personnel wear at the very minimum latex gloves and rubber booties to prevent dye from coming into contact with the hands and feet. These are the most vulnerable to splashes and the easiest means of contaminating other materials with dye. The immediate area around the dye injection point is routinely covered with plastic sheeting, 2-4 mil, and absorbent padding to confine and control unwanted spills. Care is used when handling injection equipment (pumps, tubing, etc.) and injection is usually performed by *one person* who will not have any contact with other materials or perform any other procedures until they have had a shower and change clothes. If collecting samples on the same day that a dye injection is performed, separate personnel should fulfill each duty. No personnel who will be performing a sample collection should come into contact with dye, dye containers, or materials used during dye injection.

For the purpose of decontaminating materials and equipment a 50/50 solution of bleach and water should be used. Pumps should be adequately flushed and all potentially contaminated surfaces sanitized. Containers used to hold concentrated dye and/or disposable tubing used for injection should be disposed of off-site to minimize potential for unintended introduction of dye to any water pathways. Disposable or dedicated equipment should be used for monitoring well sample collection. Contamination is the primary cause of skewed data and may compromise the results of a dye trace.

INITIAL RECEPTOR INSTALLATION AT NON-WELL MONITORING LOCATIONS

1. Determine where the receptor is to be placed.
2. Put on a new pair of latex gloves.
3. Attach black nylon twine to a gumdrop (deep water) or flat rock (shallow water).
4. Remove new receptor from bag and attach it to the weight with the paper clip on the stream receptor.
5. Place the weight and receptor into the water where it will receive the most optimal flow. (In extremely small bodies of water the channel may have to be manipulated to ensure proper flow over the receptor.)
6. Attach the other end of the twine, leaving some slack in the line, to a stable object (a tree or a post works great).
7. Mark the object that the receptor line is tied to with flagging tape so that it can be found easier when the receptor is picked up. Put the receptor name and/or number on the ends of the tape.
8. Also attach a key tag to the object that the receptor is tied to. Put the receptor name and/or number on the key tag, this serves as a double check to the flagging tape in case the flagging tape falls off or is removed.
9. Mark the receptor location on a map of the area as accurately as possible. If no map is available draw a sketch map of the receptor area, so the receptor can be found when the receptor is retrieved.

DYE RECEPTOR EXCHANGE PROCEDURES FOR NON-WELL MONITORING LOCATIONS

1. Put on a new pair of disposable gloves.
2. Write all pertinent information (project name, receptor ID number, name of monitored point, date and time of retrieval, and initials of collector) on bag with permanent BLACK ink.
3. Use tether to retrieve receptor from monitoring location. If wading is necessary, approach location from a downstream direction.
4. Remove new dye receptor and grab sample vials from polyethylene bag. Set aside grab sample vial.
5. Without touching the receptor already deployed, attach the 'new' receptor to the tether, then remove the 'old' receptor.
6. Wash off excess dirt and debris from the collected receptor directly in the water at the monitoring location; be sure to remove paper clip or extra cable ties from receptor to prevent puncture of bag.
7. Place old receptor into new polyethylene bag.
8. Place new receptor into the original receptor location, making sure to position receptor to receive optimal water flow.
9. Take a grab sample at the monitoring location.
10. Place grab vial into polyethylene bag with old receptor.
11. Seal polyethylene bag.
12. Place sealed bag into sealable cooler when leaving the field.
13. Transfer information on sample bag to the chain of custody.
14. Store samples out of direct contact with sunlight and under refrigeration until they are to be shipped.

INITIAL RECEPTOR INSTALLATION IN MONITORING WELLS

1. Using a water level indicator or other comparable means measure the distance to the water level inside the well from the top of the casing.
2. Take that distance plus ~ 15 feet to measure off the receptor line to be used in that particular well. (5 feet to tie the line off, and 10 extra feet to put receptor below water surface or appropriate length to screened section of the well).
3. Tie a loop in one end of the receptor line; this will be used to attach the well receptor to the line.
4. Attach a marble pack (or other type of weight) to the loop using the cable tie attached to the marble pack.
5. Attach the well receptor to the loop using the cable tie attached to the well receptor; leave some slack in the cable tie to make removal easier. If the well is narrow you may want to attach the receptor to the marble pack or weight system to reduce width.
6. Using the extra five feet of receptor line wrap the free end of the line around the top of the well casing. (Properly secure the line to the casing, making sure the line will not slip off the casing down into the well).
7. With the top of the receptor line secured to the well, lower the receptor and marble pack into the well making sure that all of the measured monofilament line is used.
8. Using another piece of line attach a key tag, with pertinent receptor and well information on it, to the outside of the well so it can be identified without removing the well cover.
9. Be careful not cut the monofilament line when placing the cap back on the well.

DYE RECEPTOR EXCHANGE PROCEDURES FOR MONITORING WELLS

1. Put on a new pair of disposable gloves.
2. Write all pertinent information (project name, receptor ID number, name of monitored point, date and time of retrieval, and initials of collector) on bag with permanent BLACK ink.
3. Remove the well cover and set aside.
4. Pull up receptor line slowly, wrapping the line around the palm of your hand. Do not allow the line to touch the ground or the outside of the well for it may have high levels of dye on it and cause possible cross-contamination problems. Having two field personnel present makes well receptor exchange easier.
5. Remove new dye receptor and grab sample vials from polyethylene bag. Set aside grab sample vial.
6. Without touching the receptor already deployed, attach the 'new' receptor to the line, then remove the 'old' receptor by cutting the cable tie with scissors.
7. Be sure to remove extra cable ties from receptor to prevent puncture of sample bag.
8. Place 'old' receptor into new polyethylene sample bag.
9. Lower the new receptor back into the well, making sure that all of the measured monofilament line is used.
10. If a water sample is to be collected, use a dedicated combination marble pack or disposable bailer and fill grab vials with well water sample.
11. Place grab vial into polyethylene bag with 'old' receptor.
12. Seal polyethylene bag and place into sealable cooler when leaving the field.
13. Transfer information on sample bag to the chain of custody.
14. Store samples out of direct contact with sunlight and under refrigeration until they are to be shipped.

SAMPLE BAG LABELING

The diagram shows a rectangular label with a dotted line at the top and a solid line at the bottom. The label is divided into two main sections by a horizontal line. The top section contains the following information:

Project Name → <i>U.S. LANDFILL-Geo...Corp</i>	Time → 0845
Receptor ID → <i>SP 001</i>	Date → 02/20/03

The bottom section contains the following information:

Location ID/Name → <i>Lazy Spring</i>	Sample Collector's Initials → <i>RR</i>
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Project Name-- Usually the site name followed or preceded by project contractor name.

Receptor ID-- A succinct identifier which follows a numeric sequence:

Location ID/Name-- Location name or identifier. This would be the name of the inventoried feature which corresponds uniquely to it's receptor ID number. For example MW-04 for a well name, or Bubbling Spring or Shelby Farm Karst Window for a feature, etc.

Time-- The time at which the sample was collected.

Date-- The date on which the sample was collected.

Sample Collector's Initials-- The sample collector's initials.

ADDITIONAL RECOMMENDATIONS FOR FIELD ACTIVITIES

- Label sample bags before going out to the field to collect receptors, with the exception of collection time or collector's initials (if more than one person is participating in sample collection). It may be convenient to pre-print adhesive bag labels and leave blanks where information may be entered in the field such as date, time, and sample collector's initials.
- Pre-print the chain of custody so that the receptor ID follows a numeric sequence. This makes entering COC information in the field more efficient.
- Identify on the sample bag and on the COC any conditions relevant to the sample collection. For example: Receptor lost, Receptor out of water, Receptor frozen in ice. If receptor is missing from location, always collect a water sample in a grab vial.
- Do not put paper clips in sample collection bag. Remove the paper clip from the receptor and dispose of it. A paper clip can puncture a sample bag and cause contamination problems.
- Always use a fresh pair of gloves when collecting each individual sample. Additionally use gloves when handling samples for packaging and shipping. Not only can samples cross-contaminate each other, but the collector can contaminate samples or sample collection bags inadvertently by handling the samples all the way up to the time of shipping.