100% DESIGN POST-CLOSURE OPERATIONS, MAINTENANCE AND MONITORING PLAN

HIMCO DUMP SUPERFUND SITE FINAL LANDFILL CLOSURE ELKHART, INDIANA

Prepared For:

EPA United States Environmental Protection Agency

**Region 5
Chicago, Illinois**

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OM&M PLAN

PREFACE

This Draft Operations, Maintenance, and Monitoring (OM&M) Plan has been developed as a guide for development of the Final OM&M Plan. The final OM&M Plan will be developed by the construction contractor and the site custodian to reflect equipment, materials, procedures, and other information obtained during construction and initial operation. This will include significant revision of the landfill gas collection and operation system to reflect equipment manufacturer maintenance and inspection schedules. Various forms that are provided throughout the document will need to be updated once as-built data is available.

Volume I of this plan contains the various requirements for performing post-closure activities at the site. Volume II, which is not provided, will contain the technical construction specifications and as-built drawings. A preliminary table of contents is provided for Volume II of the Plan.

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ACRONYMS

CFR:	Code of Federal Regulations
cfm:	cubic feet per minute
GAC:	Granular Activated Carbon
GCL:	Geosynthetic Clay Liner
IAC:	Indiana Adminstrative Code
LEL:	Lower Explosive Limit
LFG:	Landfill Gas
LGAC:	Liquid Granular Activiated Carbon
mg/l:	milligram per liter
OM&M:	Operations, Maintenance,and Monitoring
OSHA:	Occupational Safety and Health Adminstration
POC:	Point-of-Contact
POTW:	Publicly Owned Treatment Works
SSHP:	Site Specific Health and Safety Plan
SVOC:	Semi-Volatile Organic Compounds
USEPA:	United States Environmental Protection Agenecy
USACE:	United States Army Corps of Engineers
TBD:	To Be Determined
TSD:	Temporary Storage or isposal
VOC:	Volatile Organic Compounds

1. INTRODUCTION

1.1. GENERAL. This operations, maintenance, and monitoring (OM&M) plan is a comprehensive guide to landfill post-closure operation, inspection, maintenance, and monitoring activities required at the Himco Dump Superfund Site in Elkhart, Indiana. This plan meets the requirements of Title 329 of the Indiana Administrative Code (IAC) for landfill post-closure duties and plans as specified in 329 IAC 2-15. The plan also meet the requirements of proposed rule 329 IAC 10-23 and Title 40, Parts 264 and 265, Subparts G (closure and post-closure), K (surface impoundments), and N (landfills), of the Code of Federal Regulations (CFR).

All of the operation, inspection, routine maintenance, and monitoring activities described herein will be completed on a regular basis under a pre-established schedule. This schedule will become effective upon completion of construction of remedial measures. The construction contractor is required to operate, monitor, and maintain the site for a period of one year after completion of construction per the construction specifications and this OM&M plan. After this time, operation, monitoring, and maintenance of the site will be the responsibility of the Site Custodian as designated below.

This plan will be updated and revised by the construction contractor and the Site Custodian to reflect materials, equipment, procedures, and information obtained during construction and initial operation.

1.2. PURPOSE. This OM&M plan details those tasks which must be performed in order to ensure that the integrity of the remedial measures are maintained during the 30-year post-closure period. This manual also specifies the requirements for post-closure ground water and air monitoring. In addition to normal OM&M activities, this manual provides a contingency plan in the event that any of the systems fail.

1.3. SITE CUSTODIAN. *****TO BE INSERTED AFTER DETERMINATION IS MADE***** is designated as the Site Custodian during the post-closure period for the final landfill closure of the Himco Dump Superfund Site. The Site Custodian is responsible for implementing and maintaining this OM&M plan for the site during the 30-year post-closure period. The Site Custodian will arrange and supervise all investigation, operation, maintenance, monitoring, and reporting activities for the site as prescribed in this plan. The Site Custodian is also responsible for maintaining a permanent records file for all documents generated for this project during the closure and post-closure period.

1.4 POINTS-OF-CONTACTS. The point-of-contact (POC) for the Site Custodian is provided in Appendix A along with a list of other potential POC's.

1.5. PROJECT BACKGROUND. The Himco Dump Superfund Site is located adjacent to County Road 10 and the Fort Wayne Road (Nappanee Street Extension) in Cleveland Township adjacent to the City of Elkhart, Elkhart County, Indiana as shown in Figure No. 1.

The site covers approximately 100 acres in the northeast quarter of Section 36, Township 38 North, Range 4 East, in Cleveland Township. Of the approximately 100 acres site, approximately 58 acres were used for a landfill from approximately 1960 to 1976. Occasional dumping of debris has occurred at the site since it ceased operation in 1976. During active operation of the landfill, refuse was placed at ground surface across the site and in trenches in the eastern area of the site. Wastes accepted at the landfill included demolition/construction debris, household refuse, and industrial, manufacturing and hospital wastes.

1.6. REMEDIAL ACTION. The remedial action for this site consists of the closure of the facility by constructing a final landfill cover system (cap) and implementing long term ground water and landfill gas (LFG) monitoring. The cover system for the landfill is designed to minimize surface water infiltration into the waste mass. A typical cross section of the landfill cap identifying the various component layers is shown on Figure 2. The individual components layers are also listed below in order from top to bottom.

- Vegetative Cover
- Top Soil Layer (6-inches)
- Select Fill Layer (18-inches)
- Geocomposite Drainage Layer
- Geomembrane Liner
- Geosynthetic Clay Liner (GCL)
- Foundation Layer (12-inches)
- Random Fill/Waste

An active LFG collection and treatment system is utilized as a component of the cover system to capture and treat gases generated by the waste mass. Ground water monitoring wells and landfill gas probes are located around the landfill's perimeter to monitor ground water and the off-site migration of landfill gas. The entire site is fenced to inhibit unauthorized access.

1.7. LAND USE RESTRICTIONS. Land use at the site will be restricted to the maintenance, operation, and monitoring activities specified in this plan. Only light vehicles, such as passenger cars and utility type trucks, should be allowed on the landfill cap. All vehicles should remain on the surfaced access roads to the greatest extent possible. Trucks carrying liquid removed from the landfill gas treatment facility will utilize the north access road and will not use the access road that crosses the landfill cap.

2. INSPECTIONS AND MAINTENANCE

2.1. INSPECTIONS.

2.1.1. General. This section details the required inspections that will be performed at the Himco Dump Superfund Site during the 30-year post-closure period. Site inspections will be performed by the Site Custodian or their designee on a regularly scheduled (periodic) basis and also after significant storm events. During the first two years of post-closure, periodic inspections will be performed on a more frequent basis than in following years. In addition, storm event inspections will be triggered by less severe storms during this period. The increased frequency of both periodic and storm event inspections during the first two years after closure is warranted because the ability of the system to perform under site conditions will not have been demonstrated. If the cover and LFG collection and treatment systems are functioning properly at the end of the second year of post-closure, both the periodic and storm-event inspections will be performed on a less frequent basis. If recurring problems are encountered and are not resolved during the first two years of post-closure care, the increased frequency of inspections will continue until the problem(s) are resolved. The site inspection schedules are provided in Tables 2-1 and 2-2 and also in Appendix B.

2.1.2. Periodic Inspections. A complete inspection of the landfill cover system, drainage structures, LFG collection and treatment system, ground water monitoring wells, LFG monitoring probes, and other appurtenances will be conducted periodically during the post-closure period. Periodic inspections will be performed on a quarterly basis during the first two years of post-closure. Following this period, periodic inspections will be conducted on a semiannual basis (i.e. mid to late spring and mid to late fall) as presented in Table 2-1.

TABLE 2-1
PERIODIC INSPECTION SCHEDULE

Year After Closure	Frequency
0-2[1]	Quarterly
2-30	Semiannual

[1] Quarterly inspections will continue indefinitely if recurring problems are encountered and are not corrected.

2.1.3. Storm Event Inspections. The cover system and any drainage structures will be inspected for damage or excessive erosion within two (2) weeks after a significant storm event during the post-closure period. The return period of the storm event that triggers an inspection will depend on the year after closure as specified in Table 2-2. In addition to these inspections, an inspection will be conducted if extremely severe weather conditions, such as a tornado, occurs at or near the site.

TABLE 2-2 STORM INSPECTION SCHEDULE	
Year After Closure	**Storm Frequency**
0-2	1-year, 24-hour precipitation event (2.5 inches[1])
2-30	25-year, 24-hour precipitation event (4.5 inches[1])
[1] Defined as the specified precipitation total in inches within a 24 hour period measured in Elkhart, Indiana.	

2.1.4. Inspection Logs. Prior to conducting an inspection, the inspector(s) will review previous inspection logs and maintenance records. During each inspection, the primary inspector will complete a new inspection log (periodic or storm event). Both periodic and storm event inspection logs are provided in Appendix B. All features at the site that require inspection are provided as line items on these logs and are discussed in greater detail in the following section. If any deficiency is observed during the inspection, the problem will be described on the inspection log and clearly and accurately located on an attached drawing. In addition, the inspector will determine the status of the deficiency; either "action" (non-emergency) or "immediate action" (emergency). Typical non-emergency deficiencies include damage to fencing, minor erosion of the cover system where the waste is not exposed, damaged monitoring wells or probes, etc. An emergency situation exists when there is an immediate or potential threat to release hazardous substances, pollutants, or contaminants which may endanger public health and the environment. Potential emergency situations include damage to the cover system where waste is exposed, failure of the LFG collection and treatment system, slope failures, etc. *In the event that any of the systems fail or performance standards are not met, the Contingency Plan will be immediately implemented. The Contingency Plan is provided in Section 8.*

2.1.5. Inspection Features. A discussion of the inspection requirements for each applicable feature on the landfill is provided below.

2.1.5.1. General Site. Inspect the general appearance of the site for any unauthorized dumping or other unusual activities. Any odors encountered during an inspection will also be noted.

2.1.5.2. Security Features. Inspect the perimeter fence, gates and locks, and signs for physical damage such as corrosion, holes or tears in the fence fabric, missing barb wire, etc. All locks and gates will also be checked to ensure that they are operable. All locks should be in a closed position prior to, and after, the inspection. The visibility of all signs will also be checked to ensure they are not obstructed by vegetation or other objects.

2.1.5.3. Access Road(s). Inspect access roads for excessive rutting, ponding of water, erosion, or loss of road material which may restrict access.

2.1.5.4. Landfill Cover. Inspect the landfill cover for leachate seeps, differential settlement (i.e. localized depressions), ponding, sloughing, cracking, bulging, erosion, exposure of geosynthetic materials, signs of burrowing animals (e.g. rodent holes), distressed (e.g. discolored or dying) vegetation, excessive vegetation, and the presence of deep rooted vegetation (e.g. trees or bushes). Special attention will be paid to areas where there are breaks in slopes or steep slopes since these areas are most susceptible to surface erosion and slope stability problems. Any animal burrow found will be inspected to determine if the geosynthetic layers have been penetrated or damaged. Maximum attention should be given to this item since burrowing activity may not be readily detected without a thorough inspection.

2.1.5.5. Storm Water Management System. Inspect the perimeter drainage ditch side slopes and bottom for leachate seeps, differential settlement (i.e., localized depressions), ponding, sloughing, cracking, bulging, erosion, signs of burrowing animals (e.g., rodent holes), distressed (e.g., discolored or dying) vegetation, excessive vegetation, and the presence of deep rooted vegetation (e.g., trees or bushes). The drainage channel will also be inspected for sediment or debris deposition or any other condition which may prohibit or impede the flow of water or otherwise affect its operational efficiency. Check the area around all culverts and drain outlets for erosion and for debris or vegetation that may be blocking the inlets or outlets. Also check the general structural condition of the culvert (e.g., joint displacement, spalling concrete, etc.). Inspect the gabion drop structures for displacement and erosion of foundation soils.

2.1.5.6. Ground Water Monitoring Wells. Inspect the monitoring wells protective covers, protective posts, and concrete pads for damage or tampering. Protective casing locks will be checked for corrosion and tampering. The locks should be in a closed position when inspected and will not be opened during the inspection. The condition of the well and the operation of the locks will be determined during sampling events. The area around the monitoring wells protective casing will be checked for localized subsidence, uplift, and/or ponding. Monitoring well locations are shown on Figure 3. A list of monitoring wells is also provided in Appendix E.

2.1.5.7. Landfill Gas Monitoring Probes. Inspect the gas monitoring probes protective covers, protective posts, and concrete pads for damage or tampering. Protective casing locks will be checked for corrosion and tampering. The locks should be in a closed position when inspected and will not be opened during the inspection. The condition of the well and the operation of the locks will be determined during sampling events. The area around the well will be checked for localized subsidence, uplift, and/or ponding. Gas probe locations are shown on Figure 4. A list of landfill gas probes is also provided in Appendix G.

2.1.5.8. Landfill Gas Collection System. Inspect the vaults, protective casing, and manholes posts for corrosion, damage or tampering. Vaults, protective casings, and manholes should be in a closed and sealed position prior to, and after, the inspection. The area around the wellheads will be checked for localized subsidence, uplift, ponded water, and cracks in the cover soils. Each wellhead will be inspected and well valves, hoses, gages, sampling ports, or other visible features will be checked for corrosion or other damage. At the time of the inspection, valve position, flow rate, and vacuum will be recorded on the inspection form. Valve position, flow, and vacuum readings should be compared with the normal operating readings to determine if the system is functioning properly. All above ground piping at the treatment facility will be inspected for damage. The landfill gas collection system is shown on Figure 5.

2.1.5.9. Landfill Gas Treatment System. Inspect the blowers for unusual noises, blowers for pressure differential, gages for temperatures and pressures/vacuums, valves for correct position, flow meters for flow rates, filters for excessive pressure drop, flare for firing, pilot-gas-propane bottles for adequate fuel, carbon absorbers for temperatures and pressures, condensate tank for level of condensate, aftercoolers for unusual noises, damper operators on aftercoolers for throttling, condensate tank for interstitial leaks as indicated at leak detection panel, pipes for leaks, insulation for deterioration, vandalism, water damage, and anything else that appears abnormal to the operator. Activate the automatic phone dialer system to determine if it is operational.

2.1.5.10. Liquid-Phase Granular Carbon Adsorption Unit. Inspection of the liquid-phase granular carbon adsorption unit in the LFG treatment facility will occur at the intervals at which the condensate would be sampled during the sampling period (refer to paragraph: Operation of Granular Activated Carbon Units) and once a month thereafter. The inspections will include careful checking of the overall condition of the unit. If a problem with the unit's normal operation is encountered, either the necessary adjustment will be done by the operator to resume the normal operation or the manufacturer will be contacted for troubleshooting and for resumption of the normal operation of the unit immediately.

2.1.5.11 Vapor-Phase Granular Carbon Adsorption Units. Inspection of the Vapor-phase granular carbon adsorption unit in the LFG treatment facility will occur at the intervals at which the landfill off gas will be sampled during the sampling period (refer to paragraph: Operation of Granular Activated Carbon Units) and once a month thereafter. In addition, the units will be inspected periodically (once a month) to determine when fresh carbon is needed. The inspections will include careful checking of the overall condition of the units. If a problem with the units' normal operation is encountered, either the necessary adjustment will be done by the operator to resume the normal operation or the manufacturer will be contacted for troubleshooting and for resumption of the normal operation of the units immediately.

2.2. MAINTENANCE.

2.2.1. General. This section details the maintenance activities that will be performed at the Himco Dump Superfund Site during the 30-year post-closure period. The Site Custodian is responsible for providing all routine and non-routine maintenance that is required to insure that the remedial measures remain functional. Repairs of commonly occurring non-emergency items should be performed within 30 days of discovery or as soon as practicable to preclude further damage and the need for emergency repairs. Typical non-emergency items include damage to fencing, minor erosion of the cover system where the waste is not exposed, damaged monitoring wells or probes, etc. An emergency situation exists when there is an immediate or potential threat to release hazardous substances, pollutants, or contaminants which may endanger public health and the environment. Potential emergency situations include damage to the cover system where waste is exposed, failure of the LFG collection and treatment system, slope failures, etc. **Repair of emergency maintenance items will be initiated immediately after discovery.**

2.2.2. Routine Maintenance. Routine maintenance activities are those activities that occur frequently or regularly and include such items as mowing, rodent control, minor erosion repair, reseeding, drainage channel cleanouts, exchange of carbon filters, etc. Depending on the item, the maintenance may be required on a scheduled or on an as-needed basis during the post-closure period. The majority of routine maintenance items will be performed on an as-needed basis. A schedule of routine maintenance activities is provided in Table 2-3 and also in Appendix C. A discussion of the requirements for each maintenance item is provided in the following sections.

TABLE 2-3
ROUTINE MAINTENANCE SCHEDULE

ITEM	FREQUENCY
Mowing	Semi-annually (Spring and Summer)
Fence	As required
Rodent Control	As required
Minor Erosion Repair	As required
Seeding	As required
Drainage Channel Cleanouts	As required
Electrical Systems	Semi-annually
LFG Collection and Treatment Systems	Per Equipment Manufacturers Recommendations

2.2.2.1. Mowing. All project areas which depend on a sod cover for erosion protection will be mowed twice annually to prevent the growth of undesirable vegetation. These areas include the cover system, storm water drainage control channels, and the access zone surrounding the site. Brush or weed growth in riprapped areas or in other areas inaccessible to mowers shall be removed by hand cutting or application of a weed or brush control spray. The first mowing should be performed in mid to late spring. The second mowing should be performed in either the late summer or in the early fall prior to the annual fall inspection. The mowing schedule can be altered to accommodate conservation of desirable wildlife and to control undesirable vegetation.

2.2.2.2. Fencing. Fence gate hinges will be oiled and damaged locks damaged locks replaced as required. All new and replacement locks will be keyed alike (i.e. same key will operate all locks).

2.2.2.3. Burrowing Animal Control. Borrowing animals will be controlled through the use of State and Federally approved repellents, toxicants, or fumigants as required to prevent their activity from damaging the cover system, particularly the geosynthetic layers.

2.2.2.4. Seeding. Areas where the vegetative cover has deteriorated will be fertilized and seeded as required. The optimal time for seeding is spring or early fall when conditions are best for germination and growth.

2.2.2.5. Drainage Channels Cleanouts. Buildup of debris or sediments in the perimeter drainage channels which may impede flow will be removed as required.

2.2.2.6. Electrical Systems. The electrical equipment requires only periodic cleaning and tightening of connections. On a six (6) month basis, all panelboards, motor starters, and transformers should be checked for dirt and moisture. If dirt or moisture is found, the equipment should be de-energized, cleaned, and dried. On a twelve (12) month basis, electrical connections should be checked for tightness and retightened as needed. Lights should be relamped as needed.

CAUTION: all work on electrical equipment should only be done by personnel who have been trained to work on electrical equipment and who know the Occupational, Safety, and Health Administration (OSHA) safety requirements.

2.2.3. Non-Routine Maintenance. Non-Routine maintenance activities are activities that occur sporadically and infrequently and include such items as repair of geosynthetic cover materials, ground water monitoring wells, major erosion areas, or replacement of components of the landfill gas treatment system. Non-routine maintenance will be performed when a deficiency is determined to exist through inspections, site visits, or by other means. All non-routine maintenance activities (i.e. those not performed on a regularly scheduled basis such as mowing) will be documented on a maintenance record form. These forms will be used to track all repairs required during the post-closure period of the landfill and will be incorporated into the annual landfill condition report. A typical maintenance record form is provided in Appendix C. The individual that identifies a maintenance item will complete section 1 of the form. The individual responsible for maintenance at the site will complete section 2 of the form when the repair has been completed. The forms will be sequentially numbered for each post closure year (e.g. 1997-001, 1997-002, etc.).

2.2.4. **Typical Repair Procedures.** This section provides abbreviated instructions for repairs to common deficiencies that can be expected during the post-closure period. Any other damage to any system will need to be evaluated on a case-by-case basis to determine the repair requirements. All post-closure repairs and materials should conform to the construction plans and specifications and any subsequent modifications. A complete set of technical plans and specifications is provided in Volume II of this OM&M plan. Catalog cutouts of all equipment and materials utilized in the construction of the landfill cap and LFG collection and treatment system are provided in Appendix F.

2.2.4.1. **Fence.** Fencing and gates will be repaired to their original condition. Also refer to construction specification 02831: CHAIN LINK FENCE.

2.2.4.2. **Access Road.** Washed out roads or ruts will be built up and regraded to maintain as-built conditions with regard to grade and slope. Material matching that used in constructing the road will be also be used for any repairs. Also refer to construction specification 02210: GRADING.

2.2.4.3. **Seeding.** Reseeding for vegetation will be accomplished by applying a seed mixture in the proportions provided in Table 2-4. The minimum rate of application for the entire mixture is 222 pounds per acre pure live seed. Also refer to construction specification 02935: TURF.

TABLE 2-4
SEEDING MIXTURE

Seed Type[1]	Pounds Per Acre
Kentucky 31 fescue	200
Red Top Grass	2
Nurse Crop[2]	20
	TOTAL: 222

1 For temporary seed for erosion control purposes, use 100 pounds per acre of the specified Nurse Crop.
2 Foxtail Millet (Seeded only between May 1 and August 15),
Annual Rye (Seeded only between February 16 and April 30, August 16 through October 31),
Winter Rye (Seeded only between November 1 and February 15).

2.2.4.4. **Animal Burrows.** Prior to repairing any animal burrow on the landfill cap, the burrow will be inspected to determine if the geosynthetic materials have been penetrated or otherwise damage. If the geosynthetic materials are damaged, they will be repaired as discussed in the following sections. If there is no damage to the geosynthetic materials, the hole will be backfilled to match the existing grade so that no depression exists. Select fill will placed in six (6) inch thick loose lifts and hand compacted to the greatest degree possible. Caution will be exercised during placement and compaction of the select fill to prevent any damage to the geosynthetics. A 6-inch thick layer of topsoil will be placed above the select fill and minimally compacted. The area will then be seeded. Also refer to construction specification 02223: SELECT FILL AND TOPSOIL FOR LANDFILL COVER SYSTEMS.

2.2.4.5. Cover Erosion. Any eroded areas of the cover will be repaired to meet the original design thicknesses and grades. The final surface will be uniform and free of depressions. For limited erosion gullies, rills, or similar small erosion features, select fill will placed, if required, in six (6) inch thick loose lifts and compacted to the greatest degree possible. Topsoil will be placed above the select fill and minimally compacted. For large erosion areas, all fill will be placed in six (6) inch thick loose lifts and compacted with low ground pressure equipment as required in the construction specifications. Caution will be exercised during placement and compaction of the select fill to prevent any damage to the geosynthetic materials. Any damaged area will be reseeded at the completion of the earth work. Also refer to construction specification 02223: SELECT FILL AND TOPSOIL FOR LANDFILL COVER SYSTEMS.

2.2.4.6. Storm Water Management System. Eroded areas will be repaired as described in Paragraph 2.2.4.5. Gabions and culverts will be restored to there original as-built conditions using similar materials. Recurring areas of erosion or displacement/failure of gabions will be evaluated to determine if alternative repair methods are required. Also refer to construction specifications 02720: STORM-DRAINAGE SYSTEM and 02221: WIRE MESH GABIONS.

2.2.4.7. Cover Differential Settlement. Prior to repairing an area which have experienced differential settlement, a determination will be made as to whether the settlement has compromised the integrity of the geomembrane. There may be damage to the geosynthetics if more than 18-inches of settlement has occurred in a six foot area. **The total amount of historic differential settlement in the subject area will be evaluated. The amount of settlement will be measured and recorded.** If necessary, the select fill and topsoil layers and possibly the geocomposite will be removed and the geomembrane inspected for damage. If the geomembrane is torn, punctured, severely distorted, or otherwise damaged, it will be repaired as outlined in the following sections. If the differential settlement is minor and damage to the underlying geosynthetics is not suspected, the area will be repaired by bringing it back to grade. The repair will consist of removing and stockpiling the topsoil layer, adding compacted select fill to the proper thickness and grade, and then replacing the topsoil layer. All fill will be placed in six (6) inch thick loose lifts and compacted. Any damaged area will be reseeded at the completion of the earth work. Also refer to construction specification 02223: TOPSOIL FOR LANDFILL COVER SYSTEMS.

2.2.4.8. Geocomposite. If an evaluation of the geocomposite indicates that the geonet is not damaged, holes, tears, or other damage to the geotextile will be repaired by placing a geotextile patch above the defect. The patch will extend a minimum of 12 inches beyond the edges of the defect. Patches will be continuously fastened using a sewn seam or as recommended by the geotextile manufacturer. The machine direction of the patch will be aligned with the machine direction of the in-place geotextile.

If the geonet is damaged, the damaged section will be removed and replaced. The patch will extend a minimum of 6 inches (0.5 feet) beyond the edges of the defect. Patches will be fastened at a maximum spacing of 6-inches around the patch or as recommended by the manufacturer. The geonet will be tied to the existing geonet using white or yellow plastic fasteners placed at least every six inches of overlap. A geotextile patch will be placed above the geonet as discussed above.

The geocomposite, geotextile, or geonet used to repair the defect will be the same as, or equivalent too and compatible with, the in-place materials. Also refer to construction specification 02273: GEOCOMPOSITE.

2.2.4.9. Geomembrane Liner. Holes, tears, blisters, or other damage to the geomembrane liner will be repaired by placing a geomembrane patch over the defect. The patch will have rounded corners and will extend a minimum of 6 inches beyond the edges of the defect. The geomembrane used to repair the defect will be the same as, or equivalent too and compatible with, the in-place geomembrane. The patch will be seamed and tested as recommended by the geomembrane manufacturer. Also refer to construction specification 02271: GEOMEMBRANE.

2.2.4.10. Geosynthetic Clay Liner. Holes, tears, or other damage to the GCL will be repaired by placing a GCL patch over the defect. The patch will extend a minimum of 12 inches beyond the edges of the defect. The GCL used to repair the defect will be the same as, or equivalent too and compatible with, the in-place GCL. If required by the manufacturer, a granular bentonite of the same type as the bentonite within the GCL will be placed along the entire overlap width at a minimum rate of 0.25 pounds per lineal feet or as recommended by the GCL manufacturer. Patches will be secured with an adhesive or other approved methods as recommended by the GCL manufacturer. All repairs to the GCL will occur in the dry. Also refer to construction specification 02442: GEOSYNTHETIC CLAY LINER.

2.2.4.11. Ground Water Monitoring Wells. Corrosion to the protective casing can be repaired by sanding and repainting. If the protective casing cover is damaged, it can be replaced or welded as needed. Damaged PVC casing can be repaired by removing and replacing the damaged section, if accessible. If there is a blockage in the PVC casing that can not be dislodged by forced air or water, poles, or other methods, the casing is damaged beyond repair, or the well is unusable for any other reason, the well will be abandoned and replaced. The installation and construction of new wells will match that of the well being replaced. Replacement wells will be located 25 to 50 feet from the abandoned well. Abandonment procedures will be in accordance with State of Indiana regulations. Grout seals or concrete pads which are deteriorated or settled will be removed and replaced. Grout will be removed to a depth at which competent grout is encountered. The annulus will then be backfilled with cement bentonite grout to within one foot of the ground surface. The remainder of the annulus will be backfilled with concrete as part of the 3 foot square concrete pad. The pad will be sloped to drain away from the well. The protective casing will be anchored in the grout and concrete and centered around the PVC well casing. Also refer to construction specifications 02910: MONITORING WELL INSTALLATION and 02915: WELL ABANDONMENT.

2.2.4.12. Landfill Gas Monitoring Probes. Corrosion to the protective casing can be repaired by sanding and repainting. If the protective casing cover is damaged, it can be replaced or welded as needed. Damaged PVC casing can be repaired by removing and replacing the damaged section, if accessible. If there is a blockage in the PVC casing that can not be dislodged by forced air or water, poles, or other methods or the casing is damaged beyond repair, the probe will be abandoned and replaced. The installation and construction of new probes will match that of the probe being replaced. Replacement probes will be located 25 to 50 feet from the abandoned probe. Abandonment procedures will be in accordance with State of Indiana regulations for wells. Grout seals or concrete pads which are deteriorated or settled will be removed and replaced. Grout will be removed to a depth at which competent grout is encountered. The annulus will then be backfilled with cement bentonite grout to within one foot of the ground surface. The remainder of the annulus will be backfilled with concrete as part of the 2 foot square concrete pad. The pad will be sloped to drain away from the well. The protective casing will be anchored in the grout and concrete and centered around the PVC well casing. Also refer to construction specifications 02253: LANDFILL GAS MONITORING PROBES and 02915: WELL ABANDONMENT.

2.2.4.13. Landfill Gas Collection and Treatment System-General. General repairs to the LFG collection and treatment system are minor and involve items such as valves, valve operators, damper operators, temperature gages, pressure gages, and vacuum gages. All repairs to features or components of the landfill gas collection system should be performed by individuals thoroughly familiar with the system and safety requirements for working in a potentially explosive atmosphere.

2.2.4.14. Liquid-Phase Granular Carbon Adsorption Unit. If a problem with the normal operation of the liquid-phase granular carbon adsorption unit is encountered, either the necessary adjustment will be done by the operator to resume the normal operation or the manufacturer will be contacted for troubleshooting and for resumption of the normal operation of the unit immediately.

2.2.4.15 Vapor-Phase Granular Carbon Adsorption Units. If a problem with the normal operation of the vapor-phase granular carbon adsorption unit is encountered, either the necessary adjustment will be done by the operator to resume the normal operation or the manufacturer will be contacted for troubleshooting and for resumption of the normal operation of the units immediately.

3. LFG COLLECTION AND TREATMENT SYSTEM OPERATION

3.1. GENERAL. Provided below are preliminary operation guidelines for the facility. Catalog cutouts of all equipment utilized in the LFG collection and treatment system are provided in Appendices F and G. **The Site Custodian will revise operating procedures, equipment descriptions, and provide other information after installation of the system consistent with the requirements in Section 7.**

3.2. SEQUENCE. The landfill gas is evacuated by means of two blowers. These blowers pull a vacuum through the moisture separators, in-line filters, and flow meters. As the gas proceeds through the blowers, it is heated due to the compression affect of the blowers. The gas is then cooled down to about 135 degrees Fahrenheit as it exits the aftercoolers. The gas then enters the gas-phase-carbon absorbers where impurities are removed. Upon leaving the carbon absorbers, the gas enters the flare where it is burned and exhausted to the atmosphere. As the gas progresses through the moisture separators, leachate is removed and pumped by the condensate pump through two water-phase-carbon-adsorbers. This treated leachate is then routed to the underground condensate storage tank. Periodically this condensate is removed from the tank by means of a pumper truck.

3.3. MOISTURE SEPARATORS. The moisture separators receive the gas/leachate mix and separate the leachate (condensate) from the gas. As the condensate level in the separator rises, the upper level switch in the separator activates a time delay relay to shut off the respective blower and respective upstream butterfly valve. The respective solenoid valve opens which allows the condensate to be pumped out of the moisture separator by the condensate pump. As the level drops to the lower level switch, the solenoid valve closes and the condensate pump stops. After the time delay relay times out, the blower starts and the respective butterfly valve opens. Note that during the time when the time delay relay is activated, the gas from the other blower loop is allowed to pressurize the moisture separator that is being pumped down.

3.4. BLOWERS. Typical blower flow rates will be 550 cfm per blower. The blowers will run continuously except as described above in the moisture separators paragraph and except as follows: If the blower discharge temperature is too high or if the level of condensate in the underground storage tank is too high, then the blowers will shut off. The temperature of gas exiting each blower will be in the range of 180 to 280 degrees Fahrenheit. Suction side pressure will be in the range of minus (20 to 34) inches water column pressure (i.e. a vacuum).Discharge side pressure will be in the range of 30 to 75 inches water column positive pressure.

3.5. AFTERCOOLERS. Aftercooler fans will run when their respective blower is operating unless the ambient temperature is low enough to perform the cooling without the fans operating. Motor operated dampers will modulate air flow through the aftercoolers to maintain a gas outlet temperature between 125 and 135 degrees Fahrenheit as recommended by the manufacturer of the adsorbers. No air flow will be allowed at 125 degrees Fahrenheit gas-outlet temperature and 100% air flow will be allowed at 135 degrees Fahrenheit gas-outlet temperature.

3.6. GRANULAR ACTIVATED CARBON ADSORBERS.

3.6.1. Function. Granular activated carbon (GAC) removes organic contaminants from gases or liquids by physical adsorption. Physical adsorption is a phenomenon resulting from electrostatic forces of attraction between the impurities and the internal surfaces of the activated carbon. The activation of carbon is achieved by thermally decomposing and removing carbon from the organic, high carbon content, raw material. This is done in a reducing atmosphere. The temperature and atmosphere of the furnace are controlled to produce the desired adsorption properties. The activation produces a network of pores where the adsorption takes place. The larger pore volume an adsorbent contains per unit volume the more adsorption can occur.

3.6.2. Operation. Liquid- and vapor-phase GAC units will be operated as follows:

3.6.2.1. Liquid-Phase Granular Carbon Adsorption Unit. There will be two liquid-phase GAC (LGAC) units in series. After installation of the units per manufacturer's installation guidelines, the unit will be ready to operate. A typical installation may include the following:

The GAC canisters are shipped with dry activated carbon; the carbon must be wetted and deaerated prior to use. This procedure displaces air from the internal structure of the carbon granule, thus assuring that the liquid to be treated is in contact with the carbon surface.

Prior to operation each canister must be filled with clean water; the water should be introduced into the bottom outlet connection The unit should set for approximately 48 hrs- this allows most of the carbon's internal surface to become wetted.

After wetting, the carbon bed can be deaerated by draining the canister and again filling the canister upflow with clean water. This procedure will eliminate any air pockets which may have formed between the carbon granules. The unit may be ready for operation at this point.

The liquid-phase GAC unit will treat the condensate from two knockout pots. The condensate will enter the GAC unit from the top and flow down towards the bottom of the unit. Volatile organic compounds (VOCs) in the condensate will be removed by the GAC unit until the breakthrough is reached. Some VOCs may not be removed and may pass through the GAC unit without being adsorbed. The unit is intended to capture mostly the compounds with higher molecular weights. The following methodology and sampling scheme will be utilized for operation of the liquid-phase GAC unit:

Since the concentrations of VOCs in the condensate are not known, a reliable estimate of frequency, at which the spent carbon would be replaced upon reaching breakthrough was not made. However, concentration of VOCs in condensate is not anticipated to be significant (according to a rough estimate--see enclosure 4 in Appendix G). However, the performance of the unit will be periodically monitored in accordance with the following monitoring requirements:

FIRST SAMPLING PHASE (Months 0-2):

Sample influent and effluent biweekly (once every two weeks) and analyze the samples for the parameters outlined in Table 3-1. Adjust the sampling interval according to the results obtained during the first two months. This adjustment will be made and applied after the first two-month period.

TABLE 3-1
LIQUID-PHASE CARBON ADSORPTION UNIT SAMPLING

Parameters	Test Methods
VOCs	EPA 8260A
SVOCs	EPA 8270

SECOND SAMPLING PHASE (Months 3 through 6):

Utilize a periodic sampling interval based upon the results obtained from the first sampling phase. If the results of the analyses obtained during the first phase indicate that the breakthrough has not been reached within a two-week period, sample influent and effluent once a month and analyze the samples for the parameters outlined in Table 3-1.

THIRD SAMPLING PHASE (Seventh month and after):

Keep monitoring influent and effluent based on monthly sampling and analysis if analyses during the first six-month period indicate that influent VOCs concentrations are above the predetermined values required by the local authorities and that the monthly monitoring is reasonable.

- If it is determined during the first six-month period that the influent VOCs concentrations are consistently below the pretreatment levels indicated by the local authorities, the GAC units will be taken out of service (or by-passed). Therefore, the only sampling and analysis that remain would be the sampling and analyses that would need to be performed on the stored condensate prior to the disposal at the local Public Owned Treatment Works (POTW) (City of Elkhart Waste Water Treatment Plant). This is estimated to be done approximately once a month.

- If it is determined that the influent concentrations are above the discharge limits set by the local POTW shown in Table 3-1, but the frequency of sampling should be adjusted;

monitor the influent and effluent accordingly, either more or less frequently.

3.6.2.2. Vapor-Phase Granular Carbon Adsorption Units. Vapor-phase GAC units will be used to capture hydrogen sulfide in the landfill off gas. However, some VOCs capture will likely to be accomplished through these units. Each unit will treat approximately 275 cubic feet of off gas per minute. Influent to and effluent from each vapor-phase GAC unit will be sampled biweekly for the first two months and once a month thereafter. However, sampling frequency may be adjusted according to the previous data obtained and according to the manufacturer's recommendations. Analysis of the influent and effluent off gas samples will be done according to Table 3-2.

TABLE 3-2
VAPOR-PHASE CARBON ADSORPTION UNIT SAMPLING

Parameters	Test Methods
VOCs	EPA 8260A
SVOCs	EPA 8270
Hydrogen Sulfide	Field Kit (Colorimetric), see spec sect. 01402

3.7. LANDFILL GAS COLLECTION CONDENSATE.

3.7.1. General. The condensate from the landfill gas collection system shall be sampled to satisfy any discharge or TSD criteria, and/or POTW standards. Analytical requirements shall include the following:

- VOCs by EPA Method 8260A
- Semi-VOCs by EPA Method 8270
- Pest/PCBs by EPA Method 8081
- TAL metals by EPA Methods 6010 & 7000
- Dioxin 2,3,7,8-tetrachlorodibenzo-p-
- Dioxin(TCDD) by EPA Method 8280.
- Oil & Grease by EPA Method 413.1
- Total Suspended Solids by EPA Method 160.3
- Carbonaceous Biochemical Oxygen (cBODs) by EPA Method 405.1
- Ammonia (NH3-N) by EPA Method 350.2
- Phosphorus by EPA Method 365.1

- Surfactants
- Phenolics by EPA Method 9066

3.8. FLARE. The flare will operate continuously as long as one or both blowers is functioning. Flare controls will open and close the motor operated butterfly valve upstream of the flare as required by the flare manufacturer.

TABLE 3-3
POLLUTANTS OF CONCERN FOR CITY OF ELKHART PERMIT

Contractor shall ensure that all discharge requirements, constituents and concentrations, for the City of Elkhart, Indiana and the State of Indiana are met. The following are, but are not limited to, constituents of concern.

METALS & INORGANICS

Constituent	Allowable Max. (mg/L)
Antimony	TBD
Arsenic	2.1
Beryllium	TBD
Cadmium	1.2
Total Chromium	7.0
Copper	4.5
Lead	0.60
Mercury	0.02
Nickel	4.1
Selenium	TBD
Silver	1.2
Thallium	TBD
Zinc	TBD
Asbestos	TBD
Cyanide	TBD
Phenolic Compounds	TBD

TABLE 3-3
POLLUTANTS OF CONCERN FOR CITY OF ELKHART PERMIT

VOLATILES BY EPA METHOD 8260

Constituent	Allowable Max. (mg/L)
Acrolein	10
Benzene	10
Carbon Tetrachloride	10
Chlorobenzene	10
Chloroethane	10
Chloroform	10
Chloromethane	10
1,2-Dichlorobenzene	10
1,3-Dichlorobenzene	10
1,4-Dichlorobenzene	10
1,1-Dichloroethane	10
1,2-Dichloroethane	10
1,1-Dichloroethene	10
trans-1,2-Dichloroethene	10
1,2-Dichloropropane	10
1,3-Dichloropropene	10
Ethylbenzene	10
Hexachlorobutadiene	10
Methylene chloride	10
Toluene	10
1,2,4-Trichlorobenzene	10
1,1,1-Trichloroethane	10
1,1,2-Trichloroethane	10
Trichloroethene	10
Vinyl chloride	10

TABLE 3-3
POLLUTANTS OF CONCERN FOR CITY OF ELKHART PERMIT

SEMIVOLATILES BY EPA METHOD 8270

Constituent	Allowable Max.[1] (mg/L)
Acenaphthene	
Acenaphthylene	
Anthracene	
Benz(a)anthracene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Benzo(a)pyrene	
Benzo(ghi)perylene	
Bis(2-chloroethyl) ether	
Bis(2-chloroethoxy)methane	
Bis(2-chloroisopropyl) ether	
Bis(2-ethylhexyl) phthalate	
4-Bromophenyl phenyl ether	
Butyl benzyl phthalate	
2-Chloronaphthalene	
2-Chlorophenol	
4-Chlorophenyl phenyl ether	
Chrysene	
Dibenzo(a,h)anthracene	
Di-n-butyl phthalate	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
3,3'-Dichlorobenzidine	
2,4-Dichlorophenol	
Diethyl phthalate	
2,4-Dimethylphenol	
Dimethyl phthalate	
2-Methyl-4,6-dinitrophenol	
2,4-Dinitrophenol	
2,4-Dinitrotoluene	
2,6-Dinitrotoluene	
Di-n-octylphthalate	
Fluoranthene	

TABLE 3-3
POLLUTANTS OF CONCERN FOR CITY OF ELKHART PERMIT

ORGANOCHLORINE PESTICIDES AND PCBs

Constituent	Allowable Max.[1] (mg/L)
Aldrin	
alpha-BHC	
beta-BHC	
delta-BHC	
gamma-BHC (Lindane)	
Chlordane (technical)	
4,4'-DDD	
4,4'-DDE	
4,4'-DDT	
Dieldrin	
Endosulfan I	
Endosulfan II	
Endosulfan sulfate	
Endrin	
Endrin aldehyde	
Heptachlor	
Heptachlor epoxide	
Toxaphene	
Aroclor-1016	
Aroclor-1221	
Aroclor-1232	
Aroclor-1242	
Aroclor-1248	
Aroclor-1254	
Aroclor-1260	

TABLE 3-3 POLLUTANTS OF CONCERN FOR CITY OF ELKHART PERMIT
OTHER POLLUTANTS[1] Oil & Grease by EPA Method 413.1 Total Suspended Solids by EPA Method 160.3 Carbonaceous Biochemical Oxygen (cBODs) by EPA Method 405.1 Ammonia (NH3-N) by EPA Method 350.2 Phosphorus by EPA Method 365.1 Surfactants Phenolics by EPA Method 9066
[1]The maximum allowable concentrations for the constituents shall be decided (TBD) after the reliminary analysis is submitted with the application for a discharge permit to the Public Works & Utilities of the City of Elkhart, IN.

4. POST-CLOSURE MONITORING PLAN

4.1. SETTLEMENT MONITORING PLAN.

4.1.1. General. Periodic surveys of settlement gages on the landfill cover will be performed to monitor the magnitude and rate of settlement of the cover. The survey schedule is provided in Table 4-1 and also in Appendix D. Elevation data will be reported to the nearest 0.01 foot. The current elevation, change in elevation since the previous survey, and the total elevation change to date will be compiled at the conclusion of each survey. See Table 4-1 in Appendix D for a typical reporting format for the survey data. In addition to the tabulated data, settlement versus time plots for each settlement gage will be developed. The data from the settlement surveys will compiled in the annual landfill condition report.

TABLE 4-1
SETTLEMENT SURVEY SCHEDULE

Year After Closure	Frequency
0-1	Quarterly
1-5	Yearly[1]
5-30	Every Five Years[1]

[1] Survey should be completed in late summer or early fall prior to the annual fall inspection.

A list of all settlement gages and survey monuments is provided in Appendix D. Settlement gages and monuments will be installed during final closure of the landfill. Consequently, horizontal and vertical control for the survey points and monuments will not be available until the completion of construction activities.

4.2. LANDFILL GAS MONITORING PLAN.

4.2.1. General. To provide for the protection of the public health and safety, and the environment, a landfill gas monitoring plan will be implemented during the post-closure period per the requirements of 329 IAC 10-20-17. Due to the proximity of residential areas immediately adjacent to the southern boundary of the landfill and also across the Nappanee Street Extension east of the site, it is essentially that monitoring is periodically conducted to determine if gases are migrating from the site.

4.2.2. Monitoring Network. A total of 17 landfill gas monitoring probes are located around the landfill as shown on Figure 4. A complete list of all landfill gas monitoring probes and their surveyed coordinates are provided in Appendix G. The gas monitoring probes are constructed of a nominal 1-inch diameter PVC screen and riser and the top cap of each probe is fitted with a sampling port.

4.2.3. Sampling Schedule. Each landfill gas monitoring probe will be sampled on a periodic basis according to the schedule shown on Table 4-2. For the first two months of post-closure, the probes will be sampled weekly. After this period, the probes will be sampled at monthly intervals until the sixth month of post closure. After the sixth month of post closure, the landfill gas monitoring probes will be sampled quarterly. In addition to the monitoring probes, any enclosed structures on the site will be monitored on the same schedule as the monitoring probes. Landfill gas sampling will be coordinated with ground water sampling events. **If landfill gas concentrations ever exceed action levels as discussed below, the Contingency Plan will immediately be implemented.**

TABLE 4-2
LANDFILL GAS MONITORING SCHEDULE

Time After Closure	Frequency
0-2 Month	Weekly
2-6 Month	Monthly
0.5-30 Year	Quarterly (Every 3 Months)

4.2.4. Sampling Equipment and Procedures. A list of sampling equipment and procedures is provided in Appendix G.

4.2.5. Action Levels. If the concentration of methane gas exceeds 25 percent of the lower explosive limits (LEL) in the monitoring probes as provided in Table 4-3, an investigation will be performed to determine the extent of landfill gas migration in accordance with the Contingency Plan.

TABLE 4-3
LANDFILL GAS ACTION LEVELS

Gas	Concentration
Methane	1.25% (25% of the LEL)

4.3. GROUND WATER QUALITY MONITORING PLAN.

4.3.1 . General. To determine if contaminants associated with the landfill are impacting groundwater and migrating off-site via groundwater, a groundwater monitoring plan will be implemented during the post-closure period.

4.3.2. Monitoring Network. A total of 23 groundwater monitoring wells are located around the landfill as shown on Figure 3. A complete list of all groundwater monitoring wells and their surveyed coordinates are provided in Appendix E and in the Sampling and Analysis Plan (SAP) in Appendix H. The groundwater monitoring wells are constructed of 2- to 5-inch diameter screen and riser. Monitoring well construction details are provided in the SAP in Appendix H.

4.3.3. Sampling Schedule. Groundwater monitoring wells will be sampled on a quarterly basis for the first two years of post closure. For the remainder of the post-closure period, the wells will be sampled on a semi-annual basis.

TABLE 4-4
GROUNDWATER MONITORING SCHEDULE

Year After Closure	Frequency
0-2	Quarterly
2-27	Semi-annually

4.3.4. Sampling and Analysis Plan. A SAP is provided in Appendix H. The SAP provides specific guidance and quality assurance requirements for the groundwater monitoring activities at the site.

5. HEALTH AND SAFETY

Contractor(s) or other firms or agencies performing work or other activities at the site will develop, implement, maintain, and enforce a site-specific health and safety plan (SSHP). For contract activities, the prime contractor shall integrate all subcontractor work activities into one SSHP, make the SSHP available to all contractor and subcontractor employees, and ensure all subcontractors integrate provisions of the SSHP in their work activities. The post-closure operating contractor must also review and update the SSHP as necessary to keep it current and effective. Health and safety guidelines are intended to provide for a safe and minimal risk environment for on-site personnel.

6. RECORDS AND REPORTING MECHANISMS

6.1. General. The Site Custodian will be responsible for compiling and maintaining all records applicable to this site during the closure and post-closure period. In addition, the Site Custodian will be responsible for preparing a yearly report that documents all activities at the site.

6.2 Record Documents. The Site Custodian will collect and maintain all construction documentation, inspection logs, maintenance records, operating costs, laboratory data, correspondence with regulatory agencies, annual reports, and any other data relating to the closure or post-closure of the site. The Site Custodian will make all documents available for inspection by regulatory agencies if requested.

6.3 Annual Report. An annual report will be prepared by the Site Custodian to document all operations, maintenance, and monitoring activities at the site for the period from January 1 to December 31 of each post-closure year. The report will be distributed to the parties listed in Table 6-1 by March 1 of the following year.

TABLE 6-1
ANNUAL REPORT DISTRIBUTION LIST

ORGANIZATION	ADDRESS
U.S. Environmental Protection Agency Regional Project Manager Himco Dump Superfund Site	77 West Jackson Blvd. Chicago, Illinois 60604
Indiana Department of Environmental Management Commissioner	100 North Senate Ave. P.O. Box 6018 Indianapolis, Indiana 46206-6015

The annual report will include a narrative and supporting documentation (e.g. forms, field data, laboratory results, etc.) for the following topics:

- Introduction
- Inspections and Maintenance
- Landfill Gas Collection and Treatment System Operation
- Cover System Settlement
- Air Quality Monitoring
- Ground Water Monitoring
- Summary and Recommendations

6.3.1. Introduction. This section will include the purpose of the annual report, the period the report covers, a brief summary of the sites history to include the remedial action and any subsequent modifications, and any other applicable background data that will familiarize the reader with the site.

6.3.2. Inspection and Maintenance. This section will contain an overview of all inspection and maintenance activities that occurred at the site for the reporting period. In addition, historic records of the site will be reviewed and evaluated and any recurring or developing problems will be discussed. All inspection logs and maintenance records will be included in the report.

6.3.3. Landfill Gas Collection and Treatment System Operation. This section will contain an overview of operation of the landfill gas collection and treatment system for the reporting period. The overview will include a discussion on any operational problems or procedural or equipment modifications. In addition, historic operational records will be reviewed and evaluated and any recurring or developing problems will be discussed. All operational logs will be included in the report.

6.3.4. Cover System Settlement. This section will contain a summary of current and historic settlement of the landfill cover system. Settlement survey data summary sheets and settlement versus time plots for each settlement point will be included in the report.

6.3.5. Air Quality Monitoring. This section will contain a comprehensive review and interpretation of post-closure air monitoring activity for the reporting period. This will include a discussion of air sampling procedures and laboratory analytical results for both stack emissions and landfill gas probe monitoring. In addition, historic air quality data will be reviewed and evaluated and any developing trends or anomalies will be discussed. All field sampling forms, chain-of-custody forms, and laboratory analytical results be included in the report.

6.3.6. Ground Water Monitoring. This section will contain a comprehensive review and interpretation of post-closure ground water quality monitoring activity for the reporting period. This will include a discussion of ground water sampling procedures, ground water levels, monitoring well conditions, and laboratory analytical results. In addition, historic ground water data will be reviewed and evaluated and any developing trends or anomalies will be discussed. All field sampling forms, chain-of-custody forms, and laboratory analytical results be included in the report.

6.3.7. Operating Costs. This section will contain a summary of all costs associated with inspection, maintenance, monitoring, and operation of the site over the subject period.

6.3.8. Summary and Recommendations. This section will summarize the overall physical condition and operation of the site. Any recommended or implemented changes in post-closure operation, maintenance, and/or monitoring will also be presented in this section.

7. PLAN REVISIONS

7.1. **General.** During the post-closure period, information presented in this OM&M plan will require periodic updating. In addition, revisions may be required because of changes in operations, monitoring, and/or alteration of the remedial design. The Site Custodian is responsible for maintaining, updating, and revising this OM&M plan, after acceptance from the construction contractor, for the remainder of the post-closure period.

7.2. **Initial Revision.** This plan will initially be updated and revised by the construction contractor to reflect equipment, procedures, and information obtained during construction. The OM&M plan will be revised to include as-built construction drawings and any modifications to the specifications, operating procedures, material and equipment manufacturers and suppliers, contractors, regulatory agencies, and emergency contacts. The Site Custodian is then responsible for maintaining, updating, and revising this OM&M plan for the remainder of the post-closure period.

7.3. **Periodic Updates.** Periodic updates of the OM&M plan will be required during the post-closure period to provide current information. The periodic revisions to the plan as presented in this section do not require regulatory approval. However, all updated portions of the document will be distributed to the regulatory agencies and interested parties as listed in Table 6-1 within 30 days of the revision. Updating be performed yearly and will consist of verifying availability, phone numbers, and addresses of the firms or agencies listed in this document. Thus includes material and equipment manufacturers and suppliers, contractors, regulatory agencies, and emergency contacts.

7.4. **Other Revisions.** The OM&M plan may require revision to reflect changes in operational procedures, inspection frequency, groundwater or air monitoring requirements, or alteration of the constructed remedy. Any changes or modifications of this nature are subject to regulatory approval prior to implementation. Revised OM&M plans will be distributed to the parties shown on Table 6-1 for review and acceptance prior to implementation.

8. CONTINGENCY PLAN

8.1. General. This contingency plan should be immediately implemented in the case of a critical system failure or the off-site migration of landfill gas. Critical system failures include the failure of the landfill cover system which exposes, or has the potential to expose, waste or the failure of the landfill gas collection and treatment system.

8.2. Emergency Coordinator. It is the responsibility of the Site Custodian to have a designated Emergency Coordinator available at all times to coordinate and implement emergency actions. The Emergency Coordinator and an alternate for this site is provided in Table 8-1.

EMERGENCY COORDINATOR	
NAME	ADDRESS/PHONE
Primary:	
Alternate:	

8.3. Immediate Action. In the event of a system failure, initial precautionary emergency measures will be implemented to reduce the risk to workers and the general public. This will include notification of appropriate parties and mobilization of resources to respond to the failure. These items are discussed in more detail in the following sections.

8.4. Notification. If the failure of a system or off-site migration of landfill gases has the potential to endanger the health and safety of the public, the potentially affected parties will be immediately notified and evacuated or otherwise protected. Other local agencies will also be notified as warranted by the situation. The Indiana State Department of Environmental Management and the USEPA will be notified within 2 and 24 hours, respectively, after discovery of the failure of a critical system or the off-site migration of landfill gases. The notification will include a comprehensive description of the problem and procedures that are currently being implemented to contain potential off-site release of contaminants. The Site Custodian will submit a plan and schedule to the aforementioned parties within 72 hours of discovery of a failure. The plan and schedule will describe the remedial actions that will take place to correct/repair the defective system. A list of potential contact points are provided in Appendix A.

8.5. Technical Assistance. A list of personnel/agencies/firms that can provide technical assistance to the Site Custodian is provided in Appendix A.

8.6. Contractor Support. Contractor support should be obtained immediately if an emergency exists. A list of Contractors is provided in Appendix A.

8.7. Project Supplies. A list of potential material suppliers is provided in Appendix A. Required supplies may include borrow material, geosynthetics, etc.

8.8. Assessment and Implementation of Remedial Action.

8.8.1. General. The Emergency Coordinator will be responsible for assessing the situation and implementing remedial measures. A discussion of potential failure scenarios and possible causes and remedial actions are provided below.

8.8.2. Failure of the Cover System. Although not anticipated, the landfill cover system may fail and expose waste as a result of severe erosion, excessive differential settlement, slope instability, subsurface intrusion by equipment, rupture by the buildup of landfill gases, etc. In the unlikely event that the cover system fails and wastes are exposed, the remedial actions outlined below will be immediately implemented after discovery to limit the migration of contaminants to surface waters and soils. The area of failure will be inspected to determine the exact nature, extent, and cause of the damage. A containment system will be installed to collect all surface water run-off and/or leachate from the damaged area. The containment system will be constructed to prevent the movement of potentially contaminated water to other areas of the site (i.e., discharge points for drainage will be blocked). All water and/or soil that is determined to be contaminated will be collected, treated, and disposed of in accordance with all applicable local, state, or federal regulations. The containment system may consist of sumps, soils dikes, sand bag structures, and/or other similar features. Surface water diversion structures, such as sand bags or a soil dike will be constructed upslope of the damaged area to divert surface run-off from contacting exposed waste materials. Repairs to the cover system will be initiated immediately. If the damage was a result of the buildup of landfill gases below the cover system, a study of the effectiveness of the landfill gas collection and treatment system will be immediately implemented. Modification, if required, to the operation or features of the landfill gas collection and treatment system will be based on the results of this study. Ambient air monitoring will also be initiated to determine of landfill gases are migrating off-site due to the failure of the cover system.

8.8.3. Failure of the Landfill Gas Collection and Treatment System. The landfill gas collection and treatment system may fail as a result of loss of power, damage to the piping network or wells, and/or equipment malfunctions. In the event of power disruption or failure of the blower motors, the Site Custodian will be notified by the automatic dialer system. After discovery of system or partial system failure, the remedial actions outlined below will be immediately implemented to prevent the buildup of gases below the landfill cover. Initially, a complete inspection of the system will be performed to determine the exact nature, extent, and cause of the damage. After the damage assessment is complete, remedial actions will be implemented.

8.8.3.1. Temporary Control Measures. In the event that the system will not be operational for an extended period of time and/or there is the potential for damage to the cover system by the buildup of landfill gases, the landfill gas collection system wellheads and manifolds at the treatment facility can be opened and allowed to vent to the atmosphere. If this action is taken, warnings will be posted at all landfill entrances and adjacent to the open wells and treatments system that a potentially explosive situation exists and notification will be made as outlined in Section 8.4. In addition, the Site Custodian will institute any other site controls that may be necessary to insure the safety of the public. The Site Custodian will also implement air quality monitoring. Air quality monitoring will include monitoring at the boundaries of the site to determine the impact to adjacent areas. The Site Custodian will also immediately notify the appropriate local and state agencies and homeowners immediately adjacent to the southern and eastern border of the site. Repair of the system will be completed expediently to prevent continuing discharge of landfill gas (LFG).

8.8.3.2. Collection System Failure. If some of the landfill gas wells are operating and others are not, as determined by an evaluation of the gage readings at the well heads, the cause of failure may be that the control valving at the well heads are not adjusted properly or there may be a blockage or obstruction in the piping network. If one or more wells are affected and they are not adjacent, the problem may be corrected by adjusting the vacuum valves at the well heads. If more than one well is affected and they are in line, the problem is most likely an obstruction or break in the header pipe. The approximate location of the obstruction or break can be determined by noting which wells are functioning and which are not. Settlement data along the header pipe alignment should also be reviewed to determine if any areas have experienced excessive differential settlements. This type of failure will require excavation and repair/replacement of section of the header pipe. Any repairs will be implemented immediately.

8.8.3.3. Treatment System Failure. Failure of the treatment system may be caused by equipment failure or disruption of power. In order to determine the cause of the failure, a complete inspection of the system by knowledgeable individual(s) will be performed. Appropriate remedial measures will be implemented after the cause of the problem is determined.

8.8.4. Exceedance of Performance Standards at the Landfill Gas Treatment System. If discharged gas or treated leachate quality does not meet the regulatory and/or disposal standards as determined by scheduled testing, a complete inspection of the system by knowledgeable individual(s) will be performed. An evaluation of the condition of filter media will be conducted during the inspection. Appropriate remedial measures will be implemented after the cause of the problem is determined.

8.9. Off-Site Migration of Landfill Gas. If off-site migration of landfill gas is indicated by routine monitoring of the landfill gas monitoring probes or suspected for any other reason, an investigation to determine the extent of migration will be immediately conducted. The investigation will define the extent of above ground and subsurface movement of landfill gases. The above ground or atmospheric extent of the gases will be determined by monitoring the ambient air quality at locations radially outward from the landfill. This will include the monitoring of all structures (e.g. houses, barns, etc.) where gases may migrate and collect. The extent of subsurface migration will be determined by utilizing both active and passive gas sampling techniques. Any subsurface structures, such as basements, will also be monitored as dictated by the extent of gas movement. **In the event that gases are collecting in homes and/or other structures, the owners will be immediately notified and venting, evacuation, or other appropriate measures will be immediately implement to protect the public's health and safety.** Continuous monitoring will be implemented until extent and magnitude are determined, public health and safety concerns are addressed, and appropriate monitoring locations and frequencies established. All initial monitoring will be performed with instruments that can provide real-time data. All sampling locations, results, instrument calibrations, weather conditions, and other pertinent information will be documented.

FIGURES

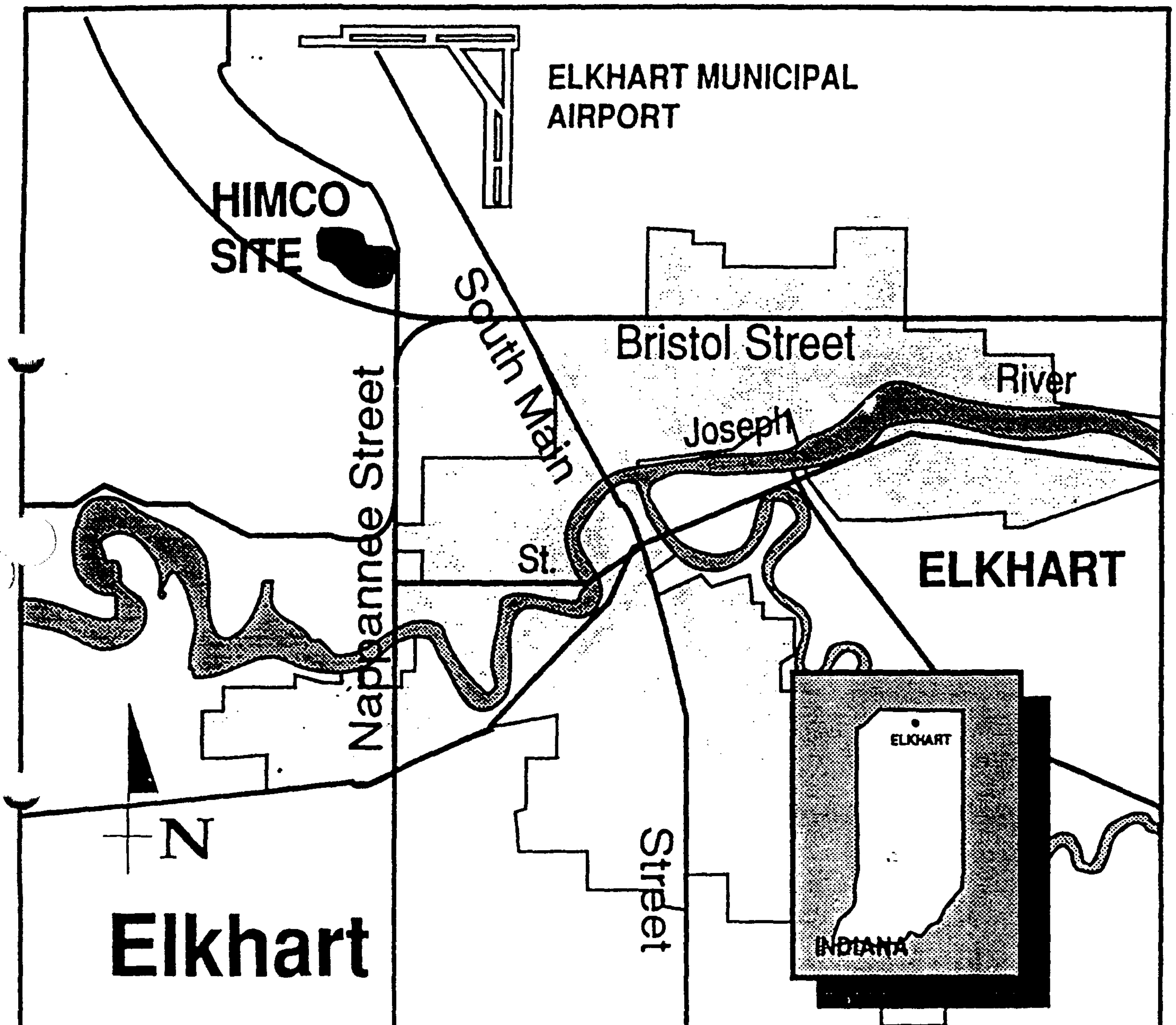
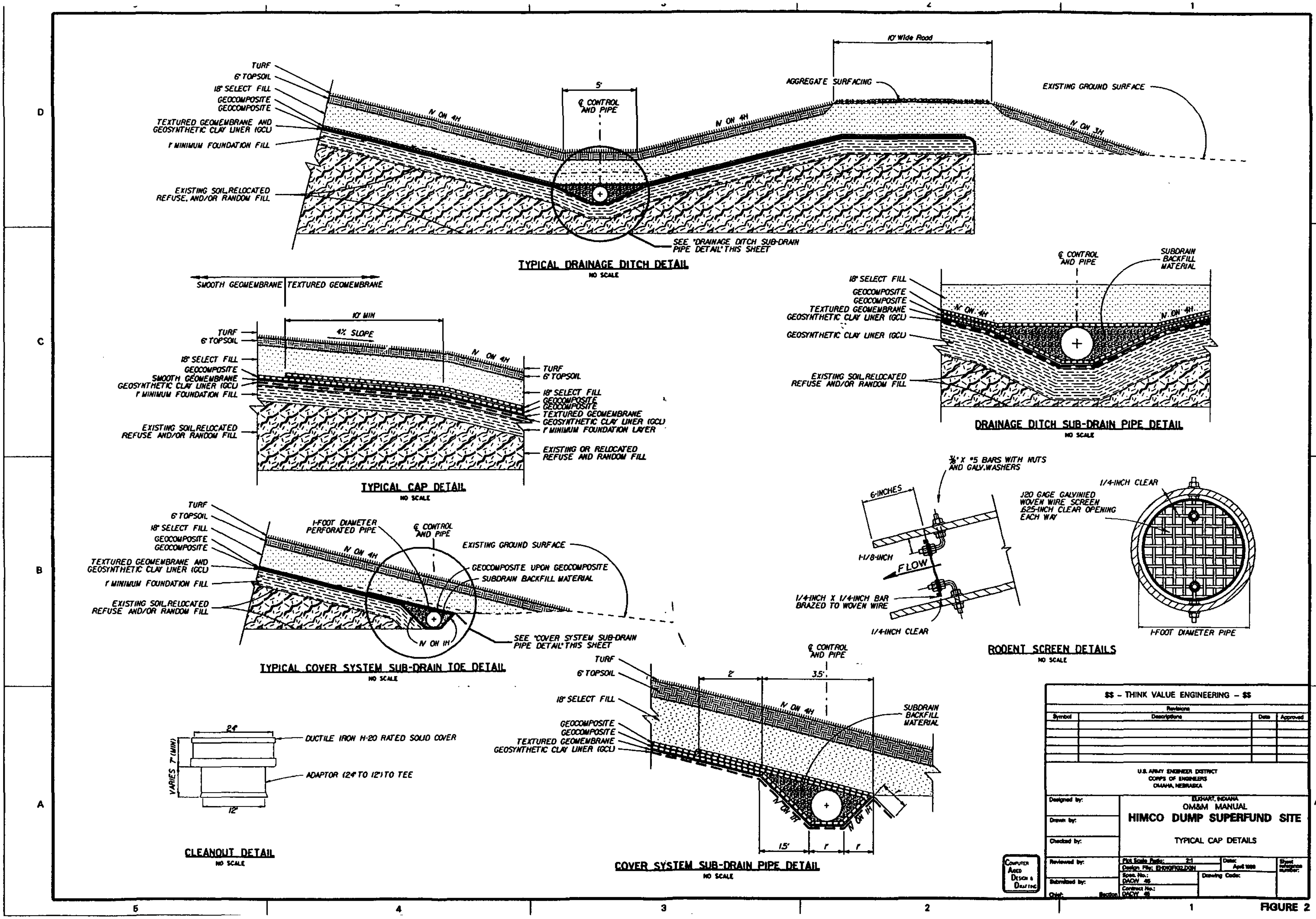
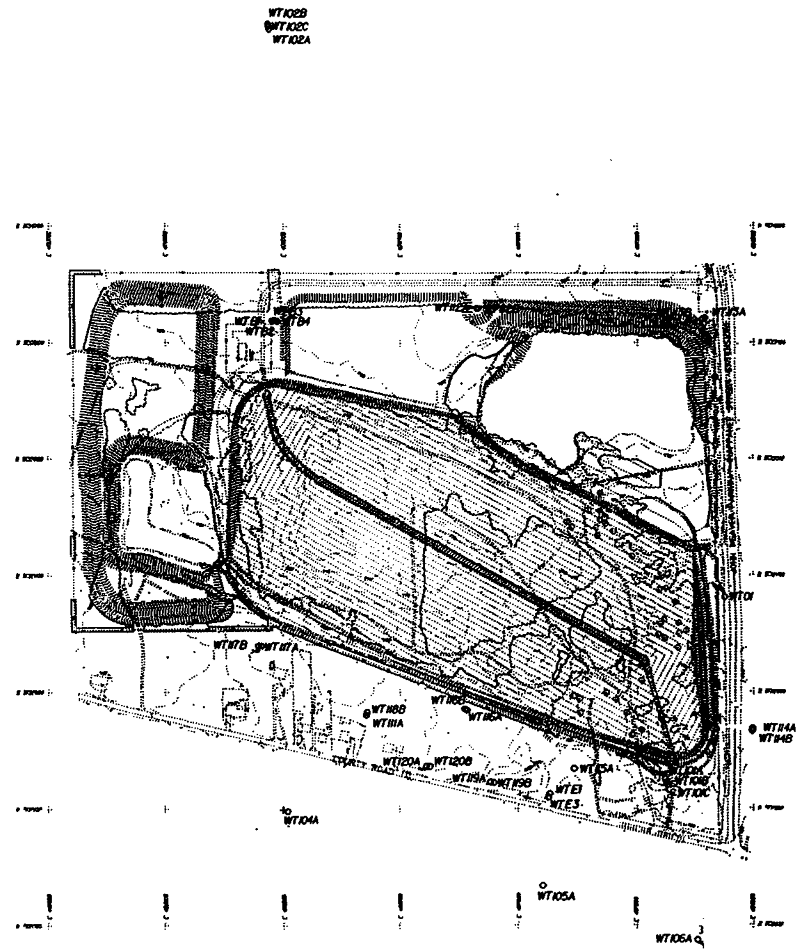


FIGURE 1. SITE LOCATION MAP

Source: USEPA Record of Decision, Himco Dump Superfund Site (1993).

FIGURES


TURF
6" TOPSOIL
18" SELECT FILL
GEOCOMPOSITE
GEOCOMPOSITE
TEXTURED GEOMEMBRANE AND GEOSYNTHETIC CLAY LINER (GCL)
1' MINIMUM FOUNDATION FILL
EXISTING SOIL, RELOCATED REFUSE, AND/OR RANDOM FILL
5'
℄ CONTROL AND PIPE
1V ON 4H
10' Wide Road
AGGREGATE SURFACING
EXISTING GROUND SURFACE
1V ON 3H
SEE "DRAINAGE DITCH SUB-DRAIN PIPE DETAIL" THIS SHEET
TYPICAL DRAINAGE DITCH DETAIL
NO SCALE
SMOOTH GEOMEMBRANE
TEXTURED GEOMEMBRANE
10' MIN
4% SLOPE
SMOOTH GEOMEMBRANE
GEOSYNTHETIC CLAY LINER (GCL)
1' MINIMUM FOUNDATION FILL
1' MINIMUM FOUNDATION LAYER
EXISTING OR RELOCATED REFUSE AND RANDOM FILL
TYPICAL CAP DETAIL
NO SCALE
SUBDRAIN BACKFILL MATERIAL
GEOSYNTHETIC CLAY LINER (GCL)
DRAINAGE DITCH SUB-DRAIN PIPE DETAIL
NO SCALE
1-FOOT DIAMETER PERFORATED PIPE
GEOCOMPOSITE UPON GEOCOMPOSITE
SUBDRAIN BACKFILL MATERIAL
1V ON 1H
SEE "COVER SYSTEM SUB-DRAIN PIPE DETAIL" THIS SHEET
TYPICAL COVER SYSTEM SUB-DRAIN TOE DETAIL
NO SCALE
3/8" X #5 BARS WITH NUTS AND GALV. WASHERS
6-INCHES
1-1/8-INCH
FLOW
1/4-INCH X 1/4-INCH BAR BRAZED TO WOVEN WIRE
1/4-INCH CLEAR
120 GAGE GALVINIED WOVEN WIRE SCREEN .625-INCH CLEAR OPENING EACH WAY
1-FOOT DIAMETER PIPE
RODENT SCREEN DETAILS
NO SCALE
24"
VARIES 7' (MIN)
12"
DUCTILE IRON H-20 RATED SOLID COVER
ADAPTOR (24" TO 12") TO TEE
CLEANOUT DETAIL
NO SCALE
2'
3.5'
1.5'
1'
COVER SYSTEM SUB-DRAIN PIPE DETAIL
NO SCALE
$$ - THINK VALUE ENGINEERING - $$
Revisions
Symbol
Descriptions
Date
Approved
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA
Designed by:
Drawn by:
Checked by:
Reviewed by:
Submitted by:
ELKHART, INDIANA
OM&M MANUAL
HIMCO DUMP SUPERFUND SITE
TYPICAL CAP DETAILS
Computer Aided Design & Drafting
Plot Scale Ratio:
Date:
April 1998
Spec. No.:
DACW 45
Contract No.:
DACW 45
Drawing Code:
FIGURE 2



LEGEND:

○ WT101A MONITORING WELL

N

SCALE: 1 INCH = 200 FEET

$$ – THINK VALUE ENGINEERING – $$

Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

ELKHART, INDIANA

OM&M MANUAL

HIMCO DUMP SUPERFUND SITE

GROUNDWATER MONITORING WELL PLAN

Designed by:
Drawn by:
Checked by:
Reviewed by:
Submitted by:
Chief: Section

Plot Scale Ratio: 200:1
Design File: EHDIGFIG3.DGN
Date: APRIL 1996
Spec. No.: DACW 45
Contract No.: DACW 45
Drawing Code:
Sheet reference number:

COMPUTER AIDED DESIGN & DRAFTING

FIGURE 3

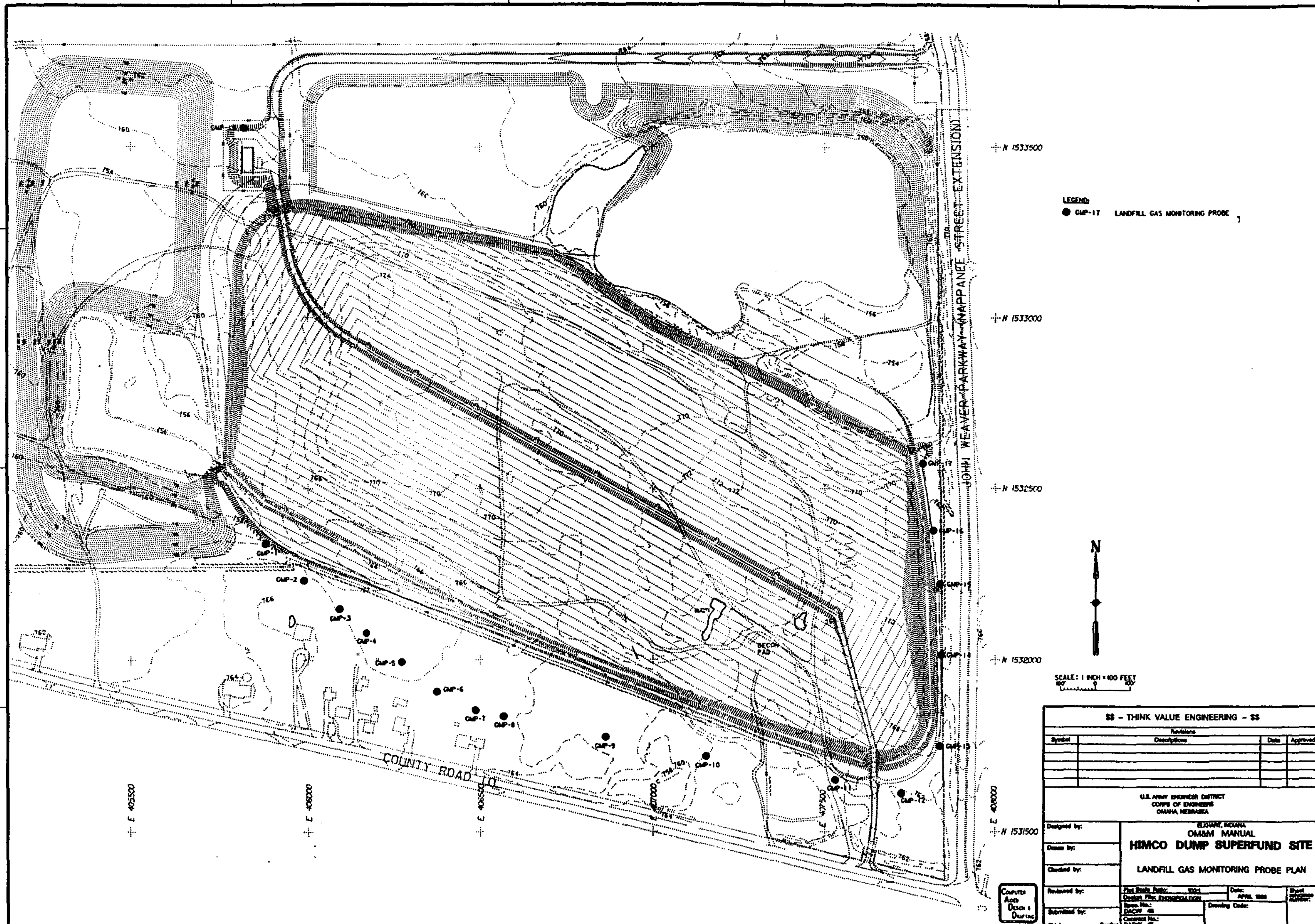
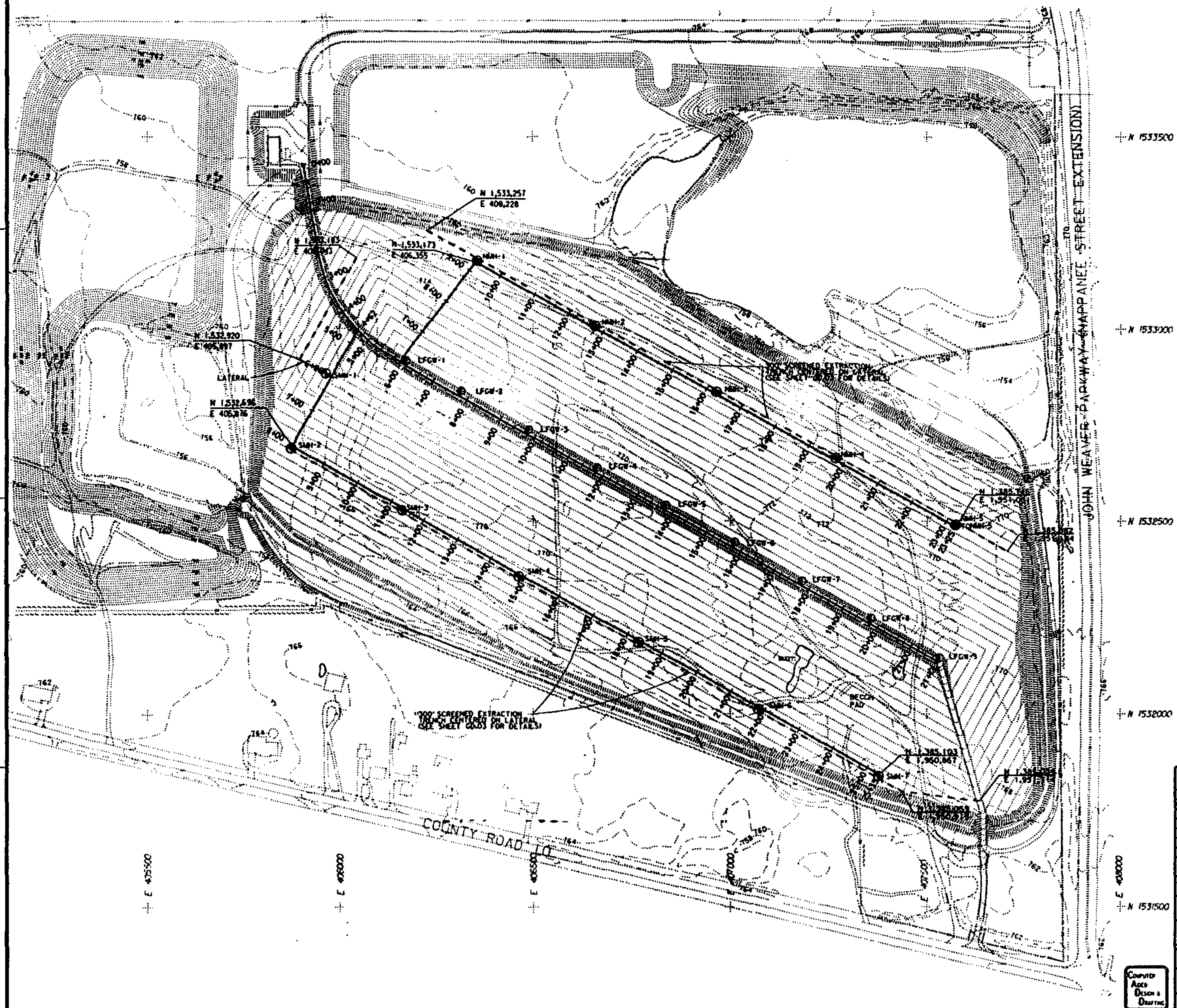

JOHN WEAVER PARKWAY (NAPPANEE STREET EXTENSION)
COUNTY ROAD 10
LEGEND:
GMP-17 LANDFILL GAS MONITORING PROBE
N 1533500
N 1533000
N 1532500
N 1532000
N 1531500
E 405500
E 406000
E 407500
E 408000
GMP-1
GMP-2
GMP-3
GMP-4
GMP-5
GMP-6
GMP-7
GMP-8
GMP-9
GMP-10
GMP-11
GMP-12
GMP-13
GMP-14
GMP-15
GMP-16
GMP-17
DECON PAD
N
SCALE: 1 INCH = 100 FEET
$$ - THINK VALUE ENGINEERING - $$
Revisions
Symbol
Descriptions
Date
Approved
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA
Designed by:
Drawn by:
Checked by:
Reviewed by:
Submitted by:
ELKHART, INDIANA
OM&M MANUAL
HIMCO DUMP SUPERFUND SITE
LANDFILL GAS MONITORING PROBE PLAN
Date:
APRIL
Spec. No.:
DACW 45
Contract No.:
Drawing Code:
Computer Aided Design & Drafting

FIGURE 4



LEGEND:

LFG-1	LANDFILL GAS EXTRACTION WELL
SMH-1	LANDFILL GAS EXTRACTION TRENCH MANHOLE
———	HEADER/LATERAL PIPING
— —	EXTRACTION TRENCH SCREEN

$$ – THINK VALUE ENGINEERING – $$

Revisions			
Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

ELKHART, INDIANA
OM&M MANUAL
HIMCO DUMP SUPERFUND SITE
LANDFILL GAS COLLECTION SYSTEM PLAN

Designed by:
Drawn by:
Checked by:
Reviewed by:
Submitted by:
Chief, Section

COMPUTER AIDED DESIGN & DRAFTING

Plot Scale Ratio: 100:1
Design File: EHGNGFIGA.DGN
Date: APRIL 1995
Spec. No.: DACW 45
Contract No.: DACW 45
Drawing Code:
Sheet reference number:

FIGURE 5

APPENDIX A

APPENDIX A

CONTENTS

- Points of Contacts

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

POINTS OF CONTACTS
GENERAL

CONTACT	TELEPHONE NUMBER
Site Custodian 24 Hour	
City of Elkhart Police Department	Emergency 911 Non-Emergency 219-295-7070
Elkhart County Sheriff Office	Emergency 911 Non-Emergency 219-533-4151
City of Elkhart Fire Department	Emergency 911 Non-Emergency 293-8931
Indiana State Police	Emergency 911 Non-Emergency 800-552-2959
Elkhart General Hospital	Switchboard 219-294-2621 Emergency 219-523-3315
City of Elkhart Environmental Center	219-293-5070
Elkhart County Health Department	219-523-2283
Indiana Department of Environmental Management Superfund Section Emergency Response Section (24 Hour)	 317-308-3120 317-233-7745
National Response Center	800-424-8802
Poison Information Center	800-382-9097
EPA Release Report No.	800-424-8802
EPA Region V, Regional Project Manager	
Indiana-Michigan Power	219-293-0661
Northern Indiana Public Service Company	800-422-6199
City of Elkhart Public Works and Utilities	Operations 219-293-2572 After Hour Emergencies 219-293-2572

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

POINTS OF CONTACTS
RESIDENTIAL PROPERTY OWNERS ADJACENT TO LANDFILL BOUNDARIES

CONTACT	TELEPHONE NUMBER/ADDRESS

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

POINTS OF CONTACTS
TECHNICAL ASSISTANCE

CONTACT	TELEPHONE NUMBER/ADDRESS

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

POINTS OF CONTACTS
CONTRACTORS

CONTACT	TELEPHONE NUMBER/ADDRESS

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

POINTS OF CONTACTS
MATERIAL SUPPLIERS

CONTACT	TELEPHONE NUMBER/ADDRESS

APPENDIX B

APPENDIX B

CONTENTS

- Inspection Schedules
- Periodic Inspection Log
- Storm Event Inspection Log
- Landfill Gas Collection SystemWellhead Record Form

HIMCO DUMP SUPERFUND SITE ELKHART, INDIANA PERIODIC INSPECTION SCHEDULE	
Year After Closure	**Frequency**
0-2	Quarterly (Every 3 Months)
2-30	Semiannual (Every 6 Months)

HIMCO DUMP SUPERFUND SITE ELKHART, INDIANA STORM EVENT INSPECTION SCHEDULE	
Year After Closure	**Frequency**
0-2	**Year 0-2 After Construction: 1-year, 24-hour event (2.5 inches[1])**
2-30	**Year 2-30 After Construction: 25-year, 24-hour event (4.5 inches[1])**
[1] Defined as the specified precipititation total in inches within a 24 hour period measured in Elkhart, Indiana.	

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

SPECIFIC ITEM	YES	NO	N/A	A	I/A	COMMENTS/NOTES
1. General Site:						
a. Unusual odors detected?						
b. Unauthorized dumping noted?						
c. Other (Specify)?						
2. Security Features:						
a. Perimeter fence damaged or deteriorated?						
b. Gates operable?						
c. Locks operable?						
d. Signs damaged?						
e. Signs visible?						
f. Other (Specify)?						
3. Landfill Cover:						
a. Leachate seeps?						
b. Surface cracks?						
c. Surface bulges?						
d. Differential surface settlement?						
e. Ponding water?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

SPECIFIC ITEM	YES	NO	N/A	A	I/A	COMMENTS/NOTES
f. Erosion?						
g. Distressed vegetation?						
h. Excessive vegetation?						
i. Deep rooted vegetation?						
j. Rodent holes/other animal activity?						
k. Other (Identify)?						
4. Storm Water Control Features:						
a. Leachate seeps?						
b. Surface cracks?						
c. Surface bulges?						
d. Differential surface settlement?						
e. Ponding water?						
f. Erosion?						
g. Distressed vegetation?						
h. Excessive or deep rooted vegetation?						
i. Rodent holes/other animal activity?						
j. Damage to culverts?						
k. Sediment Buildup in channels or culverts?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:						SHEET OF
SPECIFIC ITEM	**YES**	**NO**	**N/A**	**A**	**I/A**	**COMMENTS/NOTES**
l. Erosion around gabions, culverts, drain outlets?						
m. Other (Specify)?						
5. Ground Water Monitoring Wells:						
a. Exterior of protective casings labeled?						
b. Protective casings locked?						
c. Locks operable?						
d. Protective casings damaged?						
e. Concrete pads craked/damaged?						
f. Localized subsidence/uplift around wells?						
g. Evidience of ponded water around wells?						
h. Protective posts damaged?						
i. Other (Specify)?						
6. Landfill Gas Monitoring Probes:						
a. Exterior of protective casings labeled?						
b. Protective casings locked?						
c. Locks operable?						
d. Protective casings damaged?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

SPECIFIC ITEM	YES	NO	N/A	A	I/A	COMMENTS/NOTES
e. Concrete pads cracked/damaged?						
f. Localized subsidence/uplift around wells?						
g. Evidence of ponded water around wells?						
h. Protective posts damaged?						
i. Other (Specify)?						
7. Landfill Gas Collection System:						
a. Vaults, casings, or manholes damaged?						
b. Well controls operational?						
c. Localized subsidence/uplift around wells?						
d. Evidence of ponded water around wells?						
e. Evidence of leachate/water in vaults, protective casings, or manholes?						
f. Valves, fittings, or gages corroded or damaged?						
g. Aboveground piping damaged?						
h. Blowers operating?						
i. Vacuum relief valves OK?						
j. Flows indicated?						
k. Filters need changing?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:						SHEET OF
SPECIFIC ITEM	**YES**	**NO**	**N/A**	**A**	**I/A**	**COMMENTS/NOTES**
l. Temperature normal?						
m. Pressures/vacuum normal?						
n. Condensate tank needs emptied?						
o. Aftercoolers operating?						
p. Valves positioned correctly?						
q. Odors noticed?						
r. Condensate interstitial space leaking?						
s. Other (Specify)?						
8. Landfill Gas Treatment Plant:						
a. Flare firing?						
b. Pump-condensate cycling?						
c. Liquid-phase carbon absorbers need changing?						
d. Gas-phase carbon absorbers need changing?						
e. Propane tank need refilled?						
f. Other (Specify)?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

PERIODIC INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

INSPECTION SUMMARY

Weather Conditions:

List all deficient <u>immediate action</u> items:

List all deficient <u>action items:</u>

Other Comments:

INSPECTOR'S NAME:	FIRM/AGENCY:
INSPECTOR'S SIGNATURE:	DATE:

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

STORM EVENT INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

SPECIFIC ITEM	YES	NO	N/A	A	I/A	COMMENTS/NOTES
1. General Site:						
a. Unusual odors detected?						
b. Unauthorized dumping noted?						
c. Other (Specify)?						
2. Landfill Cover:						
a. Leachate seeps?						
b. Surface cracking?						
c. Surface bulging?						
d. Differential surface settlement?						
e. Ponding?						
f. Erosion?						
g. Distressed vegetation?						
h. Excessive vegetation?						
i. Deep rooted vegetation?						
j. Rodent holes/other animal activity?						
k. Other (Identify)?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

STORM EVENT INSPECTION LOG

INSPECTION DATE AND TIME:	SHEET OF

SPECIFIC ITEM	YES	NO	N/A	A	I/A	COMMENTS/NOTES
3. Storm Water Control Features:						
a. Leachate seeps?						
b. Surface cracking?						
c. Surface bulging?						
d. Differential surface settlement?						
e. Ponding?						
f. Erosion?						
g. Distressed vegetation?						
h. Excessive or deep rooted vegetation?						
i. Rodent holes/other animal activity?						
j. Damaged culverts?						
k. Sediment buildup in channels or culverts?						
l. Erosion around gabions or subdrain outlets?						
m. Other (Specify)?						
4. Landfill Gas Collection and Treatment System:						
a. Any signs of visible damage?						
b. Other?						

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

STORM EVENT INSPECTION LOG

INSPECTION DATE AND TIME:	**SHEET OF**

INSPECTION SUMMARY

Weather Conditions:

List all deficient **<u>immediate action</u>** items:

List all deficient **<u>action items:</u>**

Other Comments:

DATE OF STORM EVENT:	PRECIP. TOTAL FOR STORM EVENT (INCHES):
INSPECTOR'S NAME:	FIRM/AGENCY:
INSPECTOR'S SIGNATURE:	DATE:

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

LANDFILL GAS COLLECTION SYSTEM
WELLHEAD RECORD FORM

WELLHEAD DESIGNATION	VACUUM GAGE READINGS ( )		FLOW RATE (cfm)	VALVE POSITION
	NO. 1	NO. 2		
INSPECTOR'S NAME				
INSPECTOR'S SIGNATURE		Date:		

APPENDIX C

APPENDIX C

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- Maintenance Schedule
- Maintenance Record Form

HIMCO DUMP SUPERFUND SITE ELKHART, INDIANA ROUTINE MAINTENANCE SCHEDULE	
ITEM	**FREQUENCY**
Mowing	Semi-annually
Fence	As required
Rodent Control	As required
Minor Erosion Repair	As required
Seeding	As required
Drainage Channel Cleanouts	As required
Electrical Systems	Semi-annually
LFG Collection and Treatment Systems	Per Equipment Manufacturers Recomendations

HIMCO LANDFILL
ELKHART, INDIANA

MAINTENANCE RECORD FORM

SECTION 1	
MAINTENANCE RECORD NO.:	DATE:
DATE DEFICIENCY OBSERVED:	DEFICIENCY REPORTED BY:
Problem Description:	

SECTION 2	
Maintenance Performed:	
DATE(S) MAINTENANCE INITIATED AND COMPLETED:	NAME & TITLE OF APPROVING OFFICIAL:
FIRM PERFORMING MAINTENANCE:	SIGANTURE OF APPROVING OFFICIAL:

APPENDIX D

APPENDIX D

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- Survey Monument and Settlement Gage Record Sheet
- Settlement Gage Data Summary Sheet

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

SURVEY MONUMENT AND SETTLEMENT GAGE RECORD SHEET

Identification Number	Horizontal Coordinates		Initial Elevation (date)
	Northing	Easting	

SHEET OF

HIMCO SUMPERFUND SITE
ELKHART, INDIANA

SETTLEMENT GAGE DATA SUMMARY SHEET

SURVEY GAGE NO.	SURVEY GAGE NO.
INITIAL ELEVATION:	INITIAL ELEVATION:
DATE OF SURVEY:	DATE OF SURVEY:

Periodic Survey Data			Periodic Survey Data		
Date	Elevation	Elevation Change	Date	Elevation	Elevation Change
Initial		N/A	Initial		N/A

SHEET OF

APPENDIX E

APPENDIX E

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- Groundwater Monitoring Well Construction Details

HIMCO DUMP SUPERFUND SITE SAMPLING AND ANALYSIS PLAN GROUND WATER MONITORING WELL CONSTRUCTION DETAILS									
Well ID #	Date Installed	Screen Length[1]	Borhole Dia.[2]	Casing Dia.[2]	Installed Depth[1,3,5]	Northing	Easting	Well El.[3,4]	Ref.
WTB1	10/06/77	6	N/A	5.0	474.9	1533596.77	405953.28	763.65	TOC
WTB2	11/03/77	10	N/A	2.0	13.9	1533597.11	405959.05	763.18	TOC
WTB3	10/17/77	10	N/A	5.0	137.2	1533597.39	405968.13	763.28	TOC
WTB4	10/07/77	5	N/A	5.0	174.2	1533595.28	405975.91	762.33	TOC
WTE1	10/11/77	10	N/A	5.0	83.9	1531566.72	407131.36	765.75	TOC
WTE3	10/11/77	5	N/A	5.0	178.9	1531548.54	407126.66	765.47	TOC
WT01	05/01/79	5	N/A	2.0	30.0	1532407.14	407876.93	762.83	GS
WT101A	11/12/90	10	8.0	2.0	18.5	1531629.81	407616.98	764.34	TOC
WT101B	12/14/90	5	8.0	2.0	100.5	1531617.03	407621.69	764.23	TOC
WT101C	12/12/90	5	8.0	2.0	167.5	1531603.13	407627.48	764.11	TOC
WT102A	N/A	10	8.0	2.0	18.4	1534850.57	405943.64	769.09	TOC
WT102B	12/02/90	5	8.0	2.0	67.9	1534872.79	405939.79	768.82	TOC
WT102C	12/01/90	5	8.0	2.0	162.0	1534862.86	405941.85	769.20	TOC
WT103A	11/11/90	10	8.0	2.0	18.4	1532537.59	405538.04	762.61	TOC
WT104A	11/12/90	10	8.0	2.0	18.7	1531495.73	406017.30	765.29	TOC
WT105A	11/10/90	10	8.0	2.0	18.5	1531172.44	407102.56	762.58	TOC
WT106A	11/09/90	10	8.0	2.0	18.6	1530938.53	407760.41	761.50	TOC
WT111A	09/10/91	10	8.0	2.0	21.9	1531905.43	406358.78	766.45	TOC
WT112A	08/23/95	10	8.25	2.0	17.7	1533653.49	406824.67	765.90	TOC
WT112B	08/23/95	5	10.25	2.0	62.1	1533653.01	406834.06	766.09	TOC
WT113A	08/10/95	10	8.25	2.0	24.4	1533608.69	407789.11	771.85	TOC
WT113B	08/10/95	5	10.25	2.0	70.0	1533604.43	407779.02	772.06	TOC
WT114A	08/21/95	10	8.25	2.0	24.5	1531843.97	407997.29	769.19	TOC
WT114B	08/22/95	5	10.25	2.0	67.8	1531834.38	407995.71	769.37	TOC
WT115A	08/22/95	10	8.25	2.0	19.7	1531675.84	407261.44	765.87	TOC
WT116A	08/17/95	10	8.25	2.0	14.8	1531925.50	406784.96	763.86	TOC
WT116B	08/17/95	5	10.25	2.0	60.4	1531931.04	406775.79	763.89	TOC
WT117A	08/15/95	10	8.25	2.0	17.9	1532201.98	405908.93	767.19	TOC
WT117B	08/14/95	5	10.25	2.0	63.5	1532202.51	405896.41	766.60	TOC
WT118B	08/18/95	5	10.25	2.0	64.9	1531917.55	406361.16	766.49	TOC

HIMCO DUMP SUPERFUND SITE SAMPLING AND ANALYSIS PLAN GROUND WATER MONITORING WELL CONSTRUCTION DETAILS (CONT.)									
Well ID #	**Date Installed**	**Screen Length[1]**	**Borhole Dia.[2]**	**Casing Dia.[2]**	**Installed Depth[1,3,5]**	**Northing**	**Easting**	**Well El.[3,4]**	**Ref.**
WT119A									
WT119B									
WT120A									
WT120B									

1 Measured in feet
2 Measured in inches
3 Feet from Top of Casing
4 Measured in feet Mean Sea Level (MSL)
5 Bottom of Screen (does not include threaded blank cap on bottom)
GS - Ground Surface
N/A - Not Available
TOC - Top of Casing

APPENDIX F

APPENDIX F

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- List of Equipment and Material Manufacturers and Suppliers
- Equipment and Material Catalog Cutouts

APPENDIX G

APPENDIX G

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- LANDFILL GAS MONITORING EQUIPMENT AND PROCEDURES
- LANDFILL GAS MONITORING PROBE SAMPLING SHEET
- LANDFILL GAS MONITORING RECORD FORM

1. LANDFILL GAS MONITORING EQUIPMENT AND PROCEDURES.

1.1. General. To provide for the protection of the public health and safety, and the environment, a landfill gas monitoring plan will be implemented during the post-closure period to monitor for methane migration off-site per the requirements of 329 IAC 10-20-17. Due to the proximity of residential areas immediately adjacent to the southern boundary of the landfill and also across the Nappanee Street Extension east of the site, it is essentially that monitoring is periodically conducted to determine if gases are migrating from the site.

1.2. Monitoring Network. A total of 17 landfill gas monitoring probes are located around the landfill as shown on Figure 4. A list of all monitoring probes is provided in Appendix G. The gas monitoring probes are constructed of a nominal 1-inch diameter PVC screen and riser and the top cap of each probe is fitted with a sampling port.

1.3. Sampling Schedule. Each landfill gas monitoring probe will be sampled on a periodic basis according to the schedule shown on Table G-1. For the first two months of post-closure, the probes will be sampled weekly. After this period, the probes will be sampled at monthly intervals until the sixth month of post closure. After the sixth month of post closure, the landfill gas monitoring probes will be sampled quarterly. In addition to the monitoring probes, any enclosed structures on the site will be monitored on the same schedule as the monitoring probes. Landfill gas sampling will be coordinated with ground water sampling events. **If landfill gas concentrations ever exceed action levels as discussed below, the Contingency Plan will immediately be implemented.**

TABLE G-1
LANDFILL GAS MONITORING SCHEDULE

Time After Closure	Frequency
0-2 Month	Weekly
2-6 Month	Monthly
0.5-30 Year	Quarterly (Every 3 Months)

1.4. Sampling Equipment and Procedures.

1.4.1. Equipment. A nondispersive infrared gas analyzer capable of providing real time data will be used for landfill gas monitoring. The equipment will be capable of detecting methane and carbon dioxide at a minimum. Summa canisters will be used to collect QC samples for verification of real-time instruments if required. A barometer and thermometer will also be installed at the landfill gas treatment facility.

1.4.1.1. Calibration. The instrument will be calibrated daily prior to field work. The monitoring equipment will be calibrated according to the manufacturer's recommendations. All calibration results will be documented on the Landfill Gas Monitoring Record Form provided in Appendix G-1.

1.4.2. Procedures. The ambient air quality at each monitoring probe or outside of any structure will be measured and recorded prior to any intrusive type measurements. After the outside air quality is measured at the selected location, the probe or interior of the structure will be sampled. For landfill gas probes, the instrument will be connected to the sampling port. After the instrument is connected, the valve will be opened and measurement will begin. Monitoring will continue until a stable reading is attained. After the high reading and stabilized readings are properly recorded, the valve will be closed and the instrument disconnected. In addition to the methane and carbon dioxide readings, the date, time, barometric pressure, and atmospheric weather conditions will be recorded on the Landfill Gas Monitoring Record Form. Barometric pressure will be recorded at a gage located at the treatment facility. The condition of each monitoring probe will be evaluated at each sampling event to determine if it is damaged. Any damage will be noted on the record form and corrective actions will be scheduled to repair or replace the damaged probe.

If a summa canister sample is required, the sample will be collected after the real-time instrumentation sample. The canister will be connected to the tubing. After the canister is connected, the clamp on the tubing will be removed. After the hissing within the canister has stopped hissing, the valve on the canister will be closed and then the clamp on the tubing will be replaced. The canister will then be removed from the system.

1.4.3. Action Levels. If the concentration of methane gas exceeds 25 percent of the lower explosive limits (LEL) of methane, as set forth in Table G-2, in facility structures or in the monitoring probes, the contingency plan will be implemented.

TABLE G-2
LANDFILL GAS ACTION LEVELS

Gas	Concentration
Methane	1.25% (25% of the LEL)

APPENDIX G-1

HIMCO DUMP SUPERFUND SITE

LANDFILL GAS MONITORING PROBE SAMPLING SHEET

SAMPLING DATE: | **WEATHER CONDITIONS:**

CALIBRATION DATA:

Probe No.	Time	Barometric Pressure ( )	Temperature ( )	Methane ( )	Carbon Dioxide ( )	Other ( )	Comments

SAMPLER'S NAME: | **FIRM/AGENCY**

SAMPLER'S SIGNATURE | **DATE:**

HIMCO DUMP SUPERFUND SITE
ELKHART, INDIANA

LANDFILL GAS MONITORING PROBE RECORD SHEET

Probe Number	Horizontal Coordinates		
	Northing	Easting	Top Of Casing (Ft. MSL)

SHEET OF

APPENDIX H

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HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

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Well Development Record

SAP-B PID/FID Calibration
CGI Calibration
Field Record of Water Sampling
Daily Quality Control Report

1.0 PROJECT DESCRIPTION

1.1 Purpose and Scope. The Sampling and Analysis Plan (SAP) consist of the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP). This SAP is designed to provide specific guidance and quality assurance requirements for the groundwater monitoring activities at the Himco Dump Site in Elkhart, Indiana. It presents the purpose, organization, and standard operating procedures (SOPs) necessary to conduct the activities in a manner consistent with specific quality goals of precision, accuracy, completeness, representativeness, and comparability. Implementation of the procedures described in this QAPP are required for the acquisition of data of known and sufficient quality.

1.2 Himco Dumpsite.

1.2.1 Description of Dumpsite. This Superfund site is located at County Road 10 and the Nappanee Street Extension in Cleveland Township, next to the city of Elkhart, Indiana, in Elkhart County. The site is a landfill approximately 100 acres, and it is bounded on the north by a tree line and the northernmost extent of a gravel pit pond. On the south edge, the site is bounded by County Road 10 and private residences on the east edge by the Nappanee Street extension. The Himco Dump site was privately operated by Himco Waste Away Service Inc., and was in operation between 1960 and September 1976.

1.2.2 Potential Contaminants. Groundwater samples indicated traces of VOCs, Semi-VOCs, Pesticides and Metals. Leachate was analyzed and traces of VOCs, Semi-VOCs, Pesticides and Metals were found. Soil samples indicated VOCs, Semi-VOCs, Pesticides and Metals.

1.3 Site Background/Site History. The site background/site history is described in the Final Quality Assurance Project Plan, Himco Dump, Remedial Investigation/Feasibility Study (RI/FS), Elkhart, Indiana, Volume 3 (Donohue, June 1990).

1.4 Analytical Methods and Procedures. The analytical methods used for sample analysis shall be in accordance with EPA 600/4-82-057 and EPA SW-846. Sensitivity and detection limits of the methods shall be sufficient to meet all regulatory requirements.

1.4.1 Groundwater Monitoring. Samples from the specified monitoring wells shall be collected and analyzed for the following:

1.4.1.1 VOCs by EPA Method 8260A

1.4.1.2 SVOCs by EPA Method 3520/8270

1.4.1.3 TAL metals by EPA Methods 6010 & 7000 As, Pb, Hg, Se and Tl by 3020/7060, 3020/7421,7470, 7740 and 3020/7841, respectively.

1.4.1.4 Pesticides/Aroclors by EPA Method 8081

1.5 Project Definitions. The following definitions apply to terms commonly used in the text of this document:

Accuracy	Nearness of a measurement or the mean ($\bar{x}$) of a set of measurements to the true value. Accuracy is evaluated by the percent recovery of sample spikes, analysis of laboratory control samples, and reference materials.
Analytical Batch	The basic unit for analytical quality control is the analytical batch. The analytical batch is defined as 20 or fewer samples that are analyzed together with the same method sequence and the same lots of reagents and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each analytical batch should be of similar matrix (e.g., groundwater, surface water, soil, sediment, sludge, etc.). Analytical Batch should not be confused with Preparatipn Batch
Batch	Synonymous with Sample Delivery Group (SDG).
Calibration Blank	Usually an organic or aqueous solution that is as free of analyte as practical and prepared with the same volume of chemical reagents used to prepare the calibration standards and diluted to the appropriate volume with the same solvent (water or organic) used to prepare the calibration standard. The calibration blank is used to give the null reading for the instrument response versus concentration calibration curve.
Case	A finite, usually predetermined, number of samples collected over a given time period from a particular site. For this QAPP, a Case will consist of all samples of similar matrix to be collected.
Comparability	A measure of the confidence with which one data set can be compared with another.
Decontamination Water	A sample of water used for decontaminating field equipment. The source of this water can be a hydrant or the tanks used by contractors to transport the water to a site.
Completeness	A measure of the amount of valid sample data obtained from the measurement system compared to the amount of sample data that are requested. Valid results are those results which meet or exceed quality control criteria and satisfy quality assurance objectives.
Duplicate	Duplicate samples are two samples taken and analyzed independently. In cases where homogenization would affect sample quality or representativeness, as in the case of volatiles, nonhomogenized samples must be taken for the duplicate analysis.

Environmental Samples	An environmental sample or field sample is a representative sample of any material (aqueous, nonaqueous, or multimedia) collected from any source for which evaluation of composition or contamination is requested or required.
Matrix Duplicate Sample	An aliquot of the homogenized sample which is prepared and analyzed identically to the original sample. Used in metals and cyanide analyses in place of the matrix spike duplicate to measure precision of laboratory preparation and analysis.
Matrix Spike (MS)	A matrix spike is employed to provide a measure of accuracy for the method used in a given matrix. A matrix spike analysis is performed by adding a predetermined quantity of stock solutions of certain analytes to a sample matrix prior to sample extraction/digestion and analysis.
Matrix Spike Duplicate (MSD)	A second matrix spike sample prepared identically to the matrix spike on a homogenized duplicate sample of the matrix. Used to measure precision of laboratory preparation and analysis.
MDL	The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from replicate analyses of a sample in a given matrix containing low concentrations of the analyte. See 40CFR Part136 Appendix B
Method Blank	A sample matrix that is as free of analyte as practical and contains all the reagents in the same volume as used in the processing of the samples. The method blank must be carried throughout the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The blank is used to monitor for possible contamination resulting from the preparation or processing of the sample.
Performance Evaluation Sample	A material of known composition that is analyzed concurrently with test samples during a measurement process. It is used to verify the performance of the analytical system.
Precision	Precision is the agreement between a set of replicate measurements without assumption or knowledge of the true value. Precision is evaluated as the relative percent difference or relative standard deviation for replicate or split samples.
Reporting Limit	The reporting limit is the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions.

Representativeness	The degree to which a single measurement is indicative of the characteristics of a larger sample or area or the degree to which data represents field conditions.
RPD	Relative Percent Difference, calculated as

$$RPD\ (\%) = \frac{|S\text{-}D|}{(S+D)/2} \times 100$$

where

S = first sample value (original)

D = second sample value (duplicate)

SDG	Sample Delivery Group, defined as a group of 20 or fewer samples of similar matrix collected in a period of 14 days or less.

2.0 QUALITY ASSURANCE OBJECTIVES AND AUDIT PROCEDURES

2.1 <u>Data Quality Objectives.</u> The 3-stage data quality objective (DQO) process described in EPA guidance (EPA, 1987) was used to define the data objectives and quality assurance objectives for the Himco Dump Site. By following procedures outlined in the QAPP, Contractor will ensure that data collected at this site will be of sufficient quality to serve as statistically valid background data for the site. Results of the DQO process for the RD/RA are given below. The data objectives for this remediation at the Himco Dump Site are as follows:

- To collect the quantity and quality of data sufficient to characterize the physical setting and nature, extent, and rate of migration of releases of hazardous waste or constituents and to interpret this information to determine whether interim corrective measures or further measures may be necessary resulting from potential releases of chemicals from this Dump Site.

Reporting limits will be such that the DQOs are attained. Tables SAP-5, SAP-9, SAP-11, and SAP-13 list appropriate Reporting limits for this task.
Definitions: A Reporting Limit is what the lab notes on the report/forms and should be no lower than the low standard used during the initial calibration. A Detection Limit is lower than the Reporting Limit and represents the lowest concentration that the lab can determine the presence only of a given target analyte. A lab's reporting limit must be at least 3 to 5 times the laboratory's Method Detection Limit (MDL) which is defined in 40CFR part 136 Appendix B.

2.2 <u>Quality Assurance Objectives for Measurement of Data.</u>

2.2.1 **General.** The overall quality assurance (QA) objective for this task at the Himco Dump Site is to develop and implement procedures for sampling, laboratory analyses, field measurements, reporting, and data review that will provide data to a degree of quality consistent with the intended use. The sample set, chemical analysis results, and interpretations will be based on data that meet or exceed QA established for the RD/RA.

Because analytical data may be used for risk assessment, this use will determine the quality of analytical data required. The quality of analytical data generated by SW-846 methods is suitable for use in risk assessment studies. These methods are characterized by rigorous quality assurance/quality control (QA/QC) protocols and documentation providing qualitative and quantitative analytical data. EPA SW-846 methods will generate data of known quality using established methods. The addition of the full analytical data package required for this project will further enhance the documentation and data quality of the SW-846 analytical packages. Data from these analyses using standard EPA-approved procedures that meet QA objectives are acceptable for use in risk assessments (EPA, 1987).

QA objectives and procedures for field measurement systems are also important aspects of these investigations. The objectives and the QA procedures for the acquisition of nonchemical data will be discussed in the appropriate SOPs.

QA objectives are usually expressed in terms of accuracy or bias, precision, completeness, representativeness, and comparability. Target ranges for these objectives are presented for analytical testing and field measurements. Variances from the QA objectives will result in the implementation of appropriate corrective measures and an assessment of the impact on the useability of the data in the decision-making process.

2.2.2 Required Level of Analysis and Review. To generate data of sufficient quality to be used to meet the DQOs, the following approach will be used:

- EPA SW-846 methods will be used to analyze samples for metals, cyanide, volatile and semivolatile compounds, and pesticides/PCBs. Methods for Chemical Analysis of Water and Wastes (EPA, 1983) or SW-846 methods may be used to analyze samples Ph and conductivity. The sample analysis methods for each procedure are specified in Table SAP-1.

- Internal quality control samples and procedures to be used by the laboratory for analysis are specified in Section 6.4.

- Full data documentation (including raw data) will be obtained from the laboratories and will be retained within the project files for a minimum of 10 years from the time of receipt from the laboratory.

- Either full data validation or a quality control (QC) review, as defined in Section 6.7, will be completed on all data. Full analytical data packages will be obtained from the laboratory, as noted above, and checked for completeness as part of the data validation and review process. Therefore, a complete data validation could be performed on these additional data packages if required in the future.

- One duplicate/split sample per quarterly sampling event will be sent to a referee laboratory for analysis of chemical constituents.

2.2.3 Quality Control Samples. One field duplicate per sampling event will be collected and submitted to the analytical laboratory to provide a means to assess the quality of the data resulting from the field sampling program. Field duplicate samples will be analyzed for constituents to check for sampling and laboratory reproducibility. Laboratory control samples will be analyzed to measure the accuracy of the analytical method. Matrix spike samples will be analyzed to determine the matrix-specific accuracy of the analysis. Laboratory duplicates for inorganic analysis and matrix spike duplicates for organic analytes will be analyzed to evaluate laboratory reproducibility or precision. Specific QC sample descriptions are given in Section 6.4, Internal Quality Control Checks. The specific level of field QC effort is summarized in Section 4.6.

2.2.4 Quality Assurance Objectives - Quantitative Limits. Within this QAPP, quantitative goals are defined for reporting limits, accuracy, precision, and analytical completeness. Reporting limits will be set by the analytical laboratory based on historical data for similar environmental matrices. Detection limits for this project are specified in Tables SAP-5, SAP-9, SAP-11, SAP-13. Accuracy is defined as the degree of agreement of a measurement to an accepted reference or true value. Accuracy will be measured as the percent recovery (%R) of an analyte in a reference standard or spiked sample. The procedure for calculating percent recovery is specified in Section 6.6.1. Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true value. The procedures for calculating precision are specified in Section 6.6.2. Analytical completeness is defined as the percentage of analytical results requested, which are determined as valid through validation and review. The procedure for calculating analytical completeness is specified in Section 6.6.3.

2.2.4.1 Project-Required Detection Limits. Tables SAP-5, SAP-9, SAP-11, and SAP-13 list the project-required reporting limits for analyses to meet project DQOs. These are the reporting limits that the laboratory must be able to meet, based on analyses of pure water using the analytical methods specified in Table SAP-4. The reporting limits for samples from matrices other than pure water may be considerably higher.

2.2.4.2 Accuracy Limits. Accuracy (%R) limits for laboratory control samples (LCS) are specified in Tables SAP-5 through SAP-8. Accuracy limits for matrix spike recoveries are specified in Tables SAP-8 and SAP-10. Accuracy limits for surrogate spike recoveries are given in Table SAP-5. The limits specified in these tables will be used during QC review or data validation as specified in Section 6.7.

2.2.4.3 Precision Limits. Precision limits for matrix spike recoveries are specified in Tables SAP-8 and SAP-10. The limits specified in these tables will be used during QC review or data validation.

2.2.4.4 Completeness. The analytical completeness goal for this project shall be 90 percent.

2.2.5 Quality Assurance Objectives - Qualitative Limits

2.2.5.1 Representativeness. Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition.

Representativeness will be maintained during the sampling effort by performing all sampling in compliance with the procedures described in the FSP, Sections 4.3 and 5.0 of this document, and the respective SOPs.

2.2.5.2 Comparability. Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision as these quantities are measures of data reliability. Data are comparable if siting considerations, collection techniques, and measurement procedures, methods, and reporting are equivalent for the samples within a sample set. A qualitative assessment of data comparability will be made of applicable data sets.

2.3 Performance and Systems Audits. The laboratories participating in the Himco Dump Site investigations will undergo a validation audit by the EPA and/ or the State of Indiana, which includes performance evaluation sample analysis and an inspection.

The Field Investigation Task Leader is responsible for supervising and checking that samples are collected and handled in accordance with the approved project plans and that documentation of work is adequate and complete. The Project Manager is responsible for overseeing that the project performance satisfies the QA objectives as set forth in this QAPP. Reports and technical correspondence will be peer reviewed by an assigned qualified individual, otherwise external to the project, before being finalized. It is not anticipated that performance audits will be necessary for the field sampling work due to the limited sampling required for completion of this task.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES. Project organization and lines of authority and individual responsibilities are presented in the following sections.

3.1 Responsibilities

3.1.1 U.S. EPA Remedial Project Manager. The U.S. EPA Region V Remedial Project Manager (RPM) has the overall responsibility for the RD/RA.

3.1.2 U.S. EPA Regional Quality Assurance Manager. The U.S. EPA Regional Quality Assurance Manager (RQAM) RQAM has the responsibility for review and approval of the QAPP.

3.1.3 The following key (Contractor) project personnel are described below:

- Project Manager
- Project QA/QC Officer
- Site Safety and Health Officer
- Task Leaders
- Field Team

3.1.4 Project Manager. The Project Manager has primary responsibility for the completion of all activities on the project. He is responsible for the day-to-day control of planning, scheduling, cost control, and implementation of the project, and for the development of the technical reports and other project documents. The Project Manager monitors all project personnel in planning, coordinating, and controlling all technical aspects of the tasks.

3.1.5 Project QA/QC Officer. The Project QA/QC Officer reports to the Project Manager and works directly with the Project Manager and other project personnel. The Project QA/QC Officer, is responsible for monitoring and verifying that the work is performed in accordance with this plan, the SOPs, and other applicable procedures. The Project QA/QC Officer also is responsible for assessing the effectiveness of the QA/QC program and for recommending modifications to the program when applicable. The Project QA/QC Officer is responsible for assuring that personnel assigned to the project are trained and indoctrinated relative to the requirements of the QA/QC Program. The Project QA/QC Officer will advise the Project Manager on implementation of the QA/QC program, but the QA/QC functions of the Project QA/QC Officer and QA/QC representatives are independent of the Project Manager. The Project QA/QC Officer is responsible for coordination with the Quality Assurance Laboratory. The Project QA/QC Officer has the authority to halt work in case of major problems or nonconformances to the QA plan or if numerous minor problems are not corrected in a timely manner.

3.1.6 Site Safety and Health Officer. The Site Safety and Health Officer (SSHO), works directly with the Project Manager and other project personnel. The SSHO has the responsibility to monitor and verify that the work is performed in accordance with the SSHP. The SSHO will advise the Project Manager regarding health and safety issues but will function independently of the Project Manager.

3.1.7 Task Leaders. Each Task Leader is responsible to the Project Manager for planning, scheduling, cost control, and completion of assigned project tasks. The Task Leader is responsible for implementing the QA/QC program related to assigned tasks at the Himco Dumpsite. Task Leaders for the following subtasks are:

- Field Investigation
- Chemistry

3.1.8 Field Team. Each member of the field team staff is responsible to the Project Manager for completion of assigned project activities. Members of the field team are responsible for understanding and implementing the QA/QC program as it applies to their project activities. Key individuals who will be involved in this project are as follows:

- Project Manager
- Project QA/QC Officer, Chemistry Task Leader
- Field Investigation Task Leader, Site Geologist, Site Safety and Health Officer

3.2 Qualifications of Personnel. All personnel assigned to the project, including employees and consultants, are qualified to perform the tasks to which they are assigned.

Appraisal of the qualifications of technical personnel assigned to the project will be made by the Project Manager. The appraisal will include comparing the requirements of the job assignment to the relevant experience and training of the prospective assignee; it will also include determining whether further training is required and, if required, by what method. On-the-job training is an acceptable method, provided such training is provided by a person qualified to perform the trainee's assignment and the results of that training are documented.

3.3 Laboratory and Subcontractor Assignment. The commercial laboratory chosen for this investigation should be certified by the State of Indiana or another agency such as the EPA.

3.4 Project File. A project file containing complete project documentation of all aspects of the activities associated with Himco Dumpsite investigations will be maintained by the Site Custodian. An outline of project file requirements follows:

- Communications
  - Internal
  - External
- Quality assurance/quality control
  - Procedures
  - Chain of custody (COC)
  - Laboratory quality control reports

- Deviation notification forms

- Technical information
    - Analytical data
    - Field data
    - Field logbooks
    - Graphic resources
    - Data quality acceptance
    - Calculations/evaluations
    - Regulatory compliance

- Management
    - Schedule
    - Budget
    - Site database

- Health and Safety
    - Plans/procedures

- Documents
    - Plans
    - Reports
    - Relevant publications (e.g., USGS, EPA, etc.)

Project documentation will be checked for completeness before being included in the file. All evidence file documentation will be maintained by the Site Custodian under the document control system. Upon termination of the project, all records (e.g., chromatographs, spectra, and calibration records) will be archived for at least 10 years from completion of work conducted under this QAPP at the Himco Dumpsite. The Project QA/QC Officer will be responsible for ensuring that the QA/QC records are properly stored and are retrievable.

4.0 GROUND WATER QUALITY MONITORING PLAN.

4.1 __General.__ This Ground Water Quality Monitoring Plan discusses the details of ground water monitoring during the post-closure period for the Himco Dump Superfund Site. The Ground Water Quality Monitoring Plan includes sampling protocol, record keeping requirements, and monitoring system maintenance.

Post-closure regulations require monitoring the quality of ground water. This will entail monitoring the ground water for SVOCs, VOCs, Pesticides/PCBs, and Metals. Ground water monitoring wells to be sampled include: WTE1, WT01, WT101A, WT101B, WT102A, WT102B, WT111A, WT112A, WT112B, WT113A, WT113B, WT114A, WT114B, WT115A, WT116A, WT116B, WT117A, WT117B, WT118B, WT119A, WT119B, WT120A, WT120B. The locations of these monitoring wells are shown on Figure SAP-1. Monitoring well construction details are included in Appendix SAP-A as a supplement to this manual.

Wells designed to monitor the shallow portion of the aquifer include: WTO1, WT101A, WT102A, WT111A, WT112A, WT113A, WT114A, WT115A, WT116A, and WT117A. The remaining wells are screened to monitor the intermediate portion of the aquifer at a depth of approximately 60 feet below ground surface. Monitoring wells WT102A, WT102B, WT112A, WT112B, WT113A, and WT113B are located upgradient of the landfill and are background wells. Monitoring wells WTO1, WT114A, and WT114B are downgradient of the eastern-most landfill boundary along the east and west side of John Weaver Parkway (Nappanee Street Extension). Monitoring wells WTE1, WT101A, WT101B, WT111A, WT115A, WT116A, WT116B, WT117A, WT117B, and WT118B are located near the downgradient (south) edge of the landfill.

In addition, the following monitoring wells will also be used to obtain water level measurements only: WTB1, WTB2, WTB3, WTB4, WTE3, WT101C, WT102C, WT103A, WT104A, WT105A, and WT106A. The locations of these monitoring wells are also shown on Figure SAP-1, and the monitoring well construction details are included in Appendix SAP-A.

The schedule for obtaining ground water samples and water level measurements is provided in Table SAP-2.

4.2 __Water Level Measurements.__ A complete round of water level measurements will be taken and recorded from all ground water monitoring wells listed above immediately prior to the ground water sampling event outlined in Paragraph 4.3.4 of this document. Measurements from all wells will be completed within the smallest time frame possible (maximum 8-hour period) in order to reduce external variables such as weather conditions which may affect the water levels. Water level measurements will be taken in accordance with the procedures outlined below.

The exterior of all ground water monitoring wells will be visually inspected for signs of deterioration. The protective casing, lid, and well casing will be inspected for cracks or other signs of deterioration which may allow water to enter the well. Furthermore, the lock for the protective casing lid will be inspected for operability, and the slip cap or expandable plug on the well casing will be inspected for an adequate seal. Any deficient caps or locks revealed by the inspections will be replaced. The annular space around the well casing will be examined for a proper seal. The finished surface surrounding the well casing will be examined for uplift/subsidence due to freeze/thaw cycles. If any visible uplift/subsidence has occurred, then the well will be evaluated for potential separation of any sections of the casing and screen using a downhole camera if necessary. The well depth will be measured in accordance with the procedures specified below, and compared to the well depth recorded at the time of installation (see monitoring well construction details in Appendix SAP-A) to determine if sediment has accumulated in the well. If significant sedimentation (1 foot or more) is observed, then the well will be redeveloped in accordance with procedures outlined in this document.

Water level measurements will commence by removing the well cap and obtaining readings from a photoionization detector (PID) instrument and combustible gas indicator. These readings will be taken in order to monitor for dangerous conditions. All monitoring wells with a watertight cap will be allowed to sit for approximately 1/2 hour prior to taking any water level measurements. This will enable the water level to stabilize. The next step will be to measure the water level in the well using an electronic water level meter. Measurements will be taken in triplicate from the top of the well casing, and will be made to the nearest 0.01 feet. Only the average of the three measurements will be recorded. After determining the water level, the probe will be lowered to the bottom of the well to measure total depth of the well. Any sheen or odor from the probe will be noted on the record sheet for that well. All monitoring wells with a watertight cap will be rechecked no sooner than one hour after the initial water level reading to ensure that water levels have stabilized in those wells. All observations and measurements will be recorded on the Well Gauging Form shown in Appendix SAP-B.

4.3 Re-Development of Monitoring Wells. All re-development activities will be completed for a given monitoring well prior to obtaining a ground water sample. After re-development, the well will be allowed to stabilize for a minimum of 1 week prior to sampling. The objectives of well re-development are to a) assure that ground water enters the well screen freely, thus yielding representative ground water samples and accurate water level measurements, and b) remove very fine-grained sediment in the filter pack and nearby formation so that ground water samples are not highly turbid and silting of the well does not occur.

Re-development will consist of mechanical surging and pumping until little or no sediment enters the well. Any monitoring well with a 5-inch nominal diameter casing/screen will be re-developed using a drill rig and 4-inch diameter surge block attached to the end of the drill rods. A 4-inch diameter sand pump (a type of bailer) or equivalent will be used to remove fines which have entered the screen, and a submersible or bladder pump will be used for pumping. For monitoring wells with 2-inch nominal diameter casings/screens, surging will be accomplished with the use of a positive displacement pump with surge rings attached so that surging and pumping may be performed concurrently. If this method prove to be ineffective or inadequate, then a bailer will be used to surge and evacuate the well instead.

Any sediments brought into the wells during re-development will be removed. Surging and pumping/bailing will continue for a minimum of 2 hours. At the end of that time, the wells will be continuously pumped using the submersible or bladder pump. Temperature, Ph, specific conductivity, and nephelometric turbidity will be monitored at a minimum rate of 1 reading per well volume of water removed, and will be taken immediately prior to and during all re-development activities. Continuous pumping will take place until these parameters have stabilized (less than 0.2 pH units and a 10% change for the other parameters between four consecutive readings) and the water is clear and free of fines. Turbidity is the most critical parameter to monitor during well re-development. The standard to aim for in well re-development will be 5 nephelometric turbidity units (NTUs).

If the addition of water is required to facilitate surging and pumping/bailing, only formation water from that well will be used. If this is not practical due to the tightness of the formation, then only bailing will be done. In all cases, the utmost care will be taken not to collapse well screens during re-development activities.

A well re-development record will be prepared and completed for each monitoring well re-developed. This form is shown in Appendix SAP-B. Information to be recorded on the well re-development record will include, but not be limited to the following:

- Name of project and site, well identification number, and date(s) of re-development.
- Date, time, and depth to the static water level and bottom of well/top of sediment before re-development.
- Method used for re-development, to include equipment size, type, and make of bailer and/or pump used.
- Time spent re-developing the well by each method, to include the typical pumping rate if a pump was used.
- Volume and physical character of water removed, to include changes during re-development in clarity, color, particulates, and odor.
- Volume and source of any water added to the well.
- Volume and physical character of sediment removed, to include changes during re-development in color and odor.
- Clarity of water before, during, and after re-development.
- Date, time, and depth to the static water level and bottom of well/top of sediment immediately after, and 24 consecutive hours after re-development.
- Readings of pH, specific conductance, temperature, and nephelometric turbidity taken before, during, and after re-development, and time of readings.
- Name(s) and job title of individual(s) re-developing well.

4.4 Ground Water Sampling. Field instrumentation will be calibrated daily in the field prior to the start of any sampling activities and after a piece of equipment has been turned off for any length of time during the sampling in accordance with the Standard Operating Procedures (SOPs) outlined in the Field Operation Manual accompanying that instrument. Results of instrument calibrations will be recorded on the Instrument Calibration Forms shown in Appendix SAP-B. Procedures for field screening measurements may also be found in the field manual accompanying the instrument being used.

Before a sample is collected from any well, the well integrity, water level, and total well depth will be measured and recorded following the procedures outlined above. The well will then be pumped using a submersible pump or bladder pump with dedicated Teflon-lined polyethylene tubing to remove a quantity of water equal to at least five times the submerged volume of the casing. The volume of water to be removed from each monitoring well can be calculated as follows:

Volume of water = [volume of water per foot of casing depth (gal)] x [length of water column (ft)] x [5 well volumes]

Where:

- The volume of water per foot of 2-inch nominal diameter well casing is 0.16 gallons and the volume of water per foot of 5-inch nominal diameter well casing is 1.02 gallons.

- The length of the water column = [total length of well] - [depth to water].

Appendix SAP-B contains a Field Record of Water Sampling Form which can be utilized to calculate purge volumes for each monitoring well. The purge liquids will be containerized in DOT-approved polyethylene tanks or 55 gallon drums. The tanks or drums will be labeled with their contents. After sampling has been completed, the tanks/drums will be secured on wooden pallets and stored on site until receipt of ground water chemical analyses. Tanks/drums containing potentially hazardous material will be disposed of at an approved hazardous waste facility. Tanks/drums determined not to be potentially hazardous by laboratory analyses will be transported to an USEPA approved location for disposal. Other wastes generated during decontamination activities, including discarded PPE, disposable sampling equipment (tubing, rope, etc.), and other debris, will be collected and containerized in DOT-approved 55-gallon drums.

The pump intake will be set at approximately the mid-point of the open screen interval. Each monitoring well will be pumped at a rate that does not cause ground water to vigorously cascade down the sides of the screen, which could potentially cause an accelerated loss of volatile organic compounds. A flow rate not to exceed the well recovery rate will be used when purging, and a target rate of 100 ml/minute will be used for sampling. Temperature, pH, specific conductivity, dissolved oxygen, and nephelometric turbidity will be monitored at a minimum rate of 1 reading per well volume of water removed, and will be taken immediately prior to and during all sampling activities. Water quality parameters will be recorded on the Field Record of Water Sampling Form which can be found in Appendix SAP-B. Purging will continue beyond five casing volumes until these parameters have stabilized (0.2 pH units and a 10 percent change for the other parameters between four consecutive readings). All monitoring wells will be sampled immediately following completion of purging. If a low yielding well dewaters before evacuation of the required volume, the well will be allowed 30 minutes to recover, and pumping will be resumed. If the well goes dry again, pumping will cease, and the volume purged will be recorded. Ground water sampling will occur as soon as a sufficient quantity of water is available.

A ground water sample will be collected immediately after the monitoring well is fully purged. A clean, untreated sample jar will be rinsed with a small amount of sample water which is then disposed of, then the sample jar is gently filled. The order of sample collection will be:

1. Volatile Organic Compounds (VOCs)
2. Semi-Volatile Organics (SVOCs)
3. Pesticides/PCBs
4. Metals

Sampling for VOCs requires special care not to agitate the sample and promote volatilization. In addition, no headspace may be present in the sample container after it has been filled. VOC samples will be collected using a slow controlled pour down the inside of a tilted VOA container to minimize agitation. The sample container will be filled until the meniscus is above the top of the container. The sample bottle will be capped, then inverted and tapped lightly upon the back of the sampler's hand to determine if any air bubbles are trapped within the container. Containers with trapped air will be discarded and a new sample bottle will be filled.

Appropriate preservatives will be added to any samples that require them at the time of collection. Samples preserved with acid will be checked with pH paper of the proper sensitivity to ensure correct pH levels have been obtained. Sample container, volume, and preservation requirements can be found in Table SAP-3. Disposable gloves will be worn while sampling, and will be changed prior to proceeding with work at the next monitoring point.

4.5 **Sample Documentation.** All sample collection activities will be documented on the Field Record of Water Sampling form shown in Appendix SAP-B. This form will contain, at a minimum, the following information:

- Place of Sample Collection
- Sample Identification Number
- Date and Time of Sample Collection
- Total Depth of Well
- Length of Water Column
- Volume of Water in Well
- Calculation of Purge Water Volumes in Each Well
- Actual Volume of Water Removed
- Type of Sample Container(s)
- Field Observations (weather, odor, etc.)
- Name of Person(s) Collecting Sample
- Preservation Method (if any)
- Analysis to be Conducted

All samples will be accompanied with appropriate chain of custody documentation.

4.6 **Sample Containers.** All sample containers will be obtained from a qualified laboratory acceptable to the USEPA. Ground water samples will be placed in containers specially prepared by the laboratory. Container specifications can be found in Table SAP-3.

Sample containers will be labeled with a waterproof pen at the time of collection to prevent sample misidentification. The sample label will include the following information:

- Place of Sample Collection
- Sample Identification Number
- Date and Time of Sample Collection
- Initials of Collector(s)
- Analytical Parameter(s)
- Preservative (if any)

4.7 **Sample Handling.** All samples will be immediately placed in coolers with a temperature of 4°C in the field to prevent or retard the alteration of chemicals in the samples. The temperature inside the cooler will be maintained by the use of bagged ice. Samples taken and transported during subfreezing temperatures will be protected from freezing. The sample containers will be packed in the cooler in a manner which will minimize the possibility of breakage. The samples will be delivered to an approved certified laboratory after collection by the sampling personnel.

A chain of custody form will be completed and accompany each sample cooler sent for laboratory analysis. The chain of custody form will include project identification, project location, sample location, sample designation, container type and preservative, analysis type, and cooler identification. In addition, the form will contain spaces for entry of the sample collection date and time, sample collection technique, signature of the person(s) relinquishing and receiving samples, and the status of the samples upon receipt by the laboratory.

4.8 Quality Control. Ground water Quality Control samples will be collected and analyzed for the purpose of assessing the quality of the sampling effort and the analytical data. Quality Control samples will include duplicates of field samples, rinsate blanks, and trip blanks.

Field duplicates will be collected as separate grab samples obtained consecutively from a given sampling location. Field duplicates will be collected at a frequency of one per every ten field samples collected. Duplicate samples will be obtained from both the shallow and intermediate portions of the aquifer.

Rinsate blanks will be collected from the sampling equipment after the decontamination procedure has been performed by pumping distilled water through the sampling pump and collecting the water in the appropriate containers. Rinsate blanks will be taken at a frequency of one per every ten field samples collected.

Trip blanks will be shipped to and from the field with the sample containers, and will not be opened by the field sampling personnel. Trip blanks will be shipped back to the laboratory at a frequency of one per cooler of aqueous samples for VOC analysis per day.

4.9 Equipment Decontamination. All equipment coming into contact with ground water will be cleaned prior to use at each well in the following manner:

1. Non-phosphate detergent wash using a brush
2. Potable water rinse
3. Triple deionized, distilled water rinse

Decontaminated equipment will be stored in new plastic garbage bags and sealed when not in use. The waste liquids generated from decontamination activities will be disposed of in the same manner as the purge water (see Paragraph 4.3.4 above).

4.10 Monitoring Well Performance Plan. In order to ensure that each monitoring well is yielding reliable data, the following tasks must be performed at the time of each sampling event. This information will be included in the Annual Report (see Section 6.0).

An evaluation of water level conditions in the monitoring wells will be performed to ensure that the effects of waster disposal or well operations have not resulted in changes in the hydrologic setting and resultant flow patterns. Closure activities and other types of soil disturbances could influence the site ground water flow direction and water levels; therefore, this evaluation is performed to ensure that the downgradient wells are still located hydrologically downgradient of the site, and the upgradient wells are not affected by the site.

Well depth measurements will be analyzed to ensure each well is physically intact and not filling with sediment.

An examination of high and low water levels will be conducted, accompanied by a discussion of the acceptability of well location and the exposure of the screened interval to the atmosphere. This will ensure that all monitoring wells will continue to meet monitoring well siting requirements.

4.11 Daily Quality Control Report. To supplement the information recorded in the planned and completed field book, DQCRs will also be maintained to document daily field activities and will note any nonconformances and corrective actions taken at every sampling location. An example of the DQCR is shown as Appendix SAP-B. DQCRs will be maintained by members of the field sampling team and cross-checked for completeness at the end of each day by the Field Investigation Task Leader. They will be signed and dated by individuals making entries and initialed by the reviewer upon completion. Copies of the DQCR will be submitted to the EPA(RPM) on a weekly basis.

4.12 **Sample Designation.** All QA/QC samples will be assigned a unique identification number following the same procedure above except for the last number. This investigation will follow that convention so that the last number corresponds to the type of QA/QC sample:

- 1 - Groundwater Analytical
- 2 - Groundwater Field Duplicate
- 3 - QA Lab Duplicate

The only QA/QC sample type that is not identified according to the above convention is the MS/MSD sample type. These are duplicate aliquots from an analytical sample that are spiked with the target analyte(s) and reanalyzed to determine matrix-specific accuracy and precision of analysis. The samples chosen for MS/MSD analyses are labeled in the field as MS/MSD samples and are noted as such on the chain-of-custody (COC) forms.

4.13 **Field Preventative Maintenance.** To ensure that analytical data generated for the Himco Dumpsite site investigations are of sufficient quality to meet quality assurance objectives, all equipment and instruments will have a prescribed routine maintenance that will be performed and documented by qualified project personnel.

All field instrumentation, sampling equipment, and accessories will be maintained in accordance with the manufacturer's recommendations and specifications and established field practice. All maintenance will be performed by qualified project personnel and will be documented by the appointed equipment manager or designee under the direction of the equipment manager.

The Field Investigation Team Leader/SSHO will review calibration and maintenance records on a regular basis to ensure that required maintenance is occurring. These activities will be recorded in the field logbook to document that established calibration and maintenance procedures have been followed. Field instruments will be checked and calibrated prior to their use on site, and batteries will be charged and checked daily where applicable. Non-operational field equipment will be removed from service and a replacement will be obtained. Field equipment will not be repaired in the field.

All field instruments will be properly protected against inclement weather conditions during the field investigation. Each instrument is specially designed to maintain its operating integrity during variable temperature ranges that are representative of ranges that will be encountered during cold-weather working conditions. At the end of each working day, all field equipment will be taken out of the field and placed in a cool, dry room for overnight storage.

4.14 **Field Quality Control Checks.** Field quality control checks will include the review and approval of all field documentation by the Field Investigation Task Leader or his/her designee. Signature or initial approval will indicate that the provisions outlined in the QAPP and SSHP have been appropriately implemented.

Field duplicates will be collected for analysis of chemical constituents and submitted to both the Contractor and to the designated QA laboratory. One field duplicate sample will be collected per sampling event for each laboratory.

A trip blank(s) will be prepared and submitted to each laboratory along with the field samples during each sampling event to monitor potential VOC contamination.

MS/MSD (analysis for organics) and matrix spike/duplicate (MS/D) analytes (for inorganics) provide a measurement of long-term precision and accuracy of the analytical method on various matrices and demonstrate acceptable compound recovery by the laboratory on the site-specific matrix. For many analyses, extra sample volume must be collected in the field for the MS/MSD or MS/D analyses. MS/MSD and MS/D analyses will be analyzed at a frequency of 1 set per quarterly sampling event.

4.15 __Field Data Reduction.__ The field and technical (non-laboratory) data that will be collected at the Himco Dumpsite can generally be characterized as either objective or subjective data. Objective data include all direct measurements such as analytical parameters and water-level measurements. Subjective data include certain descriptions and observations.

4.15.1 Field and Technical Data Reduction. All field data will be recorded by field personnel in bound field notebooks and on standard forms. For example, during drilling activities, the field team member supervising a rig will keep a chronological log of drilling activities, a vertical descriptive log of lithologies encountered, other pertinent drilling information (working conditions, water levels), and a labor and materials accounting in the team member's bound notebook. It will be the responsibility of all field personnel to photocopy all field logs (including notebook pages and standard forms) generated during a given field day. Copies will be maintained by the Site Geologist in field log files. At the completion of a work shift, copies of all field logs, notebook pages, and standard forms will be returned to the contractor's field office. These copies will be presented to the Field Investigation Task Leader and entered into the project file.

After checking the validity of data in the field notes and on standard forms, the data administrator will reduce the data to tabular form, wherever possible, by entering the data in data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hard copies for later review by the Project Manager and to incorporate into technical reports, as appropriate.

4.15.2 Field and Technical Data Validation. Valation of field and technical data will be performed at two different levels. On the first level, data will be validated at the time of collection by following standard procedures and quality control checks. At the second level, data will be validated by the Field Investigation Task Leader who will review the data to ensure that the correct codes and units have been included. After data reduction into tables or arrays, the Field Investigation Task Leader will review data sets for anomalous values. Any inconsistencies or anomalies discovered by the Field Investigation Task Leader will be resolved immediately, if possible, by seeking clarification from the field personnel responsible for collecting the data. Subjective field and technical data will be validated by the Project Manager who will review field reports for reasonableness and completeness.

4.16 __Field Corrective Action.__ The Field Investigation Task Leader will review the procedures being implemented in the field for consistency with the established protocols. Sample collection, preservation, and labeling, etc., will be checked for completeness. Where procedures are not strictly in compliance with the established protocol, the deviation will be field documented and reported to the Project QA/QC Officer. Any and all nonconformances with the established quality control procedures will be expeditiously identified and controlled. No additional work that is dependent on the nonconforming activity will be performed until the identified nonconformance is corrected. Corrective actions will be defined by the Field Investigation Task Leader, Project QA/QC Officer, and Project Manager and documented as appropriate. Upon implementation of the corrective action, the Field Investigation Task Leader will provide the Project QA/QC Officer with a written memorandum documenting field implementation. The memo will become part of the Himco Dumpsite project file.

The Project QA/QC Officer will review the field and laboratory data generated for this project to ensure that all project quality assurance objectives are met. If any nonconformances are found in the field procedures, sample collection procedures, or field documentation procedures, the impact of those nonconformances on the overall project QA objectives will be assessed. Appropriate actions, including resampling, reanalysis, etc., may be recommended to the Project Manager so that the project objectives can be accomplished.

5.0 SAMPLE CHAIN OF CUSTODY, PACKING, AND TRANSPORTATION

5.1 Chain-of-Custody Protocol

5.1.1 Field Protocol. Each cooler containing samples sent to the analytical laboratory will be accompanied by a COC form. This section briefly describes the procedures for sample documentation using COC protocol.

The primary purpose of the COC procedures is to document the possession of the samples from collection through storage and analysis to reporting. COC forms will become the permanent records of all sample handling and shipment. The Field Investigation Task Leader/Site Geologist or designee will be responsible to the Project Manager for monitoring compliance with COC procedures.

The field team will be responsible for the care and custody of the samples until they are transferred to another party, dispatched to the laboratory, or disposed. The field team, under the direction of the Field Investigation Task Leader, will be responsible for enforcing COC procedures during field work.

The COC procedures are provided below.

- At the time of sample collection, the COC form is completed for the sample collected. The sample identification number, sample date, type and size of sample container, analysis requested, and preservative is recorded on the form.
- When the form is completed or when all samples that will fit in a single cooler have been collected, the field team members will cross-check the form for possible errors and sign the COC form. Corrections are made to the record with a single strike mark and dated and initialed. All entries will be made in blue or black ink. Each cooler will be accompanied by a separate COC form, sealed in a Ziploc-type bag, and placed inside the cooler.
- Custody seals will be placed on the outside surface of the cooler.
- The sample handler will complete and maintain a shipping bill and a copy of the COC form.

When transferring custody of the samples, the individual relinquishing custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the COC. This process documents sample custody transfer from the sampler, usually through an express courier, to the analyst in the contracted analytical laboratory. A copy of each COC form is retained by the sampling team for the project file and the original is sent with the samples. Bills of lading will also be retained as part of the documentation for the COC records.

5.1.2 Laboratory Protocol. Upon receipt at the laboratory, the designated laboratory sample custodian shall sign the COC form indicating receipt of the incoming field samples. The samples shall be checked against the COC form upon arrival at the laboratory. The receiving personnel will properly document the receipt of all arriving samples and note any problems or discrepancies between the sample and COC forms and sample container and seal conditions and report them immediately to the field sampling coordinator. The samples shall be assigned a unique laboratory number for analysis or treatment. This number will be cross-referenced to the original field sample number, recorded in the laboratory notebook, and reported in the laboratory report. In conjunction with data reporting, a copy of the COC form shall be returned to the Project Manager for inclusion in the central project file. The original shall be retained by the sample custodian.

5.2 <u>Sample Labeling.</u> A sample numbering system will provide a tracking mechanism to allow retrieval of the sample and sample information and identification of the sampling locations. A unique sample number will be assigned to each sample.

5.3. <u>Sample Handling, Packaging, and Shipping.</u> Samples collected and shipped for analysis as part of the investigation at Himco Dumpsite will be shipped according to appropriate Department of Transportation (DOT) or IATA regulations for environmental samples.

5.3.1 Sample Preservation. Sample preservation is necessary to maintain the integrity of the collected samples, and sample preservation helps to ensure that the collected samples are representative of the true characteristics of the site. The necessary sample preservation procedures are described in Table SAP-3 for each type of analysis, and these sample preservation methods typically require chilling to approximately 4° C and/or addition of an acid preservative. If acid preservatives are required they shall be added to the bottles prior to sample placement. All samples immediately upon collection and proper labeling shall be placed in a chilled sample container.

5.3.2 Sample Handling and Shipping. After collection the samples will be preserved *as required in* **Table SAP-3,** *and the affixed sample-label shall be completed. The sample cooler* shall be located in a cool, shady place during sample collecting, and the time between sample preparation, labeling and placement on ice in the sample cooler shall be minimized and shall not *exceed 5 minutes. All sample containers shall be wiped off prior to placement in the coolers.* The samples shall then be double-bagged in resealable Ziploc bags and stored on double-bagged ice in an insulated cooler maintained at approximately 4° C. All samples will be arranged within the cooler, so as to minimize the potential for breakage and leaking. Packing material will be added as needed to insulate the samples and to help prevent breakage. No sample container shall touch another, and packing material shall be placed around jars to prevent them from touching during transport. New ice, which has been double-bagged in clear Ziploc bags, shall be placed among the samples along with the packing material prior to shipment. The samples shall be covered to the top of the cooler with more packing material. For sample coolers containing Groundwater VOC samples trip-blanks shall accompany the cooler. Once the sample cooler is full and ready for shipping, the completed chain-of custody forms will be double-bagged and taped to the inside of the sample cooler lid, the cooler's latch shall be locked, the cooler lid will be taped shut by strapping tape at two locations, and the cooler's drain will be taped shut. Custody seals bearing the date and the signature of the sample custodian will be affixed such that one end is attached to the cooler lid and the other end to the body of the cooler, and then clear nylon-reinforced strapping tape shall be laid over the custody seal. Two custody seals are required for each cooler; the custody seals will be attached, as described above, on the front and the rear of the cooler at opposite corners.

5.3.3 Sample Custody and Security. The purpose of maintaining sample custody and security is to ensure that the samples are not tampered with or adulterated in any manner. At all times during the sample collection process, the samples must be kept under direct observation and in the custody of the sample custodian (sampler) or locked in a secure place. By sealing the sample cooler with the custody seals, the integrity of the samples are maintained until the Sample Custodian at the Laboratory assumes custody of the samples. In this manner the integrity of the samples and there usefulness as viable as legally defensible data is fully maintained. The sample cooler shall be delivered to the laboratory by commercial over-night air freight. No samples shall be held on-site for more than 24 hours after collection. The samples listed on the chain-of-custody form must match what samples are actually packed in the cooler. One line shall be used for each jar. For example, one line shall be used for the 8-ounce jar for TRPH analyses, and another line for the two 4-ounce jars for TCL VOCs, even though the samples are from the same nominal depth. Separate lines shall be also be used for duplicates. Once the sample cooler is ready for shipment, the sample custodian (the sample collector) shall sign and date the COC and shall retain the duplicate copy of the three-part COC form. The duplicate copy is kept by the field team leader or field geologist for submission with the drilling logs. The rest of the COC shall be double-bagged and taped to the inside lid of the sample cooler, then the cooler lid will be taped shut and sealed by affixing the custody seals signed and dated by the sample custodian. Once the sample cooler is sealed shut, it cannot be reopened until it reaches the laboratory. There the laboratory sample custodian shall take custody and responsibility for the samples.

6.0 LABORATORY ANALYTICAL PROCEDURES

6.1 Analytical Laboratory Procedures. The analytical laboratory procedures to be used to analyze groundwater samples at Himco Dump Site are specified in Table SAP-4.

6.1.1 Volatile Organic Compounds. Volatile organics include compounds among varying classes such as halogenated organics, nonhalogenated organics, and aromatic organics. The first two classes generally contain contaminants associated with solvents; the third class includes compounds associated with fuels. The method listed in Table SAP-4 for volatile organic compounds is Method 8260. Method 8260 employs gas chromatography (GC) for separation and mass spectrometry (MS) for detection. GC/MS methods are indicated where the volatile contaminants that may be present are not well defined. The power of GC/MS lies in the capacity for positive identification of a wide range of compounds at relatively low detection limits.

Reporting limits for Method 8260 are shown in Table SAP-5. Acceptance criteria for surrogate spike recoveries are specified in Table SAP-6, for laboratory control samples in Table SAP-7, and for matrix spike/matrix spike duplicates in Table SAP-8.

6.1.2 Semivolatile Organic Compounds. The method listed in Table SAP-4 for semivolatile organic compounds is Method 8270. Method 8270 is a GC/MS method for determining extractable base/neutral and acid compounds such as phenols, nitrosamines, polynuclear aromatic hydrocarbons (PAHs), phthalate esters, nitrotoluenes, etc.

Reporting limits for Method 8270 are shown in Table SAP-9. Acceptance criteria for surrogate spike recoveries are specified in Table SAP-6, for matrix spike/matrix spike duplicates in Table SAP-8, and for laboratory control samples in Table SAP-10.

6.1.3 Metals. The methodology for metals analyses is provided in Table SAP-4. The following are various factors which influence the use of particular methods:

- Detection limits
- Interference
- Stability

Most metals, with a few exceptions, are detected at levels appropriate for the Himco Dumpsite task objectives by inductively coupled plasma (ICP) emission spectroscopy, Method 6010. Cold vapor atomic absorption (CVAA), Method 7470, will be used for mercury, and graphite furnace atomic absorption Methods 7041, 7421, 7740, and 7841 will be used for antimony, lead, selenium, and thallium, respectively.

Reporting limits for metals are shown in Table SAP-11. Acceptance criteria for matrix spike/matrix spike duplicates and laboratory control samples are specified in Table SAP-12.

Reporting limits for Method 9012 analyses are shown in Table SAP-11. Acceptance criteria for matrix spike/matrix spike duplicates and laboratory control samples are specified in Table SAP-12.

6.1.4 Pesticides/Aroclors. The method listed in Table SAP-4 for Pesticides/Aroclors (PCBs) compounds is Method 8081. Method 8081 is a GC/ECD or a GC/ELCD method for determining the concentrations of various organochlorine pesticides and polychlorinated biphenyls (PCBs) as Aroclors in extracts from a liquid matrix.

Reporting limits for Method 8081 are shown in Table SAP-13. Acceptance criteria for surrogate spike recoveries are specified in Table SAP-6, for matrix spike/matrix spike duplicates in Table SAP-11, and for laboratory control samples in Table SAP-14.

6.1.5 Other Analytes. Other analytes include pH, conductivity. pH and conductivity will be measured in the field during groundwater sampling.

6.2 Preventive Maintenance. The laboratory is responsible for the maintenance of its laboratory equipment. Preventive maintenance will be provided on a scheduled basis to minimize down time and the potential interruption of analytical work. Instruments will be maintained in accordance with manufacturer's recommendations and normal approved laboratory practice.

Designated laboratory personnel will be trained in routine maintenance procedures for major instrumentation. When repairs become necessary, they will be performed by either trained staff or trained service engineers/technicians employed by the instrument manufacturer. The laboratory shall have multiple instruments that will serve as backup to minimize the potential for down time. All maintenance will be documented and kept in permanent logs. These logs will be available for review by auditing personnel.

Both scheduled maintenance and unscheduled maintenance required by operational failures will be recorded. The designated laboratory operations coordinator will review maintenance records on a regular basis to ensure that required maintenance is being performed.

6.3 Instrument Calibration and Frequency. Calibration of all analytical instrumentation is required to ensure that the analytical system is operating correctly and functioning at the required sensitivity to meet project-specific data quality requirements. Each instrument will be calibrated with standard solutions appropriate to the instrument and analytical method in accordance with the methodology specified in Table SAP-4. The following paragraphs outline important concerns and provide specific information regarding calibration.All reported target analytes should fall between the low and high standards on the initial calibration curve and be bracketed by passing CCVs. Compounds can be reported below the low standard or above the high standard but only as estimated value. All initial calibration curves should be verified with a mid-level independentsource standard for all target analytes.

6.3.1 Standard/Reagent Preparation. A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical operations. To ensure the highest purity possible, all primary reference standards and standard solutions will be obtained from the National Institute of Standards and Technology (NIST), or other reliable commercial sources. All standards and standard solutions are logged into a database that identifies the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information.

Standard solutions are validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source. Stock and working standards are checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change of concentration. Care is exercised in the proper storage and handing of standard solutions, and all containers are labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation). Reagents are examined for purity by subjecting an aliquot or subsample to the corresponding analytical method, as well.

A database is used to store essential information on specific standards or reagents. The system is designed to serve various functions (e.g., the system issues warnings on expiration dates and allows chemists to obtain a list of all working standard solutions prepared from the same stock solution). The program also facilitates the management and audit of reagents and standards.

6.3.2 Gas Chromatography. The field of gas chromatography involves a variety of instrumentation and detection systems. While calibration standards and acceptance criteria vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. Each gas chromatographic system is calibrated prior to the performance of analyses. Initial calibration consists of determining the linear range,

establishing limits of detection, establishing relative response factors, establishing calibration curves, and establishing retention time windows. The calibration is checked at a frequency that ensures the system remains within specifications. The criteria for initial and ongoing calibration of gas chromatography methods are based upon established EPA standards of performance contained in SW-846 method protocols.
For Quality Control the use of second column confirmation is recommended as described in 8000B Section 7 of SW-846 Final Update III December 1996.

6.3.3 Gas Chromatography/Mass Spectrometry. Each day, prior to analysis of samples, the instrument is tuned with reagents such as bromofluorobenzene (BFB) for volatile compounds and decafluorotriphenylphosphine (DFTPP) for semivolatile compounds, and must meet the tuning criteria specified in the respective methods prior to conducting analyses.

The instrument is calibrated for all target compounds. An initial calibration curve is produced, and certain key calibration compounds and continuing calibration compounds are evaluated on a daily basis to ensure that the system is within calibration criteria. All method target analytes must be evaluated for both the initial and continued calibration verification

6.3.4 Spectrophotometric Unit. Each spectrophotometric unit is calibrated prior to analyses being conducted. A calibration curve is prepared with a minimum of a calibration blank and five standards. The calibration is verified on an ongoing basis with a midpoint calibration standard to ensure that the instrument meets established acceptance criteria.

6.3.5 Metals. Metals analysis basically involves two types of analytical instrumentation: inductively coupled argon plasma emission spectroscopy (ICP), and atomic absorption spectroscopy (AA).

Each ICP unit is calibrated prior to the analyses being performed using criteria prescribed in the respective methods. The calibration is then verified using standards from an independent source. The linear range of the instrument is established using a linear range verification check standard. No values are reported above this upper concentration value without dilution.

A calibration curve is established daily by analyzing a minimum of two standards, one of which is a calibration blank. The calibration is monitored throughout the day by analyzing a continuing calibration blank and a continuing calibration verification standard. The standard must meet established criteria as described in the method. If the initial calibration curve is with one standard and a blank then the calibration must be verified at both a midpoint level and a low level (at the reporting limit).

An interelement check standard is analyzed at the beginning of each analytical run to verify that interelement (between analyte metals) and background correction factors have remained constant. Results outside of the established criteria trigger reanalysis of samples.

Each AA unit is calibrated prior to analyses being conducted. A calibration curve is prepared with a minimum of a calibration blank and two standards, and then verified with a standard that has been prepared from an independent source at a concentration near the middle of the calibration range. The calibration is verified on an ongoing basis with a midpoint calibration standard to ensure that the instrument meets established acceptance criteria. The method of standard additions is used when matrix interferences are present.

6.3.6 Documentation. Documentation of all calibration activities will be maintained by the laboratory and will also be submitted with the data packages. This information will become a part of the permanent project record and could be retrieved as necessary.

6.4 <u>Internal Quality Control Checks.</u> Two types of quality assurance checks will be utilized to assess the production of analytical data of known and documented quality. These include:

- Program quality assurance

- Analytical method quality control

6.4.1 Program Quality Assurance. The stated objectives of the laboratory QA/QC program are to:

- Ensure that all procedures are documented, including any changes in administrative and/or technical procedures
- Ensure that all analytical procedures are conducted according to sound scientific principles and have been validated
- Monitor the performance of the laboratory by a systematic inspection program and provide for corrective action as necessary
- Collaborate with other laboratories in establishing quality levels, as appropriate
- Ensure that all data are properly recorded and archived

All laboratory procedures are documented in writing as either SOPs or method procedures (MPs), which are edited and controlled. Internal quality control procedures for analytical services will be conducted by the laboratory in accordance with their corporate quality assurance plan and SOPs. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

The laboratory will document, in each data package provided, that analytical QC functions have been met. Any samples analyzed in nonconformance with the QC criteria will be reanalyzed by the laboratory if the laboratory procedures were not in control as assessed by laboratory control samples and other data specific to the analysis, and if sufficient sample volume is available. It is expected that sufficient volume of samples will be collected for reanalysis.

6.4.2 Analytical Method Quality Control

6.4.2.1 Matrix Spike. A matrix spike (MS) is an environmental sample to which known concentrations of analytes have been added. Spiking should be performed at a concentration equal to the site specific action level. The MS is taken through the entire analytical procedure and the recovery of the analytes calculated. Results are expressed as percent recovery of the known amount spiked. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis. MS analysis will be designated on the COC by field sampling personnel. Extra sample volume will be collected for this purpose if necessary. A determination will be made in the field concerning representative matrices.

6.4.2.2 Matrix Spike Duplicate. A matrix spike duplicate (MSD) is a split of the environmental sample used for the MS that is spiked with known concentrations of analytes. The MS and MSD are processed, separately but in identical fashion and the results compared to evaluate the precision and accuracy of the laboratory analysis. Results are expressed as percent recovery and as relative percent differences (RPD) between the MS and the MSD percent recoveries. MSD analysis will be designated on the COC by field sampling personnel.

6.4.2.3 Laboratory (or Matrix) Duplicate. A laboratory duplicate is a split of an environmental sample, which is prepared and analyzed in a manner identical to that of the original sample. The results are used to evaluate the precision of the laboratory analyses. Results are expressed in RPD between analytical results for the split and the original sample.

6.4.2.4 **Surrogate.** A compound or compounds added to every blank, sample, MS, MSD, and standard if specified in the analytical methodology. The results are utilized to evaluate the accuracy of analytical measurement on a sample-specific basis. Surrogates are generally brominated, fluorinated, or isotopically labeled compounds not expected to be detected in environmental media. Results are expressed in percent recovery (%R) of the surrogate spike.

6.4.2.5 **Internal Standards.** Internal standards are added to every sample analyzed by GC or GC/MS methods. ^{13}C-isotopically labeled internal standards are used for dioxin analyses to quantitate sample concentrations and to evaluate stability of the GC/MS system throughout the analytical run.

6.4.2.6 **Method or Preparation Blank.** A method blank consists of analyte-free deionized water. The method blank is carried through each step of the analytical method. The method blank data will be used to evaluate laboratory contamination during analysis.

6.4.2.7 **Laboratory Control Samples.** Laboratory control samples (LCS) are well-characterized, laboratory-generated samples used to monitor the laboratory's day-to-day performance of routine analytical methods. Certain LCS are used to monitor the precision and accuracy of the analytical process independent of matrix effects. Other LCS are used to identify any background interference or contamination of the analytical system that may lead to the reporting of elevated concentration levels or false positive data.

The results of the LCS are compared to well-defined laboratory acceptance criteria to determine whether the laboratory system is "in control." Controlling laboratory operations with LCS (as opposed to MS/MSD samples) offers the advantage of being able to differentiate low recoveries due to procedural errors from those due to matrix effects.

6.5 **Laboratory Corrective Action.** The Laboratory QA/QC Officer or the officer's designee shall be responsible for initiating corrective action as necessary. Corrective action will be required if analyses of QC samples or laboratory conditions do not meet criteria specified in the respective methods, the laboratory quality assurance plan or the SOPs.

The Project QA Officer will review the field and laboratory data generated for this project to ensure that all project quality assurance objectives are met. If any nonconformances are found in the laboratory analytical and documentation procedures and data assessment and validation procedures, the impact of those nonconformances on the overall project QA objectives will be assessed. Appropriate actions, including resampling, reanalysis, etc., may be recommended to the Project Manager so that the project objectives can be accomplished.

6.6 **Data Assessment Procedures.** The reliability and credibility of analytical laboratory results are evaluated by the inclusion, as an integral part of any analytical procedure, of a program of randomly selected replicate analyses, and analysis of standards and spiked samples.

Precision of analytical results will be evaluated as the relative percent difference or relative standard deviation from the mean of replicate analyses. Accuracy is reported as the percent recovery of a parameter from a sample of known value with a given analytical procedure.

The procedures described herein are designed to ensure precise and accurate data for each analytical method. To ensure that reliable data continue to be produced, systematic checks must show that test results remain reproducible and that the methodology is actually measuring the quantity of analyte in each sample. Quality assurance must begin with sample collection and not end until the resulting data have been reported.

The Project QA/QC Officer will be responsible for data assessment and review. The Project QA/QC Officer or his/her designee will review the analytical results for compliance with the established QC criteria as described below. Problems arising during sample collection, packing, shipping, or analysis will be taken into consideration in the data assessment.

The following procedures will be used to evaluate data precision, accuracy, and analytical completeness for the analyses conducted.

6.6.1 Accuracy. Accuracy will be expressed as percent recovery for laboratory control samples as follows:

$$\text{Percent Recovery} = \frac{x}{T} \times 100$$

where

x = the observed value of measurement
T = "true" value

Recoveries will be compared with the applicable control limits (Section 2.0) and the data associated with outliers will be evaluated to determine its useability. The surrogate recoveries will also be calculated as above and compared against the limits shown in Section 2.0. If the surrogate percent recovery limits are exceeded, the data will be assessed to determine the potential effect of the poor surrogate recovery on the reported results.

In addition, the MS and MSD sample results will be used to calculate the percent recovery.

$$\text{Percent Recovery} = \frac{X - S}{T} \times 100$$

where

X = observed value after spike
S = sample value
T = amount spiked

These MS and MSD percent recoveries will be compared with the applicable control limits (Section 2.0) and the data associated with outliers will be assessed in conjunction with other QC data to determine if the sample matrix is adversely affecting the data.

6.6.2 Precision. Precision will be expressed as RPD for duplicate environmental samples and for duplicate control samples, as follows:

$$\text{RPD (\%)} = \frac{|S\text{-}D|}{(S+D)/2} \times 100$$

where

S = first sample value (original)

D = second sample value (duplicate)

The RPDs will be compared with the applicable quality control limits, and the effect of inadequate precision on the associated sample data will be assessed.

6.6.3 Assessment of Data for Completeness and Useability. Following validation of the data packages, assessment of the data with respect to fulfillment of quality assurance objectives and useability will be accomplished by the joint efforts of the Project QA/QC Officer and the Project Manager. This assessment will include sample collection, sample handling, field data, consideration of blank values and field duplicate values, and additional flagging of qualifying data for use at each site.

The analytical completeness will be calculated by the ratio of acceptable analytical results to the total number of analytical results requested on samples submitted for analysis.

$$\% \text{ Completeness} = \frac{\text{Acceptable Analytical Results}}{\text{Total Number of Analytical Results Requested}}$$

The percent completeness will be compared against the overall program goal of 90 percent. If the goal is not met, the Project QA/QC Officer and the Project Manager will decide if the data are sufficient for the site characterization or other types of data uses. If it is judged that the data are inadequate, additional field samples will be collected to accomplish the project goals. Decisions to repeat sample collection and analysis may be made by the Project Manager and the Project QA/QC Officer based on the extent of the deficiencies and their importance in the overall context of the project.

6.7 Data Reduction, Validation, and Documentation. The analytical data generated by the laboratory will be reviewed for accuracy, precision, completeness, representativeness, and comparability. The data validation process for this project will consist of data generation, reduction, and two levels of review, the first by the analytical laboratory and the second through an independent data review.

6.7.1 Analytical Laboratory Data Review and Reporting. The first level of review will be conducted by the Laboratory analyst who has the initial responsibility for the correctness and completeness of 100% of the data. The second level of review at least 25% of the data will be performed by a peer chemist. The third level of review will be performed by as an administrative review. All data are generated and reduced in accordance with protocols specified in the analytical methodology. The Laboratory QA/QC Officer will evaluate the quality of 5 to 10% of the data. Reviewers will review the data package to ensure that:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate methods have been followed.
- Analytical results are correct and complete.
- QC samples are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.
- Documentation is complete (all anomalies in the preparation and analysis have been documented; out-of-control forms, if required, are complete; holding times are documented).

The Laboratory QA/QC Officer is responsible for assessing data quality and advising the Project QA/QC Officer of any data which were rated "preliminary" or "unacceptable," or other notations that would caution the data user of possible unreliability. Data reduction, QA review, and reporting by the laboratory will be conducted as follows:

- Raw data produced by the analyst is processed and reviewed for attainment of quality control criteria as outlined in this QAPP and/or established EPA methods and for overall reasonableness.
- After entry into the Laboratory Information Management System (LIMS), a computerized report is generated and sent to the Laboratory QA/QC Officer.
- The Laboratory QA/QC Officer will decide whether any sample reanalysis is required.

- Upon acceptance of the preliminary reports by the Laboratory QA/QC Officer, final reports will be generated.

Laboratory data reduction procedures will be those specified in the respective EPA SW-846 Methods, 3rd Edition, and those described in the laboratory SOPs.

The laboratory will prepare and retain full analytical and QC documentation. For SW-846 and other analytical methods, the following reporting requirements shall be met. The laboratory will report the data as a group of 20 samples or less, along with QC supporting data, in a Contract Laboratory Program (CLP)-equivalent data package. The laboratory will provide the following hard copy information in each analytical data package:

- Chain-of-custody forms

- Cover sheet listing the samples included in the report and narrative comments describing problems encountered in analysis

- Tabulated results of inorganic and organic compounds identified and quantified and reporting limits for all analytes

- Analytical results for QC sample spikes, sample duplicates, initial and continuing calibration verifications of standards and blanks, standard procedural blanks, laboratory control samples, and ICP interference check samples

- Tabulation of reporting limits related to the sample

- Raw data system printouts (or legible photocopies) identifying date of reported analysis, analyst, parameters analyzed, calibration curve, calibration verifications, method blanks, any reported sample dilutions, sample duplicates, spikes, and control samples; sample spiking levels, preparation/extraction logs and run logs

For organic analyses, the data packages will include matrix spikes, matrix spike duplicates, surrogate spike recoveries, chromatograms, GC/MS spectra, and computer printouts for reported analyses and associated QC data.

The narrative accompanying the data package will include the identification of samples not meeting total QC criteria as specified in the analytical method and the laboratory data quality review SOPs.

The data reduction and the QC review steps will be documented, signed, and dated by the analyst.

Laboratory qualifiers will include:

- Concentration below required reporting limit

- Concentration of chemical also found in laboratory blank

The narrative accompanying the data package will include cautions regarding nonquantitative use or unuseability due to out-of-control QC results.

6.7.2 Independent Data Review Process. Laboratory analytical data packages will receive a second level of review by a designee of the Project QA/QC Officer whose function is to provide an independent review of the data package. Laboratory results will be reviewed and data qualified, if required. Sample data may be qualified as "J" (estimated), "UJ" (not detected - estimated), or "R" (rejected). The qualifier "U" is normally used for analytes not detected by the laboratory. Rejected data are not usable for any purpose.

A summary of the elements to be checked in the validation and review process is included below:

6.7.2.1 QC Review of Sample Data Packages

Review of Metals and Cyanide Analyses

Metals and total cyanide (where applicable) analytical data will undergo evaluation of:

- Holding times

  Calibration
  Initial & Continuing

- Blanks

  ICP Interference Check Sample

  ICP Serial Dilution

- Laboratory control samples
- Laboratory duplicate sample analysis
- Matrix spike sample analysis with Post Digestion Analysis
- Field duplicate sample analysis
- Overall assessment of data for a case
- Completeness of data package

Review of Volatile and Semivolatile Organic Analyses

Volatile and semivolatile organic analytical data will undergo evaluation of

- Holding times

  GC/MS Tuning and Performance

  Calibration
  Initial & Continuing

- Blanks
- Surrogate recovery

  Laboratory Control Samples

- Matrix spike/matrix spike duplicates

  Internal Standard Performance

- Field duplicates

  TCL Compound Identification

- Tentatively identified compounds (TICs)
- Overall assessment of data for a case
- Completeness of data package

Review of Organochlorine Pesticides/PCBs

Organochlorine pesticides/PCBs analytical data will undergo evaluation of:

- Holding times

  Calibration
  Initial & Continuing

- Blanks
- Surrogate recovery

  Laboratory Control Samples

- Matrix spike/matrix spike duplicates

  Internal Standard Performance

- Field duplicates

  Compound Identification

  Compound Quantitation and Reported Detection Limits

- Overall assessment of data for a case
- Completeness of data package

Review of Other Analytical Data

Other analytical data will undergo evaluation of:

- Holding times
- Blank contamination
- Spike recoveries (matrix spikes, surrogate spikes, and laboratory control sample spikes if specified in the QAPP)
- Duplicate analysis precision (field duplicates, laboratory duplicates, and matrix spike duplicates if specified in the QAPP)
- Overall assessment of data for a case
- Completeness of data package

Additional Quality Assurance Data

In addition to the above specified quality control data and validation guidelines, one sample from each quarterly sampling event will be sent to the designated QA laboratory. Comparison will be made between the analytical results for the samples split between the contract and QA laboratories. These interlaboratory results will then be used in the Overall Assessment of Data for a Case for each of the analyte groupings.

6.7.3 Data Management

Data management will conform to the policies and procedures of the EPAs guidelines (to be determined) .
The Project QA/QC Manager will oversee all data management activities, establish priorities, and ensure that milestones and objectives are met. The Project QA/QC Manager will be the Electronic Data Management Point-of-Contact (EDM POC) for this task. Both the Project Manager and the Project

QA/QC Manager will monitor the work conducted by the data management group and provide communications support with EPA and analytical subcontractors.

7.0 DELIVERABLES

Deliverables for this project include DQCRs, Quarterly Sampling and Analysis Reports, and field well construction logs.

7.1 Daily Quality Control Report. The Field Investigation Task Leader will report to the (Contractor) Project Manager on a daily basis regarding fieldwork progress and quality control issues associated with the field activities. He/she will provide details in a DQCR. A report of non-routine occurrence shall be sent to the Project Manager within 48 hours of the occurrence. The report shall include problems identified, corrective actions, and verbal/written instructions for sampling or reanalysis. Two copies of the DQCRs will be sent at the end of each week in the field to the PM. An example DQCR is presented in Appendix SAP-B.

7.2 Quarterly Sampling and Analysis Report. After receipt and validation of the analytical data for each quarterly sampling event the Project QA/QC Officer and Project Manager will review the accuracy and precision of the data collected and prepare a summary of the analytical results. A quarterly sampling and analysis report will be prepared on the basis of field investigation activities and other information reported by the Field Investigation Task Leader as well as all field- and laboratory-related QC data.

Copies of each quarterly sampling and analysis report will be submitted to the EPA(RPM). The reports will include data packages, which will be in a CLP-equivalent format. Each successive report will include a summary of previous sampling rounds. These reports will be submitted in draft and draft final form.

7.3 Electronic Data. Electronic data will be submitted in ASCI II format to the Project Manager.

8.0 ACRONYMS AND ABBREVIATIONS

%R	Percent recovery
AA	Atomic absorption
AFB	Air Force Base
BFB	Bromofluorobenzene
BTEX	Benzene, toluene, ethylbenzene, xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of custody
CVAA	Cold vapor atomic absorption
CWA	Clean Water Act
DFTPP	Decafluorotriphenylphosphine
DOT	Department of Transportation
DQCR	Daily Quality Control Report
DQOs	Data Quality Objectives
DSHO	Designated Safety and Health Officer
EPA	U.S. Environmental Protection Agency
ECD	Electron Capture Detector
ELCD	Electrolytic Conductivity Detector
FSP	Field Sampling Plan
GC/MS	Gas chromatography/mass spectrometry
HMTC	Hazardous Materials Technical Center
HPLC	High pressure liquid chromatography
HRGC/LRMS	High-resolution capillary column gas chromatography/Low-resolution mass spectrometry
ICP	Inductively-coupled plasma
ICS	ICP interference check sample
IDEM	Indiana Department of Environmental Management

LCS	Laboratory control sampler
LIMS	Laboratory Information Management System
MCL	Maximum contaminant level
MDL	Method detection limit
mg/l	Milligrams per liter
MP	Method procedures
MS	Matrix spike
MSD	Matrix spike duplicate
NAPLs	Nonaqueous-phase liquids
NDI	Non-destructive inspection
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Act
OSWER	Office of Solid Waste Emergency Response
PCBs	Polychlorinated biphenyls
PCDD	polychlorodibenzo-p-dioxin
POL	Waste petroleum, oil, and lubricants
QA/QC	Quality assurance/quality control
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RSHO	Regional Health and Safety Officer
SARA	Superfund Amendment and Reauthorization Act (1986)
SDG	Sample delivery group
SDWA	Safe Drinking Water Act
SICPs	Selected ion current profiles
SOPs	Standard operating procedures
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan

SVOCs	Semivolatile organic compounds
TCDD	Tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TICs	Tentatively identified compounds
USGS	U.S. Geological Survey
UST	Underground storage tank
VOCs	Volatile organic compounds
μg/l	Micrograms per liter

9.0 REFERENCES

United States Environmental Protection Agency. 1983. *Methods for chemical analysis of water and wastes.* EPA/600/4-79/020.

———. 1986. *Test methods for evaluating solid waste, physical/chemical methods.* SW-846, Third Edition (including Final Update II).

———. 1987. *Data quality objectives for remedial response activities.* et. EPA/540/G-87/003. March.

———. 1990. *Guidance for data useability in risk assessment.* OSWER Directive 9285.7-05. EPA 540/G-90/008. October.

———. 1994a. *EPA contract laboratory program national functional guidelines for inorganic data review.* February 1994.

———. 1994b. *EPA contract laboratory program national functional guidelines for organic data review.* February 1994.

TABLES

TABLE SAP-1
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS SUMMARY

SAMPLE MATRIX	FIELD PARAMETERS	DQO LEVEL	LAB PARAMETERS	DQO LEVELS	LAB	FIELD QC			TOTAL TO LAB	LAB QC	LAB QA		
						TB[1]	RB	FD[6]		LD/MS-/MSD[2]	TB	RB	FD
Ground Water	Water Level	I	TCL VOC	III	SW-846	5	1	1	7	1	1	-	1
	pH		TCL SVOC			-	1	1	2	1	-	-	1
	Conductivity DO		TCL Pest/ Aroclor[3]			-	1	1	2	1	-	-	1
	Temperature Turbidity		TAL Metals/ CN (Total)[4]			-	1	1	2	1	-	-	1
Water Source Blanks	pH[5]	I	TCL VOC	III	SW-846	1	-	-	1	-	-	-	-
	Conductivity		TCL SVOC			-	-	-		-	-	-	-
	Temperature		TCL Pest/ Aroclor[3]			-	-	-		-	-	-	-
			TAL Metals/ CN (Total)[4]			-	-	-		-	-	-	-

Notes:
[1]Trip blanks will be shipped at a frequency of one per cooler of aqueous samples for VOC samples. This number is an estimate based on the number of coolers anticipated to be shipped.
[2]MS/MSD samples required for organic samples. Groundwater samples shall be collected with extra sample volume at a frequency of one per 20 or fewer investigative samples. Triple the normal volume will be collected for VOC's and double tge normal volume will be collected for SVOC's *and Pesticides/Aroclor.*
[3]The term Aroclor and Polychlorinated Biphenyl (PCB) can be interchangeable.
[4]Total Metals are defined as digestion and analysis of TAL metals on unfiltered samples.
[5]Field Parameters will only be collected at the water supply point.
[6]Estimate one field duplicate will be collected from the shallow aquifer and one field duplicate will be collected from the intermediate aquifer.

TCL	Target Compound List	Pest	Chlorinated Pesticide	DQO	Data Quality Objective	FD	Field Duplicate
TAL	Target Analyte List	HDPE	High Density Polyethylene	CLP	Contract Laboratory Program	LD	Lab Duplicate
VOC	Volatile Organic Compound	CN	Cyanide	DO	Dissolved Oxygen	MS/MSD	Matrix Spike/Matrix Spike Duplicate
SVOC	Semivolatile Organic Compound	QC	Quality Control Lab Duplicate	RB	Rinsate Blank		
TB	Trip Blank						

TABLE SAP-2
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

GROUNDWATER SAMPLING SCHEDULE

YEAR AFTER CLOSURE	FREQUENCY
0-3	Quarterly (Every 3 months)
3-30	Semi-Annually (Every 6 months)

TABLE SAP-3
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

SAMPLE CONTAINER, PERSERVATIVES, VOLUMES, AND HOLDING TIMES

Sample Matrix	Analyses	Container	Preservative	Maximum Holding Time	Volume
Groundwater	TCL VOC[1]	(2) 40-ml glass Septa vials	4 degree C 1-2 drops HCL	10 days	Full, No headspace with Teflon septum, pH<2
	TCL SVOC[1]	(2) 1-liter amber glass bottles	4 degree C	5 days to extraction 40 days to analyze	Fill to shoulder
	TCL Pest/Aroclor[1]	(2) 1-liter amber glass bottles	4 degree C	5 days to extraction 40 days to analyze	Fill to shoulder
	TAL Metals (Totals)	(1) 1-liter HDPE bottle	5-ml (1:1) HNO_3 *per liter to pH<2*	Metals: 180 days *Hg: 26 days*	Fill to shoulder
	Cyanide	(1) 1-liter HDPE bottle	4 degree C 5-ml 6N NAOH per liter to pH>12	12 Days	Fill to shoulder

NOTES:
[1]Triple volume must be collected for MS/MSD analyses for volatiles; double volumes must be collected for SVOC and PCB/Pesticides.

TCL	Target Compound List	Pest	Chlorinated Pesticide
TAL	Target Analyte List	HDPE	High Density Polyethylene
VOC	Volatile Organic Compound	Hg	Mercury
SVOC	Semivolatile Organic Compound	N	Normality (Normal)
HCL	*Hydrochloric Acid*	NaOH	Sodium Hydroxide
ml	Milliliter	HNO_3	Nitric Acid

TABLE SAP-4
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

ANALYTICAL METHODS

Analyses	Required Methods from SW-846 Final Update III December 1996
TCL Volatile Organic Compounds	SW-846 Method 8260A
TCL Semivolatile Organic Compounds	SW-846 Method 3550B/8270C
TCL Pesticides/Aroclors	SW-846 Method 3550B/8081A
TAL Metals (total)	SW-846 Method 3005A,3010A,3020A/6010, 6020 & 7000

Legend:

TCL Target Compound List

TAL Target Analyte List

TABLE SAP-5
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

REPORTING LIMITS FOR VOLATILE ORGANICS BY GC/MS[1]
(8260C)[2]

Compounds[3]	Water (ug/L)	Compound	Water (ug/L)
Chloromethane	10	cis-1,3-Dichloroprene	5
Bromomethane	10	Trichloroethene	5
Vinyl chloride	2	Dibromochloromethane	5
Chrlorethane	10	1,1,2-Tricloroethane	5
Acetone	10	Benzene	5
Carbon Disulfide	5	trans-1,3-Dichloropropene	5
1,1-Dichloroethene	5	Bromoform	5
1,1-Dichloroethane	5	4-Methyl-2-Pentanone	10
1,2-Dichloroethene (total)	5	2-Hexanone	10
Methylene Chloride	5	Tetrachloroethene	5
Chloroform	5	Toluene	5
1,2-Dichloroethene	5	1,1,2,2-Trichloroethane	5
2-Butanone	10	Chlorobenzene	5
1,1,1-Trichloroethane	5	Ethyl Benzene	5
Carbon Tetrchloride	5	Styrene	5
Bromodichloromethane	5	Xylenes (total)	5
1,2-Dichloromethane	5		

NOTES:
[1]Specific quantitation limits are highly dependent. The reporting limits listed herein are provided for guidance and may not always be achievabLE.
[2]EPA SW-846, 3rd Edition Final Update III December 1996
[3]2-Chloroethyl vinyl ether and vinyl acetate are not reported by the laboratory.

TABLE SAP-6
HIMCO DUMP SUPERFUND SITE
GROUNDWATER MONITORING PLAN

DATA QUALITY OBJECTIVES FOR ACCURACY (SURROGATE SPIKE RECOVERIES) FOR ORGANIC PARAMETERS

Accuracy as % Recovery		
Fraction	Surrogate	Water
Purgeable Volatile	1,2-Dichlorethane-d4	78-113
	Toluene-d8	90-108
	4-Bromoflourobenzene	88-113
Semivolatile Base/Neutral Fraction	2-Flourobiphenyl	43-116
	Nitrobenzene-d5	35-114
	Terphenyl-d14	33-141
Semivolatile Acid Fraction	2-Flurophenol	21-100
	Phenol-d5	10-94
	2,4,6-Tribromophenol	10-123
Pesticide	Decachlorobipheny Tetrachloro-m-xylenel	50-138 51-103
Herbicide	2,4-Dichlorophenyl Acetic Acid	51-138

Source:
For volatiles, semivolatiles, and pesticides these limits are based on historical laboratory data or SW-846 Method limits, whichever limits are the most stringent. In the circumstances that the laboratory reports an upper limit less than 100 percent recovery, then the SW-846 upper limit has been used.

For herbicides, the limits are based on historical laboratory data.

In accordance with the provision of SW-846, the historical data are upgraded periodically. If the limits are updated prior to or during analysis of samples, an Addendum will be filed to amend the SAP. Note:a The values provided in this table are subject to change based on the results of a final review of the proejct-specific data requirements.

TABLE SAP-7 HIMCO DUMP SUPERFUND SITE GROUNDWATER SAMPLING AND ANALYSIS PLAN QC ACCEPTANCE CRITERIA FOR VOLATILES IN LABORATORY CONTROL SAMPLES[1] (GC/MS) (8260B)[2]		
Parameter	Accuracy (Percent Recovery)	PRECISION RPD (%)
	Water	Water
1,1-Dichloroethene	61-145	14
Trichloroethene	71-120	14
Benzene	76-127	11
Toluene	76-125	13
Chlorobenzene	75-135	13

[1]Acceptance criteria listed are from FormIII, 3rd Editon, SW-846, Rev 0, September 1986.
[2]EPA SW-846, 3rd Edition Final Update III December 1996
GC/MS = Gas Chromatography/Mass Spectrometry
RDP = Relative Percent Difference

The laboratory control samples are spike with the five chemicalsat site specific action levels to represent all of the VOCs listed in TABLE SAP-7. The Results for the LCS are evaluated for precision and accuracy to determine whether the laboratory was in control for the analysis.

TABLE SAP-8
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

DATA QUALITY OBJECTIVES FOR ACCURACY (MATRIX SPIKE RECOVERIES) AND PRECISION (RELATIVE PERCENT DIFFERENCE) FOR ORGANIC PARAMETERS[1]

Fraction/Parameter	Percent Recovery	Relative Percent Difference
Purgeable Volatiles		
Benzene	76-127	11
Chlorozbenzene	75-130	13
1,1-Dichloroethene	61-145	14
Toluene	76-125	13
Trichloroethene	71-120	14
Semivolatiles		
1,4-Dichlorbenzene	36-97	28
Pyrene	26-127	31
1,2,4-Trichlobenzene	39-98	28
2-Chlorophenol	27-123	40
Phenol	12-110	42
N-Nitroso-di-n-propylamine	41-116	38
4-chlor-3-methylphenol	23-97	42
Acenaphthene	46-118	31
4-nitrophenol	10-80	50
2,4-Dinitrotoluene	24-96	38
Pentachlorophenol	9-103	50
Pesticides		
4,4-DDT	38-127	27
Aldrin	40-120	22
Gamma-BHC (Lindane)	56-123	15
Dieldrin	52-126	18
Endrin	56-121	21
Heptachlor	40-131	20

[1]Guidance provided by U.S. EPA. Contract Laboratory Program (CLP) Staement of Work for Organic analyses, Document Number OLM010.0 with revision OLM01.1, Dec. 1990. Ranges subject to change when laboratory is selected.

TABLE SAP-9
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

REPORTING LIMITS FOR SEMIVOLATILE ORGANICS BY GC/MS[1]
(8270C)[2]

Compounds[3]	Water (ug/L)	Compound	Water (ug/L)
Phenol	10	2-Chloronaphthalene	10
bis (2-Chloroethyl)ether	10	2-Nitroaniline	50
2-Chlorophenol	10	Dimethylphthalate	10
1,3-Dichlorobenzene	10	Acenaphthylene	10
1,4,dichlorobenzene	10	2,6-Dinitrotoluene	10
Benzyl alcohol	10	3-Nitroaniline	50
1,2-Dichlorobenzene	10	Acenaphthene	10
2-Methylphenol	10	2,4-Dinitrophenol	50
4-Methylphenol	10	4-Nitrophenol	50
N-Nitroso-di-n-dipropylamine	10	Dibenzofuran	10
Hexachloroethane	10	2,4-Dinitrotoluene	10
Nitrobenzene	10	Diethylphthalate	10
Isophorone	10	4-Chlorophenylphenyl ether	10
2-Nitrophenol	10	Flourene	10
2,4-Dimethylphenol	10	4-Nitroaniline	50
Benzoic Acid	50	4,6-Dinitro-2-Methylphenol	50
2,2'-Oxybis(1-chloropropane)	10	N-nitrosodiphenylamine	10
2,-Dichlorophenol	10	4-Bromophenylphenyl ether	10
1,2,4-Trichlorozenzene	10	Hexachlorobenzene	10
Napthalene	10	Pentachlorophenol	50
4-Chloroaniline	10	Phenanthrene	10
Hexachlorobutadiene	10	Anthracene	10
4-Chloro-3-methylphenol	10	Carbazole	10
2-Methylnapthalene	10	Di-n-butylphthalate	10
Hexachlorocyclopentadiene	10	Fluoroanthene	10
2,4,6-Trichlorophenol	10	Pyrene	10
2,4,5-Trichlorophenol	50	Butylbenzylphthalate	10

TABLE SAP-9 (CONT.)
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

REPORTING LIMITS FOR SEMIVOLATILE ORGANICS BY GC/MS[1]
(8270)[2]

Compounds[3]	Water (ug/L)	Compound	Water (ug/L)
3,3'-Dichlorobenzidine	20	Benzo(k)flouroanthene	10
Benzo(a)anthracene	10	Benzo(a)pyrene	10
Chrysene	10	Dibenza(a,h)anthracene	10
bis(2-Ethylhexyl)phthalate	10	Benzo(g,h,i)perylene	10
Di-n-octylphthalate	10	Benzo(b)flouroanthene	10

NOTES:
[1]Specific quantitation limits are highly dependent. The reporting limits listed herein are provided for guidance and may not always be achievable.
[2]EPA SW-846, 3rd Edition (1986)
[3]Benzyl alcohol and benzoic acid are not reported by the laboratory

TABLE SAP-10
HIMCO DUMP SUPERFUND SITE
GROUNDWATER MONITORING PLAN

QC ACCEPTANCE CRITERIA FOR SEMIVOLATILES IN LABORATORY CONTROL SAMPLES[1] (GC/MS) (8270C)[2]

Parameter	Accuracy (Percent Recovery)	PRECISION RPD (%)
	Water	Water
Phenol	12-89	42
2-Chlorophenol	27-123	40
1,4-Dichlorobenzene	36-97	28
N-Nitroso-di-N-propylamine	41-126	38
1,2,4-Trichlorobenze	29-100	33
4-Chloro-3-methylphenol	23-97	42
Acenaphthenene	48-99	27
4-Nitrophenol	29-124	53
2,4-Dinitrotoluene	52-104	26
Pentatchlorophenol	25-132	49
Pyrene	51-116	26

[1]Acceptance criteria listed are subject to change
GC/MS = *Gas Chromatography/Mass Spectrometry*
RDP = Relative Percent Difference

The laboratory control samples are spike with the five chemicals to represent all of the VOCs listed in TABLE SAP-7. The Results for the LCS are evaluated for precision and accuracy to determine whether the laboratory was in control for the analysis.

TABLE SAP-11
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

CHEMICALS OF INTEREST
REPORTING LIMITS FOR TARGET ANALAYTE LIST OF METALS

Analyte	ICP[2]	AA-DA[3]	AA-GF[4]	CVAA[5]
	Water (ug/l)	Water (ug/l)	Water (ug/l)	Water (ug/l)
Aluminum, Al	100	-	-	-
Antimony, Sb	60	-	-	-
Arsenic, As	10	-	5	-
Barium, Ba	10	-	-	-
Beryllium, Be	2	-	-	-
Cadmium, Cd	5	-	-	-
Calcium, Ca	200	-	-	-
Cromium, Cr	10	-	-	-
Cobalt, Co	10	-	-	-
Copper, Cu	20	-	-	-
Iron, Fe	100	-	-	-
Lead, Pb	3	-	3	-
Magnesium, Mg	200	-	-	-
Manganese, Mn	10	-	-	-
Mercury, Hg	-	0.2[5]	-	-
Nickel, Ni	40	-	-	-
Potassium, K	5000	-	-	-
Selenium, Se	5	-	5	-
Silver, Ag	10	-	-	-
Sodium, Na	5000	-	-	-
Thallium, Tl	10	-	1	-
Vanadium, V	10	-	-	-
Zinc, Zn	20	-	-	-
I	-	-	-	

NOTES:
[1]All mehtods contained in EPA SW-846, #rd Edition (1986)
[2]ICP=Inductively Coupled Plasma; Method 6010
[3]AA-DA=Atomic Absorption-Direct Aspiration; Method 7470 for aqueous samples.
[4]AA-GF=Atomic Absorption-GraphiteFurnace; Method 7060 for Arsenic, Method 7421 for Lead, Methid 7740 or selium, Method 7841 for Thallium
[5]Cold Vapor Atomic Absorption Technique

TABLE SAP-12
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

QC ACCEPTANCE CRITERIA FOR METALS FOR LABORATORY CONTROL SAMPLES AND MATRIX SPIKES/MATRIX DUPLICATE SAMPLES

Parameter	Accuracy Method[2](Percent Recovery)	PRECISION RPD (%)
	Water	Water
Metals-ICP[3]	3005/6010 75-125	20
Antimony	3005/6010 75-125	20
Arsenic-GFAA	7060 75-125	20
Lead-GFAA	3020/7421 75-125	20
Selenium-GFAA	7740 75-125	20
Mercury-CVAA	7470 75-125	20
Thallium-GFAA	3020/7841 75-125	20

[1]Guidance providd by USEPA CLP Staement of Work for Inorganic Analysis, SOW No. 788, Rev 2/89 and 6/89.
[2]
[3]See Section 8 for list of ICP metals

RDP = Relative Percent Difference
ICP = INductively coupled plasma spectrometry
GFAA = Graphite furnace atomic absorption
CVAA = Cold Vapor atomic adsorption

For analysis of total metals, water samples will not be filtered prior to digestion.

TABLE SAP-13
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

REPORTING LIMITS FOR ORGANOCHLORINE PESTICIDES AND PCBs[1]
(8081)[2]

Compounds[3]	Water (ug/L)	Compound	Water (ug/L)
alpha-BHC	0.05	Endrin	0.10
beta-BHC	0.05	Endosulfan II	0.10
delta-BHC	0.05	4,4'-DDD	0.10
gamma-BHC (Lindane)	0.05	Endosulfan sulfate	0.10
Heptachlor	0.05	4,4'-DDT	0.10
Aldrin	0.05	Methoxychlor	0.5
Heptachlor epoxide	0.05	Endrin Ketone	0.10
Endosulfan I	0.05	gamma-Chlordane	0.05
Dieldrin	0.10	Toxaphene	5.0
4,4'-DDE	0.10	alpha-Chlordane	0.05
Aroclor-1016	1.0	Aroclor-1248	1.0
Aroclor-1221	1.0	Aroclor-1254	1.0
Aroclor-1232	1.0	Aroclor-1260	1.0
Aroclor-1242	2.0		

NOTES:
[1]Specific quantitation limits are highly dependent. The reporting limits listed herein are provided for guidance and may not always be achievable. Reporting limits listed for for soil are based on a wet weight. Reporting limits calulated by the laboratory fir soil, calulated on dry weight basis, will be higher.
[2]EPA SW-846, 3rd Edition (1986)
[3] BHT = Benzene hexachloride
DDT = 1,1,-Trichloro-2,2-bis(p-chlorophenyl)ethane(Dichlorodepenyltrichloroethane)
DDD = Dichlorodiphenyldichloroethane
DDE = Dichlorodiphenyldichloroethylene
PCB's = Polychlorinated byphenyls (Aroclors)

TABLE SAP-14
HIMCO DUMP SUPERFUND SITE
GROUNDWATER SAMPLING AND ANALYSIS PLAN

QC ACCEPTANCE CRITERIA FOR PESTICIDES IN LABORATORY CONTROL SAMPLES[1] (GC)
(8081)[2]

Parameter	Accuracy (Percent Recovery)	PRECISION RPD (%)
	Water	Water
Aldrin	40-120	22
Gamma-BHC (Lindane)	56-123	15
4,4'-DDT	38-127	27
Dieldrin	52-126	18
Endrin	56-121	21
Heptachlor	40-131	20

[1]Acceptance criteria subject to change
[2]

GC/MS = Gas Chromatography/Mass Spectrometry
RDP = Relative Percent Difference

The laboratory control samples are spike with the six chemicals to represent all of the Pesticides listed above. The Results for the LCS are evaluated for precision and accuracy to determine whether the laboratory was in control for the analysis.

APPENDIX SAP-A

HIMCO DUMP SUPERFUND SITE
SAMPLING AND ANALYSIS PLAN

GROUND WATER MONITORING WELL CONSTRUCTION DETAILS

Well ID #	Date Installed	Screen Length[1]	Borhole Dia.[2]	Casing Dia.[2]	Installed Depth[1,3,5]	Northing	Easting	Well El.[3,4]	Ref.
WTB1	10/06/77	6	N/A	5.0	474.9	1533596.77	405953.28	763.65	TOC
WTB2	11/03/77	10	N/A	2.0	13.9	1533597.11	405959.05	763.18	TOC
WTB3	10/17/77	10	N/A	5.0	137.2	1533597.39	405968.13	763.28	TOC
WTB4	10/07/77	5	N/A	5.0	174.2	1533595.28	405975.91	762.33	TOC
WTE1	10/11/77	10	N/A	5.0	83.9	1531566.72	407131.36	765.75	TOC
WTE3	10/11/77	5	N/A	5.0	178.9	1531548.54	407126.66	765.47	TOC
WT01	05/01/79	5	N/A	2.0	30.0	1532407.14	407876.93	762.83	GS
WT101A	11/12/90	10	8.0	2.0	18.5	1531629.81	407616.98	764.34	TOC
WT101B	12/14/90	5	8.0	2.0	100.5	1531617.03	407621.69	764.23	TOC
WT101C	12/12/90	5	8.0	2.0	167.5	1531603.13	407627.48	764.11	TOC
WT102A	N/A	10	8.0	2.0	18.4	1534850.57	405943.64	769.09	TOC
WT102B	12/02/90	5	8.0	2.0	67.9	1534872.79	405939.79	768.82	TOC
WT102C	12/01/90	5	8.0	2.0	162.0	1534862.86	405941.85	769.20	TOC
WT103A	11/11/90	10	8.0	2.0	18.4	1532537.59	405538.04	762.61	TOC
WT104A	11/12/90	10	8.0	2.0	18.7	1531495.73	406017.30	765.29	TOC
WT105A	11/10/90	10	8.0	2.0	18.5	1531172.44	407102.56	762.58	TOC
WT106A	11/09/90	10	8.0	2.0	18.6	1530938.53	407760.41	761.50	TOC
WT111A	09/10/91	10	8.0	2.0	21.9	1531905.43	406358.78	766.45	TOC
WT112A	08/23/95	10	8.25	2.0	17.7	1533653.49	406824.67	765.90	TOC
WT112B	08/23/95	5	10.25	2.0	62.1	1533653.01	406834.06	766.09	TOC
WT113A	08/10/95	10	8.25	2.0	24.4	1533608.69	407789.11	771.85	TOC
WT113B	08/10/95	5	10.25	2.0	70.0	1533604.43	407779.02	772.06	TOC
WT114A	08/21/95	10	8.25	2.0	24.5	1531843.97	407997.29	769.19	TOC
WT114B	08/22/95	5	10.25	2.0	67.8	1531834.38	407995.71	769.37	TOC
WT115A	08/22/95	10	8.25	2.0	19.7	1531675.84	407261.44	765.87	TOC
WT116A	08/17/95	10	8.25	2.0	14.8	1531925.50	406784.96	763.86	TOC
WT116B	08/17/95	5	10.25	2.0	60.4	1531931.04	406775.79	763.89	TOC
WT117A	08/15/95	10	8.25	2.0	17.9	1532201.98	405908.93	767.19	TOC
WT117B	08/14/95	5	10.25	2.0	63.5	1532202.51	405896.41	766.60	TOC
WT118B	08/18/95	5	10.25	2.0	64.9	1531917.55	406361.16	766.49	TOC

HIMCO DUMP SUPERFUND SITE
SAMPLING AND ANALYSIS PLAN

GROUND WATER MONITORING WELL CONSTRUCTION DETAILS (CONT.)

Well ID #	Date Installed	Screen Length[1]	Borhole Dia.[2]	Casing Dia.[2]	Installed Depth[1,3,5]	Northing	Easting	Well El.[3,4]	Ref.
WT119A									
WT119B									
WT120A									
WT120B									

1 Measured in feet
2 Measured in inches
3 Feet from Top of Casing
4 Measured in feet Mean Sea Level (MSL)
5 Bottom of Screen (does not include threaded blank cap on bottom)
GS - Ground Surface
N/A - Not Available
TOC - Top of Casing

HIMCO DUMP SUPERFUND SITE
WELL GAUGING FORM

Inspector(s):______________________ Equipment Used:______________________________________
Date:______________________

Well ID #	Time	PID Read. (ppm)	CGI Read. O_2 / LEL	Depth to Water (ft)[1]	Time	PID Read. (ppm)	CGI Read. O_2 / LEL	Depth to Water (ft)[1]	TOC Elev.[2]	Water Elev. (ft)[2]	Depth to Bottom (ft)[1]	Comments
WTB1									763.65			
WTB2									763.18			
WTB3									763.28			
WTB4									762.33			
WTE1									765.75			
WTE3									765.47			
WTO1									762.83			
WT101A									764.34			
WT101B									764.23			
WT101C									764.11			
WT102A									769.09			
WT102B									768.82			
WT102C									769.20			
WT103A									762.61			
WT104A									765.29			

HIMCO DUMP SUPERFUND SITE
WELL GAUGING FORM (CONTINUED)

Well ID #	Time	PID Read. (ppm)	CGI Read. O$_2$ / LEL	Depth to Water (ft)[1]	Time	PID Read. (ppm)	CGI Read. O$_2$ / LEL	Depth to Water (ft)[1]	TOC Elev.[2]	Water Elev. (ft)[2]	Depth to Bottom (ft)[1]	Comments
WT105A									762.58			
WT106A									761.50			
WT111A									766.45			
WT112A									765.90			
WT112B									766.09			
WT113A									771.85			
WT113B									772.06			
WT114A									769.19			
WT114B									769.37			
WT115A									765.87			
WT116A									763.86			
WT116B									763.89			
WT117A									767.19			
WT117B									766.60			
WT118B												
WT119A												
WT119B												6

HIMCO DUMP SUPERFUND SITE WELL GAUGING FORM (CONTINUED)													
Well ID #	**Time**	**PID Read. (ppm)**	**CGI Read.**	**Depth to Water (ft)[1]**	**Time**	**PID Read. (ppm)**	**CGI Read.**	**Depth to Water (ft)[1]**	**TOC Elev.[2]**	**Water Elev. (ft)[2]**	**Depth to Bottom (ft)[1]**	**Comments**	
			O_2				**O_2**						
			LEL				**LEL**						
WT120A													
WT120B													

1 Feet from Top of Casing
2 Measured in feet Mean Sea Level (MSL)
TOC - Top of Casing

1 Feet from Top of Casing
2 Measured in feet Mean Sea Level (MSL)
TOC - Top of Casing

HIMCO DUMP SUPERFUND SITE
WELL DEVELOPMENT RECORD

SITE & WELL DATA

Project:	Well Number:
Location:	TOC Elevation:
Well Coordinates:	Ground Elevation:
Date Well Installed:	Installed Well Depth (TOC):
Date Well Developed:	Screened Interval (TOC):
Fluid Losses During Drilling:	Casing Diameter:

DEVELOPMENT DATA

☐ Initial Development ☐ Redevelopment

Weather Conditions:

Static Water Level (TOC): Initial: ____________ Time:______ Final:__________ Time:_________	Sounded Depth (TOC): Initial:_______ Time:_____ Final:________ Time:________	Post Development Water: Jar Photographed ☐Yes ☐ No
Development Start: Date:______ Time:_______	Development Finish: Date:_______ Time:_________	*Measured Sediment Thickness in Jar:_____

Development Method (Completely describe development method to include all equipment and procedures):

Misc. Notes:

Submerged Volume Calculation:	One Submerged Volume:

Time	Pump Rate (gpm)	Volume Removed (gal)	pH	Temp. (°C)	Turb. (ntu)	Cond. (mV)	D.O. ( )	Eh ( )	Remarks (Color, odor, etc.)

Name:	Firm:	
Signature:	Date:	Page ____ of ____

HIMCO DUMP SUPERFUND SITE
WELL DEVELOPMENT RECORD

SITE & WELL DATA

Project:	**Well Number:**
Location:	**TOC Elevation:**

DEVELOPMENT DATA (CONT.)

Misc. Notes:

Time	Pump Rate (gpm)	Volume Removed (gal)	pH	Temp. (°C)	Turb. (ntu)	Cond. (mV)	D.O. ( )	Eh ( )	Remarks (Color, odor, etc.)

Name:	**Firm:**	
Signature:	**Date:**	**Page _____ of ______**

APPENDIX SAP-B

PID/FID CALIBRATION

Date	Instrument Name/No.	Battery Check	Seal Check	Calibration Gas Concentration	Instrument Reading	Operators Initials

CGI CALIBRATION

Date	Instrument Name/No.	Battery Check	Calibration Gas Concentration	Instrument Reading	Operators Initials

FIELD RECORD OF WATER SAMPLING

PROJECT: ______________________________ **WELL NO.:** ____________________

DATE: ________________ **TIME:** ______________ **WEATHER:** ____________________

WELL CONDITION: ____

____

____

____

WELL DEPTH (TOC): _____ **ft. WATER LEVEL (TOC):** _____ **ft. WELL DIAMETER:** _____ **in.**

PUMP DEPTH: _____ **ft. PURGE METHOD:** ____

MINIMUM PURGE VOLUME*: _______________ **PURGE RATE:** ____________________

SAMPLER(S): ____

DID WELL PUMP DRY? ____ **DESCRIBE:** ____

____

____

SAMPLE TYPES: ____

____

____

____

SAMPLE NUMBERS: ____

____

____

____

REMARKS: ____

____

____

____

*** Purge volume = Depth of well (ft.) x Multiplier x 5**

DIAMETR	2"	4"	5"	6"	8"
MULTIPLR	0.16	0.65	1.02	1.47	2.61

FIELD RECORD OF WATER SAM. CONTINUATION SHEET)

PROJECT: ______________________ WELL NO.: ______________ DATE: ______________

TIME	GALLONS REMOVED	TEMP. (° C)	pH	COND.	TURB (NTU)	DISSOLVED OXYGEN	REMARKS

EXAMPLE DQCR FORM

DAILY QUALITY CONTROL REPORT

Site Name: ____________________

Weather: Air Temp. ________ °C Winds N NE E SE S SW W NW ____________ (est. mph)

(Circle One) Clear Cloudy Rain Snow Fog Sleet

Purpose of Site Visit: ____________________

____

____

____

____

Sampling Performed (Circle One): GW SW Soils Sediment Rock Sludge (Pump or Non-Pump)

Other (specify) ____________________

Sample Type: Grab Composite

Method: Bail Soil Auger Shelby Tube Split-Spoon Rock Core

Pump (airlift, suction, positive displacement, turbine, centrifugal)

Other (specify) ____________________

Field Analysis/Results: pH ________ Temp. ________ °C

Sp. Cond. ________ umhos/cm Other (specify) ____________

Instrument Calibrations/Repairs: pH ________ Sp. Cond. ____________

Calib. Frequency ____________ Other (specify) ____________

____

Problems/Corrective Actions (give details) ____________________

____

____

Level of Protection used ____________________

Quality Control: QC Samples Y or N ? If Y, type? (duplicate split blank)

Xerox of Logbook Pages Attached Y or N ? Chain of Custody Y or N ?

Signature: ____________________

Date: ____________________
Day-Month-Year