Work Plan to Investigate Extent of Contamination

Former Gravel Pit
Town of Newton, Wisconsin

January 1993

SEC DONOHUE
Environment & Infrastructure

WORK PLAN TO INVESTIGATE EXTENT OF CONTAMINATION FORMER GRAVEL PIT TOWN OF NEWTON, WISCONSIN

FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

PREPARED BY:

SEC DONOHUE INC.
4738 NORTH 40TH STREET
SHEBOYGAN, WISCONSIN 53083

SUBMITTED BY:

CITY OF MANITOWOC
OFFICE OF DEPARTMENT OF PUBLIC WORKS, ENGINEERING
817 FRANKLIN STREET
MANITOWOC, WISCONSIN 54221-1597

JANUARY 1993

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

RP/MANIWORK/AA2

1.0 INTRODUCTION

This Work Plan was prepared in response to Wisconsin Department of Natural Resources (WDNR) concerns over past industrial waste disposal practices at a former gravel pit in the Town Newton, Wisconsin. This plan details field investigative tasks designed to characterize the nature and extent of contamination resulting from past disposal practices, as well as address remedial actions. The investigation will include the following:

- Definition of vertical and horizontal distribution of contamination in the groundwater and soil.
- Definition of the stratigraphy of the study area.
- Definition of water table conditions.
- Sampling procedures with a quality assurance/quality control measures.
- Private water supply well sampling.

This Work Plan presents the technical scope of work and includes a discussion of site background and setting, an initial evaluation of the waste present and the potential pathways of contaminant migration, the sampling rationale and objectives, sampling procedures, and a schedule for completion of the investigation tasks.

RP/MANIWORK/AA1

2.0 SITE BACKGROUND AND SETTING

2.1 LOCATION AND SITE HISTORY

2.1.1 Location

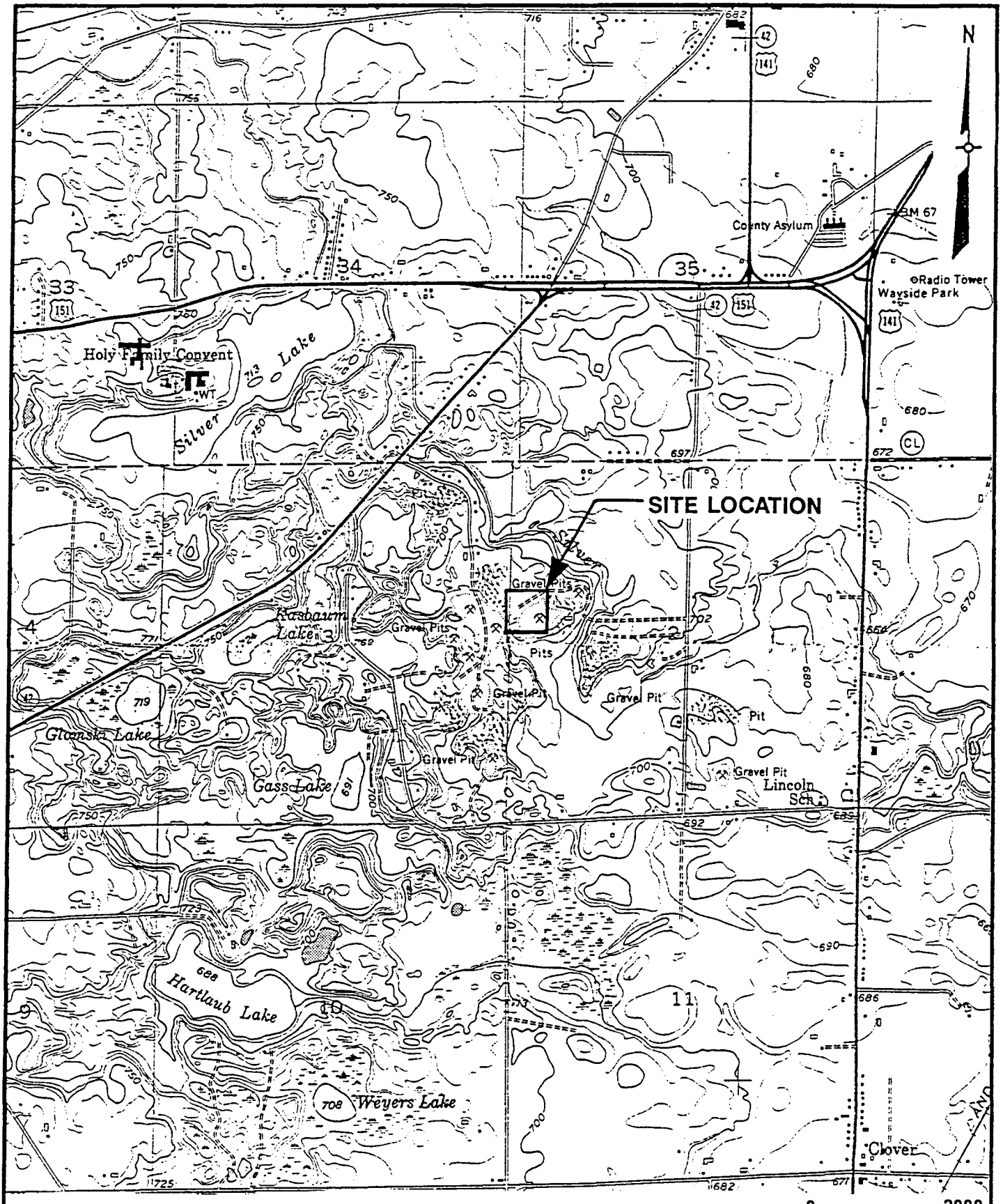
The project site consists of a former gravel pit located in the SW 1/4 of the NW 1/4 of Section 2, Township 18 North, Range 23 East, Town of Newton, Manitowoc County, Wisconsin (Figure 1). Site access is obtained directly from Gravel Pit Road via Hecker Road. The project site is located approximately 3,500 feet west of Interstate 43. The vicinity of the site is rural, marked by numerous active and former gravel pits, and with some residences.

2.1.2 Site History and Response Actions

On July 9, 1991, the City of Manitowoc, Wisconsin, received a letter from WDNR suggesting that industrial waste may have been disposed at the site and indicating that the alleged disposal may have resulted in contamination of soil and groundwater. WDNR also requested that the City of Manitowoc retain a consultant to conduct a site assessment of soil and groundwater and identify private wells within 1,200 feet of the disposal area. The WDNR further requested that remedial actions to address any contamination be chosen and implemented, if they are needed.

The City of Manitowoc responded to the letter seeking additional clarification. On August 19, 1992, WDNR responded that there was a current complaint under investigation by WDNR concerning a past disposal practice. No specific information was provided by WDNR. The City of Manitowoc provided the WDNR with an update in a letter dated March 31, 1992. Additionally, the City requested better delineation of the area to be investigated.

More recently (September 24, 1992), the WDNR alleged that the City of Manitowoc had failed to take actions necessary to restore the environment and minimize the effects from the discharge of a hazardous substance. As a result, an enforcement conference was held on October 21, 1992, to clarify the issue. At the enforcement conference, the complainant was identified as Don Vogt. Mr. Vogt clarified the nature of past disposal practices based on his employment with the Aluminum Specialty Company during the summers of 1965 and 1966, however, his recollection of the disposal area could not accurately delineate the area to be investigated. Mr. Vogt described hauling approximately six to eight 55-gallon drums of waste; benzene, solvents, thinners, and waste oil to the site and draining the contents of the drums into a pit. The pooled liquids were reportedly subsequently burned off by the City weekly or bi-weekly. WDNR personnel expressed concern for potential groundwater contamination at the site. WDNR personnel concurred with a phased investigative approach aimed at first identifying the contaminant source by investigating



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE OF MANITOWOC, WISCONSIN, 1973.

SEC DONOHUE
Environment & Infrastructure

JAN. 1993

70416

FIGURE 1

SITE LOCATION MAP

FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

site soils with backhoe excavations and subsequently assessing the nature and extent of potential contamination through the installation of groundwater monitoring wells, sampling of surface water, and soil sampling.

More accurate delineation of the disposal area was necessary to appropriately focus the investigation. Accordingly, on December 1, 1992, Mr. Paul Steckmesser (retired Superintendent of Public Works for the City of Manitowoc) was able to delineate the approximate former disposal pit boundaries and provide additional information on the past disposal practices. According to Mr. Steckmesser, the disposal practices spanned an approximate 10-year time period between the early 1960s and early 1970s. Reportedly, 2,000-gallon capacity tanker trucks routinely emptied their contents into the pit. The liquid wastes apparently drained into the subsurface, however, on occasion pooled wastes would be burned off. Subsequent to halting disposal operations, the pit was backfilled with sand and gravel.

2.1.3 Current Conditions

As identified by Mr. Paul Steckmesser, the past waste disposal encompasses an approximate 100 x 100-foot square area along the westernmost boundary of the former gravel pit. The area apparently serves as a storage area, littered with sand and gravel (including dolomite boulders) piles, machinery parts, corrugated metal pipes, large diameter concrete pipes, corrugated sheet metal, wooden utility poles, and metal guardrail sections (Figure 2).

Consistent with the phased approach discussed with the WDNR, backhoe excavations were completed on December 8, 1992, as a precursor to Work Plan development. The purpose of the excavations was to verify the contaminant source within the area delineated by Mr. Steckmesser. A total of seven excavations (Figure 3) were completed to depths ranging from 1 to 25 feet below the surface. Excavated soils were field screened with an HNu photoionization detector (PID) using a modified headspace technique. Materials descriptions, as well as headspace HNu readings, were recorded on Test Pit Logs (Appendix A).

As indicated on the Test Pit Logs (Appendix A), Trenches 1, 3, and 5 revealed the presence of a hard, black, crusty layer characterized by petroleum-like odor and high (80 to 400 ppm) headspace HNu readings. The occurrence of this layer between 8 and 12 feet beneath the surface is thought to be coincident with the bottom of the former disposal pit. Additionally, Trench 2 encountered what appeared to be multi-colored paint sludge within 1 foot of the surface, exhibiting sustained HNu readings of 5 ppm in the breathing zone. Trenches 4, 6, and 7 (Figure 3) did not encounter any black, crusty layers and exhibited HNu readings less than 10 ppm. The decreased HNu readings and lack of visual impacts within Trenches 4, 6, and 7 may serve as initial delineation of the northern limits of the former disposal pit.

N

SEC DONOHUE
Environment & Infrastructure

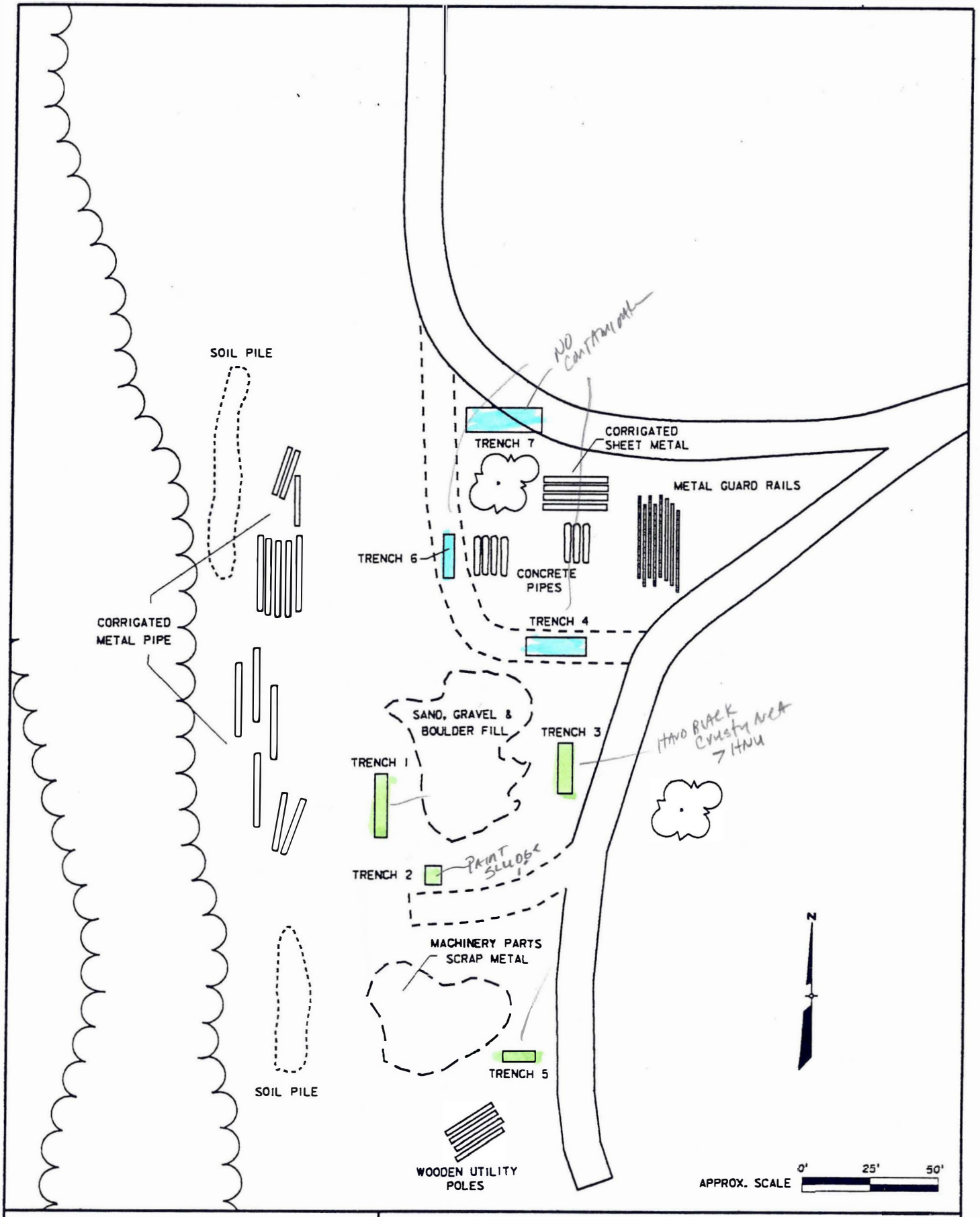
JAN. 1993

70416

FIGURE 2

FORMER DISPOSAL PIT AREA

FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN



SEC DONOHUE
Environment & Infrastructure

JAN. 1993

70416

FIGURE 3

TRENCH LOCATION MAP
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

2.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.2.1 Topography and Drainage

Regional topography was determined by reviewing the 1973 Manitowoc 7.5-Minute Quadrangle (Figure 1). The generally undulating land surface present across Manitowoc County is divided by a series of low-relief, elongated, north-trending end moraines and ground moraines formed during Quaternary glaciation (Finley, 1976).

The numerous rivers, streams, intermittent drainages, and wetland areas observed in Manitowoc County are also the result of Wisconsinan glaciation.

2.2.2 Geology

Manitowoc County lies within the Eastern Ridges and Lowland Physiographic Region (Finley, 1976). The region is characterized by three low, roughly parallel, north-south trending limestone ridges with intervening lowlands, all of which are obscured by deposits of glacial drift.

Geologic strata present in Manitowoc County consist of variable thicknesses of Quaternary-age glacial drift and lake deposits overlying dolomite bedrock of Silurian age (Niagara Dolomite). The glacial drift deposits in the vicinity of the site consist largely of till and stratified gravel and sand. Glacial deposits reach an estimated maximum thickness of between 100 and 200 feet in Manitowoc County (Skinner and Borman, 1973).

2.2.3 Hydrogeology

Regional hydrogeologic information indicates that groundwater moving within the water table aquifer may be hydraulically interconnected with small lakes, rivers, wetland areas, and Lake Michigan. Shallow groundwater generally flows eastward to Lake Michigan.

The water table aquifer is jointly comprised of the Niagara Dolomite and an overlying shallow glacial drift aquifer (Skinner and Borman, 1973). The Niagara Dolomite aquifer system is the most widely used aquifer in the Lake Michigan Basin. Water supplies obtained from this unit are dependent on the thickness of the aquifer penetrated and the amount of porosity developed within the Niagara due to fracturing, jointing, and solution weathering.

2.3 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

2.3.1 Topography and Drainage

Local relief within a 1-mile radius of the site is greater than 60 feet. Uneven glacial deposits, as well as the mining activities associated with the gravel pits, account for most of the surface irregularities at the site. Elevations across the site average between

approximately 685 and 740 feet above mean sea level (USGS datum). East of the former gravel pit, the land surface slopes gently toward Lake Michigan.

The former gravel pit is located in the Lake Michigan Basin. Surface water drainage in the site vicinity is directed primarily north, east, and southeast toward Silver Creek. Silver Creek discharges to Lake Michigan approximately 3 miles east of the site. Numerous small lakes (Silver Lake, Kasbaum Lake, Glomski Lake, Gass Lake, and Hartlaub Lake) are located northwest, west, and southwest of the site.

2.3.2 Geology

Based upon the review of the nearest geologic logs (Wisconsin Geological Survey Log Nos. MN-28 and MN-27, see Appendix B), the site geology consists of approximately 125 to 165 feet of glacial drift overlying dolomite bedrock. North and east of the site, the drift is primary till, unstratified clay, silt, and sand, whereas at the site, till, stratified sand, and gravel comprise the glacial drift.

2.3.3 Hydrogeology

Private well logs within Sections 2 and 3, T.18N, R.23E, indicate that groundwater occurs between approximately 15 and 80 feet beneath ground surface. The elevation of nearby kettle lakes and of Silver Creek suggest the occurrence of groundwater at an elevation of approximately 690 MSL. Based on this information, groundwater is expected to be encountered approximately 30 feet beneath ground surface at the location of the former disposal pit. Groundwater may occur near the ground surface within the mined areas of the gravel pit (gravel pit floor). It is anticipated that local groundwater flow is to the north, east, and southeast toward Silver Creek, and ultimately eastward to Lake Michigan.

RP/MANIWORK/AA1

3.0 SAMPLING AND ANALYSIS PLAN

3.1 INTRODUCTION

This plan details the procedures to be followed for collecting samples for chemical and physical analyses at the former gravel pit. The following sections detail the field investigation rationale and approach, as well as media-specific sampling plans, including sample locations, equipment requirements, sample collection procedures, decontamination procedures, quality control protocols, and documentation requirements.

3.2 SAMPLING APPROACH, RATIONALE, AND OBJECTIVES

Sampling needs specific to the former disposal pit have been identified based on consideration of the primary contaminants associated with the pit and on potential contaminant migration pathways. The interrelationships between the contaminant source (former disposal pit), contaminant migration pathways, and potential receptors are presented as a Site Conceptual Model in Figure 4. The format and presentation of the model facilitates development of data needs, sampling design, contaminant fate and transport evaluations, and assessment of potential risk to receptors.

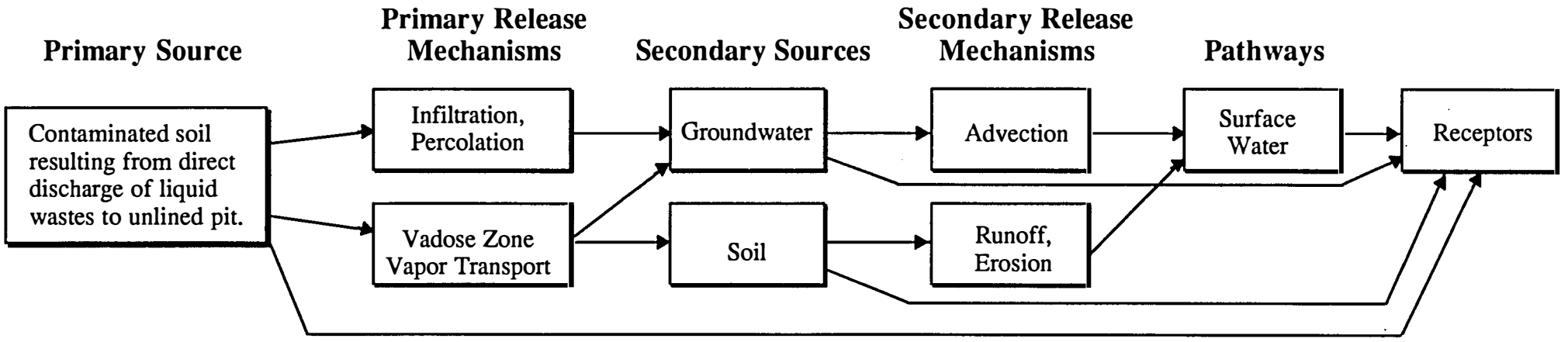
As indicated by Mr. Don Vogt and Paul Steckmesser (see Section 2.1.2), the primary contaminants associated with past industrial waste disposal include benzene, solvents, and thinners. Additionally, backhoe excavation revealed the presence of what appeared to be paint sludge. Accordingly, the analytes of concern include volatile organic compounds (VOCs), lead, chromium, and Toxicity Characteristic Leaching Procedure (TCLP) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). Polyaromatic hydrocarbons (PAHs) will be analyzed in select samples as possible by-products resulting from the practice of burning off the pooled wastes. Also, because of the unknown waste composition, semi-volatile organic compounds (SVOCs) will be analyzed in several samples for the purpose of waste characterization. The analytical parameters are detailed further in Sections 3.3.2, 3.5.2, and 3.6.2.

The investigative approach is focused to address the following:

- Characterization of nature and extent of contamination in site soils and groundwater. These media are potential contaminant sources or pathways.
- Characterization of site hydrogeology and geology.
- Assessment of potential exposure to receptors.
- Consideration of remedial action alternatives.

Figure 4

Site Conceptual Model
Former Disposal Pit
Town of Newton, Wisconsin



FC.NEWTON(MALETZKE)12.92

The investigative approach encompasses subsurface soil sampling from a maximum of 12 boreholes, six monitoring well installations, groundwater sampling, and two surface water samples from Silver Creek. A total of approximately 11 private water supply wells will also be sampled. Pending WDNR approval, no additional samples will be collected to assess media background conditions. Detections of analytes of concern in soil samples will be considered impact attributable to the former disposal pit. Analytical results for groundwater will be compared to Maximum Contaminant Levels (MCLs), and surface water analytical results will be evaluated with regard to ambient water quality criteria. The specific components of the investigative approach presented in this section seek to accommodate the flexibility necessary to adjust sample locations based on field screening and to adjust sampling methods based on the subsurface conditions encountered, while maintaining the sampling objectives.

Sampling objectives as well as sample locations are detailed in Sections 3.3.1, 3.4.1, 3.5, and 3.6.1. Components such as field screening and borehole groundwater sampling are designed to reduce analytical costs and reduce the number of required monitoring well installations.

3.3 SOIL SAMPLING

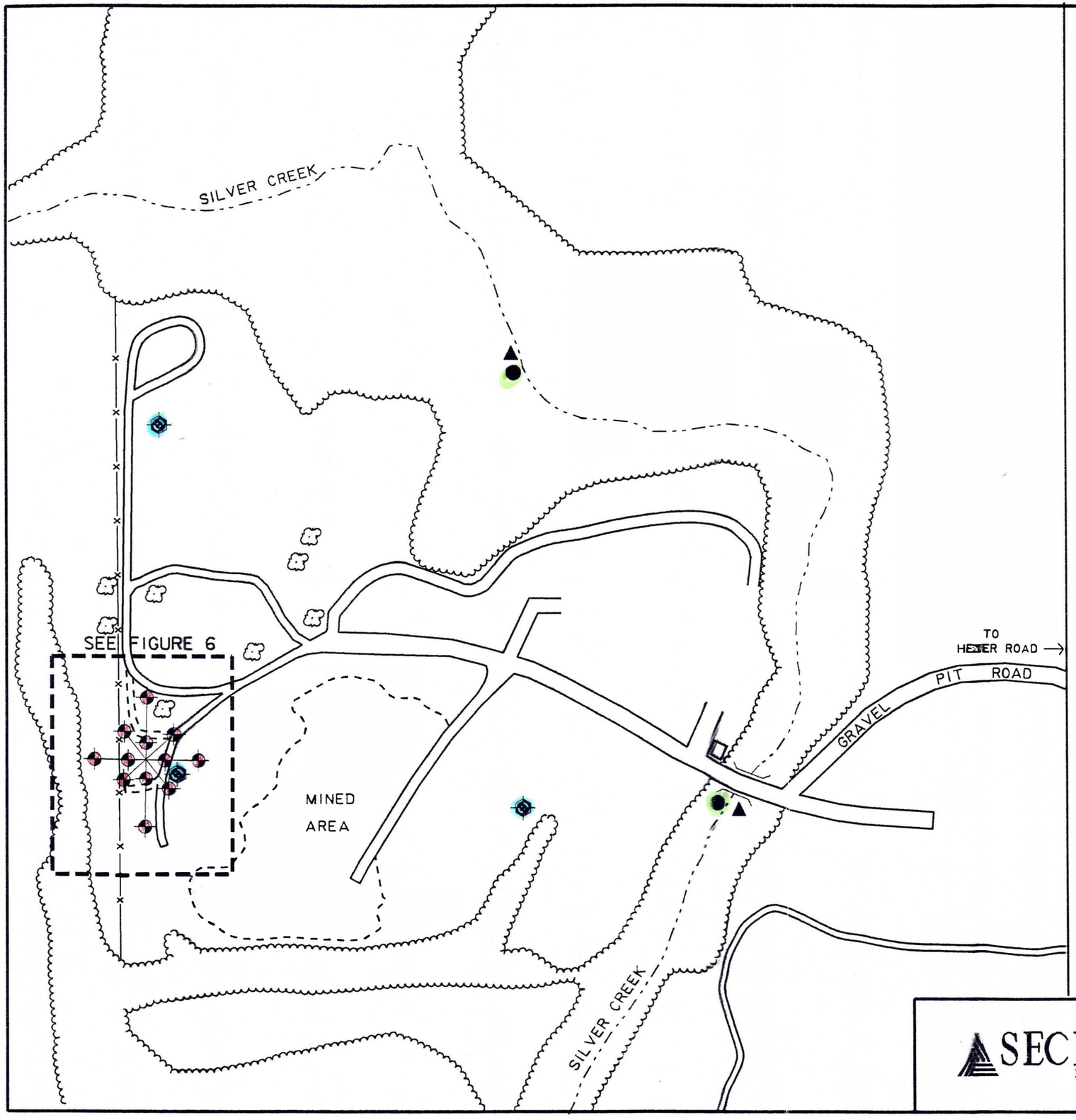
3.3.1 Sample Locations

Soil samples will be collected from 12 borings advanced to the water table at locations shown in Figures 5 and 6. The boring locations are established on a radial pattern, centered on the former disposal pit. Sample collection will be initiated at two locations centered within the approximate limits of the former disposal pit. Sample collection will then proceed to the periphery of the radial pattern. In the event that field screen readings at the peripheral locations indicate high VOC concentrations (relative to two locations within the approximate limits of the former disposal pit), subsequent sample locations will be adjusted outward. If field screen readings at the peripheral locations do not indicate high VOC concentrations, subsequent sample locations will tract toward the former disposal pit as indicated on Figures 5 and 6. In this way the waste source will be characterized and the areal extent of soil contamination will be defined. Subsurface samples collected from the vadose zone will serve to define the vertical extent of contamination. Boring locations will be field identified and surveyed prior to sampling.

3.3.2 Analytical Parameters

Soil samples submitted to the laboratory will be analyzed for VOCs. Additionally, samples exhibiting characteristics of paint sludge (as encountered during backhoe excavating - see Section 2.1.3) will be analyzed for lead, chromium, and TCLP metals. A limited number of samples will also be analyzed for PAHs. A maximum of four samples will also be analyzed for SVOCs. If detected in significant concentrations, SVOC analysis will be expanded to

- which way does stream flow
- Well locations too far removed from site for first try
- borings pretty tight to soil



LEGEND

- STAFF GAUGE
- GROUNDWATER MONITORING WELL NEST
- SURFACE WATER SAMPLE
- SOIL BORING/BOREHOLE GROUNDWATER SAMPLE
- TREES
- FENCE

ADAPTED FROM AIR PHOTO SHEET NO. 8M,
MAY 8, 1990, AERO-METRIC ENG. INC.

APPROX. SCALE 0' 100' 200' 400'

N

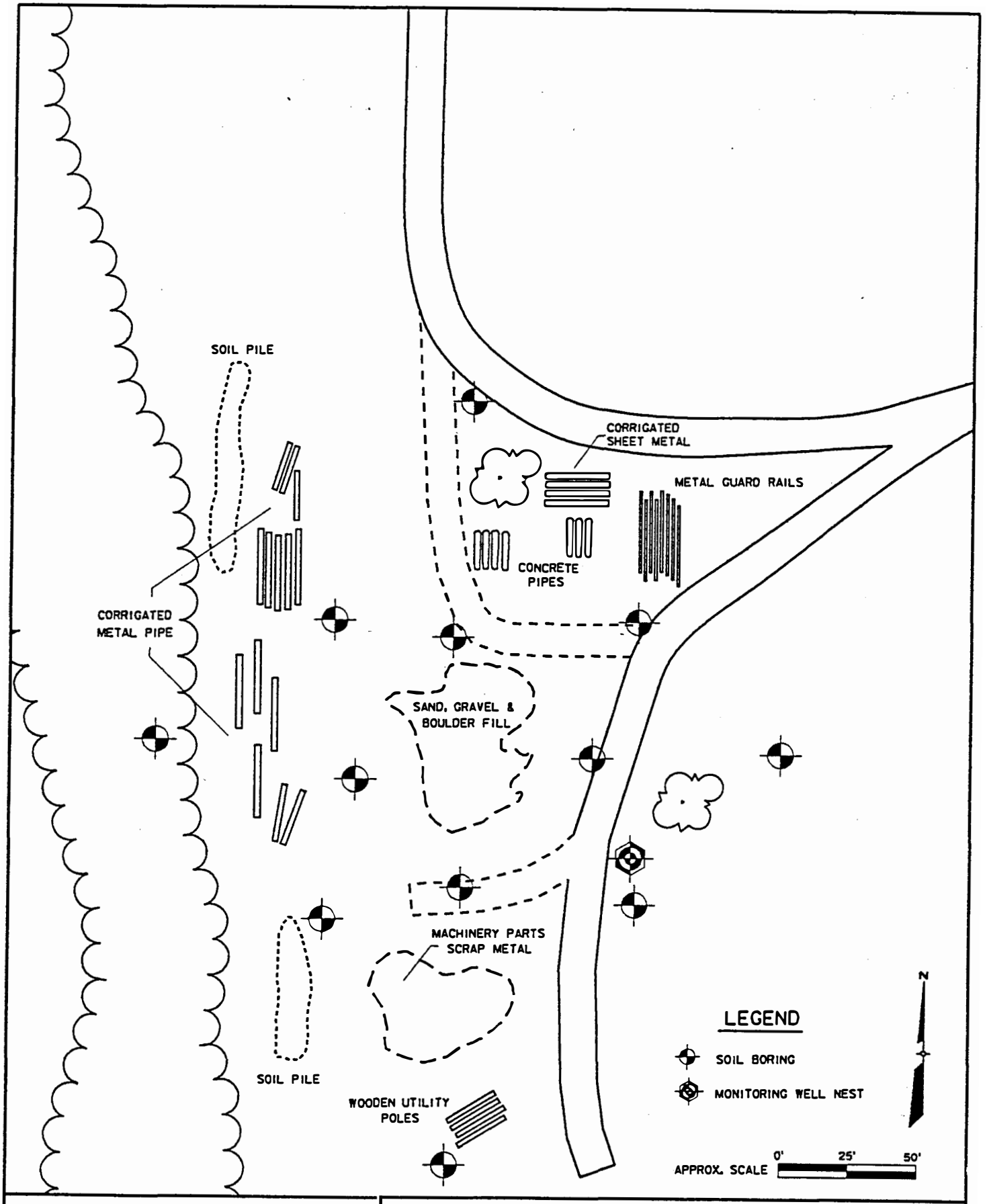
SEC DONOHUE
Environment & Infrastructure

JAN. 1993

FIGURE 5

70416

SAMPLE LOCATION MAP
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN



SEC DONOHUE
Environment & Infrastructure

JAN. 1993

70416

FIGURE 6

DISPOSAL PIT SAMPLE LOCATION
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

monitoring well and private well water samples. Sample numbers and corresponding analytes are summarized in Table 1.

3.3.3 Equipment

Equipment and materials used during soil boring activities will include:

1. A fully-equipped drill rig capable of:

    a. Accomplishing soil boring to an approximate 40-foot depth using standard 4 1/4-inch hollow stem auger or mud rotary drilling techniques.
    b. Performing 2-inch and 3-inch (O.D.) standard split-spoon sampling.
    c. Completing borehole abandonment in accordance with Chapter NR 141 of the Wisconsin Administrative Code.
    d. Obtaining groundwater samples through screened augers.

2. Fiberglass tape of adequate length to measure depth of boring.

3. Electric water level indicator.

4. Tap water.

5. Munsell Soil Color Chart.

6. Boring logs.

7. Indelible marking pen and black ink pen.

8. Sample labels.

9. Photoionization detector.

10. Oxygen, LEL detector.

11. Hard hat, safety glasses, and steel-toed boots.

12. Level B personal protective clothing and respiratory protection.

3.3.4 Procedures

Borings will be advanced to the water table through unconsolidated soils using hollow stem auger or mud rotary techniques. Subsurface soil will be collected utilizing split-spoon samplers. In unconsolidated soils, split-spoon samplers will be advanced ahead of the augers with an ATV or truck-mounted drill rig. The geologist will classify and log subsurface soils using the United Soil Classification System (USCS) and a Munsell Soil

TABLE 1

SAMPLING AND ANALYSIS SUMMARY
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

Matrix	Field Parameters	Laboratory Parameters	Field Samples	TB[a]	FB	FD	Number of Samples to be Collected
Soil	VOCs by HNu	VOCs	10	-	-	1	11
		total metals*	1	-	-	1	2
		TCLP lead	1	-	-	1	2
		TCLP chromium	1	-	-	1	2
		PAHs	3	-	-	1	4
		SVOCs	4	-	-	1	5
Groundwater							
Borehole Samples	--	VOCs	12	4	2	2	20
		SVOCs	4	-	1	1	6
Monitoring Wells	Temperature, pH, specific conductance	VOCs	6	2	1	1	10
		total metals	1	-	1	1	3
Private Wells	Temperature, pH, specific conductance	VOCs	11	1	-	2	14
Surface Water	Temperature, Ph, specific conductance	VOCs	2	1	-	1	4

a = Trip Blank in each cooler containing VOC samples (water).
TB = Trip Blank.
FB = Field Blank.
FD = Field Duplicate.
* = total metals = arsenic, barium, cadmium, chronium, lead, mercury, selenium, silver.

Color Chart and maintain a complete soil boring log for each borehole. Soil samples will be collected continuously to 25 feet and at 5-foot intervals thereafter from each borehole, placed in appropriate sample jars, and screened (modified headspace method) for VOCs with a photoionization detector (PID).

Immediately after opening the stainless steel split-spoon, two clean 120 ml wide-mouth glass jars will be filled. Concurrently, soil from the split-spoon will be transferred to a clean, 8-ounce, wide-mouth jar with metal screw-on lid. After one-half of a sample jar has been filled with soil, a sheet of aluminum foil will be placed over the open end of the jar and the lid securely closed. The dual purpose of the aluminum foil sheet is to reduce the potential for VOCs to escape from the jar and to facilitate the "head space" screening of air in the sample jar while using the photoionization detector.

– what is lamp intensity for PID?

PID screening of the recovered soil sample will be accomplished first by shaking the soil samples for several seconds, which increases the surface area of soil particles exposed to the air inside the jar, followed by inserting the tip of the PID probe a few inches into the jar through the aluminum foil cover. The highest value read off of the PID meter during the first few seconds after inserting the probe tip will be recorded as the PID reading for the soil sample. All readings will be recorded on field logs along with other observations and pertinent data.

A maximum of 10 soil samples will be selected for submittal to the laboratory for analysis. Nine of the 10 samples will be representative of the 3 highest PID readings, the 3 lowest PID readings (including non-detect) and 3 mid-range PID readings. One sample will be selected as representative of the paint sludge encountered during trenching. Because of laboratory sample holding time requirements and the anticipated duration of drilling and sampling activities, the selection of samples for laboratory submittal cannot wait until completion of all 12 borings. However, the radial pattern of sampling will facilitate selection of the three highest samples from the inner ring of borings, the mid-range samples from the middle ring of borings, the lowest samples from the periphery. Jarred soil samples not submitted for laboratory analysis will be emptied and spread thinly on the ground surface around the soil boring from which they originated.

By location

If subsurface conditions permit boring completion utilizing hollow stem auger techniques, a groundwater sample will be collected from within each borehole with a teflon bailer as described in Section 3.5.4.1. Upon completion of drilling and sampling activities, boreholes will be abandoned in accordance with Chapter NR 141 of the Wisconsin Administrative Code.

need 10.5 lamp?

	eV
Benzene	9.25
TCE	9.27
111 TCE	11.25
PCE	9.32
Hexane	10.18
Pentane	10.35

3.3.5 Decontamination

Soil drilling and sampling equipment will be decontaminated prior to use and between borings to avoid cross-contamination. Drilling equipment will be steam-cleaned at a predetermined location at the site. Decontamination of sampling equipment will include:

1. Liquinox wash.

2. Tap water rinse.

3. Isopropanol rinse.

4. Distilled water rinse.

3.3.6 Quality Control

Table 2 lists the samples needed for field quality control. Field duplicates will be collected at the same time and in the same manner as original samples. Field documentation will be reviewed for completeness and accuracy.

3.3.7 Documentation

Data collected and observations made during borehole drilling and sampling will be recorded on appropriate field forms as included in Appendix C. This will include:

1. Daily Time Log.

2. Soil Boring Logs (WDNR Forms 4400-122 and 4400-122A).

3. Atmospheric Monitoring Logs.

4. Well/Drillhole Abandonment (WDNR Form 3300-5B).

3.4 MONITORING WELL INSTALLATION

3.4.1 Soil Boring and Well Locations

Soil borings will be completed in conjunction with monitoring well installations at locations shown on Figure 5. A minimum of three nested systems will be installed in the glacial drift, each to include a water table observation well and a deeper piezometer. The three nested systems will define site hydrogeologic characteristics as well as determine potential contaminant impact to groundwater. Two additional water table observation wells may be installed at the periphery of the former disposal pit, pending the results of borehole groundwater sampling described in Section 3.5.4.1. The two additional wells will be located at the limits of the contaminant plume as suggested by borehole groundwater sampling.

TABLE 2

SAMPLE CONTAINERS, VOLUMES, PRESERVATION, AND HOLDING TIMES
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

Matrix	Parameter	Container	Preservation	Holding Time
Soil	VOCs	Two 120-ml VOA glass vials	4° C	14 days
	SVOCs (includes PAHs)	One 8-ounce wide-mouth glass jar	4° C	extract in 14 days analyze in 40 days
	Metals	One 8-ounce wide-mouth glass jar	None	TCLP extract in 14 days Analyze Hg in 28days Others in 6 months
Groundwater/ Surface Water	VOCs	Two 40-ml VOA glass vials	1:1HCl, pH < 2,4° C	14 days
	SVOCs	Two 1-liter amber glass jars	4° C	extract in 7 days analyze in 40 days
	Metals	One 1-liter HDPE	1:1 HNO_3, pH < 2	Hg in 28 days Others in 6 months

RP/MANIWORK/AA3

If the drilling methods utilized (mud rotary) are not conducive to borehole groundwater sampling, the two additional water table observation wells will be located outside of the outermost completed borings, to the northeast and southeast of the former disposal pit.

3.4.2 Equipment

The following equipment will be used for monitoring well installation:

1. Soil drill rig with the following capabilities:

    a. Use of hollow stem augers or casing to 100-foot depth.
    b. Rig pump adequate to pump grout.
    c. Monitoring well installation to 100-foot depth.
    d. Groundwater sample collection within hollow stem augers or open boreholes.

2. Fiberglass tape (200 feet).

3. Electric water level indicator of adequate length (100 feet).

4. Field notebook and field documentation forms (Appendix C).

5. Tap water.

6. Liquinox detergent.

7. High pressure hot water steam cleaner.

8. Camera and film.

9. Well construction materials:

    a. 2-inch I.D. flush-threaded, Schedule 40 and 80 PVC riser and 0.010-inch slot PVC screen.
    b. Silica sand.
    c. Bentonite pellets.
    d. Bentonite slurry.
    e. Neat cement.
    f. Steel protective casing and guard posts.
    g. Keyed-alike locks.

10. pH and conductivity meters, calibration solutions, thermometer.

11. Isopropanol.

12. Five-gallon pail with cover.

3.4.3 Procedures

3.4.3.1 Drilling and Sampling Procedures

Borings completed in conjunction with monitoring well installations will be advanced as described in Section 3.3.4. Subsurface soil will be collected at 5-foot intervals utilizing split-spoon samplers. Samples will not be submitted for laboratory analysis, however, one representative sample from each screened interval will be analyzed for grain-size distribution. Borings completed for water table observation wells are anticipated to extend to approximately 40 feet. Borings completed for piezometer installation are anticipated to extend to approximately 100 feet.

3.4.3.2 Well Installation Procedures

Observation wells and piezometers will be installed in separate boreholes located adjacent to each other and will be constructed of 2-inch I.D., threaded flush joint, Schedule 40 PVC riser. Wells greater than 100 feet will be constructed of 2-inch I.D., threaded flush joint, Schedule 80 PVC riser. PVC well screens will have a slot size of 0.010 inches. Observation wells will have 10-foot screens; piezometers will have 5-foot screens.

Well borings will be drilled with 4-inch minimum I.D. hollow stem augers or with mud rotary methods using 4-inch minimum I.D. casing to stabilize the borehole. Potable water will be used as the drilling fluid. Bentonite drilling fluids will not contain additives. Bentonite drilling fluids will not be used within 10 feet of the well screen interval. Observation well screens will intersect the water table such that approximately 3 feet lies above the water table and 7 feet lies below the water table. After drilling and placement of the PVC riser and screen, appropriate filter packs and annular seals will be emplaced according to Chapter NR 141 of the Wisconsin Administrative Code. Anticipated monitoring well completion depths are approximately 40 feet for water table observation wells and approximately 100 feet for piezometers. Actual completion depths will be based on the position of the water table and on stratigraphy.

After each well has been constructed, but no sooner than 48 hours after grouting is completed, the wells will be developed by pumping and without the use of acids, dispersing agents, or explosives. Development will be accomplished with a Keck pump and/or bailer. Development shall continue until five well volumes have been removed from the well and pH, temperature, and conductivity are stable. At a minimum, a volume equaling five times the standing water volume in the well shall be removed. The standing water volume includes the water volume within the well screen and casing, plus the saturated annulus. Should the water remain discolored after development, the volume of the water removed shall be increased to 10 times the well volume. If the water still remains discolored, this will be noted on a well development form. No water or other liquid shall be introduced

into the well. Representative formation water shall be assumed to have been obtained when the pH, temperature, and conductivity readings are stable (when readings are within ± 10 percent of one another), the water is clean, and the minimum volumes for development specified herein have been completed.

3.4.4 Decontamination

Groundwater monitoring well installation equipment will be decontaminated prior to use and between installation activities to avoid cross contamination between well locations. Prior to well installation and drilling at each well location, and before leaving the site, drill rigs and other equipment will be decontaminated. Decontamination will consist of a high pressure hot water steam cleaning. Brush scrubbing may be required to remove encrusted material. Decontamination of PVC riser and screen will consist of a high pressure hot water steam cleaning. Riser and well screens will be wrapped in plastic for transport to the well location. Workers will use clean cotton gloves when handling riser and well screen. Decontamination of groundwater development equipment will consist of a soap and water wash, followed by a tap water rinse, an isopropanol rinse, and two distilled water rinses. Decontamination fluids (with the exception of isopropanol rinse fluids), drilling fluids, and water purged from the wells will be disposed on-site on the ground surface.

Isopropanol rinse fluids will be composited with isopropanol rinses from other decontamination procedures and disposed in the municipal wastewater treatment system. Borehole cuttings will remain on-site and be spread out thinly on the ground surface next to the boring from which they originated.

3.4.5 Quality Control

Original field forms and photo documentation will be reviewed for completeness and accuracy.

3.4.6 Documentation

Data collected and observations made during monitoring well installation and development will be recorded on appropriate field forms (Appendix C). Documentation will consist of:

1. Daily Time Log.
2. Soil Boring Logs (WDNR Forms 4400-122 and 4400-122A).
3. Monitoring Well Construction Logs (WDNR Form 4400-113A).
4. Well Development Form (WDNR Form 4400-113B).
5. Atmospheric Monitoring Logs.

3.5 GROUNDWATER SAMPLING

As presented in the following subsections, groundwater samples will be collected from newly installed monitoring wells, from boreholes (if hollow stem auger techniques utilized), and from private wells. Groundwater samples collected from monitoring wells will determine the vertical and horizontal distribution of selected chemical constituents in the glacial drift aquifer. In the event that the deeper piezometers reveal groundwater contamination, a Phase 2 investigation would be proposed to assess groundwater impacts in the underlying dolomite. It is anticipated however, that contaminant plume delineation within the fractured dolomite system may not be possible.

Groundwater samples collected with a bailer from boreholes will serve to define the areal extent of groundwater contamination beneath the former disposal pit. These samples will also refine the location of two additional water table observation wells. Select private wells will be sampled as a precautionary measure to assess potential impacts to drinking water supplies.

3.5.1 Sampling Locations

Groundwater samples will be collected from the six newly installed monitoring wells (three well nests) at locations shown on Figure 5. The locations and elevations of the proposed monitoring wells will be surveyed. Borehole groundwater samples will coincide to the boring locations established on a radial pattern centered on the former disposal pit. Pending field verification of private well locations, a maximum of 11 private wells will be sampled. These wells will be located within an approximate 1/2-mile radius from the former disposal pit.

3.5.2 Analytical Parameters

Groundwater samples submitted to the laboratory will be analyzed for VOCs and SVOCs. Additionally, samples collected from wells located near paint sludge (as identified in borings) will be analyzed for lead, chromium, and TCLP metals. SVOCs will only be analyzed in four groundwater samples collected from boreholes. If significant concentrations are detected, SVOC analysis will be expanded to include monitoring well and private well water samples.

3.5.3 Equipment

The following equipment will be used for groundwater sampling:

1. Keck pump.

2. Electric water level indicator, water level popper, or teflon coated woven tape.

3. Field notebook.

4. Teflon bailer.

5. Yellow Springs dissolved oxygen meter/temperature meter, manual, spare membranes, and electrode solution.

6. Conductivity meter - Yellow Springs or equivalent.

7. pH meter and calibration buffer solutions - Orion or equivalent.

8. Tap water, distilled water, and isopropanol (ACS).

9. Five-gallon pail with cover for collecting and storing isopropanol rinses.

10. Liquinox detergent.

11. Plastic sheeting.

12. Sample bottles.

13. pH paper.

3.5.4 Procedures

3.5.4.1 Borehole Groundwater Sampling

If subsurface conditions permit the utilization of hollow stem auger techniques, groundwater will be sampled from each borehole. If mud rotary drilling techniques are employed, borehole groundwater sampling will not be conducted. Upon completion of drilling and sampling activities described in Section 3.3.4, groundwater samples will be collected from each borehole as groundwater enters through the screened lead hollow stem auger. Groundwater sample acquisition will be consistent with procedures outlined for monitoring wells in Section 3.5.4.2. Prior to sample collection, the water level, the initial pH, conductivity, and dissolved oxygen will be measured. Groundwater samples will be collected using a teflon bailer attached to a nylon cord. A new piece of nylon cord will be used at each borehole. The bailer will be filled with a stopcrock and teflon tubing to facilitate sample transfer from the bailer to the sample bottle while minimizing aeration. Sample containers to be used are listed in Table 2.

3.5.4.2 Monitoring Well Sampling

Prior to groundwater sample collection, monitoring wells will be purged to collect samples representative of hydrogeological conditions. Prior to conducting purging procedures, static water levels in the wells will be measured and recorded.

A minimum of five well volumes will then be removed from the monitoring wells through the use of a submersible pump or bailer. If well recharge rates are insufficient to conduct continuous pumping, the wells will be pumped dry and a sample will be obtained soon after recharge.

Pumps used in the purging process will be fitted with a backflow check valve to prevent purge water from flowing back into the well. During the purging process, selected chemical and physical characteristics of the purge water will be monitored. These characteristics include turbidity, conductivity, pH, and temperature. Field meters will be calibrated according to manufacturer's instructions prior to daily sampling procedures.

Require purge volumes will be calculated as follows:

- To determine the volume of water to be purged from each well, measure the depth to the static water level and depth to the bottom of the well from the predetermined measuring point. Between measurements at each well, rinse the measuring tape several times with distilled water.

- Based on the depth to water, the total depth of the well and the diameter of the well, the volume of water standing in the well (well volume) shall be calculated using the following formula:

  1 well volume (gallons) = 3.14 $d^2/4$ x h x 7.48 gallons/ft^3

  Where:

  d = diameter of well (in feet)
  h (height of water) = depth of bottom - depth to water level (in feet)

Groundwater samples will be collected from the monitoring wells following the purging process. Samples will be collected within 24 hours of well purging, with the exception of those wells where recovery from the purging process exceeds 24 hours. Groundwater samples will be collected using a Keck pump. Sample containers to be used are listed in Table 2.

3.5.4.3 Private Well Sampling

Residential wells will be purged by running water from the system access point closest to the well pump for a period of at least 15 minutes prior to sample collection. Conductivity, pH, and temperature measurements will also be made before samples are taken.

3.5.5 Decontamination

Decontamination of groundwater sampling equipment will consist of a soap and water rinse, followed by a tap water rinse, an isopropanol rinse, and two rinses with distilled water. Additionally, 1-gallon of distilled water will then be pumped through the Keck Pump before the next sample is taken.

3.5.6 Quality Control

In order to verify the quality of the groundwater sampling process, sample blanks and duplicates will be collected during the sampling process. The number of QC samples to be collected is listed in Table 1.

Field blanks will be taken at a frequency of one per every ten field samples collected. The bailer will be decontaminated before collecting the blank. Field blank rinsate samples will then be collected by pouring distilled water through the bailer and collecting the water in the appropriate bottles listed in Table 2. In the case of the Keck pump, field blank rinsate samples will be collected after the decontamination procedure by pumping distilled water through the Keck pump and collecting the water in the appropriate bottles.

In order to assess the degree and type of accidental contamination by volatile organics during the sample collection and shipment procedures, two 40-ml volatile vial trip blank samples will be filled completely with the distilled water prior to mobilization to the site and stored with the sample volatile vials to be used during field sample collection. The vials will be packaged with the site field samples and sent to the laboratory for analysis.

Duplicate samples will be taken at a frequency of one per every ten field samples collected. A field duplicate sample is a second sample collected form the same well at approximately the same time in the same manner as the original sample.

3.5.7 Documentation

Data collected and observations made during groundwater sample collection will be recorded on the purging and sample collection form included in Appendix C.

3.6 SURFACE WATER SAMPLING

3.6.1 Sampling Locations

Surface water sample locations within Silver Creek are shown on Figure 5. Sample locations will be field identified prior to sampling and noted on field forms with reference to permanent structures or other physical features. The surface water samples will be collected to assess potential contaminant impacts resulting from runoff and erosion, or groundwater discharge to the creek.

3.6.2 Analytical Parameters

Surface water samples will be analyzed in the field for specific conductance, pH, and temperature. Laboratory analysis will include VOCs.

3.6.3 Equipment

The following equipment and materials will be used during surface water sampling:

1. Sample containers as listed in Table 2.
2. Chest waders.
3. pH meter.
4. Thermometer.
5. Sample labels.
6. Sample log sheets.

3.6.4 Procedures

Surface water samples will consist of grab samples collected bankside where possible or by wading into shallow water where practical. Surface water samples will be collected by immersing the sample container in the creek. After sample collection, field measurements of specific conductance, pH, and temperature will be made and recorded on the surface water sample log sheet.

3.6.5 Decontamination

There will be no equipment decontamination associated with the surface water sampling.

3.6.6 Quality Control

One field duplicate sample will be collected as listed in Table 1. The field duplicate will be collected at the same time and in the same manner as the original sample. As with groundwater samples, trip blank samples will be packaged with the field samples and sent to the laboratory for analysis.

3.6.7 Documentation

Surface water sampling information and other observations made by the samplers during sampling activities will be recorded on the appropriate field forms contained in Appendix C. This will include:

1. Daily Time Logs.

2. Surface Water Sampling Form.

3. Sample labels.

3.7 SURFACE WATER AND GROUNDWATER HYDRAULIC CHARACTERIZATION

3.7.1 Staff Gauge Installation

3.7.1.1 Staff Gauge Locations

Two staff gauges will be installed within Silver Creek at locations shown on Figure 5. Data from these gauges will be used with groundwater elevations from monitoring wells to develop a water table map for the site. The locations and elevations of the staff gauges will be surveyed.

3.7.1.2 Equipment

The following equipment will be used for staff gauge installation:

1. Porcelain enameled - steel staff gauges labeled in 0.1-foot increments.

2. Sledge hammer and/or post driver.

3. Camera and film.

4. Waders.

5. Nails, nuts, and bolts.

3.7.1.3 Installation Procedures

The staff gauges will consist of 2-1/2-inch wide steel staff gauges, finished with porcelain enamel, graduated to hundredths, and marked at every foot and every tenth of a foot. If possible, 3-1/2-foot gauge sections will be nailed through grommeted holes to trees near the creek bank to minimize the potential for damage during spring bankfull discharge. If a tree is not available, the staff gauges will be bolted to steel fence posts and driven into the creek bottom so that water levels can be read from the creek bank. Final installed locations and top of gauge elevations will be surveyed with respect to mean sea level elevation with an accuracy of 0.01 feet. Surface water level measurements at the staff gauges will be taken on the same day as groundwater levels from the monitoring wells.

one record elev.?

3.7.1.4 Decontamination

No decontamination is necessary.

3.7.1.5 Quality Control

Field documentation and photo documentation will undergo an internal QC review after the completion of field activities.

3.7.1.6 Documentation

Data collected and observations made as the gauges are installed and monitored will be recorded on appropriate field forms (Appendix C). The documentation will consist of:

1. Daily Time Log.

2. Staff Gauge Information Form.

3. Photographs of staff gauge locations.

3.7.2 Water Level Measurements

Water level and well depth measurements will be taken after installation of the new wells and before and after well development and during groundwater sampling. Site conditions at the time of measurements, rain events, and well integrity will also be noted. Static water levels will be measured and recorded for the purpose of determining groundwater flow directions and gradients at the site. The water level surface will be measured using a popper or electric water level indicator. Each well will have a reference point indicated on the top of the PVC well casing from which water level measurements will be taken. Measurements will be noted to the nearest 0.01 feet on Water Elevation Forms (Appendix C).

RP/MANIWORK/AA1

4.0 FIELD SCHEDULE

The proposed field schedule is shown in Table 3. This schedule has been developed to accomplish the proposed field investigation using an efficient and cost-effective strategy. Mobilization, sampling sequences, and field personnel responsibilities have been planned to maximize efficiency of personnel use, pre-mobilization arrangements, and field data prerequisites. The actual scheduling of field work and work plan implementation is contingent on WDNR approval of the work plan.

Sampling sequences will be focused to include soil sampling, borehole groundwater sampling, and borehole abandonment during one 10-day period; and groundwater monitoring well installation, well development, surface water sampling, staff gauge installation, and surveying during a second 10-day period. Groundwater sampling and water level measurement will be initiated two weeks after well development (to provide for stable, recovered wells) and completed within two days. Private well sampling is anticipated to be completed prior to the onset of other field activities. After evaluation of results from the field tasks, a detailed schedule will be prepared for remaining tasks (data validation, data evaluation, report preparation, etc.).

The project schedule is based on the following assumptions:

1. Approval of the work plan by WDNR and authorization to proceed is obtained by February 15, 1993.

2. A 6-week turnaround time for laboratory analyses is secured.

3. Drilling and sampling will be initiated in Level B personal protection with potential downgrade. Non-intrusive tasks and work located beyond the limits of the former disposal pit may be completed in lower levels of protection.

RP/MANIWORK/AA1

TABLE 3

PROJECT SCHEDULE
FORMER GRAVEL PIT
TOWN OF NEWTON, WISCONSIN

Activity	Start Date	Completion Date
Submit Work Plan	January 15, 1993	January 15, 1993
WDNR Approval and Notice to Proceed	January 15, 1992	February 15, 1993
Drilling Specifications and Subcontract Preparation	February 15, 1993	March 1, 1993
Health and Safety Plan Preparation	February 15, 1993	March 1, 1993
Prefield Preparation/Boring Location Survey	February 15, 1993	March 5, 1993
Mobilization	March 8, 1993	March 8, 1993
Soil Sampling, Borehole Groundwater Sampling, and Borehole Abandonment	March 8, 1993	March 17, 1993
Groundwater Monitoring Well Installation, Well Development, Surface Water Sampling, Staff Gauge Installation, Surveying	March 22, 1993	March 31, 1992
Groundwater Sampling, Water Level Measurements	April 14, 1993	April 16, 1993
Sample Analyses	March 8, 1993	May 26, 1993

RP/MANIWORK/AA3

5.0 SAMPLE HANDLING AND PACKAGING

5.1 CHAIN-OF-CUSTODY RECORD

Soil, groundwater, and surface water sample custody procedures will follow the procedures outlined in this plan. Upon collection of the samples, a chain-of-custody form will be filled out in duplicate. When transferring the possession of samples, the individuals relinquishing and receiving shall sign, date, and note the time of the record. The original custody form will be taped to the inside lid of the shipping cooler and the duplicate will be maintained for project files. The shipping cooler will be secured with strapping tape and two custody seals that are signed and dated by the sampler will be placed across the cooler opening. These custody seals will have unique numbers preprinted on them. An example of the chain-of-custody record to be filled out is included in Appendix C.

Header information includes the project number, sampler's signatures, and the project name. For each station number, the sampler indicates: date, time, station location, number of containers, analytical parameters, and the tag and label numbers. The lower remarks section will include the airbill number (if applicable) and the custody seal numbers.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing the error, then entering the correct information. Erasures are not permissible.

5.2 PACKAGING AND SHIPPING

Each bottle will be placed in a ziploc bag and sealed. Only high quality plastic coolers and/or metal coolers will be used. Styrofoam coolers, boxes, or foam lined fabric coolers are not acceptable.

Vermiculite or equivalent will be placed in the cooler bottom. Bottles will be arranged upright in plastic bags so none touch each other. The coolers will not be over packed. Additional vermiculite will be added to cover bagged bottles. Frozen blue ice packs or equivalent will be placed ziploc bags and put around samples, but will not come in direct contact with the bottles. Additional vermiculite will be added to fill the cooler. The cooler drain will be taped shut with fiber trapping tape. The original chain-of-custody form will be put in a ziploc bag and taped to the underside of the cooler lid with fiber strapping tape.

The lid of the cooler will be taped with fiber strapping or duct tape. At least two custody seals (numbers recorded on the custody form) will be placed on the cooler over the cooler latch(es) and at the back of the cooler. The seals will be signed and dated by the person sealing the cooler. Three inches (wide) of clear tape will cover the seals.

Sample delivery to the laboratory will be made by Federal Express Overnight Delivery or equivalent to ensure sample arrival to the laboratory by the following morning. The laboratory will be informed by phone of the date of the shipment, number of coolers and samples, analyses required, and expected date/time of arrival of shipment. Upon receipt of the coolers, the date, time of arrival, and signature of person will be noted on the airbill. The person receiving the samples will then sign the custody form and inform the site manager of any discrepancies between bottles, labels, and custody.

RP/MANIWORK/AA1

6.0 HEALTH AND SAFETY

A comprehensive site specific Health and Safety Plan will be developed for site work prior to implementation of the work plan. Items contained in the plan will govern activities conducted as part of the field investigation. The most hazardous chemical constituents associated with the former waste disposal is benzene. Benzene is considered carcinogenic to humans. Due to the potential for exposure by inhalation, coupled with air monitoring results obtained during backhoe excavation at the site, it is anticipated that drilling and sampling activities will be initiated in Level B personal protection, with downgrade as appropriate.

RP/MANIWORK/AA1

7.0 REFERENCES

Aero-Metric Engineering, Inc., 1990, Air photo sheet No. 8M, City of Manitowoc, Wisconsin.

Finley, Robert W., 1976, Geography of Wisconsin, University of Wisconsin Press, Madison, Wisconsin, 558 p.

Skinner, Earl L. and Borman, Ronald G., 1973, Water Resources of Wisconsin - Lake Michigan Basin, Hydrologic Investigations Atlas HA-432, U.S. Geological Survey, Washington, D.C.

U.S. Geological Survey, 1973, Manitowoc Quadrangle, 7.5 Minute Series (Topographic).

RP/MANIWORK/AA1

APPENDIX A

TEST PIT LOGS

(Backhoe Excavation December 8, 1992)

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET ___ OF ___

PROJECT: City of Manteca
PROJECT NO.: 20416-001
TRENCH OR PIT NO.: 1
APPROXIMATE DIMENSIONS: 8' X 4' X 12'
DEPTH TO GROUNDWATER: NA

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: Backhoe - John Deer 690D-LC
LOGGED BY: Melissa Michaels

FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION

Depth 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Fill material
Yellow gravel with Sand — 3ppm to 4ppm
H. gray brown Sand with Rock
Brow gray Sand with pebbles — 100 ppm
Sand — 125ppm
Very hard Some black oily gravelly substance — 150ppm
Stop Excavating B.Z Readings above 1ppm

Fill
Sand — 3'
Sand — 6' 100ppm
125 ppm
150 ppm
Oily Gravely — 13'

NOTES:

List Sample Contents In Decreasing Relative % By Volume

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc Gravel Pit
PROJECT NO.: 70416-001
TRENCH OR PIT NO.: 2
APPROXIMATE DIMENSIONS: 4 X 4 X 1
DEPTH TO GROUNDWATER: N/A

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: Backhoe
LOGGED BY: Melissa Michaels

Depth	FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION
0	
1	Sustained 5ppm at 1ft Multi colored depris paint & thinner Smell
2	Cover up & move off
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	

NOTES:

List Sample Contents In Decreasing Relative % By Volume

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc Gravel pit
PROJECT NO.: 70416-001
TRENCH OR PIT NO.: 3
APPROXIMATE DIMENSIONS: 4 X 5 X 14.5
DEPTH TO GROUNDWATER: NA

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: Backhoe
LOGGED BY: Melissa Michaels

FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION

Depth	
0	
1	
2	
3	Yellow brown Sand with cobbles + Clay — 200 ppm
4	
5	
6	Same — 13ppm 18ppm peak
7	
8	
9	Sandy gravelly loam — 16ppm
10	
11	Initial 200ppm sustained 10ppm
12	Same
13	40 ppm sustained
14	
15	Same — ~~Initial 200ppm Sustained 10ppm~~
16	80ppm high 60ppm sustained
17	Very hard Can't go deeper Stop at ~ 14 ft
18	
19	

NOTES: Can see some stratification. Very ~~os~~ unstable

List Sample Contents In Decreasing Relative % By Volume

Rev. 10/92

F229/CF/TestPit

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc gravel pit
PROJECT NO.: 70416-001
TRENCH OR PIT NO.: 4
APPROXIMATE DIMENSIONS: 4' x 6' x 25'
DEPTH TO GROUNDWATER: NA

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: backhoe
LOGGED BY: MelissaMichaels

FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION

Depth	
3	Reddish brown gravelly Clay — 1ppm
6	Some many large boulders — 2ppm
9	Some — 6ppm High 5ppm Sustained
14	Some — Very unstable Sidewalls — 1.2ppm Sustained
19	Some — 1.2ppm Sustained

NOTES: 23 ft Some — 4ppm Sustained 5ppm high

List Sample Contents In Decreasing Relative % By Volume

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc Gravel pit
PROJECT NO.: 704116.001
TRENCH OR PIT NO.: 5
APPROXIMATE DIMENSIONS: 4 x 9 x 15
DEPTH TO GROUNDWATER: NA

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: back hoe
LOGGED BY: Melissa Michaels

FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION

Depth 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

looks stratified
1+ gray green fine sand — 128ppm > this looks like a layer very obvious
Reddish brown Silty Clayey Sand — 3ppm
Sand — 23ppm — smells
Grayish black — 400ppm High — 200ppm sustained
Cover hole readings 8 to High

NOTES:

List Sample Contents In Decreasing Relative % By Volume

Rev. 10/92

F229/CF/TestPit

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc Gravel pit
PROJECT NO.: 704116.001
TRENCH OR PIT NO.: 6
APPROXIMATE DIMENSIONS: 4 x 10 x 20
DEPTH TO GROUNDWATER: NA

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: Backhoe
LOGGED BY: Melissa Michaels

Depth	FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION	
0	fill Concrete rubble brown sandy Fill	
1		
2		
3		
4	Very clayey - Red brown Clay	4ppm High
5	lots of boulders	
6		
7	Brownish red bolderly sandy clay	6 ppm High
8		~~5ppm~~ mm
9		
10		
11		
12	much sandier little to no clay few cobbles	4 ppm High
13		
14		
15		
16	sand.	7 ppm High
17		
18		
19		
20	Sand pale tan	6 ppm High

NOTES: very stratified

List Sample Contents In Decreasing Relative % By Volume

SEC DONOHUE
Environment & Infrastructure

TEST PIT LOG

SHEET 1 OF 1

PROJECT: City of Manitowoc gravel Pit
PROJECT NO.: 70416.001
TRENCH OR PIT NO.: 7
APPROXIMATE DIMENSIONS: 4x8 x 20
DEPTH TO GROUNDWATER:

DATE STARTED: 12-8-92
DATE COMPLETED: 12-8-92
METHOD OF EXCAVATION: Backhoe
LOGGED BY: Melissa Michaels

FIELD SKETCH OF TEST PIT OR TRENCH EXCAVATION

Depth
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

reddish brown sandy clay with boulder .9 ppm
very gravelly + cobbly

Same 2.1 ppm

Same 3 ppm

Same 4 ppm

NOTES:

List Sample Contents In Decreasing Relative % By Volume

APPENDIX B

WISCONSIN GEOLOGICAL SURVEY - GEOLOGIC LOGS

WISCONSIN GEOLOGICAL SURVEY, Science Hall, Madison, Wisconsin — LOG NO. Ma-27

HOLY FAMILY COLLEGE CONVENT WELL, MANITOWOC, WISCONSIN
SW1/4? SE¼, Sec. 34, T 19N, R 23E
Layne-Northwest Co., Driller, May 1959
Sample Nos. 210430-210508 - Examined by M. E. Ostrom

DRIFT		0 - 5	5		Silt & clay, brown, slightly sandy & calcareous
		5 - 45	40		Silt & clay, moderate brown, sandy, very calcareous, scattered pebbles, very fine to coarse
		45 - 50	5		Gravel, coarse, to very fine sand, mixed
		50 - 70	20		Silt & clay, scattered rock pebbles, calcareous
		70 - 90	20		Silt & clay, slightly sandy, rare pebbles, calcareous
		90 - 95	5		Gravel, dolo., very fine grained, poorly sorted
		95 - 105	10		Gravel, very fine grained, little sand
		105-- 110	5		Silt & clay, scattered pebbles, calcareous
		110 - 135	25		Sand, dolomitic, grades from silt to fine gravel, poorly sorted, mixed
		135 - 155	20		Sand, grades from silt to coarse gravel, poorly sorted, dolomitic, mixed
	163	155 - 165	10		Gravel, dolomitic, fine to coarse, poorly sorted
NIAGARA		165 - 180	15		Dolomite, yellow gray, finely crystalline, dense rare dark mottling
		180 - 210	30		Dolomite, yellow gray, fine to medium crystalline, dense, rare dark mottling
		210 - 225	15		Dolomite, yellow gray, fine to coarse crystalline, dense, dark mottling. No sample 215-220
		225 - 245	20		Dolomite, yellow gray, fine to coarse crystalline, dense, mottled pink
		245 - 260	15		Dolomite, yellow gray, fine to medium crystalline, dense, dark mottling
		260 - 310	50		Dolomite, very light gray, fine to medium crystalline, rare gray mottling
		310 - 325	15		Dolomite, very light gray, very fine to medium crystalline, dense, rare gray mottling
		325 - 355	30		Dolomite, medium gray, very fine to finely crystalline, dense, pale gray mottling
		355 - 375	20		Dolomite, medium light gray, very fine to finely crystalline, dense, shaly, cherty, brown mottling
	237	375 - 400	25		Dolomite, light olive gray, very fine to finely crystalline, dense, shaly, cherty, brown mottling

Grout (neat cement)
18"hole
18"pipe
41'
47' water
12"hole
12"pipe
163'
401'

Formations: Drift, Niagara
Tested for 8 hours @ 230 gpm, specific capacity 76.6
Driller reports bedrock at 163'

WISCONSIN GEOLOGICAL SURVEY, Science Hall, Madison, Wisconsin — Log No. Mn-28

WISCONSIN STATE ROADSIDE PARK, JUNCTION HIGHWAYS #141 & #151, MANITOWOC, WISCONSIN
NE¼,SE¼,SE¼,NE¼,S.35 T 19N, R 23E
E. Sperling & Son, Driller, September 1959
Sample Nos. 212545-212575 - Examined by M. E. Ostrom
ALT = 676'

	0- 5	5		Cl & st,mod bn,calcic,ltl V fn-C qtz snd	Cem grout 12"hole 10"pipe
	5- 10	5		Cl & st,mod bn,calcic,ltl V fn-C qtz snd.	
	10- 15	5		Cl & st,pl bn,calcic,ltl V fn snd,tr wh cht	
	15- 20	5		Cl & st,pl bn,calcic,ltl V fn-M gvl,tr snd	20'
	20- 30	10		Cl & st,pl bn,calcic,ltl V fn-fn gvl,ltl mxd snd	21'
	30- 40	10		Cl & st,pl bn, calcic,ltl mxd snd,mostly qtz	8"hole 36'
R	40- 45	5		Cl & st,pl bn,calcic,ltl V fn-M gvl,ltl snd	
	45- 60	15		Cl & st,pl bn,calcic,ltl mxd V fn gvl,ltl mxd snd,mostly qtz	50'
	60- 65	5		Cl & st,pl bn,calcic,ltl V fn-M gvl,ltl snd	
	65- 75	10		Cl & st,pl bn,calcic,tr mxd snd,mostly qtz	6"hole 6"pipe
T	75- 85	10		Cl & st,pl bn,calcic,ltl mxd V fn-M gvl,ltl mxd snd,mostly qtz	
	85- 95	10		Cl & st,pl bn,calcic,ltl V fn-fn gvl,ltl mxd snd,mostly qtz	
	95-110	15		Cl & st,pl bn,calcic,tr mxd snd	
	110-115	5		Cl & st,pl bn,calcic,ltl V fn-M gvl,tr mxd snd	
	115-120	5		Cl & st,pl bn,calcic,ltl mxd snd,mostly qtz	
125	120-125	5		Cl & st,pl bn,calcic,ltl V fn-fn gvl,ltl snd	
N	125-140	15		Dol,ol gry,fn-V fn xln,dns,mch mxd snd,mostly qtz,ltl wh cht	133'
22	140-147	7		Dol,yl gry,fn-V fn xln,dns,mod hd,ltl wh cht	147'

Formations: Drift, Niagara
Tested for 6 hours at 15 gpm with no change in water level.

APPENDIX C

FIELD FORMS

- Daily Time Log
- Soil Boring Log (WDNR Forms 4400-122 and 4400-122A)
- Atmospheric Monitoring Log
- Well/Drillhole Abandonment Form (WDNR Form 3300-5B)
- Monitoring Well Construction Log (WDNR Form 4400-113A)
- Well Development Form (WDNR Form 4400-113B)
- Purging and Sample Collection Form
- Surface Water Sampling Form
- Water Elevation Form
- Staff Gauge Information Form
- Chain-of-Custody Form

SEC DONOHUE
Environment & Infrastructure

DAILY TIME LOG

Date: ____/____/____

Circle: Sun Mon Tue Wed Thu Fri Sat

Site: _____ Project No.: _____

Weather: _____

Task/Equipment: _____

Firm/Contractor's Personnel: _____ Hrs On–Site: _____

Donohue's Personnel: _____ Hrs On–Site: _____

Site Visitors: _____

Time Log indicating work in progress, remarks:

0600 – 0630

0630 – 0700

0700 – 0730

0730 – 0800

0800 – 0830

0830 – 0900

0900 – 0930

0930 – 1000

1000 – 1030

1030 – 1100

1100 – 1130

1130 – 1200

1200 – 1230

1230 – 1300

1300 – 1330

1330 – 1400

1400 – 1430

1430 – 1500

1500 – 1530

1530 – 1600

1600 – 1630

1630 – 1700

1700 – 1730

1730 – 1800

Items requiring follow–up: _____

Over for Summary

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Other _____

SOIL BORING LOG INFORMATION
Form 4400-122 7-91

Page _____ of _____

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
	_ _ _ _ _ _ _	

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started M M / D D / Y Y	Date Drilling Completed M M / D D / Y Y	Drilling Method

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
_ _ _	_ _ _ _ _ _ _		_____ Feet MSL	_____ Feet MSL	_____ inches

Boring Location
State Plane _____ N, _____ E S/C/N Lat ___ ___ ___
_____ 1/4 of _____ 1/4 of Section _____, T _____ N, R _____ E/W Long ___ ___ ___

Local Grid Location (If applicable)
_____ Feet ☐ N ☐ S _____ Feet ☐ E ☐ W

County	DNR County Code	Civil Town/City/ or Village
	_ _ _	

Sample Number	Sample Length Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature | Firm

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT

Form 4400-122A 7-91

Boring Number _____ Use only as an attachment to Form 4400-122. Page _____ of _____

Sample		Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties					RQD/ Comments
No.	Length Recovered (in)								Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	

SEC DONOHUE
Environment & Infrastructure

ATMOSPHERIC MONITORING LOG
FIELD HEALTH AND SAFETY

Page _____ of _____
Date _____/_____/_____
Circle: Sun Mon Tue Wed Thu Fri Sat

Site: _____ Project No.: _____

Site Safety Officer: _____

Action Levels: D ☐ ⟶ C ☐ ⟶ B ☐ ⟶ (Stop work, call in for instructions)

(Check box and write in levels for upgrade)

Task/Equipment: _____

Weather: _____

Time	OVA PPM	HNu PPM	O_2 %	LEL %	H_2S PPM	Comments: Duration of Readings, Upgrades, Location, etc.

Additional Comments: _____

_____

_____

Signature: _____

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B Rev. 12-91

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County

___ 1/4 of ___ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

(If applicable)

_____ Gov't Lot _____ Grid Number

Grid Location

_____ ft. ☐ N. ☐ S., _____ ft. ☐ E. ☐ W.

Civil Town Name

Street Address of Well

City, Village

(2) FACILITY NAME

Original Well Owner (If Known)

Present Well Owner

Street or Route

City, State, Zip Code

Facility Well No. and/or Name (If Applicable)

WI Unique Well No. _ _ _ _ _ _

Reason For Abandonment

Date of Abandonment

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) _____

☐ Monitoring Well
☐ Water Well
☐ Drillhole
☐ Borehole

Construction Report Available? ☐ Yes ☐ No

Construction Type:
☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) _____ Casing Diameter (ins.) _____
(From groundsurface)

Casing Depth (ft.) _____

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? _____ Feet

(4) Depth to Water (Feet) _____

Pump & Piping Removed?	☐ Yes	☐ No	☐ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☐ Not Applicable
Screen Removed?	☐ Yes	☐ No	☐ Not Applicable
Casing Left in Place?	☐ Yes	☐ No	

If No, Explain _____

Was Casing Cut Off Below Surface?	☐ Yes	☐ No
Did Sealing Material Rise to Surface?	☐ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☐ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

(5) Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (Circle One)	Mix Ratio or Mud Weight
	Surface			

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work

Signature of Person Doing Work | Date Signed

Street or Route | Telephone Number ( )

City, State, Zip Code

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	☐ Complying Work ☐ Noncomplying Work
Follow-up Necessary	

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name

Local Grid Location of Well
_____ ft. ☐ N. ☐ S. _____ ft. ☐ E. ☐ W.

Well Name

Facility License, Permit or Monitoring Number
_ _ _ _ _ _ _

Grid Origin Location
Lat. _ _ _ _ _ Long. _ _ _ _ _ or
St. Plane _____ ft. N. _____ ft. E.

Wis. Unique Well Number DNR Well Number
_ _ _ _ _ _ _ _ _ _

Well Water Table Observation Well ☐ 11
Piezometer ☐ 12

Date Well Installed
m m / d d / y y

Distance Well Is From Waste/Source Boundary
_____ ft.

Section Location of Waste/Source
___ 1/4 of ___ 1/4 of Sec. ___, T. ___ N, R. ___ ☐ E. ☐ W.

Well Installed By: (Person's Name and Firm)

Is Well A Point of Enforcement Std. Application?
☐ Yes ☐ No

Location of Well Relative to Waste/Source
u ☐ Upgradient s ☐ Sidegradient
d ☐ Downgradient n ☐ Not Known

A. Protective pipe, top elevation _ _ _ _ . _ _ ft. MSL
B. Well casing, top elevation _ _ _ _ . _ _ ft. MSL
C. Land surface elevation _ _ _ _ . _ ft. MSL
D. Surface seal, bottom _ _ _ _ . _ ft. MSL or _ _ . _ ft.

E. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

F. Sieve analysis attached? ☐ Yes ☐ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☐ 41
_____ Other ☐ _ _

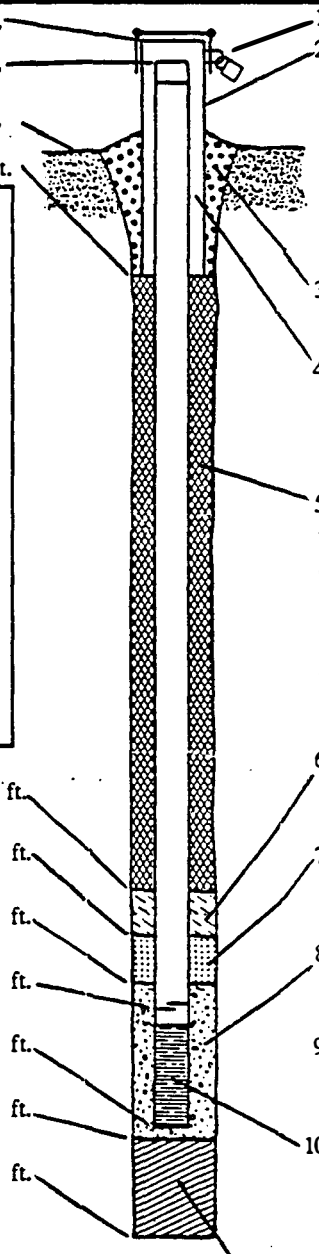
15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No

Describe _____

17. Source of water (attach analysis):
_____

H. Bentonite seal, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
Fine sand, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
G. Filter pack, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
Screen joint, top _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
I. Well bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
Filter pack, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
J. Borehole, bottom _ _ _ _ . _ ft. MSL or _ _ _ . _ ft.
K. Borehole, diameter _ _ . _ in.
L. O.D. well casing _ _ . _ _ in.
M. I.D. well casing _ _ . _ _ in.



1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: _ _ . _ in.
b. Length: _ _ . _ ft.
c. Material: Steel ☐ 04
_____ Other ☐ _ _
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
_____ Other ☐ _ _
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐ _ _
_____ Other ☐ _ _
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. _____ Other ☐ _ _
7. Fine sand material: Manufacturer, product name & mesh size
a. _____ _ _
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. _____ _ _
b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23
Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐ _ _
10. Screen material: _____ _ _
a. Screen type: Factory cut ☐ 11
Continuous slot ☐ 01
_____ Other ☐ _ _
b. Manufacturer _____
c. Slot size: 0. _ _ _ in.
d. Slotted length: _ _ . _ ft.
11. Backfill material (below filter pack): None ☐ 14
_____ Other ☐ _ _

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Firm

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_ _ _ _ _ _ _	_ _	_ _ _ _ _ _ _	_ _ _

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well _ _ _ _ min.

4. Depth of well (from top of well casisng) _ _ _ . _ ft.

5. Inside diameter of well _ _ . _ _ _ in.

6. Volume of water in filter pack and well casing _ _ _ _ . _ gal.

7. Volume of water removed from well _ _ _ _ . _ gal.

8. Volume of water added (if any) _ _ _ _ . _ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. _ _ _ _ . _ _ ft.	_ _ _ _ . _ _ ft.
Date	b. _ _ / _ _ / _ _ m m d d y y	_ _ / _ _ / _ _ m m d d y y
Time	c. _ _ : _ _ ☐ a.m. ☐ p.m.	_ _ : _ _ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	_ _ . _ inches	_ _ . _ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_ _ _ _ _ . _ mg/l	_ _ _ _ _ . _ mg/l
15. COD	_ _ _ _ _ . _ mg/l	_ _ _ _ _ . _ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: _____

Firm: _____

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: _ _ _

Firm: _____

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

SEC DONOHUE
Environment & Infrastructure

WELL DEVELOPMENT
(Must Have Well Construction Diagrams)

Well No. ( )

Date: ____/____/____
Mon. Tues. Weds. Thurs. Fri.

Site: _____

Weather: _____ Project No.: _____

Development Method: Pumped ☐ Bailed ☐ Other: _____

Pump Type: _____ Bailer Type: _____

Volume Calculation: _____

(D.T.B. – D.T.W. x vol./ft. = PVC/well volume) + (N* x H* x Annulus vol./ft.) = Total Well Volume
* (Wells that cannot be purged dry, 10x's the Total Well Volume must be purged)
(Wells that can be purged dry, slowly removing water, without surging until Dry)

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	Cond.	Temp.	Color	Odor Y/N	Turbidity

Comments: _____

_____

_____

*N = porosity of filter pack
*H = length of filter pack or length of saturated filter pack (water level within screen length)
* = A 30–minute surge and purge before the 10x's the Total Well Volume

Annulus	vol./ft.
4"	0.42
6"	1.24
8"	2.38
10"	3.85

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

HNu/PPM	LEL/%	O_2/%	H_2S/PPM	CO/PPM	

Signature: _____

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Well Purging and Sample Collection

Well No. ( )

Project No.: _____ **Site:** _____

Purging Method: Pumped ☐ Bailed ☐ Other: _____

Pump Type: _____ **Bailer Type:** _____

Weather Conditions: _____

Volume Calculation: _____

(D.T.B. – D.T.W. x vol./ft. = Gals./well vol.) **Gals./well vol.:** _____
(Gals./well vol. x 5 = Total Volume to be removed)

Time	Depth to Water (D.T.W.)	Depth to Bottom (D.T.B.)	Volume Removed (gal.)	pH	Cond.	Temp.	Color	Odor Y/N	Turbidity
		Sample Readings							

Comments: _____

Inside Diameter	vol./ft.
1"	0.04
1.25"	0.06
2"	0.16
4"	0.65

Field Blank Taken ☐ **Time:** _____

Well Duplicate ☐ **No.:** _____

HNu/PPM	LEL/%	O_2/%	H_2S/PPM	CO/PPM	

Signature: _____

Date: ____/____/____

SEC DONOHUE
Environment & Infrastructure

SURFACE WATER/ SEDIMENT DATA FORM

SURFACE WATER

SITE _____ PROJECT NUMBER _____

Temperature _____

DATE _____ pH _____

TIME _____ Conductivity _____

COLLECTORS _____ Turbidity: Low _____

_____ Medium _____

High _____

SAMPLE NUMBER _____

Color: _____

SAMPLING EQUIPMENT _____ Odor: _____

_____ Water Depth: _____

Physical Description of Surface Water Sample Location: _____

SEDIMENT

DATE _____

TIME _____

COLLECTORS _____

_____

SAMPLE NUMBER _____

SAMPLING EQUIPMENT _____

_____

Physical Description of Sediment Location: _____

Physical Description of Sediment: _____

DONOHUE

WATER ELEVATION

PROJECT NO ______________ SITE ______________

WELL NUMBER	ELEVATION OF TOP OF PIPE	DEPTH TO WATER	WATER ELEVATION	DEPTH TO BOTTOM	WELL INTEGRITY				COMMENTS
					LOCKED	CAPPED	CRACKED	OBSTRUCT	

DESCRIPTION OF SITE ______________

SOIL CONDITIONS ______________

WEATHER ______________ TEMPERATURE ______________

ENTERED ON COMPUTER ____ SIGNATURE ______________ DATE ______________

Staff Gauge Information Form

Donohue
Engineers, Architects & Scientists

Site: _____ Date: _____

By: _____ Project No.: _____

Staff Gauge No. _____

Location: _____

Top of Pipe Elevation: _____

Date/Time: _____ Water Level: _____

Comments: _____

Staff Gauge No. _____

Location: _____

Top of Pipe Elevation: _____

Date/Time: _____ Water Level: _____

Comments: _____

Staff Gauge No. _____

Location: _____

Top of Pipe Elevation: _____

Date/Time: _____ Water Level: _____

Comments: _____

Staff Gauge No. _____

Location: _____

Top of Pipe Elevation: _____

Date/Time: _____ Water Level: _____

Comments: _____

SEC DONOHUE
Environment & Infrastructure

Chain of Custody Record

SEC Donohue Inc.

Custody Seal #	SEC Donohue Cooler #

Project Number	Project Name/Client
18903.410	Ft. McCoy/USACE-Omaha

Samplers: (Signature)

Item No.	Sample Description (Field ID Number)	Date	Time	Grab	Comp.	Lab Sample Number	Tag Number	Analysis Required: TCL VOA	TCL BNA	TAL Metals	PCB/Pest. (8080)	Pest. (8140)	Herbicides	TPH	TRPH	Water Quality	Explosives	X-Field Filtered	Preservative Type	X-Susp. Hazard Matl	Matrix: Sample Type: Soil	Groundwater	Surface Water	Sediment	Leachate	Sample Container: 40 ml VOA	120 ml VOA	8 oz	1 Litre Amber	1 Litre HDPE
1																														
2																														
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														
13																														
14																														
15																														
16																														
17																														
18																														
19																														
20																														

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Disposed of by: (Signature)	Items:	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature) [Laboratory]	Disposed of by: (Signature)	Items:	Date/Time

Send Lab Results To:

Greg Ruechel
SEC Donohue Inc.
4738 N. 40th St.
Sheboygan, WI 53083

Remarks:

Federal Express Airbill No.:
Lab:

Check Delivery Method:

- ☐ Samples delivered in person
- ☐ Donohue courier
- ☐ Common carrier
- ☐ Mail

Laboratory Receiving Notes:

Custody Seal Intact?
Temp. of Shipping Container:
Sample Condition:

White Copy – Lab Yellow Copy – File Pink Copy – Client