WORK PLAN

Site Characterization Work Plan
Kozdranski Site
Wheatfield, New York

The Goodyear Tire & Rubber Company

January 2005

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Kozdranski Site
Wheatfield, New York

The Goodyear Tire & Rubber Company
Akron, Ohio

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Vice President

January 2005

O'BRIEN & GERE
ENGINEERS, INC.

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1. Introduction

1.1. General

This document is the Site Characterization Work Plan (SCWP) for the Kozdranski Property located in the Town of Wheatfield, New York (Figure 1). The Work Plan is submitted on behalf of The Goodyear Tire & Rubber Company (Goodyear), which entered into an Order on Consent agreement with the New York State Department of Environmental Conservation (NYSDEC) effective November 4, 2004.

In a May 11, 2004 letter to Goodyear, the NYSDEC stated that it documented a release or threatened release at the Site of "hazardous substances" as defined by the Comprehensive Environmental Response, Compensation and Liability Act, 42 USC 9601 et seq. (CERCLA). The letter also indicates that the NYSDEC has documented the presence on-site of "hazardous wastes" as defined in Environmental Conservation Law (ECL) 27-1301.1. At present, the Site is not listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. By the Order on Consent, Goodyear agreed to undertake the development and implementation of this SCWP.

1.2. Project Objectives

As summarized in Section 2, waste material has been observed on-Site during investigations conducted by the Niagara County Health Department (NCHD) and NYSDEC. The waste material includes drum carcasses and other solid industrial waste.

The Registry Site Classification Decision document prepared by the NYSDEC on June 14, 1993 describes that a small area of the Site (approximately 5 acres) contains exposed waste. The Environmental Site Assessment (ESA) Report prepared by the NYSDEC (NYSDEC, 1993) states that as many as 50 drum carcasses are present on-site. The Decision document reports that test pits excavated by the NCHD encountered buried wastes over a similarly sized area. During an inspection that occurred on September 25, 1986, the waste was observed as a layer 2 to 12 inches in thickness at a depth of about one-foot below ground surface (bgs).

An Interim Remedial Measure (IRM) is proposed, under which drum carcasses and waste visible at the surface will be collected and disposed of off-site. As part of the IRM, the waste material and impacted soil up to a depth of 1 foot below the waste material would be excavated. Afterwards, confirmatory samples of soil will be collected and analyzed to assess the concentration of residuals, if any, remaining.

In addition, several borings and ground water monitoring probes will be installed on-site to assess conditions at the Site.

1.3. Access Agreements

Before work can proceed on-site, Goodyear will enter into an access agreement with Wheatfield Properties, Inc., the current Site owner. The agreement will be executed to allow Goodyear and its contractors to enter the Site for the purpose of conducting investigations and completing remedial actions, including the IRM, as necessary.

Separate agreements will be executed with one or more of the adjoining property owners to allow right-of-way passage from the public roads to the Site. A right-of-way agreement with an adjoining property owner is necessary since the Site is landlocked without public road frontage. Similar to the Site access agreement, the right-of-way agreement will allow Goodyear and its contractors to enter the Site for the purpose of conducting investigations and remedial actions.

1.4. Work Plan Organization

Section 2 presents a summary of the background information regarding the Site.

Section 3 describes the fish and wildlife resource assessment that will be performed.

Section 4 presents the field sampling plan (FSP), including a description of the waste characterization, post-IRM sampling, and other sampling that will be performed.

Section 5 outlines the site characterization report that will be prepared following receipt of the laboratory results.

A Quality Assurance Project Plan (QAPP) is provided as Appendix A.

A health and safety plan (HASP) for the protection of employees of O'Brien & Gere Engineers, Inc. (the "Engineer") and the public while implementing the site-investigation fieldwork is included as Appendix B.

2. Background

2.1. General

This Section presents a summary of the background information regarding the Site. The information summarized herein was excerpted from NYSDEC, 1993 and other documents available in the NYSDEC project files.

2.2. Site Description

The Kozdranski site is located on a triangular piece of property between River, Liberty, Williams, Jagow, and Witmer roads in the Town of Wheatfield, New York (Figures 1 and 2). The property is immediately south of the Niagara Mohawk right-of-way and approximately 300 feet east of the Conrail right-of-way. The Site latitude is 43° 4' 45" and its longitude is 78° 55' 15".

The Summit Park lakes are located southeast and east of the Site. Dold's Hill is located on a neighboring property south of the Site.

The surrounding properties to the north and west are utilized for agricultural purposes. Black Creek lies approximately 400 feet north of the Site, and a designated wetland (TW-26) lies approximately 1,000 feet to the west.

In the May 3, 1994 Hazardous Substance Disposal Site Nomination Form prepared by the NYSDEC, the nearest water supply is indicated as being 2,600 ft away (Note: In the Registry Site Classification Decision prepared by the NYSDEC on June 14, 1993, the nearest water supply is indicated as being 3,600 ft away). The nearest building is identified to be 2,200 ft away. The nearest surface water is noted as being 50 ft away.

The Site is landlocked, meaning that access to public roads is not available without a right-of-way across private property held by others. The property to the west and south is presently owned by Forest City Enterprises. A dirt road (former railroad bed) extends from Jagow Road toward the northwest corner of the Site east of the Conrail tracks and west of property owned by Forest City Enterprises that is presently used for agricultural purposes. The former railroad bed, which runs alongside

the west border of the Kozdranski Site is owned by Empire State Pipeline.

2.3. Site Ownership

Information concerning historic site ownership, as presented in NYSDEC, 1993, was based on Niagara County tax maps, review of aerial photographs, and interviews conducted by the NYSDEC. Most of the historic information was obtained from the files of the Niagara County Health Department (NCHD). According to property tax map number 175-1-3, the property was owned by the Wheatfield Farm Association (WFA) prior to 1944. It is not known how long the WFA owned the property prior to that time or whether they owned the adjacent land south of the site. On October 11, 1944, Mr. Walter S. Kozdranski (deceased) purchased the property.

Wheatfield Properties, Inc. (formerly known as Wheatfield Partnership, Inc. of 1520 Pine Avenue, Niagara Falls, NY, 14301) currently owns the property. Wheatfield Partnership, Inc. purchased the Site from the estate of Mr. Kozdranski. A July 15, 1993 letter from the NYSDEC informed Wheatfield Partnership that investigations had implicated the former owner, Mr. Kozdranski, as a hauler of wastes to the Site.

Wheatfield Properties was later sent a May 11, 2004 "notice letter" communicating that the Department intended to conduct an environmental site assessment on the former Kozdranski Site. The owner favorably acknowledged the "notice letter" and requested that communications regarding site activities be directed to Mr. Long, 6779 Walmore Road, Niagara Falls, NY 14303.

2.4. Site Zoning

The Town of Wheatfield zoning plan of January 2002 (Figure 3) shows the Site and surrounding parcels as zoned for Planned Unit Development (PUD). With such a zone classification, activities permitted to occur at the Site include residential development.

Previously, properties adjoining the Site to the south, west, and north were considered as potential parts of a residential development conceptualized by the Summit Park Wheatfield Properties Company. The development plans were undergoing SEQR review when the NCHD, as a result of the process, raised concerns in a May 13, 1993 memorandum about potential health risks related to the presence of drums and exposed wastes at the Site.

2.5. Historic Activity

As documented in the ESA Report (NYSDEC, 1993), the NCHD first gained knowledge of the Site through a complaint filed in June 1986 by a local resident who claimed to have known of the existence of the Site for approximately 20 years. The individual, who had worked for a logging company in the area, reported observing drums at the Site and also reported finding junked automobiles within the trees and brush while clearing trees in the area of Dold's Hill.

A second individual was interviewed by the NCDH on July 30, 1986, who recalled truck traffic toward the Kozdranski property. He remembered that some trucks belonged to the Kozdranski Company. This local resident, who had farmed the property south and west of the Site, could only recall the removal of excavated soil and did not observe active dumping.

On July 30, 1986 the NCHD interviewed a third individual who remembered trucks dumping loads of "hot lime" at the Site. This local resident, who had farmed the area as well, did not know who generated the waste or the name of the hauler.

In a lawsuit filed against the Estate of the Walter S. Kozdranski Company regarding another site, several former Kozdranski Company employees gave depositions. Two of the employees remembered the Kozdranski property located off River Road in the Town of Wheatfield. One of the two only recalled that topsoil was excavated and removed from the Site. The other employee, however, indicated that material from Goodyear, as well as others that he could not recall, was buried at the Site and leveled off during the middle 1970's following the closure of Johnson's dump (a.k.a. 64th Street Site). Goodyear acknowledged that the Walter S. Kozdranski Company was a waste hauler for the company in a May 27, 1988 letter to the NYSDEC from Mr. Gilmore to Ms. Gallego (NYSDEC, 1993).

In an effort to further understand historic activities at the Site, the NCHD obtained and reviewed aerial photographs from the Cooperative Extension for 1951, 1958, 1966, and 1977. The ESA Report (NYSDEC, 1993) provided the following interpretation of the aerial photographs:

1951 aerial photograph (Exhibit 1) -

The eastern portion of the Site is heavily vegetated while the western half shows evidence of disturbance. Most of the property adjacent to the Site is under active cultivation. Access roads are visible north and south of the suspected disposal area but are difficult to delineate. A loop in the access road is visible south of the northernmost disturbed area.

1958 aerial photograph (Exhibit 2) –

The areal extent of disturbed land is much larger than in 1951. Several access roads are visible. One access road leads north of the known disposal area toward Jagow Road. A second access road leads to an area of disturbed land south of the Kozdranski property and then farther south toward River Road. A third access road leads east from the Kozdranski property along the Niagara Mohawk right-of-way toward Witmer Road. The loop in the access road is pronounced.

1966 aerial photograph (Exhibit 3) –

The areal extent of the disturbed land identified in the 1958 aerial photograph has generally remained the same. Clearing of trees east of the Site, however, is now evident. The major access road appears to be the one located along the Niagara Mohawk right-of-way, however, the access road leading to River Road is also clearly defined. The access road and loop along the western boundary of the Site are now largely overgrown. The Conrail railroad has been constructed and parallels the western boundary of the Kozdranski property.

1977 aerial photograph (Exhibit 4) –

There is no new evidence of active land disturbance. Revegetation in the area of cleared trees has occurred. The access road along the Niagara Mohawk right-of-way is still visible and its access from Witmer Road can be confirmed.

Figure 4 presents the suspect disposal areas on site identified by the NCHD based on the aerial photos.

2.6. Site Investigations

As documented in the ESA Report (NYSDEC, 1993), the NCDH conducted an initial inspection of the Site on June 30, 1986. During the inspection, the complainant outlined the former disposal areas for observation. Several non-vegetated areas were noted as containing a white ash-like material in addition to assorted wood scrap, bottles, etc. as documented in NYDEC, 1993. The ash-like material was also observed at several locations along the southern portion of Dold's Hill. No drums, however, were observed during the initial site inspection.

A follow-up inspection of the Site was conducted by the NCHD on July 1, 1986. Based on the inspection, the disposal area was estimated to be approximately 200 or 300 feet by 600 or 700 feet (2.75 to 4.8 acres). Dense vegetation, however, made it difficult to estimate distances precisely. The observed waste material included a sand-like substance, lime, ash, wood pallets and drum remains. The east and south portions of the disposal area exhibited the highest frequency of drums observed.

At least one drum was noted as containing a brittle, black to tan, phenolic-like resin, while the other drums contained a white lime-like material. One drum contained carbon/charcoal-like gravel.

The third inspection was conducted on July 3, 1986 by the NCHD. The area searched was heavily vegetated and visibility of the ground surface was limited. Additional disposal areas were not observed during the inspection, however an area where soil is unnaturally mounded was noted. Partially buried concrete blocks and broken sewer pipes were observed on the mounds. The mounded area was estimated to be 400 feet south of the previously observed disposal area.

On September 9, 1986, under direction by the NCHD, test pits were excavated to a depth between 6 inches and 2 feet within an area in the northwest corner of the Site exhibiting waste material. The waste material area had dimensions of approximately 100 feet x 300 feet (Figure 5). A total of six samples, five discrete samples and one composite sample, were submitted for E.P. Toxicity analyses (Table 2-1).

Table 2-1 *September 9, 1986 Sampling – Summary of EP Toxicity Test Results.*

Parameter	Standard	Sample Number				
		1	2	4	5 & 7	6
Arsenic	5	ND	0.015	0.02	0.023	0.015
Barium	100	ND	1.29	ND	3.13	ND
Cadmium	1	ND	ND	0.07	ND	ND
Chromium	5	ND	0.97	0.64	ND	ND
Mercury	0.2	ND	ND	0.002	ND	ND
Silver	5	ND	ND	0.20	ND	ND

NOTES
1. Samples 1 through 5 and 7 were collected from a white lime-like substance. Sample 6 was collected from a hard, black resin-like material. All concentrations presented in units of mg/l.
2. The ESA Report (NYSDEC, 1993) did not present the results of Sample 3.
3. ND – not detected

Source: Table 1, NYSDEC. 1993

Six additional areas were investigated, with a total of 18 test pits advanced, on September 25, 1986. In all the areas except one, construction material or native soils were encountered. At the one site, however, a large quantity of a white, insoluble powder was encountered. To delineate the powder, additional test pits were completed and revealed that the area covered by the waste was approximately 0.5 acres (100 feet by 200 feet). The waste was observed as a layer 2 to 12 inches in thickness at a depth of about one foot bgs.

Another site visit was conducted by the NCHD on October 10, 1986 to collect samples from the southwest area of the disposal site. This was an area where a resin-like material, approximately 25 square feet in size, was observed on a previous site inspection. Three composite samples were collected from this location. One composite comprised three grab samples, each of which was collected one foot from the center of the resin. The second composite comprised three grab samples, each of which was collected three feet from the center of the resin. The third composite comprised four grab samples, each of which was collected seven feet from the center of the resin. In addition, one sample from a gray, solidified material and one sample from a nearby drum were collected. The ESA Report (NYSDEC, 1993) stated, however, that the analytical results for these samples were lost.

The NYSDEC collected three samples from the northwest disposal area on April 12, 1990. The approximate locations of these samples are shown on Figure 6. Two samples (1 and 3) were collected from a black, hard, resin-like material and analyzed for base/neutral and acid extractables (BNAs). The third sample (2) was collected from a mound of tanish-white, fine granular material. This sample was analyzed for EP Toxicity, corrosivity, and BNAs. The BNA compounds detected in the three samples are summarized in Table 2-2. The EP Toxicity test results for sample 2 are summarized in Table 2-3.

Table 2-2 *April 12, 1990 Sampling – Detected BNAs.*

Parameter	*Sample 1*	*Sample 2*	*Sample 3*
Phenol	49	ND	15J
Benzoic acid	73J	ND	19J
N-nitrosodiphenylamine	330	ND	1,100E
Butylbenzylphthalate	ND	0.29J	ND
Bis(2-ethylhexyl)phthalate	ND	0.21J	ND

NOTE 1. Concentrations presented in units of mg/kg.
2. ND – not detected

Source: Table 2, NYSDEC. 1993

Table 2-3 *April 12, 1990 Sampling – Sample No. 2 EP Toxicity Results.*

Parameter	Standard	EP toxicity test result	Total metals
Arsenic	5	ND	7.7
Barium	100	ND	ND
Cadmium	1	0.031	5.4
Chromium	5	0.052	19
Lead	5	0.35	67.8
Mercury	0.2	ND	ND
Selenium	1	ND	ND
Silver	5	0.033	6.8
2,4-D	10 µg/l	0.16 µg/l	N/A

Notes: Units in mg/l, unless otherwise indicated.

Source: Table 3, NYSDEC. 1993

In addition to the compounds identified above, twenty semivolatile organic compounds (SVOCs) were tentatively identified as detectable in samples 1 and 3, while thirteen were tentatively identified as detectable in sample 2. The total concentrations of these compounds were 88,869 mg/kg, 80.83 mg/kg, and 62,486 mg/kg for samples 1, 2 and 3, respectively. In sample 1, tentatively identified compounds (TIC) included four methyl phenyl derivatives, one benzenamine isomer, and one benzeamine derivative. The remaining TICs were unidentified, as were all of the TICs detected in sample 2. In sample 3, the TICs included three methyl phenyl derivatives, with the remaining TICs unidentified.

Two additional samples of the white, insoluble powder observed during the September 25, 1986 investigation were collected by the NYSDEC on August 8, 1990. The approximate locations of these samples are shown on Figure 6. Sample 1 was collected from a black-gray sand-like material, while sample 2 was collected from a white-gray powder mixed with sand. These samples were analyzed for Target Compound List (TCL) parameters and EP Toxicity. The TCL analytical results are summarized in Table 2-4, and the EP Toxicity results are summarized in Table 2-5.

Table 2-4 *August 8, 1990 Sampling – TCL Parameter Summary*

Parameter	Sample 1	Sample 2
Acetone	0.025	ND
Naphthalene	0.077J	0.22J

Parameter	*Sample 1*	*Sample 2*
2-methylnaphthalene	0.082J	ND
Phenanthrene	0.092J	4.0
Bis(2-ethylhexyl)phthalate	0.5J	20.0
Acenaphthalene	ND	0.33J
Dibenzofuran	ND	0.29J
Fluorene	ND	0.51J
N-nitrosodiphenylamine	ND	0.26J
Anthracene	ND	0.84J
Fluoranthene	ND	2.7
Pyrene	ND	2.6
Benzo(a)anthracene	ND	1.4J
Chrysene	ND	1.2J
Benzo(b)fluoranthene	ND	0.99J
Benzo(k)fluoranthene	ND	0.60J
Benzo(a)pyrene	ND	0.73J
Indeno(1,2-cd)perylene	ND	0.32J
Benzo(g,h,i)perylene	ND	0.20J
Aroclor-1254	0.18J	ND

Note 1: Analytical results from samples collected by NYSDEC on August 8, 1990 from the Kozdranski property. The samples were collected from a powdery, sand-like material. All concentrations are in mg/kg.

2: ND - compound not detected (detection limit not provided)

Source: Table 4, NYSDEC, 1993

Table 2-5 *August 8, 1990 Sampling – EP Toxicity Test Summary.*

		Sample 1		*Sample 2*	
Parameter	*Standard*	*E.P. Tox*	*Total Metals*	*E.P. Tox*	*Total Metals*
Arsenic	5.0	ND	8.3	0.015	7.9
Barium	100.0	ND	217.0	ND	44.2
Cadmium	1.0	ND	ND	0.028	0.96
Chromium	5.0	ND	47.5	ND	19.0
Lead	5.0	0.08	63.4	0.36	28..8

		Sample 1		Sample 2	
Parameter	**Standard**	**E.P. Tox**	**Total Metals**	**E.P. Tox**	**Total Metals**
Mercury	0.2	ND	0.64	ND	0.90
Selenium	1.0	ND	0.60	ND	ND
Silver	5.0	ND	ND	0.033	4.0

ND - Compound not detected (detection limit not provided)

Source: Table 5, NYSDEC, 1993

In addition to the sampling described above, the NYSDEC conducted a site visit on May 26, 1993 for the express purpose of collecting waste samples for analysis of indicator compounds the NYSDEC had established for the Forest Glen Subdivision Superfund Site in Niagara Falls, New York. The Forest Glen indicator compounds include aniline, diphenylamine, 2-mercaptobenzothiazole, benzothiazole, and phenothiazine. As these compounds were not part of the TCL, they were not analyzed during the previous sample events.

Five samples were collected for analyses during the site visit, at the locations shown on Figure 6. Samples 1 and 5 were collected from a white powder-like material, samples 2 and 4 were collected from a yellow resin-like material, and sample 3 was collected from a purple powder-like material. The results of the analyses are summarized in Table 2-6. During sampling, holes were dug through the white powder-like material with a shovel to not only determine the thickness of the waste, but to obtain unweathered samples. The material was approximately 1.5 and 3 feet in thickness at sample locations 1 and 5, respectively. In addition, approximately 50 drums were reported observed throughout the area, most of which were largely decayed carcasses.

Table 2-6 *May 26, 1993 Sampling – Forest Glen Indicator Compounds.*

	SAMPLE NUMBER												
	01	***01DL***	***02***	***02DL***	***02RE***	***03***	***03DL***	***03RE***	***04***	***04DL***	***04RE***	***05***	***05DL***
Carbon disulfide	ND	NA	7J*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	ND	NA	11J*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	52E	43	9.4J	ND	ND	ND	ND	ND	NA	NA	NA	3.9E	3.7
Aniline	ND	ND	1300E	ND	1200E	37	ND	50	2100E	2000J	3600E	ND	ND
2-mercaptobenzothiazole	ND	ND	4400E	24%	4.1%E	2500E	2.1%	4000E	9800E	34%	15%E	ND	ND
Benzothiazole	74J*	360J*	3200E	5.7%J	3700E	110E	ND	150E	5.5%	4.5%J	20%E	42J*	47J*
Phenothiazine	ND	ND	ND	ND	ND	ND	ND	ND	1200E	1600J	ND	ND	ND

	SAMPLE NUMBER												
	01	*01DL*	*02*	*02DL*	*02RE*	*03*	*03DL*	*03RE*	*04*	*04DL*	*04RE*	*05*	*05DL*
Diphenylamine	ND	ND	5600E	3200J	9700E	ND	ND	3.5J	2200E	2200J	5000E	ND	ND
N-nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	ND	3.6J	NA	NA	NA	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	18J*	ND

Note: Units in µg/kg.

Source: NYSDEC memorandum dated July 26, 1993 from Mr. May to Mr. Sciascia

In a July 26, 1993 memorandum, the NYSDEC indicates that all five of the Forest Glen indicator compounds were detected in the samples collected on May 26, 1993. The memorandum in particular noted that the white powder-like material contained benzothiazole, which could indicate a similar source as the resin also found on-site according to the NYSDEC. However, the white powder-like material did not contain vinyl chloride.

In the Registry Site Classification Decision document prepared by the NYSDEC on June 14, 1993, it is described that a small area of the Site (approximately 5 acres) contains exposed waste. The document describes that a second area of similar size is known to contain buried wastes through test pitting. Based on the interpretation of aerial photographs of the Site, the NYSDEC estimated that the site could be as large as 19 acres.

2.7. Area Geology

Little information exists regarding the Site geology. However, Wehran Engineering and Earth Dimensions conducted separate investigations on the neighboring property to the north, east, and south proposed then for the Summit Park Subdivision (Stormwater Retention Lakes), during 1981 and 1983 respectively. In a December 8, 1988 NYSDEC memorandum, it is stated that investigations conducted by Wehran Engineering and Earth Dimensions were targeted toward determining the viability of a commercial clay mining venture with subsequent residential development. As part of those investigations, 14 test pits, 14 hand auger holes, and 7 soil borings were completed over a 120-acre site according to the memorandum.

The memorandum identifies that subsurface investigations at the proposed lakes indicate clay to a depth of 31.5 ft at the southeast portion of the property. The memorandum indicates, however, that the clay appeared to thin to the northwest to the point where there was no clay and only glacial till. The NYSDEC indicates that the final location of the two Summit Park lakes (Figure 2) was established at generally the central and eastern portion of the particular property.

An objective of the site characterization investigation for the Kozdranski Site is to identify if clay is present below the waste disposal areas on-site.

3. Fish and Wildlife Resource Assessment

3.1. Habitat Assessment

A qualitative assessment of the natural vegetative communities will be performed as part of the Site Characterization efforts. O'Brien & Gere biologists will traverse the Site on foot to record the dominant flora species observed. Observations of ecological receptors (*i.e.* fish and wildlife), and indicators thereof (*i.e.* tracks, burrows, scat, nests), will also be recorded in a field logbook. Results of this qualitative assessment will be utilized in the evaluation of the value of the Site to local populations of fish and wildlife.

3.2. Wetlands Delineation

O'Brien & Gere performed a qualitative assessment to evaluate if areas in the vicinity of the site contain regulated wetland habitats. This assessment consisted of reviewing available wetland mapping and evaluating if site activities would potentially affect regulated habitats under the jurisdiction of the NYSDEC and/or the U.S. Army Corps of Engineers (USACE). Based on the qualitative assessment, it appears that state and/or federally regulated habitats exist on properties adjacent to the site.

To assess whether or not regulated habitats also exist on the Kozdranski Site, representatives of O'Brien & Gere will perform a field survey of the Site to evaluate the presence or absence of regulated wetland habitat. A wetland delineation will be conducted in accordance with the *Corps of Engineer's Wetlands Delineation Manual (1987)* and *New York State Department of Environmental Conservation's (NYSDEC) Freshwater Wetlands Delineation Manual* (1995). The methods specified in both manuals are similar in that they both utilize a three-parameter approach that calls for the presence of hydrophytic vegetation, hydric soils, and wetland hydrology for an area to be considered a jurisdictional wetland.

The information gathered will include data from soils, vegetation, and hydrology for each potential wetland habitat. Sample plots will be established on-site to determine the presence or absence of indicators of wetland soils, wetland hydrology and hydrophytic vegetation.

Soil samples will be collected by advancing boreholes with hand-held dutch augers (or equivalent) to a depth of 18 inches (or refusal). Field observation will include information such as soil color, texture, and structure. Hydrologic characteristics will also be determined by observation of boreholes.

Areas of saturated soils within 12 inches of ground surface, standing water within the boreholes, and drainage patterns will be evaluated for wetland hydrologic characteristics. These parameters will allow for determination of site hydrology and hydrologic influences in accordance with the *Corps Manual*.

The vegetative communities will be observed for the presence of hydrophytic (water tolerant) species. Observed vegetative species will be compared to the *National List of Plant Species that Occur in Wetlands New York* (USFWS 1988). Key observations include the presence of 50% or greater of hydrophytic vegetation focusing on dominant plant species for four categories: trees (3-inch diameter at breast height), saplings and shrubs (less than 3 inches in diameter and greater than 3.2 feet tall), herbs, and woody vines.

Wetland boundaries will be determined based on the area meeting the requirements of hydric soils, wetland hydrology, and hydrophytic vegetation characteristics. The delineated boundaries will be marked sequentially with coded surveyor's ribbon. The coordinates will then be recorded using a hand-held Global Positioning Satellite (GPS) Unit and subsequently recorded during the site topographic survey.

It should be noted that if regulated wetlands are identified within the boundaries of the waste disposal areas, then specific conditions will need to be met prior to the performance of the IRM activities to minimize impacts to the wetlands. Such requirements may include, but are not limited to: obtaining applicable permits, soil erosion control measures and mitigation (*e.g.* replacement or restoration) for lost or impacted wetland and/or associated buffer areas. The identification, design and performance of mitigative measures associated with potential impacts to regulated habitats are not included in the scope of this Work Plan.

3.3. Additional Resource Characterization

Based on the results of the Site Characterization, additional fish and wildlife resource characterization may be performed. In accordance with the draft *Technical Guidance for Site Investigation and Remediation (DER-10)* (NYSDEC, 2002), a Fish and Wildlife Resources Impact Analysis – Part 1 consists of five steps, as follows:

- identify fish and wildlife resources and present on an area map
- identify contaminant migration pathways and fish and wildlife exposure pathways
- describe resources on and within a one-half mile radius of the site

- identify contaminants of ecological concern
- draw conclusions regarding the actual or potential adverse impacts to fish and wildlife resources

Based on the results of the Part 1 resource analysis, additional investigative may be required or the resource analysis may be terminated.

Performance of the steps outlined above is not included in the scope of this work plan. If, after the performance of the Site Characterization and proposed IRM activities, it is determined by the Site' stakeholders that additional fish and wildlife resource characterization is required, then a separate work plan will be prepared for review and approval.

4. Field Sampling Plan

4.1. General

This Section presents the FSP, including a description of the waste-characterization sampling, post-IRM characterization sampling, and other sampling that will be performed. In addition to this Section, the QAPP provided as Appendix A to this SCWP describes requirements for the field sampling and analyses.

4.2. Selective Clearing and Exploratory Test Pits

Selective clearing may occur on Site, and test pits may be advanced, to visually confirm the areal extent of the solid waste previously observed by the NCHD and NYSDEC. The purpose of the test pits would be to confirm the area, depth, and thickness of waste material on or just below the surface in the areas previously identified (Figures 4, 5, and 6). The test pits will also be used to identify if clay is present below the surface. Test pits would either be made using a hand-shovel or excavator, depending on accessibility.

A composite sample of waste material will be collected for characterization analyses for disposal. The composite sample will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP), VOCs, & TCLP SVOCs, TCLP target analyte list (TAL) metals, polychlorinated biphenyls (PCBs), pesticides & herbicides, flashpoint, ignitiability, and pH. Such analyses are required to allow Goodyear to complete the necessary waste-profile forms for disposal later as part of the IRM.

4.3. Site Survey

A licensed land surveyor will be retained to prepare a topographic and property survey of the Kozdranski parcel. The survey will depict the property lines of the Site, and include a grid based on the New York State Planner Coordinate System.

The surveyor will also locate the staked areas of visible waste and the wetlands flagged during the initial site visit and wetland delineation described in Section 3. The survey will also record the location of exploratory test pits made to visually confirm and assess the extent of solid waste (Section 4.2). Mapping developed during this task will be

utilized to develop plans for incorporation into the IRM Work Plan to be prepared and submitted separately to the NYSDEC.

The fieldwork for the Site survey will be conducted within 4 weeks of the date on which the limited clearing and exploratory test pits (Section 4.2) is complete.

4.4. Post-IRM Characterization Sampling

After completing the removal action proposed as part of an IRM, characterization samples will be collected from the floor and perimeter of the identified disposal areas following excavation of the surface wastes and visually impacted soils. The purpose of the characterization sampling will be to evaluate the concentration of residuals in soil below the fill material, if any, remaining following the excavation of waste.

The approximate boundaries of the disposal areas on the Kozdranski property are shown on Figure 4, based on the ESA Report prepared by the NYSDEC (NYSDEC, 1993). The approximate size of the northern disposal area is 1 acre. The approximate size of the southern disposal area is 0.5 acres. For each area, the characterization samples will be collected on an offset grid with sample locations spaced approximately 60-ft apart on the floor, providing approximately 12 samples per acre. Additionally, samples will be collected from the base of the excavation sidewalls, spaced approximately 100-ft apart. If during the IRM, the size of the disposal areas is discovered to be substantially larger than shown on Figure 4, the sample grid spacing may be increased. However, a minimum of 3 floor samples and 4 perimeter samples will be collected from each excavation made, regardless of areal extent of the disposal areas. Also, in the event that visibly stained soil is observed on the floor of the excavation, at least one of the samples collected will be characteristic of the stained soil.

Each soil sample collected will be analyzed in the laboratory for base/neutral and acid extractables (BNAs) including aniline, phenyl isothiocyanate, diphenylamine, 2-mercaptobenzothiazole, perylene, N,N-diphenyl-1,4-benzenediamine, benzothiazole, and pheno-thiazine using USEPA Method 8270. Also, a soil sample from each location will be analyzed for volatile organic compounds (VOCs) using USEPA Method 8260. In addition to these samples, quality assurance/quality control (QA/QC) samples will be collected in the field as described in the QAPP.

Samples will be collected from the 0 to 6-inch interval of the excavation floor at each location. Samples of the excavation sidewalls will be collected from a point where the sidewall meets the excavation floor. The samples will be collected using disposable sampling scoops. Samples collected for VOCs will be transferred directly to the appropriate laboratory sample jar. Samples for SVOCs will be homogenized in a ziplock bag, and then portioned into the appropriate sample jars for each

analysis. It is anticipated that the characterization samples will be collected within 24-hours of excavation.

The location of each sample will be assigned a unique identification, which will be marked on a stake. A licensed land surveyor will later record the location of each sample, as described in the IRM Work Plan.

4.5. Monitoring Well Installation/Ground Water Sampling

Up to four monitoring wells will be installed to evaluate overburden ground water quality upgradient and downgradient of the disposal areas and ground water flow direction across the disposal areas. A decision regarding the number of wells, if any, will be made after the IRM is complete and the results of soil sampling reviewed. The potential well locations are shown on Figure 7. Given the apparent sporadic nature of saturated conditions in the general vicinity of the Kozdranski property, any monitoring wells constructed will be installed to screen the first encountered water-bearing materials.

4.5.1. Well installation procedures

Boreholes for the monitoring wells will be advanced using hollow-stem auger drilling methods. During advancement of each borehole, soil samples will be obtained continuously. Each soil sample will be 5described as to its color, moisture content, density, grain-size, and recovery. This descriptive information will be recorded on test boring logs.

Soil samples from the borings will also be screened for the presence of VOCs using a portable photoionization detector (PID). The PID screening will be conducted by placing a representative portion of the sample in a glass jar, covering the jar with aluminum foil, capping the jar, and allowing the sample to equilibrate for a minimum of 15 minutes. After the equilibration time, the jar will be uncapped and the aluminum foil will be pierced. The headspace within the jar will then be screened using the PID. The PID screening information will be recorded on the Test Boring Log.

Upon completion of each borehole, a 2-inch diameter PVC monitoring well will be constructed. Each monitoring well will consist of a 10-ft long 0.010-inch slotted well screen flush-threaded to lengths of riser casing. The well materials will be installed through the auger string. The driller will verify the total depth of the borehole prior to installation of the well by sounding the bottom with a weighted tape. Once the total depth is verified as correct, the well will be installed.

A sandpack compatible for use with a 0.010-inch slotted screen will be installed within the annular space between the well and the borehole wall. The sandpack will be installed by slowly adding quantities of sand through the auger string, allowing sufficient time for the sand to settle and avoid bridging. As the sandpack is added, the auger string will be retracted, during which time the driller will check the depth to the top of the sandpack to ensure that the sandpack is within the lead auger. The sandpack materials will be installed such that sandpack extends two feet above the top of the well screen. A bentonite seal will be installed on top of the sandpack. The bentonite will be hydrated using potable water if the seal interval is above the water table. The bentonite seal will be a minimum of two feet thick. A cement/bentonite grout will be tremied on top of the bentonite seal. As the grout is being installed, the auger string will be retracted. The driller will maintain a head of grout within the auger string at all times until the last auger is removed.

The well heads will extend between 2.5 to 3-ft above grade. A 4-inch diameter protective steel casing will be installed over the well, and set in a concrete well pad.

Soil cuttings generated during the installation of the monitoring wells will be consolidated and staged in one of the waste disposal areas on site. If strong odors or elevated PID readings are observed in the soil cuttings, those cuttings will be contained in a labeled 55-gallon drum and staged in an area of the Kozdranski property.

4.5.2. Well development procedures

Following the completion of the monitoring well installation program, each monitoring well will be developed prior to ground water sampling.

Each monitoring well constructed will be developed to:

- Remove fine-grained materials from the sand pack and formation;
- Reduce the turbidity of ground water samples; and
- Increase the yield of the well to reduce the potential of the well yielding an insufficient volume of water during ground water sampling.

The wells will be developed using one of the following procedures:

- Bailing;
- Inertial pumping (*i.e.*, WaTerra pump); and/or
- Centrifugal pumping in conjunction with manual inertial pumping.

The well development equipment (i.e., bailers, tubing, etc.) will be new, pre-cleaned and/or dedicated to each monitoring well. Care will be taken not to introduce contaminants on the equipment during installation.

Well development will proceed by repeated removal of ground water from the well. The goals for development will be to obtain ground water in which the pH, temperature and specific conductivity have stabilized and exhibits a turbidity of less than or equal to 50 Nephelometric Turbidity Units (NTUs). Should the wells bail dry prior to stabilization of field parameters, the water levels will be allowed to recover, and the well will be bailed dry a second time after which development will be considered complete.

Given the expected low ground water yield, it is not anticipated that significant quantities of water will be generated during development. Therefore, water generated during the development process will be discharged to the ground surface in the vicinity of each monitoring well, providing the discharge infiltrates the immediate ground surface and does not flow to nearby drainage. If sheens or strong odors are noted in the development water, then the water will be contained in a labeled 55-gallon drum(s) and staged in an area of the Kozdranski property.

4.5.3. Ground water sampling procedures

Pre-sampling

Prior to initiation of the ground water sampling, a complete round of ground water elevations will be recorded from the four monitoring wells. An electronic water level probe will be used to measure the depth to water in each well. The depth to water will be measured to the nearest 0.01 foot from the surveyed points on the well casings. The depth to water measurements will be recorded in the field log notebook.

Low flow purging and sampling

Prior to commencing sampling activities, the ground water quality monitoring probes/meters including pH, conductivity, oxidation-reduction potential (ORP), dissolved oxygen, and turbidity will be calibrated daily in accordance with the manufacturer's instructions. At a minimum, two-point calibrations will be conducted for pH, conductivity, and turbidity. The dissolved oxygen probe will be checked against a zero-dissolved oxygen solution. Calibration results will be recorded in the field log notebook.

The following describes the low-flow purging and sampling procedures:

1. Don a new pair of gloves.

2. Prepare the pumping system for operation. A peristaltic pump will be used. Connect the tubing from the peristaltic pump to the in-line, water quality parameter meter.

3. Commence well purging by low flow pumping from the well. The flow rate shall not exceed 0.5 liters/min. Initially, a flow rate between 200 ml/min and 500 ml/min will be used. Efforts will be made to minimize the generation of air bubbles in the sample tubing by either increasing the flow rate as appropriate, or restricting the flow by clamping the tubing. Record purge rate on the Low-Flow Ground Water Sampling Log.

4. During purging, monitor and record pH, specific conductivity, temperature, ORP, dissolved oxygen, turbidity, water levels, and purged volume at time intervals sufficient to evacuate the volume of the flow-through cell. This time interval can be calculated by dividing the volume of the flow through the cell by the pumping rate.

5. Well sampling can commence after equilibration of water quality parameters. Equilibrated trends are generally obvious and usually follow either an exponential decay or asymptotic trend during purging. The equilibration guidelines are as follows:

Temperature	± 3% of measurement
pH	± 0.1 pH units
Specific conductance	± 3% of measurement
ORP	±10 mV
DO	±10% of measurement
Turbidity	± 10% of measurement

   If the indicator field parameters have not equilibrated within the above specified limits after 4 hours of purging, then one of the following options will be taken: 1) continue purging until stabilization is achieved; or 2) discontinue purging and collect samples (document attempts to achieve stabilization). Record total volume of water purged and purging time on the Low-Flow Ground Water Sampling Log for future reference.

6. Ideally, drawdown in the well would not exceed 0.3 ft. Pumping rates will, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or allow stabilization of indicator parameters. If the recharge rate of the well is very low and it appears that the well will be purged dry, the pump will be shut down prior to purging the well dry. Sampling will commence as soon as the well has recharged to a sufficient level to collect the appropriate volume of samples. Sample collection using bailing techniques may be used in this situation. However, turbidity levels shall be maintained as low as possible.

7. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles will be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling.

8. Sample bottles for VOC analyses, containing hydrochloric acid for preservation, will be filled completely so that there is no headspace or bubbles. The VOC sample vials will be examined for proper filling by inverting the vials immediately after filling.

9. After the last sample has been collected, record the date and time.

10. Begin preparing the Chain of Custody documentation.

Quality Control Samples
Quality control samples, consisting of MS/MSDs, field duplicates, and equipment blanks will be collected in the same type sample containers and handled in the same manner as the field samples for contaminate determination. Field duplicate samples will not be distinguishable from the field samples.

Triplicate volumes of sample will be collected for samples designated for MS/MSD analyses. Laboratory quality control samples will be collected at a frequency of one per matrix type and/or sample batch and every 20 samples of similar matrix.

As dedicated sampling equipment will be used, equipment blanks will not be collected.

Field duplicate samples will be collected at the same time from the same source, but submitted as separate samples, for the purpose of assessing the consistency of the overall sampling and analytical system. Field duplicate samples will be collected at a frequency of five percent for each analysis.

Trip blanks will be submitted to the laboratory in coolers that contain VOC samples. One trip blank will be required per cooler.

A temperature control blank will be included in each cooler shipment to the laboratory.

Analyses
Ground water samples will be analyzed for field and laboratory parameters as discussed below.

Field parameters
Ground water samples will be analyzed in the field for pH, temperature, conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity. Field instrumentation operating procedures are provided in the operations manual for the instrument. These data will be recorded on field logs.

Laboratory parameters
Analyses will include VOCs by USEPA Method 8260 and SVOCs by USEPA Method 8270.

Sample vials for VOC analyses, containing hydrochloric acid for preservation, will be filled completely so that there is no headspace or bubbles. The VOC sample vials will be examined for proper filling by inverting the vials immediately after filling.

5. Site Characterization Report

5.1. General

A Site Characterization Report will be prepared following receipt of the laboratory results. The report will include a summary of historic sampling conducted by the NCHD and NYSDEC, and will summarize the IRM completed at the Site prior to conducting the field sampling described within this SCWP.

The report will include an assessment of hazardous waste residuals, if any, remaining at the Site following the IRM. If applicable, based on the findings of the post-IRM sampling, the report will also recommend if further investigation of the Site is necessary.

Reference

Corps of Engineer's *Wetlands Delineation Manual*, 1987.

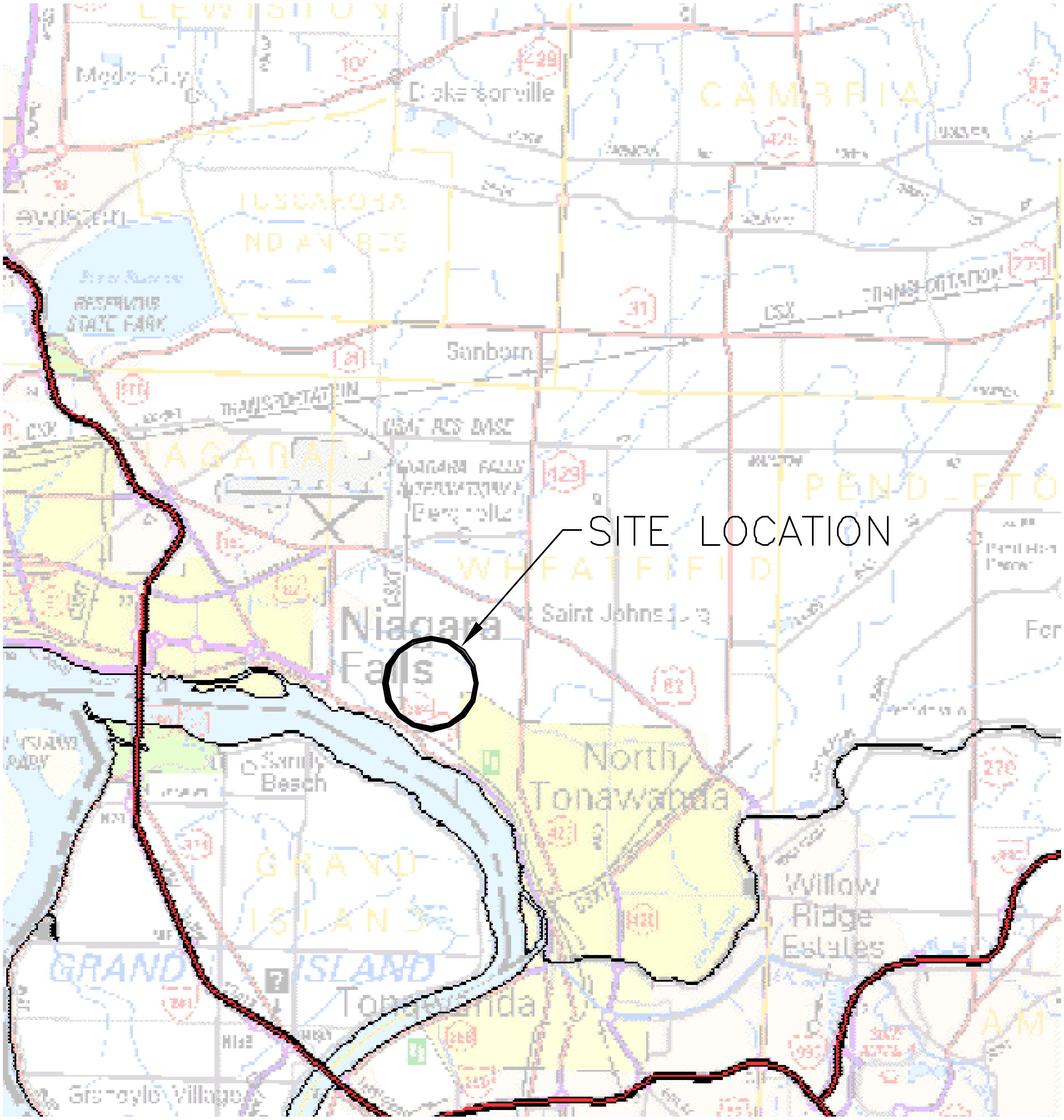
NYSDEC, 1993. *Environmental Site Assessment for the Kozdranski Property, Town of Wheatfield, Niagara County, New York*, NYSDEC Region 9, June 14, 1993.

NYSDEC, 1995. *Freshwater Wetlands Delineation Manual*, 1995.

NYSDEC, 2002. *Draft Technical Guidance for Site Investigation and Remediation (DER-10)*, NYSDEC, December 25, 2002.

USFWS, 1998. *National List of Plant Species that Occur in Wetlands New York*

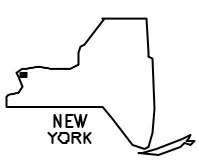
FIGURE 1



KOZDRANSKI SITE WHEATFIELD, NEW YORK
INTERIM REMEDIAL MEASURE
WORK PLAN

SITE LOCATION MAP

NOT TO SCALE



QUADRANGLE LOCATION

FILE NO. 5540.35090.001
JANUARY 2005

O'BRIEN & GERE ENGINEERS INC.

Jan 13, 2005 – 10:44am

I:\DIV71\Projects\5540\35090\dwg\RM\35090-001-FIG1.dwg

Jan 13, 2005 - 10:45am

FIGURE 2

LEGEND

APPROXIMATE PROPERTY LINE (NOT CONFIRMED BY SURVEY)

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL
MEASURE WORK PLAN

SITE PLAN

NOT TO SCALE

FILE NO. 5540.35090.002
JANUARY 2005

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ENGINEERS INC.

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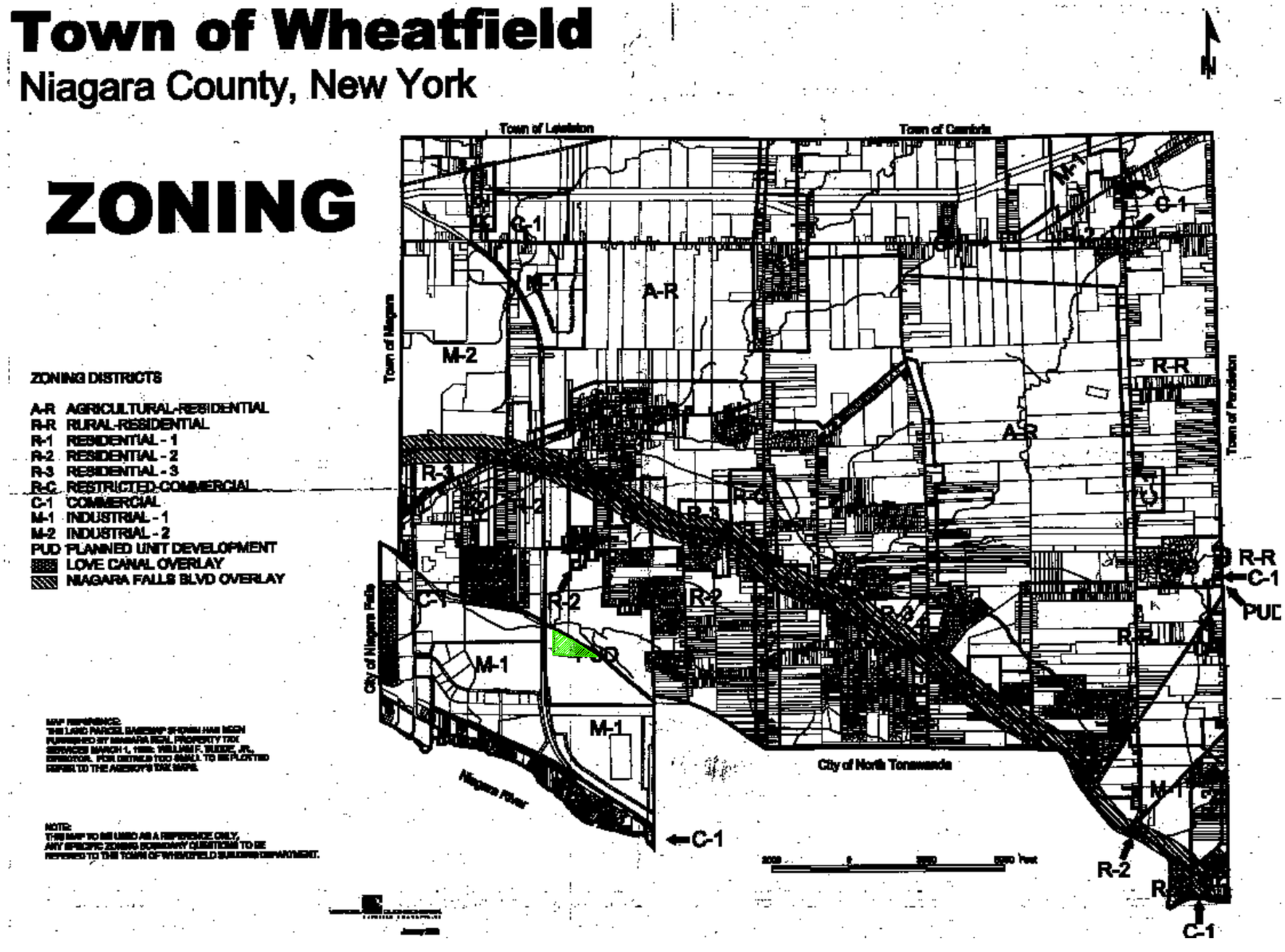
Jan 13, 2005 - 10:45am

Town of Wheatfield
Niagara County, New York

ZONING



ZONING DISTRICTS

- A-R AGRICULTURAL-RESIDENTIAL
- R-R RURAL-RESIDENTIAL
- R-1 RESIDENTIAL - 1
- R-2 RESIDENTIAL - 2
- R-3 RESIDENTIAL - 3
- R-C RESTRICTED-COMMERCIAL
- C-1 COMMERCIAL
- M-1 INDUSTRIAL - 1
- M-2 INDUSTRIAL - 2
- PUD PLANNED UNIT DEVELOPMENT
- LOVE CANAL OVERLAY
- NIAGARA FALLS BLVD OVERLAY

MAP REFERENCE:
THIS LAND PARCEL BASEMAP SHOWN HAS BEEN FURNISHED BY NIAGARA REAL PROPERTY TAX SERVICES MARCH 1, 1999, WILLIAM F. BUDDE, JR., DIRECTOR. FOR DETAILS TOO SMALL TO BE PLOTTED REFER TO THE ASSESSOR'S TAX MAPS.

NOTE:
THIS MAP TO BE USED AS A REFERENCE ONLY. ANY SPECIFIC ZONING BOUNDARY QUESTIONS TO BE REFERRED TO THE TOWN OF WHEATFIELD BUILDING DEPARTMENT.

I:\DV71\Projects\5540\35090\dwg\RM\35090-003-FIG3.dwg

FIGURE 3

LEGEND

KOZDRANSKI SITE

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL
MEASURE WORK PLAN

TOWN OF WHEATFIELD
ZONING PLAN
(JANUARY 2002)

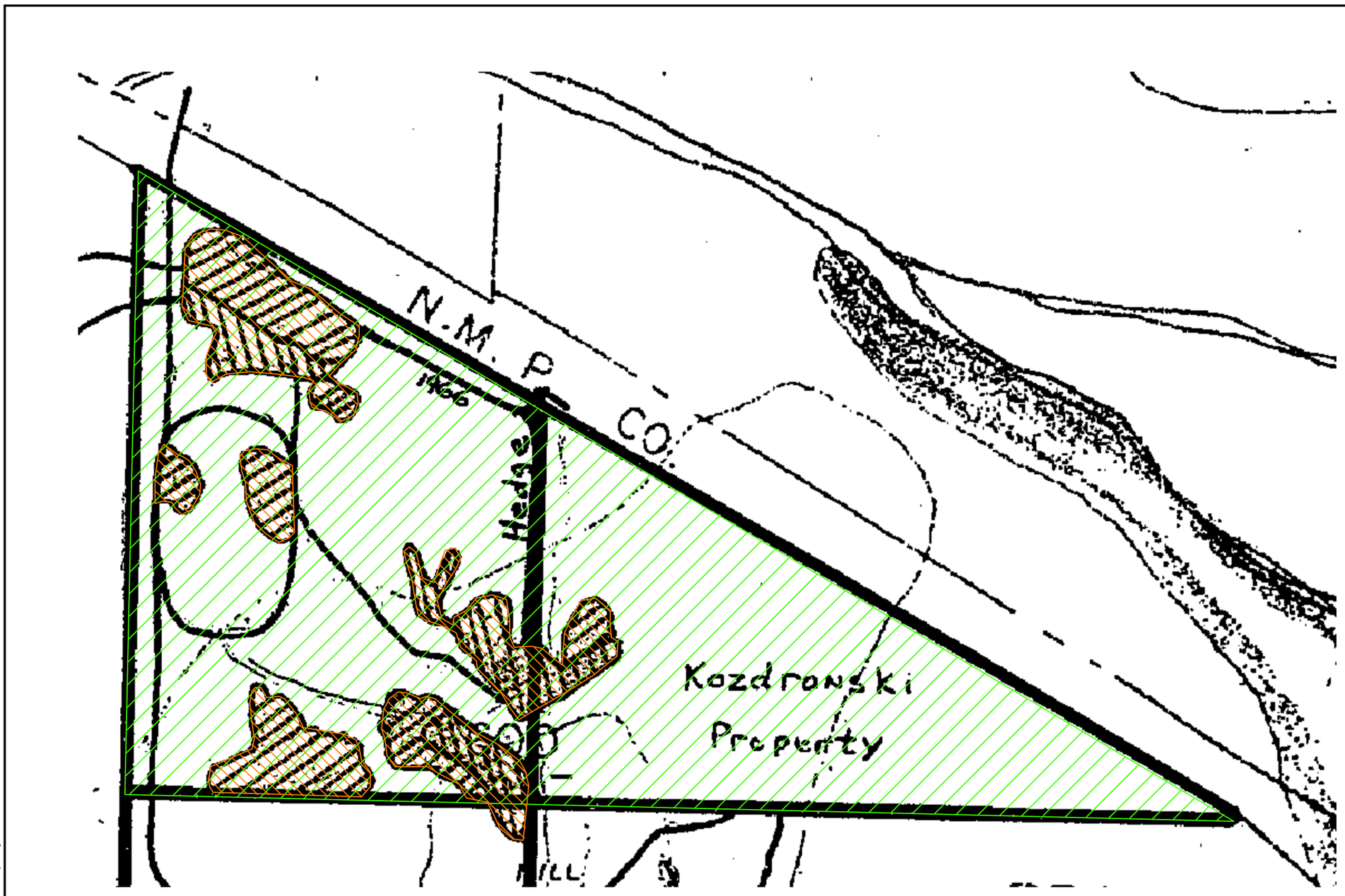
NOT TO SCALE

FILE NO. 5540.35090.003
JANUARY 2005

O'BRIEN & GERE
ENGINEERS INC.

Jan 13, 2005 - 10:45am

FIGURE 4



LEGEND

KOZDRANSKI SITE

CLEARINGS AND SUSPECT DISPOSAL AREAS

NOTE: CLEARINGS AND POTENTIAL DISPOSAL AREAS IDENTIFIED BY NYSDEC BASED ON REVIEW OF AERIAL PHOTOS FROM 1951, 1958, AND 1966.

SOURCE: ENVIRONMENTAL SITE ASSESSMENT REPORT PREPARED BY NYSDEC, JUNE 14, 1993.

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL MEASURE WORK PLAN

CLEARINGS AND SUSPECT DISPOSAL AREAS BASED ON AERIAL PHOTOS

NOT TO SCALE

FILE NO. 5540.35090.004
JANUARY 2005

O'BRIEN & GERE ENGINEERS INC.

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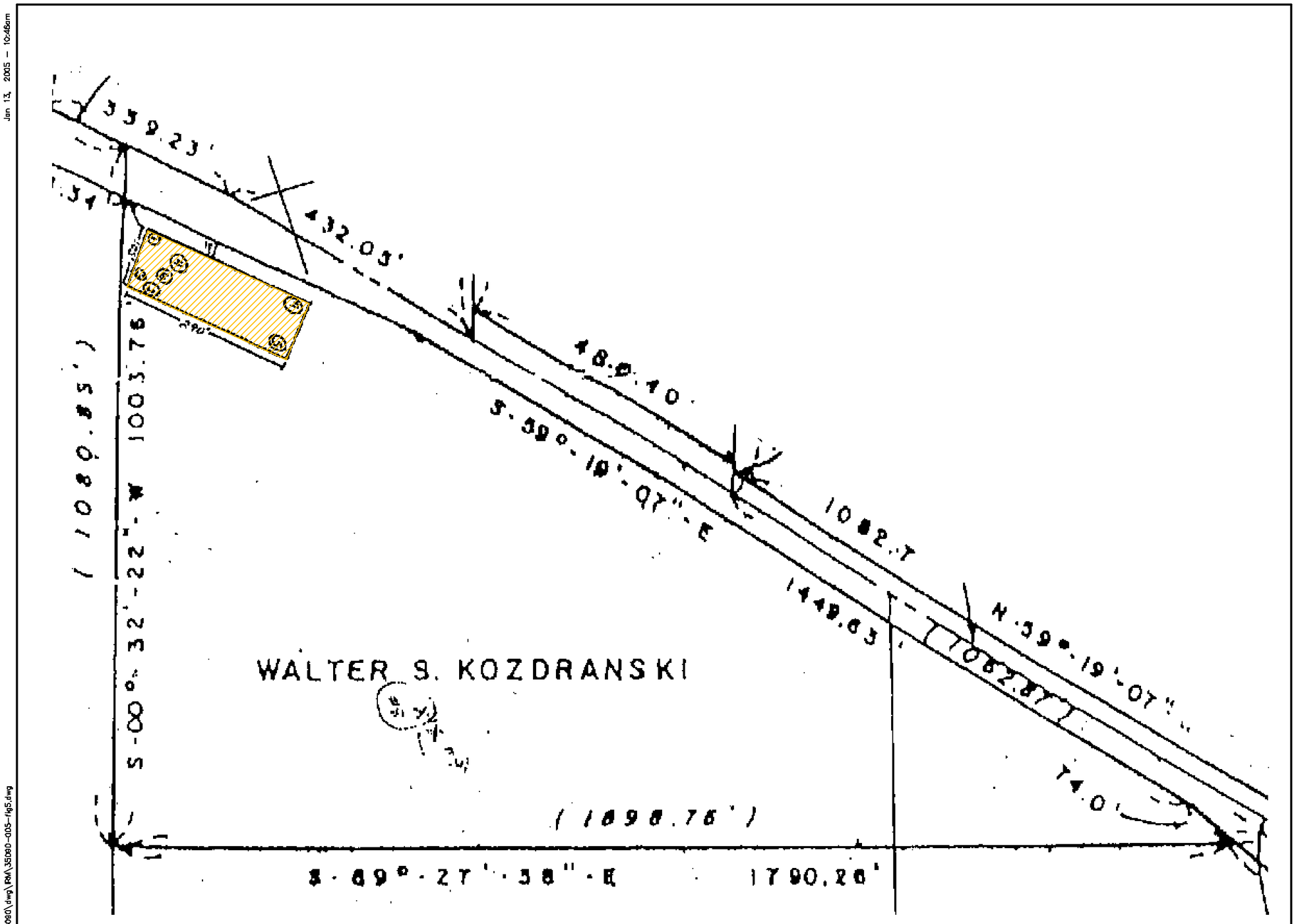
FIGURE 5



SOURCE: ENVIRONMENTAL SITE ASSESSMENT REPORT PREPARED BY NYSDEC, JUNE 14, 1993.

LEGEND

① TEST PIT LOCATION

AREA OF DEBRIS BEING EXAMINED ON SEPT. 6, 1986

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL MEASURE WORK PLAN

SEPTEMBER 9, 1986
TEST PIT LOCATIONS

NOT TO SCALE

FILE NO. 5540.35090.005
JANUARY 2005

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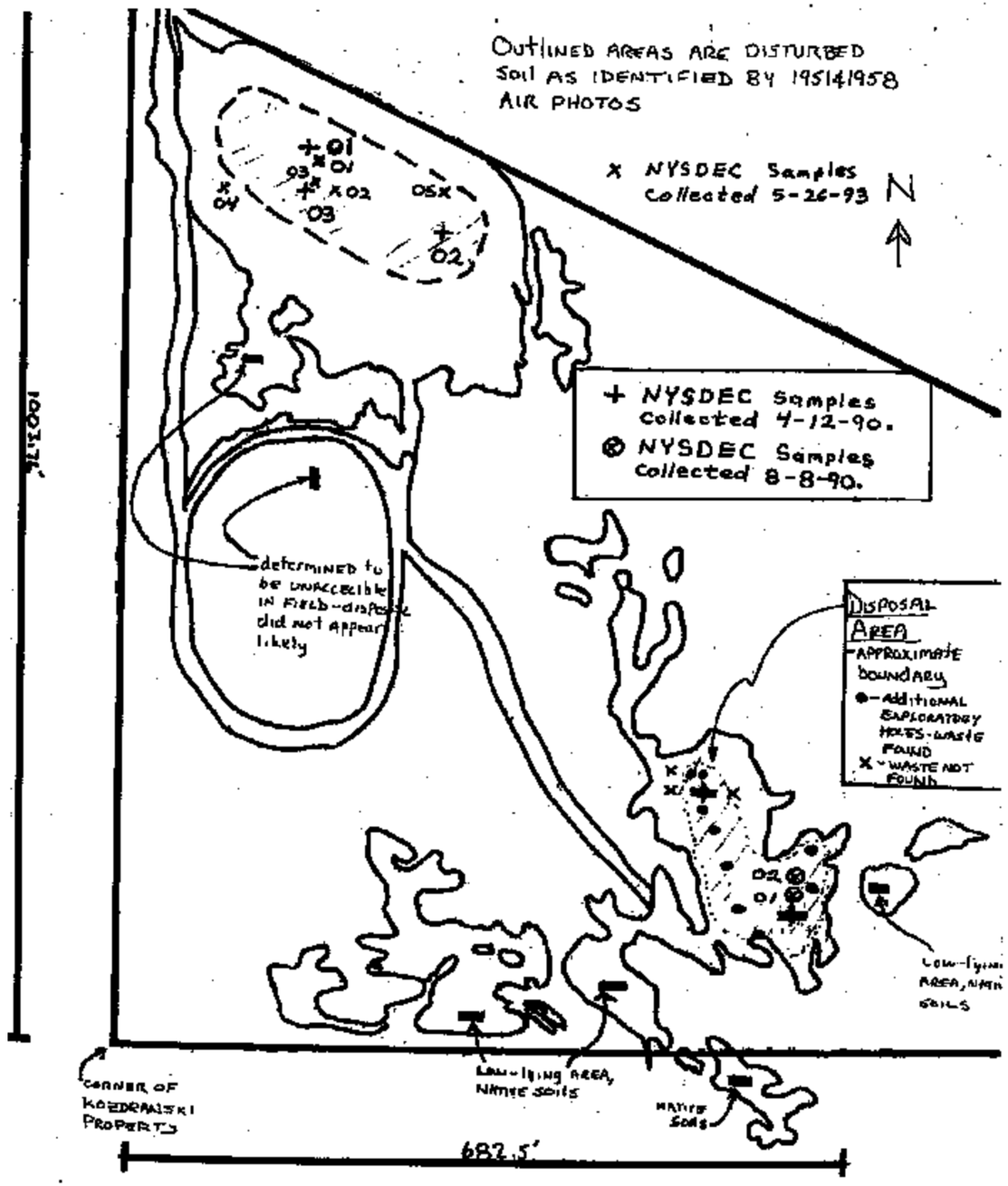

LOCATION OF TEST PITS COMPLETED ON SEPTEMBER 25, 1986 AND NYSDEC SAMPLES COLLECTED DURING 1990 AND 1993.

SOURCE: ENVIRONMENTAL SITE ASSESSMENT REPORT PREPARED BY NYSDEC, JUNE 14, 1993.

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL MEASURE WORK PLAN

1990 AND 1993 NYSDEC SAMPLE LOCATIONS

NOT TO SCALE

FILE NO. 5540.35090.006
JANUARY 2005

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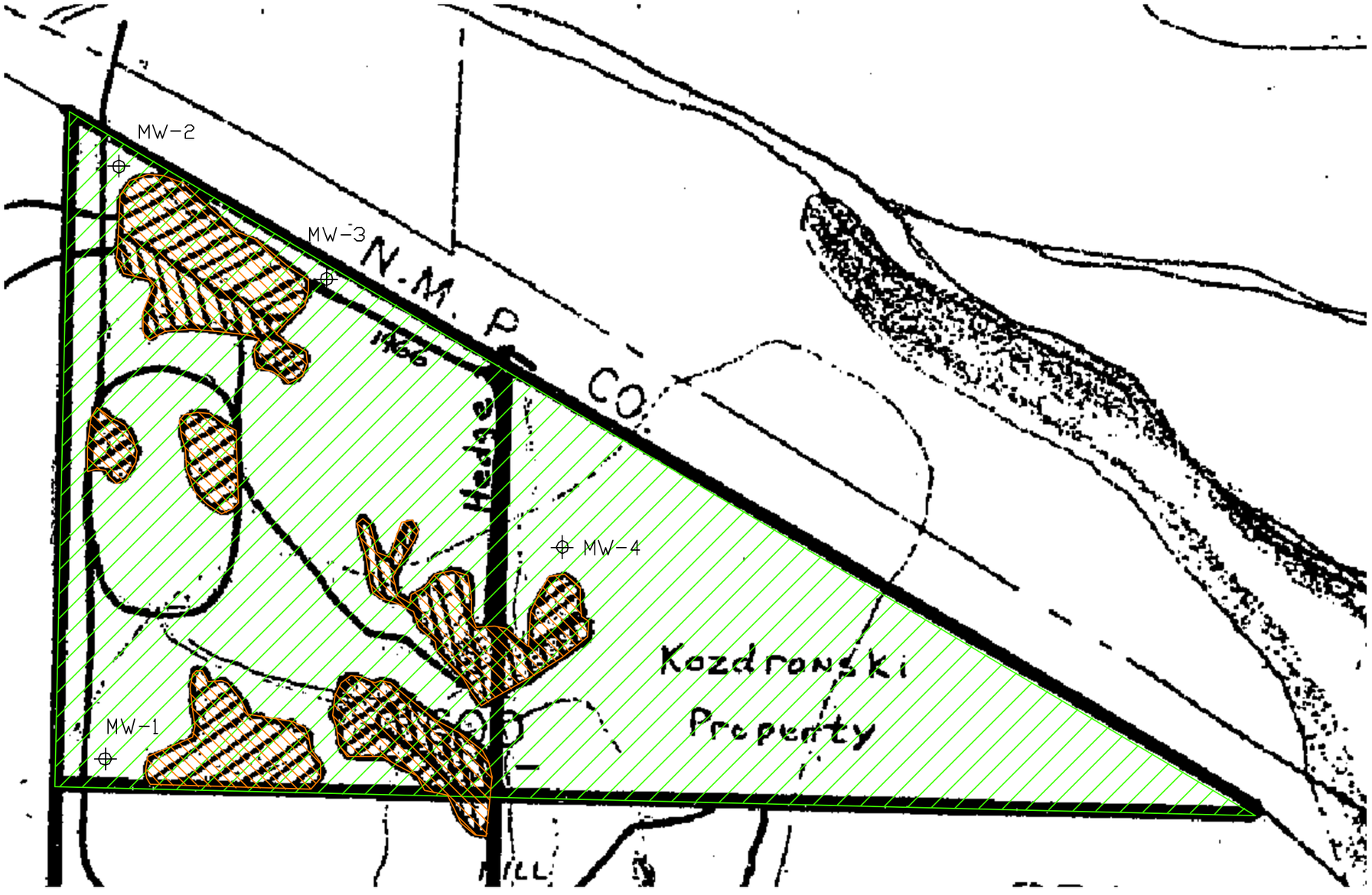
Jan 13, 2005 - 10:48am

FIGURE 7



LEGEND

KOZDRANSKI SITE

CLEARINGS AND SUSPECT DISPOSAL AREAS

MW-1 PROPOSED MONITORING WELL LOCATION (IF NECESSARY)

NOTE: CLEARINGS AND POTENTIAL DISPOSAL AREAS IDENTIFIED BY NYSDEC BASED ON REVIEW OF AERIAL PHOTOS FROM 1951, 1958, AND 1966.

SOURCE: ENVIRONMENTAL SITE ASSESSMENT REPORT PREPARED BY NYSDEC, JUNE 14, 1993.

KOZDRANSKI SITE
WHEATFIELD, NEW YORK

INTERIM REMEDIAL MEASURE WORK PLAN

MONITORING WELL LOCATION PLAN

NOT TO SCALE

FILE NO. 5540.35090.007
JANUARY 2005

O'BRIEN & GERE ENGINEERS INC.

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Appendix A

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

Site Characterization and Interim Remedial Measure Kozdranski Site Wheatfield, New York

The Goodyear Tire & Rubber Company

January 2005

5540/35090

QUALITY ASSURANCE PROJECT PLAN

Site Characterization and Interim Remedial Measure
Kozdranski Site
Wheatfield, New York

The Goodyear Tire & Rubber Company
Akron, Ohio

James R. Heckathorne, P.E.
Vice President

January 2005

O'BRIEN & GERE
ENGINEERS, INC.

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A Laboratory Quality Assurance Manual

List of Acronyms/Abbreviations

%D	Percent difference
%R	Percent recovery
%RSD	Percent relative standard deviation
AA	Atomic Absorption
ACS	American Chemical Society
APHA	American Public Health Association
ASP	Analytical Services Protocol
AWWA	American Water Works Association
BFB	Bromofluorobenzene
CCB	Continuing Calibration Blank
CCC	Calibration Check Compounds
CCV	Continuing calibration verification
CLP	Contract laboratory program
COD	Coefficient of Determination
CRA	Contract required detection limit (AA)
CRDL	Contract required detection limit
CRI	Contract required detection limit (ICP)
CV	Coefficient of variation
DBMS	Database management system
DFTPP	Decafluorotriphenylphosphine
DQO	Data quality objective
DSR	Duplicate sample result
EDD	Electronic disk deliverable
GC/MS	Gas chromatograph/mass spectrometer
HASP	Health and Safety Plan
ICB	Initial Calibration Blank
ICP	Inductively coupled plasma
ICSA	Interference check sample A
ICSAB	Interference check sample AB
ICV	Initial calibration verification
IDL	Instrument detection limit
IRM	Interim Remedial Measure
LCS	Laboratory control sample
MDL	Method detection limit
MS	Matrix spike
MSA	Method of standard addition
MS/MSD	Matrix spike/matrix spike duplicate
MSD	Matrix spike duplicate
NYSDEC	New York State Department of Environmental Conservation
OSR	Original sample result
PSA	Preliminary Site Assessment
PQL	Practical quantitation limit
QA/QC	Quality assurance/quality control
QAO	Quality assurance officer

QAPP	Quality assurance project plan
RPD	Relative percent difference
RRFs	Relative response factors
RSD	Relative standard deviation
SC	Site Characterization
SDG	Sample delivery group
SOP	Standard operating procedure
SPCC	System performance check compound
SR	Sample result
SVOC	Semivolatile organic compound
TIC	Tentatively identified compounds
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WEF	Water Environment Federation

Distribution List

The NYSDEC Project Manager

The Project Manager

The Field Manager

The Laboratory QC Coordinator

1. Introduction

1.1. General

This Quality Assurance Project Plan (QAPP) has been developed for the site characterization sampling and post-Interim Remedial Measure (IRM) sampling at the Kozdranski Site (the Site) in Wheatfield, New York. The QAPP is provided on behalf of The Goodyear Tire & Rubber Company (Goodyear) which entered into an Order on Consent agreement with the New York State Department of Environmental Conservation (NYSDEC) effective November 4, 2004. This document provides quality assurance/ quality control (QA/QC) criteria for work efforts associated with the sampling of environmental media at the Site. This QAPP is one component of the *Site Characterization Work Plan (SCWP)* (O'Brien & Gere, 2004) for the Kozdranski Property located in the Town of Wheatfield, New York.

This document has been prepared utilizing the guidance and format provided in the following documents:

- United States Environmental Protection Agency (USEPA), *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA,* Office of Emergency and Remedial Response, Washington, D.C. (USEPA 1988).

- United States Environmental Protection Agency (USEPA), *EPA Requirements For Quality Assurance Project Plans For Environmental Data Operations,* EPA QA/R-5, Washington, D.C. (USEPA 2001a).

This QAPP will assist in generating data of a known and acceptable level of precision and accuracy for the analysis of ground water, soil and subsurface soil environmental samples. The QAPP provides information regarding the project description and personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices, other field activities, and the analyses of data. The procedures in this QAPP will be followed by personal participating in the field investigation and in the laboratory analyses of environmental samples.

The following quality assurance topics are addressed in this QAPP:

- Project organization and responsibilities
- Project background and definition
- Project description and schedule
- Data quality objectives and criteria
- Special training requirements
- Documentation
- Sampling design
- Sampling method requirements
- Sample handling and custody
- Analytical method requirements
- Quality control requirements
- Instrumentation/equipment testing and maintenance
- Calibration and frequency
- Inspection requirements for supplies
- Data acquisition requirements
- Data management
- Assessments and response actions
- QA reports to management
- Data review, validation, verification, and management
- Data validation and usability
- Reconciliation with user requirements

2. Project Organization and Responsibility

2.1. Project Organization

While each person involved in the investigation and in the generation of data is implicitly part of the QA program for the project, certain individuals have specifically designated responsibilities. These are the Project Officer, Project Manager, Field Manager, Quality Assurance Officer, Data Validator, and sampling personnel. Laboratory personnel with QA/QC responsibilities include the Laboratory Quality Assurance Coordinator and Laboratory Sample Custodian.

2.2. Goodyear Project Manager

The Goodyear Project Manager, Mr. David J. Berkebile, will have overall responsibility for all phases of the Site Characterization and IRM.

2.3. Project Officer

The Project Officer, Mr. Swiatoslav W. Kaczmar, will be responsible for the overall corporate management of the investigation. It will be the Project Officer's responsibility to provide for the allocation of staff and other resources required to complete the project within the specified schedule and budget. The Project Officer's primary function is to verify that technical, financial, and scheduling objectives are achieved successfully. The Project Officer will report directly to the Goodyear Project Manager.

2.4. Project Manager

The Project Manager, Mr. Alfred R. Farrell, will be responsible for the implementation and completion of each of the tasks identified in the Work Plans. The Project Manager will manage the technical and administrative aspects of the project and function as the principal contact to the Goodyear Project Manager for the project.

The Project Manager will:

- Define project objectives and develop a sampling plan schedule
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task
- Apply technical and corporate resources as needed
- Develop and meet ongoing project staffing requirements
- Review the work performed on each task to verify its quality, responsiveness, and timeliness
- Review and analyze overall task performance with respect to planned requirements and authorizations
- Approve reports before their submission to NYSDEC
- Ultimately be responsible for the preparation and quality of reports
- Represent the project team at meetings

The Project Manager will report to the Project Officer.

2.5. Field Manager

The Field Manager, to be determined, will oversee field and related activities as described in the SCWP.

The sampling personnel will report to the Field Manager who will be responsible for leading, coordinating, and supervising the day-to-day field activities. The Field Manager's responsibilities include:

- Provision of day-to-day coordination with the Project Manager on technical issues
- Communicate and coordinate with laboratory prior to sample collection and shipment of sample coolers to the laboratory
- Develop and implement field-related sampling plans and schedule
- Coordinate and manage field staff
- Supervise or act as the field sample custodian
- Implement the QC for technical data, including field measurements
- Adhere to work schedules
- Authorize and approve text and graphics required for field team efforts
- Coordinate and oversee technical efforts of subcontractors assisting the field team
- Identify problems at the field team level, resolve difficulties in consultation with the Project Manager
- Implement and document corrective action procedures, and provide communication between team and upper management.

The Field Manager will report to the Project Manager.

2.6. Quality Assurance Officer

Mr. Kaczmar will also serve as the Quality Assurance Officer (QAO) for the project. As the QAO, he will review project plans and revisions to plans to assure QA is maintained throughout the investigations.

2.7. Data Validator

Ms. Karen Storne will serve as the Data Validator for the Site Characterization and IRM. If required, the Data Validator will be responsible for reviewing chemical data and validating laboratory analytical data. Validation reports will be submitted to the QAO for review. The Data Validator will also be responsible for performance and systems audits, data processing activities, data processing QC, data quality review, corrective actions and coordinating the QA/QC efforts between the contractor and the laboratory.

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2.8. Sampling Personnel

Sampling tasks required by this investigation will be conducted by experienced chemists, engineers, geologists, hydrogeologists and/or environmental technicians. Their responsibilities will include the documentation of the proper sample collection protocols, sample collection, field measurements, equipment decontamination and chain of custody documentation.

The sampling personnel will report to the Field Manager.

2.9. Laboratory QA Coordination

The Laboratory QA Coordinator will be responsible for the respective laboratory's QA/QC activities associated with the project, which include determining whether analyses are conducted within the appropriate holding times, determining that laboratory custody procedures are followed, monitoring daily precision and accuracy records, maintaining detailed copies of all procedures, rescheduling analyses based upon unacceptable data accuracy or precision, identifying and implementing corrective actions necessary to maintain QA standards, and approving the final laboratory reports prior to delivery to the Project Manager.

The Laboratory QA Coordinator will conduct initial validations and assessments of analytical data results and report the findings directly to the Project Manager.

2.10. Laboratory Sample Custodian

The Laboratory Custodian's responsibilities include verifying proper sample entry and sample handling procedures by laboratory personnel. The Laboratory Sample Custodian will report to the Laboratory QA Coordinator and their responsibilities will include the following:

- Set up field sampling coolers and containers
- Receiving and inspecting the incoming sample containers
- Recording the condition of the incoming sample containers
- Signing appropriate documents
- Verifying the chain-of-custody and its accuracy
- Notifying the Laboratory QC Coordinator of sample receipt an inspection
- Assigning a unique identification number and entering each into the sample receiving log
- Controlling and monitoring access and storage of samples.

3. Project Background and Definition

3.1. Site History and Description

The project description and site history are presented in the SCWP. Specific project objectives for this phase of the data gathering process are also presented in the SCWP.

3.2. Scope of Work

The project scope of work is presented in the SCWP. Specific project objectives for this phase of the data gathering process are also presented in the SCWP.

4. Project Description and Schedule

4.1. Project Description

The Site Characterization and IRM will include the sampling of ground water, soil, and subsurface soils at the Kozdranski Site in Wheatfield, New York. In particular, samples of ground water will be collected and evaluated for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Also, samples of surface and subsurface soil will be collected following the IRM to assess the concentration of residual SVOCs and VOCs, if any, remaining at the floor and perimeter of the identified disposal areas following excavation.

The following types of samples will be collected as part of the IRM:

- Grab soil samples from the floor and perimeter
- Soil boring samples advanced in each of the former waste disposal areas
- Ground water sample from each boring advanced providing that the static ground water table is encountered

Samples to be collected during the IRM and the associated analysis to be performed are presented in Table 5-3.

Data usability with respect to the data quality objectives and data uses will be compared to the project requirements. In the event that the completeness objective of 95% is not achieved, samples will be recollected at the discretion of the Project Manager.

The sample locations are presented in the Work Plans. The sample custody requirements are presented in Section 10 of this QAPP.

The laboratory will perform the VOC and SVOC analyses.

The analytical methods to be used in this investigation are listed in Table 5-2. Analyses will meet the requirements listed in the analytical methods listed in Table 5-2, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2 and additional requirements listed in this QAPP. The most recent laboratory control limits will be used to evaluate the sample data.

The laboratory will report non-detected sample results to the practical quantitation limits (PQLs). Results that are less than the PQLs but

greater than or equal to the method detection limits (MDLs) will be reported by the laboratory using the "J" flag. The laboratory-generated MDLs and PQLs, which are applicable at the time of analysis, will be provided by the laboratory along with the sample results. The applicable detection limits listed in Tables 5-4 and 5-5, or the most recent detection limits, will be reported by the laboratory.

In the case of matrix interference, the laboratory will perform sample cleanup as provided by the methods. Interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. Samples will be cleaned up in accordance with the methods. The clean-up, extraction and sample preparation methods will be listed in the data package case narrative. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Project Manager will be contacted as soon as the situation is identified. The Laboratory QC Coordinator will document in the data package case narrative how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

The data results will be reported in NYSDEC ASP (NYSDEC 2000) Category B deliverable format, including the forms described in the NYSDEC guidance, in both hardcopy and electronic data format.

At the discretion of the Project Manager, data validation will be performed on results from the analysis, for each matrix analyzed by the laboratory for the IRM. Current USEPA Region II data validation guidance documents and professional judgment will be used as guidance by the data validators to evaluate the analytical data. Upon request by the data validator, the laboratory will provide additional or supplemental information within 3 working days of the request.

At the discretion of the Project Manager, one field audit and one laboratory audit for each laboratory will be performed during the investigation. Additional audits may be required if issues that would severely limit the use of the sample data are identified during the investigation, and will be performed at the discretion of the Project Manager. Corrective action procedures will be implemented based on unacceptable audit results, as defined herein.

4.2. Project Schedule

The project schedules are presented in the Work Plans.

5. Data Quality Objectives and Criteria

Data quality objectives (DQOs) are quantitative and qualitative statements specifying the quality of the environmental data required to support the decision making process. DQOs define the total acceptable uncertainty in the data for each specific activity conducted during the investigation. The uncertainty includes both sampling error and analytical error. Ideally, zero uncertainty is the intent. However, the variables associated with the process (field and laboratory) inherently contribute to the uncertainty of the data. It is the overall objective to keep the total uncertainty within an acceptable range that will not hinder the intended use of the data. The QA/QC requirements have been established such that there will be a high degree of confidence in the measurements.

The principal DQOs of this investigation include the following:

- Determine the concentration of site-related residuals in the ground water, soil, and subsurface soil remaining at the identified disposal areas following excavation.

The following types of samples will be collected as part of the IRM:

- Grab soil samples from the floor and perimeter
- Soil boring samples advanced in each of the former waste disposal areas
- Ground water sample from each boring advanced providing that the static ground water table is encountered

In order to achieve these DQOs, the process of data generation was designed to develop a body of analytical data of sufficient quality to support the subsequent project decisions

Specific data quality requirements such as criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity are specified in this document.

Analytical levels as defined in USEPA guidance are as follows:

Screening Data: Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantitation, although the quantitation may be relatively imprecise. At least 10% of the screening data should be confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data.

Screening data without associated confirmation data are not considered to be data of known quality. For this investigation, screening data will be generated through field measurements that are associated with sample collection for the IRM.

Definitive Data: Definitive data are generated using rigorous analytical methods, such as USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or computer-generated electronic files. Data may be generated at the site of at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined. The level of QC that will be performed for the definitive data involves the QC efforts described in Section 12, the calibration procedures described in Section 14, the analytical methods listed in Table 5-2, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2 and the most recent laboratory control limits.

Table 5-1 contains sampling efforts, objectives, analyses, data uses, and analytical levels. In order to assess adherence to DQOs, O'Brien & Gere has developed the QA/QC program described in this QAPP. The remainder of this QAPP describes the specific approaches that will be taken to achieve the required DQOs.

Precision describes the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements that have been made in an identical manner, compared to their average value. Precision can be expressed in a variety of manners, including absolute methods such as deviation from the mean or median values, standard deviation and variance, or relative methods, such as relative deviation from the mean or median. The overall precision will be determined through the analysis of field duplicate, laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples.

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement is. Accuracy is expressed in terms of absolute or relative error. Accuracy will be determined through analysis of spiked samples and the analysis of standards with known concentrations.

Representativeness refers to the degree to which a sample taken from a site accurately reflects the matrix at the site. It is a qualitative parameter that is most concerned with the design of the sampling program. Factors that should be considered in the determination of representativeness include appropriateness of sampling and analytical methodologies, representativeness of the selected media, and representativeness of the selected analytical procedures. Representativeness will be achieved by the use of procedures for the collection and preservation of samples as described in the Work Plans and the methods in this QAPP.

Comparability refers to the use of consistent procedures, second source reference standards, reporting units, and standardized data format with document control. Adherence to standard procedures and the analysis of external source standard materials maximizes the probability that data generated from a particular method at a given laboratory can be validly compared to the data of another. This QAPP has been written to provide data that will be comparable to other data collected, as standard methods will be utilized for this investigation.

Completeness refers to the process of obtaining the required data as outlined in the Work Plans. Completeness is also defined as the percentage of measurements judged to be useable. Samples for which the critical data points fail completeness objectives will require reanalysis of samples (within the specified holding times) until the DQOs are met. The completeness goal has been specified at 95% for this investigation.

Sensitivity refers to a measurable concentration of an analyte that has an acceptable level of confidence. MDLs are the lowest concentration of an analyte that can be measured with 99% confidence that the analyte concentration is greater than zero. PQLs are levels above the MDLs at which the laboratory has demonstrated the quantitation of analytes. The laboratory-generated MDLs and PQLs, which are applicable at the time of analysis, will be provided by the laboratory along with the sample results. The reporting limits listed in Tables 5-4 and 5-5, or the most recent detection limits, will be reported by the laboratory.

5.1. Field Sampling

The objective of field sampling procedures is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment as presented in the Work Plans.

Certain field investigation activities do not require sample collection, but nonetheless involve measurements for which QA concerns are appropriate. The primary QA objective of these activities is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of the measurements and to document measurement procedures.

5.2. Laboratory Analyses

To obtain data of a quality sufficient to meet the applicable project DQOs, the following methods will be performed:

- VOCs analysis by gas chromatography/mass spectrometry (GC/MS)
- SVOCs analysis by GC/MS

The specific methods, analytical QA/QC and data reporting will adhere to the analytical methods listed in Table 5-2.

6. Special Training Requirements

As described in the Health and Safety Plan (HASP) (O'Brien & Gere, 2004a) developed for this IRM, field investigation personnel must comply with the training requirements for hazardous waste operations, codified in 29 CFR 1910.120(e). Each individual must have successfully completed a 40-hour (or 24-hour) course appropriate to the level of work that they perform. In addition, each individual must have completed an 8-hour refresher course within the last 12 months if the initial training was more than 12 months ago. Personnel acting in the capacity of an on-site supervisor, directly responsible for supervising employees engaged in hazardous waste operations, shall also have successfully completed an 8-hour Supervisor training course. Field investigation personnel must have documentation (copies of certificates, or identification (ID) cards) available on-site as proof of compliance with these training requirements.

7. Documentation

At the discretion of the Project Manager, this QAPP will be amended as necessary when guidelines and regulatory documents are revised or if site requirements necessitate such changes. Whenever the QAPP is amended, the project personnel will receive the amended copy of the QAPP and outdated copies will be removed from circulation. A distribution list is provided in this document.

The analytical data generated for this project will be reported to the contractor in NYSDEC ASP Category B deliverable format, including a comprehensive case narrative, which describes the following:

- A cross reference list which includes the field sample ID name, the laboratory ID number, and sampling dates for each sample in the sample delivery group (SDG) included in the data package;
- Documentation of the methodologies utilized to prepare and analyze the samples and references;
- Detailed documentation of QC, sample shipment, and analytical problems encountered in processing the samples for the data package; and,
- Documentation of re-analyses, internal QC processes used (for example, data provided in the data package but not used to generate sample results), corrective actions taken, and the resolution of the corrective actions taken.
- Documentation of communications made with project personnel during the data generation process.

The laboratories will provide complete data packages within 5 weeks of receipt of the last sample in a sampling event at the laboratory. The field logs, data packages, and records will be included in the Project Manager's project files. The project files will be archived by the Project Manager for a period of 10 years.

8. Sampling Design

8.1. Objectives

The objective of the sampling program is to obtain environmental media of sufficient quality to determine the chemical characteristics of media as described in the Work Plans. Sampling procedures and practices that will be used in the investigation are presented in the Work Plans.

8.2. Sampling Network

The types of parameters, methods, matrix, and numbers of samples to be collected for this project are presented in Table 5-3. The specific parameters for each method, and the reporting limits are listed in Tables 5-4 and 5-5.

8.3. Sampling Locations

Sampling locations for the IRM are described in the Work Plans.

8.4. Sampling Numbering System

A sample numbering system will be used to uniquely identify each sample collected during the investigation and to allow retrieval of sample specific information.

8.5. Sample Matrices

Ground water, soil, and subsurface soil will be sampled during this investigation.

9. Sampling Method Requirements

9.1. Sampling Procedures

Protocols for the various sampling activities are described in the Work Plans.

9.2. Decontamination of Sampling Equipment

Protocols for the decontamination of sampling equipment are described in the Work Plans.

10. Sampling Handling and Custody

10.1. Sample Preparation and Preservation

Immediately following collection, samples will be transferred to properly labeled sample containers and properly preserved. Table 5-3 lists proper sample containers and preservations. Samples will be promptly transferred to coolers packed with wet ice and/or ice packs. Samples will be shipped or transported within 24 hours of collection and will arrive at the laboratory no later than 48 hours after collection. Proper chain-of-custody documentation will be maintained as discussed in Section 10 of this QAPP. Samples will be extracted, digested and analyzed within the holding times specified in Table 5-3.

10.2. Sample Custody and Procedures

Chain-of-custody procedures will be instituted and followed throughout the IRM. Custody is one of several factors necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory activities, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area. Samples are physical evidence and will be handled according to strict chain-of-custody protocols.

The QAO should be prepared to produce documentation that traces the samples from the field to the laboratory and through analyses. The USEPA has defined custody of evidence as follows:

- In actual physical possession,
- In view after being in physical possession,
- In a locked laboratory, or
- In a secure, restricted area.

QA measures for this project will begin with the sample containers. Pre-cleaned sample containers will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent).

10.3. Field Custody Procedures

The field sampler is personally responsible for the care and custody of the sample until transferred. In the field sampler's individual bound field notebook, samplers will note, with permanent ink, meteorological data, equipment employed for sample collection, calculations, information regarding collection of QA/QC samples, and any observations. All entries will be signed and dated, and any entry that is to be deleted shall use a single cross out which is signed and dated. The following physical information will be recorded in the field notebook by the field sampling team:

- Sample number
- Project identification
- Sampling location
- Required analysis
- Date and time of sample collection
- Type and matrix of sample
- Sampling technique
- Preservation used if applicable
- Sampling conditions
- Observations
- Initials of the sampler

The following information will be recorded on the chain-of-custody by the field sampling team:

- Project identification and number
- Sample description/location
- Required analysis
- Date and time of sample collection
- Type and matrix of sample
- Number of sample containers
- Analysis requested/comments
- Sampler signature/date/time
- Air bill number (if shipped by a commercial carrier)

A completed sample tag (attached with adhesive) will be attached to each investigative or QC sample and the sample placed in a shipping container. Sample custody seals will be applied to coolers if samples are shipped by commercial carrier. The following will be recorded with permanent ink on sample labels by the field sampling team:

- Project name and number
- Sample number identification
- Initials of sampler
- Sampling location (if not already encoded in the sample number)
- Required analysis
- Date and time of sample collection
- Space for laboratory sample number

- Preservative used, if applicable.

Immediately after collection, samples will be transferred to properly labeled sample containers and properly preserved. Table 5-3 lists the proper sample containers and preservations.

The field sampling team will transport or ship by commercial carrier the coolers containing environmental samples to the laboratory agreed to by the NYSDEC. Samples will not be sent to another laboratory without the permission of NYSDEC.

A chain-of-custody document providing all information, signatures, dates, and other information, as required on the chain-of-custody form will be completed by the field sampler and provided for each sample cooler. Figure 1 presents an example external chain-of-custody form to be used for samples sent to laboratories for analysis. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody. The field sampler will sign the chain-of-custody record when relinquishing custody, make a copy to keep with the field logbook. When shipped by commercial carrier, the original form in an air-tight plastic bag in the sample cooler with the associated samples.

Sampling containers will be packed with packing materials and put in plastic bags to help prevent breakage and cross-contamination. Samples will be shipped in coolers, each containing a chain-of-custody and ice and ice packs to maintain inside temperature at approximately 4°C. When shipped by commercial carrier, sample coolers will then be sealed between the lid and sides of the cooler with custody seals prior to shipment. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. Samples will be shipped to the laboratory by common overnight carrier or will be hand delivered to the laboratory. Samples will be shipped or transported to arrive at the laboratory no later than 48 hours after sample collection. Prior to shipment of sample coolers, the field team leader will contact the laboratory to notify the laboratory of the sample shipments.

Samples will remain in the custody of the sampler until transfer of custody is completed. Transfer consists of:

- Delivery of samples to the laboratory sample custodian
- Signature of the laboratory sample custodian on the chain-of-custody document as receiving the samples and signature of sampler as relinquishing the samples.

If a carrier is used to deliver samples from the sampler to the laboratory, a copy of the air bill must be attached to the chain-of-custody to maintain proof of custody, and the air bill number must be written on the chain-of-custody.

If the cooler arrives at the laboratory after hours, an external chain-of-custody will be properly filled out and will accompany the cooler until the laboratory receives the cooler.

10.4. Laboratory Custody Procedures

Laboratory custody procedures begin when the samples are received by the laboratory. When the samples arrive at the laboratory, the sample custodian will sign the chain-of- custody. The sample custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples
- If the samples were shipped, the courier's air bill number will be written on the chain-of-custody form.
- Inspect sample shipping containers for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity
- Check the cooler temperature and record on the chain-of-custody. If the cooler temperature is greater than 6°C, the Project Manager will be contacted
- Sign and date the appropriate forms or documents, verify and record the agreement or disagreement of information on sample documents, and, if there are discrepancies, record the problem and notify the Laboratory QC Coordinator
- Log sample information into the laboratory sample tracking system, including:
    - Date and time of sample receipt
    - Project number
    - Field sample number
    - Laboratory sample number (assigned during log-in procedure)
    - Sample matrix
    - Sample parameters
    - Storage location
    - Log-in person's initials
- Label sample with a unique, sequential laboratory sample number.
- Place samples in the walk-in cooler, or sample storage area that is a secure, limited-access storage. The samples collected for volatile analysis will be stored in a separate refrigerator.

The laboratory will assign a number for each sample upon receipt. That sample number will be placed on the sample label. The sample label will remain attached to the sample container.

At the laboratory, the analysts will be required to log samples and extracts in and out of storage as the analysis proceeds. Samples and extracts will be returned to secure storage at the close of business. Written records will be kept of each time the sample or extract changes

hands. Care must be exercised to properly complete, date, and sign items needed to generate data.

The following procedures must be followed by the laboratory:

- Samples will be handled by the minimum number of people possible.
- The laboratory will set aside a secured sample storage area consisting of a clean, dry, refrigerated, isolated room, which is capable of being locked.
- The sample custodian will ensure that samples which are heat-sensitive, light-sensitive, radioactive, or which require special handling in other ways, are properly stored and maintained prior to analysis.
- The analytical area will be restricted to authorized personnel only.
- After sample analyses are complete, the laboratory may discard sample one month after the date on the final report. Analytical data is to be kept secured and released to authorized personnel only.

If quality control samples have not been properly identified during sample collection, the Laboratory QC Coordinator will contact the Project Manager to assign quality control samples prior to the start of sample analysis.

10.5. Final Evidence File Chain-of-Custody Procedures

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QAPP. The Project Manager is the custodian of the evidence file and maintains the contents of evidence files for the site, including relevant records, reported, logs, field notebooks, pictures, subcontractor reports, and data reviews.

Copies of the laboratory data packages will be stored by the laboratory for incorporation into the sample file; the Laboratory QC Coordinator will be responsible for final evidence documentation assembly.

Upon completion of the analyses, the Project Manager will begin assimilating the fied and laboratory notes. In this way, the file for the samples will be generated. The final file for the sample will be stored by the Project Managers and will consist of the following:

- Laboratory data packages, including summary and raw data from the analysis of environmental and QC samples, chromatograms, mass spectra, calibration data, work sheets, and sample preparation logs
- Chain-of-custody records
- Data validation reports.

The following documentation will supplement the chain-of-custody records:

- Field notebooks and data
- Field collection report
- Pictures and drawings
- Progress and QA reports
- Contractor and subcontractor reports
- Correspondence.

The evidence file must be maintained in a secured, limited access area until submittals for the project have been reviewed and approved, and for a minimum of ten years past the submittal date of the final report.

11. Analytical Method Requirements

11.1. Laboratory Analytical Methods

The analytical methods utilized in this project are presented in Table 5-2. Analyses will meet the requirements listed in the analytical methods listed in Table 5-2, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2 and additional requirements listed in this QAPP. The most recent laboratory control limits will be used to evaluate the sample data. In the event of an analytical system failure, the Laboratory QC Coordinator will identify the situation and provide corrective action guidance. The Project Manager will be notified as soon as the situation is identified and the resolution will be documented in the data package case narrative.

The laboratory will utilize the mandatory sample clean-ups for samples submitted for SVOC analyses listed in the methods.

Communications with the QAO and the Project Manager will be documented in the data packages.

The accuracy of the method will be determined by spiking the sample matrix with analytes and surrogates. Standards and reference materials will also be analyzed to determine analyte concentrations for comparison with expected concentrations to provide a measure of accuracy of the methods. Percent recoveries of the spikes will be calculated and compared to established control limits.

A measure of precision will be obtained through the relative percent difference (RPD) between matrix spikes and matrix spike duplicates and laboratory duplicates. Sampling precision will be evaluated based on the RPD of duplicate field samples. RPDs will be compared to established control limits.

The generated data will be input into the laboratory database management system.

Complete descriptions of analytical procedures to be used in the laboratory are described in the methodologies, in the USEPA methods, and the laboratory Standard Operation Procedures (SOPs). A copy of the laboratory Quality Assurance Manual will be provided upon request.

11.2. Reporting and Detection Limits

For organics, MDLs are the lowest concentration of an analyte that can be measured with 99% confidence that the analyte concentration is greater than zero. The PQL is the lowest concentration that can be reliably quantified within specified limits of precision and accuracy during routine laboratory operations. The laboratory-generated MDLs and PQLs, which are applicable at the time of analysis, will be provided by the laboratory along with the sample results. The reporting limits listed in Tables 5-4 and 5-5, or the most recent detection limits, will be reported by the laboratory.

Reporting limits may only be achieved in an undiluted sample free of matrix interferences or of high concentrations of target analytes. If matrix interferences are encountered or if high concentrations of target compounds are present, established reporting limits may not be achievable without impacting the instrument quality. The laboratory and QAO will discuss these situations before the laboratory proceeds with sample analysis. Samples may be diluted if analytes of concern generate responses in excess of the linear range of the instrument. When matrix interferences are present, samples will be cleaned up using appropriate methods. The clean-up, extraction and sample preparation methods will be listed in the data package case narrative. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Project Manager will be contacted as soon as the situation is identified and the Laboratory QC Coordinator will document in the data package case narrative how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

12. Quality Control Requirements

The overall effectiveness of a quality control program depends upon operating in the field and laboratory according to a program that systematically ensures the precision and accuracy of analyses by detecting errors and preventing their recurrence or measuring the degree of error inherent in the methods applied. The following sections describe the QA/QC checks that will be utilized in the laboratory and the field during this project.

12.1. Laboratory QA/QC Checks

Tables 12-1 and 12-2 summarize the laboratory quality control checks, frequency of analysis, control limits, and laboratory corrective actions for the analytical method used in this investigation. The following sections present a brief description of laboratory QA/QC analyses.

12.1.1. GC/MS tuning

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

12.1.2. Calibration

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis. Section 14 of this QAPP describes the laboratory equipment calibration process.

12.1.3. Blanks

Several types of blanks will be analyzed by the laboratory. Corrective action procedures will be implemented for blank analyses if target compounds are detected at concentrations greater than the method or QAPP criteria. The criteria for evaluation of blanks apply to any blank associated with a group of samples. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project or if the problem is an isolated occurrence not affecting other data.

Reagent blanks consist of laboratory analyte-free water and any reagents added to a sample during analysis only, or straight solvent. This type of blank is analyzed to evaluate whether contamination is occurring during the analysis of the sample. A reagent blank is usually analyzed following highly contaminated samples to assess the potential for cross-contamination during analysis.

Calibration blanks consist of acids and reagent water used to prepare metal and cyanide samples for analysis. This type of blank sample is analyzed to evaluate whether contamination is occurring during the preparation and analysis of the sample.

A method blank is a water or soil blank that undergoes the preparation procedures applied to a sample (i.e., extraction, digestion, clean-up). These samples are analyzed to examine whether sample preparation, clean-up, and analysis techniques result in sample contamination. The laboratory will prepare and analyze a method blank with each group of twenty samples of similar matrix that are extracted, digested, or analyzed at the same time (within same 12 hour period for GC/MS VOC analysis).

Field/equipment and sampler check blanks will also be collected and submitted for laboratory analysis, where appropriate. Field/equipment and sampler check blanks will be handled in the same manner as environmental samples. Equipment, field, and sampler check blanks are analyzed to assess contamination introduced during field sampling procedures.

Trip blanks will consist of samples of analyte-free water that have undergone shipment from the sampling site to the laboratory in coolers with the aqueous and soil environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be utilized for aqueous and soil samples at a frequency of one each per cooler sent to the laboratory for volatile organic analysis.

Storage blanks consists of sample vials filled with laboratory analyte-free water. The vials are stored at the laboratory with the samples collected for VOC analysis, under the same conditions as the samples. The storage blank is analyzed with the VOC samples to evaluate for contamination due to sample storage.

12.1.4. Internal standards performance

Internal standards, which are compounds not found in environmental samples, will be spiked into samples, blanks, MS/MSDs, and laboratory control samples (LCSs) at the time of sample preparation. Internal standards must meet retention time and performance criteria specified in the analytical method or the sample will be reanalyzed.

12.1.5. Surrogate recovery

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions. Surrogates are compounds similar in nature to the target analytes which are spiked into environmental samples, blanks, and quality control samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results is frequently subjective.

12.1.6. Laboratory control sample and matrix spike blank analyses

LCSs are standard solutions that consist of known concentrations of the complete list of target analytes spiked into laboratory analyte-free water or sand. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects.

The laboratory will prepare and analyze a LCS with each group of a minimum of twenty samples of similar matrix that are extracted, digested, or analyzed at the same time (or for each 12-hour analytical sequence for VOCs). Percent recoveries will be evaluated to assess the efficiency of preparation and analysis method independent of environmental sample matrix effects.

12.1.7. MS/MSD or laboratory duplicate samples

MS/MSD or laboratory duplicate analyses will be performed on environmental samples at a frequency of one per sample matrix and every twenty samples of similar matrix. MS/MSD/laboratory duplicate samples will be prepared and analyzed within the same batch as the environmental samples. The MS/MSD samples will be spiked at the laboratory with the complete list of target analytes listed in Tables 5-4 and 5-5. MS/MSD/laboratory duplicate data are generated to determine

precision and accuracy of the analytical method with respect to sample matrices. Generally, the MS/MSD data alone are not used to evaluate the precision and accuracy for associated organic samples since data may reflect specific matrix effects only present within one sample.

12.1.8. Compound identification and quantitation

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detected compounds, on the other hand represent an absence of data and are, therefore, much more difficult to assess. The objective for quantitative requirements is to maximize the accuracy of data and sensitivity of the instrument. Unless sample screening indicates the presence of high concentration target analytes, samples should be analyzed undiluted to maximize sensitivity. Samples must be reanalyzed at the appropriate dilution when concentrations exceed the linear calibration range to maximize accuracy.

In the case of matrix interference, the laboratory will perform sample cleanup as provided by the methods. Interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. When matrix interferences are present, samples will be cleaned up during the extraction processes using appropriate methods. The clean-up, extraction and sample preparation methods will be listed in the data package case narrative.

12.2. Corrective Action

Generally, the following corrective actions may be taken by the laboratory. When calibration, instrument performance, and blank criteria are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, reference standard, or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated.

Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable. If the laboratory determines data to be unusable, those samples will be re-prepared and reanalyzed.

If through the application of the corrective actions listed in Tables 12-1 and 12-2 the data is determined to be unusable, the QC analysis will be re-prepared and reanalyzed. If QC criteria are met upon reanalysis, only

the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported and the Project Manager will be notified of the situation at the time of sample analysis.

If matrix interferences are suspected, the Project Manager will be contacted. In the case of matrix interference, the laboratory will perform sample cleanup as provided by the methods. Interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument, as determined through sample screening. When matrix interferences are present, samples will be cleaned up during the extraction processes using appropriate methods. The clean-up, extraction and sample preparation methods will be listed in the data package case narrative. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Project Manager will be contacted as soon as the situation is identified and the Laboratory QC Coordinator will document in the data package case narrative how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

The laboratory will make every reasonable effort to correct QC excursions and to document the presence of matrix interferences. In this way, unnecessary resampling of difficult matrices may be avoided. However, if matrix interferences are not documented resampling may be required.

In addition, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2 which augment the method requirements, are to be followed by the laboratory during the IRM.

12.3. Control Limits

Control limits are established separately for respective matrix types for surrogate, LCS, MS/MSD, and duplicate analyses. Control limits can be considered action limits. The laboratory-established limits are defined as ± three standard deviations of the mean and correspond to 99.7% confidence limits of a normal distribution curve. Unless previously established, the laboratory will establish control limits for each analyte of concern using a minimum of twenty data points. The control limits are updated by the laboratory on an annual basis. Therefore, the most recent control limits will be used to evaluate data for this IRM. The current control limits used to assess data for this program will be summarized by the laboratory in the analytical report.

12.4. Field Sampling

Field sampling crews will always be under direct supervision of the Field Manager. Bound log books and appropriate data sheets will be used to document the collection of samples and data so that an individual sample or data set can be traced back to its point of origin, sampler, and type of sampling equipment.

Sampling will be performed according to the methods provided in the Work Plans.

Quality assurance will be evaluated by results of QC analyses. Field sampling precision will be evaluated through the RPD of the matrix spike and blind field duplicate sample analyses results. Decontamination of sampling equipment, if required, will be verified through the analysis of field/equipment blanks. The presence of matrix interferences will be evaluated by the analysis of spiked MS/MSD samples. The trip blank results will be used to determine of contamination of the samples submitted for VOC analysis occurred during shipment and/or storage. Proper chain-of-custody protocols, as presented in Section 6 of this QAPP, will be followed.

In order to evaluate data quality, QA/QC samples will be collected during the field investigation. Table 5-3 lists the environmental and corresponding QC samples to be collected by analyses and matrix type.

12.5. Field QA/QC Checks

12.5.1. Field duplicate samples

Collection of field duplicate samples provides for the evaluation of environmental representatives and field sampling and laboratory analytical performance. For this evaluation, analytical results of two samples from the same location are compared. The results of duplicate analysis provide an assessment of environmental variability and sampling uncertainty. The duplicate results along with MS/MSD results are also useful for evaluating laboratory precision performance and the representativeness of field collection precision procedures.

Field duplicate samples are duplicate samples collected from one location and sent to the laboratory blind (with two different sample identifications). One field duplicate sample will be collected for every 20 environmental samples (*i.e.*, minimum frequency of 5%) or one per matrix for less than 20 samples. If less than twenty samples are collected, 1 field duplicate sample will be collected.

12.5.2. Matrix spike and matrix spike duplicates

MS/MSD samples are duplicate samples that have spiking solutions added. MS/MSD samples are considered identical to the original sample and require that the sampled material be homogenized in the field and laboratory prior to analyses. Due to the potential loss of volatile organic compounds during homogenization, samples collected for VOC analyses will not be homogenized in the field. Since they will not be homogenized, field samplers must make every effort to collect representative samples of the location sampled for VOCs.

The percent recovery of the spiked amount indicates the accuracy of the analysis extraction as well as interferences caused by the matrix. RPDs between spike sample recoveries will indicate the precision of the data. One MS/MSD sample set will be collected for every 20 environmental samples submitted to the laboratory (*i.e.*, minimum frequency of 5%) or one MS/MSD for less than 20 samples.

12.5.3. Field/equipment blanks

Field/equipment blanks will consist of samples of analyte-free water that are passed through and or over decontaminated sampling equipment. One field/equipment blank will be collected per set of sampling equipment per sampling event. Field/equipment blanks will not be required if dedicated sampling equipment is used. The field/equipment samples will be subject to the same analyses as the environmental samples. One field blank will be collected for every 20 environmental samples submitted to the laboratory (*i.e.*, minimum frequency of 5%).

12.5.4. Trip blanks

Trip blanks will consist of samples of analyte-free water that have undergone shipment from the sampling site to the laboratory in coolers with the aqueous environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be utilized for VOC samples at a frequency of one each per cooler of aqueous and soil environmental samples sent to the laboratory for VOCs analysis.

12.5.5 Temperature blanks

Temperature blanks will consist of vials of water that have undergone shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for the IRM. The temperature of these blanks will be measured at the laboratory upon receipt of the sample cooler to verify compliance with the cooler temperature requirement.

12.6. Data Assessment Procedures

The procedures employed by the laboratory to assess the quality of data generated in the laboratory include, but are not limited to, the following:

- Determination of analytical precision per method
- Determination of analytical accuracy per method
- Determination of analytical completeness
- Determination of MDLs and PQLs.

Data quality reviews by analysts, supervisors, managers, laboratory directors, and QA personnel contribute to the total process.

Precision and accuracy may be assessed utilizing control charts. Control charts will consist of line graphs that provide a continuous graphic representation of the state of each analytical procedure. The standard deviation of the mean of the QC measurement is calculated and the upper and lower warning limits are set at plus or minus two standard deviation units. The upper and lower control limits are set at plus or minus three standard deviation units. Acceptable data are realized when results fall between the lower and upper warning limits. If the QC value falls between the control limit and the warning limit, the analysis should be scrutinized as possibly out of control.

In general, the accuracy of the methods will be determined by spiking the sample matrix with the analyte and by analyzing reference materials with known concentrations. The spiking levels will be selected to reflect the concentration range of interest. Percent recoveries of the spikes and reference materials will be calculated and compared to the established limits.

The precision of the methods will be determined by the analysis of matrix spike, laboratory replicate and field duplicate samples. The precision will be evaluated by calculating the RPD between the duplicates and replicates. RPD calculations will be compared to the established limits.

The definitions and equations used for the assessment of data quality are discussed below.

Accuracy - Is a measure of the nearness of an analytical result, or a set of results, to the true value. It is usually expressed in terms of error, bias, or percent recovery (%R).

Normally, the term accuracy is used synonymously with percent recovery. It describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added

to a sample of known value. The %R or accuracy can be calculated by using:

standards: %R = (observed value/true value) x 100

spikes: %R=[((conc. spike + sample conc.)-sample conc).x100)]/conc spike

Precision - Refers to the agreement or reproducibility of a set of replicate results among themselves without assumption of any prior information as to the true result. It is usually expressed in terms of the percent difference (%D) or RPD. The %D is calculated by using:

%D = (larger SR - smaller SR x 100)/ smaller SR

where SR is the sample result.

The RPD is calculated by using:

RPD = ($|OSR - DSR|$ x 100)/ ((OSR + DSR)/2)

where OSR is the original sample result and DSR is the duplicate sample result.

Average - The average or arithmetic mean (X) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$X = (\sum Xi_{\ I=1\ to\ n})/n$

Range - The range (R_i) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X_2, X_1) the range (R_i) of the duplicates and the average range (R) of the n sets are calculated by the following:

$R_i = X_2 - X_1$

$R = \sum Ri_{i=1\ to\ n}/n$

Standard deviation and variation - The standard deviation (S) of a sample of n results is the most widely used measure to describe the variability of a data set. It is calculated by using the following equation:

$$S = \sqrt{\frac{\Sigma(Xi - \overline{X})^2}{n-1}}\ n_{\ to\ i-1}$$

where X is the average of the n results and Xi is the value of result. Normally, X ± S will include 68% and X ± 2S includes about 95% of normally distributed data.

The variance is equal to S2. The percent relative standard deviation (%RSD) or coefficient of variation (CV) is the standard deviation divided by the mean and multiplied by 100 as follows:

$CV = 100S/X$

The Laboratory QC Coordinator, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable," based on the assessment of the QA/QC criteria.

Data assessment will be evaluated during data validation (if performed) and discussed in the data validation report.

13. Instrument/Equipment Testing and Maintenance

Each major piece of analytical laboratory instrumentation that will be used on this project has been documented and is on file with the laboratory. An equipment form will be prepared for each new purchase and old forms will be removed from the instrument area and filed when an instrument is replaced.

The laboratory will be required to maintain an equipment form detailing both preventative maintenance activities and the required QA testing and monitoring. In the event the instrument does not perform within the limits specified on the monitoring form, the Laboratory Manager will be notified and a decision will be made as to what corrective action is necessary. The corrective action procedure shall be documented in the instrument log. If repair is necessary, the instrument will not be used for analyses until repairs are completed and the instrument tested. Repairs made to the instrument will be documented in the instrument logbook. Required QA/QC testing and monitoring will be completed prior to the resumption of sample analysis.

Preventative maintenance procedures will be carried out on field equipment by the contractor's personnel in accordance with the procedures outlined by the manufacturers' equipment manuals. Maintenance activities involving field equipment will be recorded in the field notebook.

Routine maintenance is performed to keep laboratory instruments running under optimum conditions and to reduce instrument malfunction. Specific preventative maintenance programs outlining required maintenance procedures and their application frequencies are incorporated in laboratory SOPs for each methodology.

Minimally, field and laboratory instruments will undergo maintenance on an annual basis and when calibration, blank, or QC analyses indicate that maintenance is necessary to correct or improve system performance. Maintenance, whether performed by laboratory personnel or manufacturer, is documented as an entry in the appropriate log. Log entries include the reason for maintenance, maintenance performed, date, and initials of person in charge during maintenance.

The operating temperatures for refrigerators, coolers, ovens, and water baths will be monitored by the laboratory daily. The analyst will record the following information in a bound logbook: equipment ID, temperature reading, data and time of reading, and analyst initials.

14. Calibration and Frequency

14.1. Field Equipment Calibration

Field equipment used to collect data during sample collection will be calibrated in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment to be used for the field sampling will be examined to confirm that it is in good operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to confirm that the maintenance requirements are being observed.

Field notes from previous sampling trips will be reviewed so that the notations on any prior equipment problems are not overlooked, and all necessary repairs to equipment have been carried out. Spare parts will be sent to the sampling locations.

In general, instruments will be calibrated daily prior to use and will be recalibrated as required. All the calibration procedures performed will be documented in the field logbook.

Where applicable, calibration of field instruments will be performed at the intervals specified by the manufacturers. In the event that an internally calibrated field instrument fails to meet calibration procedures, it will be returned to the manufacturer for service, or another field instrument in working order will be obtained.

The Work Plans present specific field equipment calibration information.

14.2. Laboratory Equipment Calibration

Proper calibration of laboratory analytical instrumentation is essential for the generation of reliable data which meets the project DQOs. Analytical instrument calibration is monitored through the use of control limits which are established for individual analytical methods. Calibration procedures to be followed are specified, in detail, in the analytical methods. These procedures specify the type of calibration, calibration materials to be used, range of calibration and frequency of calibration. In addition, the calibration requirements listed in the quality control requirements and corrective actions in Tables 12-1 and 12-2, which

augment the method requirements, are to be followed by the laboratory during the IRM.

The laboratory will be responsible for proper calibration and maintenance of laboratory analytical equipment. Calibration procedures are presented in the analytical methods and the laboratory QA Manual. The following subsections detail some of the calibration procedures outlined in the analytical methods and the laboratory QA Manual.

14.2.1. Gas chromatography/mass spectrometry (GC/MS)

Before the GC/MS is calibrated for organics analysis, the mass calibration and resolutions of the instruments are verified by 4-bromofluorobenzene (BFB) for VOCs, and by decafluorotriphenylphosphine (DFTPP) for SVOCs. The performance check analysis must meet the criteria referenced in the analytical method and the QAPP. The system must be verified every 12 hours of analysis and when the instrument performance check solution fails to meet criteria. Samples are not analyzed until performance check analysis criteria are met.

For organics analysis, an initial five-point calibration is performed for the target compounds prior to start-up and whenever system specifications change or if the continuing calibration acceptance criteria have not been met. The method criteria, including relative response factors (RRFs) and percentage relative standard deviation (% RSD), of specific compounds must meet established criteria as specified in the method and the QAPP. If these parameters fail to meet criteria, corrective actions must be implemented and the initial calibration must be repeated.

14.3. Standards and Solutions

The use of standard materials of a known purity and quality is necessary for the generation of reproducible data. The laboratory will monitor the use of laboratory materials including solutions, standards, and reagents. Reagent solutions used for quantitation purposes must be ACS-grade or better. Standards prepared or purchased must be traceable to National Standards of Measurement. Standards should be traceable by lot number to a certificate of analysis, which is on file at the laboratory. Standards and standard solutions are verified prior to use. This verification may be in the form of a certification of analysis from the supplier or by comparison to a standard curve or another standard from a separate source. Standards are routinely checked for signs of deterioration, including unusual volume changes, discoloration, formation of precipitates, or changes in analyte response.

Solvent materials are also verified prior to use. Each new lot of solvent is analyzed to verify the absence of interfering constituents. Reagent and method blanks are routinely analyzed to evaluate possible laboratory-based contamination of samples.

14.4. Records

A records book will be kept for standards and will include the following information:

- Material name
- Control or lot number
- Purity and/or concentration
- Supplier/manufacturer
- Receipt/preparation date
- Recipient's/preparer's name
- Expiration date.

These records will be checked periodically as part of the laboratory's internal laboratory controls review.

14.5. Calibration Records

Calibration data will be kept for each instrument that requires calibration. The data will contain a record of activities associated with QA monitoring and instrument repairs. These records will be checked during periodic equipment review and internal and external QA/QC audits.

15. Inspection Requirements for Supplies

The use of standard materials of a known purity and quality is necessary for the generation of reproducible data. The laboratory will monitor the use of laboratory consumable materials including solutions, standards, and reagents, as described in Section 14.

Reagent solutions used for quantitation purposes must be ACS-grade or better. Standards prepared or purchased must be traceable to National Standards of Measurement. Standards should be traceable by lot number to a certificate of analysis, which is on file at the laboratory.

Standards and standard solutions are verified prior to use. This verification may be in the form of a certification of analysis from the supplier or by comparison to a standard curve or another standard from a separate source. Standards are routinely checked for signs of deterioration, including unusual volume changes, discoloration, formation of precipitates, or changes in analyte response.

Solvent materials are also verified prior to use. Each new lot of solvent is analyzed to verify the absence of interfering constituents. Reagent and method blanks are routinely analyzed to evaluate possible laboratory-based contamination of samples.

The sample containers used for this project will be supplied by the laboratory. The containers will be pre-cleaned sample containers that will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent container) or are cleaned using USEPA protocols.

16. Data Acquisition Requirements

Non-direct measurement data, in the form of historical data from previous site investigations, will be utilized for the IRM.

17. Data Management

Definitive data will be generated in the laboratory and screening data will be generated in the field as described in Section 5. The laboratory-generated data will be entered into the laboratory database management system and presented in data packages. The laboratory will perform the data review process, described in Section 20. Validation of the sample data may be performed as described in Section 21.

Data will be managed in a relational database management system (DBMS). Laboratory analytical data will be provided in electronic disk deliverable (EDD) format for direct upload into the DBMS. Associated field data will be entered into the DBMS by hand. The DBMS will then be used to provide custom queries and reports to support data validation, data analysis, and report preparation. Data validation qualifiers will be entered into the DBMS by hand and checked independently. Final tables containing the validated sample data will be presented in the IRM Report.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the Project Manager's project files. The project files will be archived by the Project Manager for a period of 10 years.

18. Performance and System Audits

18.1. Audit Definitions

The performance audit is an independent check to evaluate the quality of data being generated. The system audit is an on-site review and evaluation of the quality control practices, laboratories, instrumentation, data validation, and documentation procedures.

At the discretion of the Project Manager, one field audit will be performed during the field sampling activities and one laboratory audit will be performed during the sample analysis activities. Additional audits may be required if issues that would severely limit the use of the sample data were identified during the IRM. Corrective action procedures will be implemented based on unacceptable audit results. The audit will be performed by the QAO or their designee.

These audits will evaluate the adherence of the field programs and the laboratory programs to the QA program outlined in the Work Plans and this QAPP. The protocols used to conduct the audits may be found in the following sections. Acceptance criteria used in determining the need for corrective action will be those criteria defined in this QAPP. The results of the audits will be documented and submitted to the Project Manager. These reports and any corrective actions that were implemented as a result of the audits will be included in the IRM report.

The audits of field and laboratory activities include two independent parts: internal and external audits.

18.2. Field Performance and System Audits

18.2.1. Internal field audits

Internal field audit responsibilities. Internal audits of field activities including sampling and field measurements will be conducted by the QAO or their designee.

Internal field audit frequency. These audits will verify that established procedures are being followed. Internal field audits will be conducted at least once during the site sample collection activities.

Internal field audit procedures. The audits will include examination of field sampling records, field instrumentation operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, and other elements of the field program. Follow-up audits will be conducted to correct deficiencies and to verify that QA procedures are maintained throughout the IRM. The audits will involve review of field measurement records, instrumentation calibration records, and sample documentation. The areas of concern in a field audit include:

- Sampling procedures
- Decontamination of sampling equipment, if applicable
- Chain-of-custody procedures
- SOPs
- Proper documentation in field notebooks.

18.2.2. External field audits

External field audit responsibilities. External field audits may be conducted by NYSDEC.

External field audit frequency. External field audits may be conducted at any time during the field operations. These audits may or may not be announced and are at the discretion of NYSDEC.

Overview of the external field audit process. External field audits will be conducted according to the field activity information presented in this QAPP.

18.3. Laboratory Performance and System Audits

18.3.1. Internal laboratory audits

Internal laboratory audit responsibilities. The internal laboratory audit will be conducted by the QAO or their designee.

Internal laboratory audit frequency. The internal laboratory system audits will be conducted during the sample analysis activities while the internal laboratory performance audits will be conducted on a quarterly basis.

Internal laboratory audit procedures. The internal laboratory system audits will include an examination of laboratory documentation on sample receiving, sample login, sample storage, chain-of-custody procedures, sample preparation, and analysis, instrumentation operating records, etc. The performance audits will involve reviewing the results for performance evaluation samples sent to the laboratory by regulating

agencies. The QAO or their designee will evaluate the analytical results to ensure the laboratory maintains acceptable QC performance.

18.3.2. External laboratory audits

External laboratory audit responsibilities. An external audit may be conducted by NYSDEC.

External laboratory audit frequency. An external laboratory audit may be conducted at least once during the sampling and analysis activities. These audits may or may not be announced and are at the discretion of NYSDEC.

Overview of the external laboratory audit process. External laboratory audits will include review of laboratory analytical procedures, laboratory on-site audits, and/or submission of performance evaluation samples to the laboratory for analysis.

The specific parameters to be evaluated (at a minimum) will include:

- Data comparability
- Calibration and quantitation
- QC execution
- Out-of-control events
- SOPs
- Sample management
- Record keeping
- Instrument calibration records
- Other analytical records
- QC records
- Corrective action reports
- Maintenance logs
- Data review
- Limits of detection
- QC limits
- Analytical methods

18.3. Corrective Actions

Corrective action procedures will be implemented based on unacceptable audit results or upon detection of unacceptable data during validation. Two types of audits may be performed during this investigation. The data generation process will be audited by assessing adherence to control limits and by performing an on-site laboratory audit, if requested by the Project Manager. The field program will be audited by assessing adherence to the procedures outlined in this document by the analysis of field QC samples and by performing an on-site field audit, if requested

by the Project Manager. If required, corrective action procedures will be developed on a case-by-case basis. The enacted corrective actions will be documented in the appropriate notebook, log, or case file. File and laboratory personnel are encouraged to discuss specific issues and proposed corrective actions with the QAO.

Generally, the following corrective actions will be taken by the laboratory. When calibration, instrument performance, and blank criteria are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. The Project Manager will be notified of situations of repeated calibration, instrument performance, or blank criteria failure at the time of sample analysis. When matrix spike, reference standard, or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable. If, through the application of the corrective actions listed in Tables 12-1 and 12-2 the data is determined to be unusable, the QC analysis will be re-prepared and reanalyzed. If QC criteria are met upon reanalysis, only the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported and the Project Manager will be notified of the situation at the time of sample analysis.

If matrix interferences are suspected, the Project Manager will be contacted. In the case of matrix interference, the laboratory will perform sample cleanup as provided by the methods. Interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. When matrix interferences are present, samples will be cleaned up using appropriate methods. The clean-up, extraction and sample preparation methods will be listed in the data package case narrative. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Project Manager will be contacted as soon as the situation is identified and the Laboratory QC Coordinator will document in the data package case narrative how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

In addition, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2, which augment the method requirements, are to be followed by the laboratory during the IRM.

The laboratory will make every reasonable effort to correct QC excursions.

If problems arise with procedures or guidelines set forth herein, the client, the QAO, and the Project Manager, in conjunction with the appropriate agencies, will formulate an appropriate corrective action.

19. QA Reports to Management

Following completion of the IRM, the contractor will prepare a IRM Report for the Kozdranski Site. The IRM Report will include the results of the investigations.

20. Data Review, Validation, Verification and Management

20.1. Deliverables

For data to be scientifically valid, legally defensible and comparable, valid procedures must be used to prepare this data. NYSDEC ASP Category B laboratory analytical documentation will be required for each sample analysis.

20.2. Data Production, Handling and Reporting

20.2.1. Underlying documents

Specific laboratory procedures and instrumentation can be found in the QA Manual and/or SOPs from the laboratory.

20.2.2. Data reduction

Data reduction consists of manual and computer data reduction procedures and calculations. Computer data reduction procedures and calculations will be checked manually by the laboratory to verify that compound identification and quantitation adhere to method requirements. The laboratory will be responsible for maintaining a listing of computer-based data reduction programs and SOPs for data reduction. Sample preparation or extraction logs will be used to document sample preparation information (for example, preparation weights, volumes, reagents). Instrument injection logs or bench sheets will also be maintained for each instrument.

Qualitative identification and quantitation of organic analytes will be performed by experienced analysts in accordance with analytical method requirements.

20.2.3. Laboratory data review

Analytical results are generally entered into the laboratory computer system by the analyst, independently reviewed by another analyst or

supervisor experienced in the method, and approved by the Laboratory Manager. The following are requirements that are generally examined as part of this review:

- Initial calibration criteria were met. Standards in the calibration curve covered the expected concentration ranges of the samples including the PQL.
- Initial and continuing calibrations met the acceptance criteria defined in the method standard procedure.
- Sample results fell within the range of the standard curve.
- For GC/MS methods requiring internal standards, retention times and area responses were evaluated against limits established by the daily calibration.
- Method blanks were processed with each analytical batch and no detectable levels of contamination were identified.
- MS/MSDs were performed at the required frequency and recoveries were within acceptable control limits.
- Duplicate analyses were performed at the required frequency and results were within the control limits.
- LCS analyses were performed with each analytical batch and the results obtained were within control limits.
- For organic compound analyses, surrogate spike recoveries were within control limits.
- Compounds identified by GC/MS have been manually rechecked by comparison with the data system library for both target compounds and tentatively identified compounds. Retention times and ratios of fragmentation were verified.
- Calculations have been accurately performed.
- Reporting units are correct.
- Data for the analysis provide a complete audit trail.
- Reported detection limits comply with data quality indicator requirements.

The analyst's supervisor will check a minimum of 10% of the data back to raw data in the secondary review. When required analyses on the samples in a project are complete, entered, and reviewed, a report will be generated. The report will be forwarded to the assigned Laboratory

Project Supervisor or designee for review. The report will then be reviewed for the following items (at a minimum):

- QC data will be reviewed to identify whether or not internal specification and contract requirements have been met.

- Non-conformance reports, if any, will be reviewed for completion of corrective actions and their impact of results. Quality control requirements and corrective actions listed in Tables 12-1 and 12-2 in this QAPP will be referenced in the laboratory review process. Non-compliance and corrective action procedures will be documented in the case narrative in the final report.

The report requires the signature of the Laboratory Project Supervisor or designee. Electronic data are copied onto computer tape, inventoried, and stored off-site in a secure facility, or within locked cabinets on site. This data archive system is maintained for a minimum of ten years.

Following final review, two hard copies of the report will be transmitted to the Project Manager.

The laboratories will present the analytical data packages in NYSDEC ASP Category B format. The data packages, which will be fully validatable, will document sample preparation, extraction, and analysis and include raw data and logs associated with the analyses performed for the IRM.

The data packages will be provided within 5 weeks of receipt of the last sample at the laboratory. If during the validation process, additional or supplemental information is requested, the laboratory will provide data reduction, validation, and reporting information to the validator within three working days.

Data report forms will be securely bound and the pages will be sequentially numbered. In addition to the hardcopy version of the analytical data packages, the laboratory will provide electronic deliverables.

20.2.4. Data management

Data will be managed in a relational DBMS. Laboratory analytical data will be provided in EDD format for direct upload into the DBMS. Associated field data will be entered into the DBMS by hand.

Data validation qualifiers will be entered into the DBMS by hand and checked independently by the data management group. The DBMS will then be used to provide custom queries and reports to support data validation, data analysis, and report preparation.

21. Data Validation and Usability

At the discretion of the Project Manger, data validation will be performed on each analysis, for each matrix analyzed by the laboratory in the IRM.

Upon request by the data validator, the laboratory will provide additional or supplemental information within 3 working days of the request. If the validator finds the re-submittal information is deficient, the laboratory will be required to respond within 24 hours or the affected data will be considered noncompliant.

21.1. Validation Procedures

Data validation will be performed utilizing the QA/QC criteria established in this QAPP, the quality control requirements and corrective actions listed in Tables 12-1 and 12-2, the analytical methods, and laboratory established criteria.

Data validators will be responsible for reviewing the QC parameters as listed below. Data validators will recalculate approximately 10% of the laboratory sample calculations using raw data when verifying sample results for validation. In addition, data validators will review approximately 10% of the raw data to verify that compound identification was performed correctly and transcription errors are not present for full validation.

Sample data will be qualified based on excursions from control limits. Data not within control limits require corrective action by the laboratory. Data validators will check corrective action reports and results of reanalysis if available. Corrective actions implemented by the laboratory will be referenced in the data validation report.

The following QA/QC information will be included in the review for organic and inorganic analyses where applicable:

- Data package completeness;
- Laboratory qualifier application;
- Sample collection;
- Chain-of-custody records;
- Laboratory analysis issues;
- Holding times, sample preservation and percent solids;
- Calibrations
- Contract required detection limit (CRDL) analysis (inorganics);
- Blank analysis;

- Matrix spike/matrix spike duplicates;
- Laboratory control sample analysis;
- Field duplicate analysis;
- Surrogate recovery (organics);
- Internal standards performance (organics);
- Gas chromatography/mass spectrometry instrument performance check (organics);
- Column performance check standard analysis (organics);
- GC performance (organics);
- Analytical sequence (organics);
- Cleanup efficiency (organics);
- Confirmation analysis (organics);
- Inductively coupled plasma interference check sample analysis (inorganics);
- Inductively coupled plasma serial dilution (metals);
- Laboratory duplicates (inorganics);
- Verification of instrument parameters (inorganics);
- Target analyte quantitation, identification, and reported detection limits;
- Tentatively identified compounds;
- Documentation completeness; and
- Overall data assessment.

Control limits for the blind field duplicate precision have been established at ±50% for water samples and ±100% for solid samples. For sample results that are less than or equal to five times the PQL, the criterion of plus or minus two times the PQL will be applied to evaluate field precision.

Tentatively identified compounds (TICs) for organic analyses will be evaluated as part of the validation process since this information is required for this investigation.

21.2. Assignment of Qualifiers

Data affected by excursions from the previously mentioned QA/QC criteria will be qualified using the following USEPA data validation guidance documents or the most current documents:

- USEPA. 1999. *USEPA Region II Validating Volatile Organic Compounds by SW-846 Method 8260B, SOP HW-24* Revision 1, (modified). New York, NY.

- USEPA. 2001b. *USEPA Region II Validating Semivolatile Organic Compounds by SW-846 Method 8270, SOP HW-22* Revision 2, (modified). New York, NY.

In many cases, the USEPA guidance for data validation refers to professional judgment to determine the appropriate validation technique in several situations. In these situations, the validation approach to be taken by the validator will be a conservative one; qualifiers will be applied to sample data to indicate both major and minor excursions. In this way, data associated with any type of excursion is identified to the data user. Minor deficiencies in the data generation process noted in the data validation will result in approximation of sample data. Approximation of a data point indicates uncertainty in the reported concentration of the chemical but not its assigned identity. Major deficiencies noted in the data validation will result in the rejection of sample results. Rejected data would be considered unusable for quantitative or qualitative purposes. In accordance with USEPA validation guidance, and using professional judgment, data qualifiers may include the following:

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following guideline will be used regarding the assignment of qualifiers and the use of qualified data:

- The data quality evaluation may result in only one type of qualifier ("U", "J", "UJ," or "R") for each analyte; in a case when several qualifiers are applicable to the same analyte, the cumulative effect of the various QA/QC excursions is employed in assigning the final data qualifiers. For example, if a sample result is affected by low surrogate recoveries for which the "J" qualifier is applied, but low MS/MSD recoveries result in the rejection of the sample result

(application of the "R" qualifier), the final data qualifier is the "R" qualifier.

21.3. Data Usability Evaluation

Based on the QA/QC information review and the qualifiers assigned to the analytical data, an overall evaluation of the data's usability will be performed and reported. Data usability is defined as the percentage of data that remains unqualified or is qualified as approximate or non-detected due to blank contamination, divided by the data reported by the laboratory times 100. The percentage usability excludes the data qualified as rejected due to major QA/QC excursions. The non-usable data is defined as the percentage of the data qualified as rejected divided by the data reported by the laboratory times 100. The data usability will be provided for each type of analysis performed for samples analyzed for this investigation.

The data usability evaluation considers the data parameters of precision, sensitivity, accuracy, representativeness, comparability, and completeness, which are described as follows:

- Precision is evaluated through the review of field duplicate samples, laboratory replicates, and MS/MSD samples.
- Sensitivity is evaluated through the review of reported detection limits.
- Accuracy is evaluated through the review of MS/MSD samples, internal standards, surrogate recoveries, LCS recoveries, calibration, instruction performance check, ICP interference check analysis, and ICP serial dilutions.
- Representativeness is evaluated through the review of holding times, sample preservation and preparation, blank analysis and target compound identification and quantification.
- Comparability is evaluated through the review of the analytical methods and reporting procedures for consistency.
- Completeness is defined as the overall percentage of sample results that are determined to be usable.

21.4. Data Validation Report

The data validation report will present the samples and analytical parameters, and will describe data deficiencies, analytical protocol deviations, quality control problems and effects on the data, and provide recommendations for resampling and reanalyses.

The data validation report will contain separate QA sections in which data quality information collected during the investigation is summarized. The data validation report will include the following:

- Guidelines used to evaluate the data.
- Definitions of data qualifiers applied to sample results.
- Quality control exceedances will be identified in the report and in the corresponding sample result sheet from the data package.
- Summary of samples collected and analyses performed.
- Narrative that identifies major and minor analysis excursions detected for each parameter evaluated for each analysis.
- Additional issues and information that may be beneficial to the data user will be discussed.
- Qualified sample result sheets.

The data validation report will be reviewed by the QAO and will include the report on the usability of the data. A separate report will be provided for the QAO's report on the results of any laboratory and field audits.

22. Reconciliation with User Requirements

Validated sample results from these investigations will be reviewed by the Project Manager. Data usability with respect to the data quality objectives and data uses will be compared to the project requirements. The parameters that will be used to assess the precision, accuracy, representativeness, comparability, and completeness are presented in Section 5 of this QAPP. In the event that the completeness objective of 95% is not achieved due to major quality control deviations in the sample analysis process, samples will be recollected at the discretion of the Project Manager.

References

American Water Works Association (AWWA), American Public Health Association (APHA) and Water Environment Federation (WEF). 1992. *Standard Methods for the Examination of Water and Wastewater*, 18th Edition. Washington, D.C.

New York State Department of Environmental Conversation (NYSDEC). 2000. *Analytical Services Protocol (ASP)*, June 2000 Revision. Albany, NY.

O'Brien & Gere Engineers, Inc. 2004. *Site Characterization Work Plan, Wheatfield, New York,* Syracuse, New York.

United States Environmental Protection Agency (USEPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* Office of Emergency and Remedial Response, Washington, D.C.

United States Environmental Protection Agency (USEPA). 1996. *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846),* Third Edition. Washington, D.C.

United States Environmental Protection Agency (USEPA). 1999. *USEPA Region II Validating Volatile Organic Compounds by SW-846 Method 8260B, SOP HW-24* Revision 1, (modified). New York, NY.

United States Environmental Protection Agency (USEPA). 2001a. *EPA Requirements For Quality Assurance Project Plans For Environmental Data Operations, Final,* EPA QA/R-5. Washington, D.C.

United States Environmental Protection Agency (USEPA). 2001b. *USEPA Region II Validating Semivolatile Organic Compounds by SW-846 Method 8270, SOP HW-22* Revision 2, (modified). New York, NY.

Table 5-1. *Sampling efforts, objectives, analyses, data uses and analytical level*

Sampling Effort	Objective	Types of Analysis	Data Uses	Analytical Level
Soil sampling	Evaluate concentration of residuals from identified disposal area following excavation of waste	VOCs and SVOCs	Support project decisions	Definitive Data
Subsurface soil sampling	Evaluate concentration of residuals from identified disposal area following excavation of waste	VOCs and SVOCs	Support project decisions	Definitive Data
Ground water sampling	Evaluate concentration of residuals from identified disposal area following excavation of waste	VOCs and SVOCs	Support project decisions	Definitive Data

Notes:
VOCs indicates volatile organic compounds
SVOCs indicates semivolatile organic compounds

Table 5-2. *Analytical methods*

Sample type	Parameter	Analytical method	Reference
Ground water	VOCs	USEPA Method 5030B/8260B	1
Soils, Subsurface soil	VOCs	USEPA Method 5035/8260B	1
Ground water	SVOCs	USEPA Method 3510C/3520C/8270C	1
Soils, Subsurface soil	SVOCs	USEPA Method 3541/3550B/8270C	1
Soils, Subsurface soil	Percent solids	SM 2540G	2

Notes:

VOCs indicates volatile organic compounds
SVOCs indicates semivolatile organic compounds

1. USEPA. 1996. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846,* 3rd Edition. Washington, D.C.
2. APHA, AWWA, WPCF. 1992. *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, Washington, D.C.

Source: O'Brien & Gere Engineers, Inc.

Table 5-3. *Field sampling summary*

Parameter (method)	Matrix	Sample containers and volumes	Preservation	Holding times*	Number of Investigative Samples	QC sample frequency			
						Field duplicate	Trip blank	MS/MSD /Spike Duplicate**	Equipment blank***
VOCs (USEPA Method 5030B/8260B)[1]	Ground water	3-40 milliliter glass vials with Teflon® lined septum caps	4°C FC 1:1 HCL	14 days from collection for preserved samples 7 days for unpreserved samples	4	One per 20 samples or one per matrix (for less than 20 samples)	1 ea. per cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 20 samples or one per matrix (for less than 20 samples), per sampling event
VOCs (USEPA Method 5035/8260B)[1]	Soil / subsurface soil	125 mm wide mouth glass container sealed with Teflon® lined lid or Encore sampler (in accordance with USEPA Method 5035). 5-10 grams sample volume required.	4°C	Analysis within 14 days from collection. For Encore sampler, transferred to soil container within 48 hours from collection. Analysis within 14 days from collection. If not transferred to soil container then 48 hours from collection.	32	One per 20 samples or one per matrix (for less than 20 samples)	1 ea. per cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 20 samples or one per matrix (for less than 20 samples), per sampling event

Table 5-3. *Field sampling summary*

Parameter (method)	Matrix	Sample containers and volumes	Preservation	Holding times*	Number of Investigative Samples	QC sample frequency			
						Field duplicate	Trip blank	MS/MSD /Spike Duplicate**	Equipment blank***
SVOCs (USEPA Method 3510C/3520C/8270C)[1]	Ground water	1-one liter amber glass container with Teflon® lined screw caps 1000 milliliters sample volume required.	4°C	7 days from collection to extraction; 40 days from extraction to analysis	4	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 20 samples or one per matrix (for less than 20 samples), per sampling event
SVOCs (USEPA Method 3541/3550B/8270C)[1]	Soil / subsurface soil	250 milliliter wide mouth glass container with Teflon® lined lid 100 grams sample volume required.	4°C	14 days from collection to extraction; 40 days from extraction to analysis	32	One per 20 samples or one per matrix (for less than 20 samples)	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 20 samples or one per matrix (for less than 20 samples), per sampling event

Table 5-3. *Field sampling summary*

NOTES:
* Indicates holding times from collection to analysis unless noted otherwise.
**MS/MSD indicates matrix spike/matrix spike duplicate sample for organic analyses. Spike duplicate may be performed for inorganic analyses.
*** Field/equipment blank is required at a frequency of one per 20 samples or one per day if less than 20 samples are collected for each matrix type. Equipment blank is not required if disposable equipment is used.

1. USEPA. 1996. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846,* 3rd Edition. Washington D.C.
2. APHA, AWWA, WPCF. 1992. *Standard Methods for the Examination of Water and Wastewater*, 18th Edition, Washington, D.C.

FC indicates that if free chlorine is present in samples, it must be removed by the appropriate addition of $Na_2S_2O_3$ or ascorbic acid
OA indicates that if oxidizing agents are present, add 5 ml 0.1N $NaAsO_2$ per liter and 0.6g of ascorbic acid per liter.
VOCs indicates volatile organic compounds.
SVOCs indicates semivolatile organic compounds.
NA indicates not applicable.

A temperature blank will be submitted with each sample cooler.

Source: O'Brien & Gere Engineers, Inc.

Table 5-4. *Laboratory MDLs and PQLs for volatile organic compounds by USEPA Method 8260B.*

Parameter	Water MDL (µg/L)*	Water PQL (µg/L)	Low Soil MDL (µg/kg), wet weight	Low Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
Chloromethane	0.03	1	0.2	5	500
Bromomethane	0.1	1	0.2	5	500
Vinyl chloride	0.03	1	0.2	5	500
Chloroethane	0.08	1	0.2	5	500
Methylene chloride	0.09	2	0.4	5	500
Acetone	0.2	10	2	10	1000
Carbon disulfide	0.03	0.5	0.4	2.5	250
1,1-Dichloroethene	0.02	0.5	0.1	2.5	250
1,1-Dichloroethane	0.02	0.5	0.09	2.5	250
cis-1,2-Dichloroethene	0.04	0.5	0.08	2.5	250
trans-1,2-Dichloroethene	0.04	0.5	0.08	2.5	250
Chloroform	0.02	0.5	0.08	2.5	250
1,2-Dichloroethane	0.02	0.5	0.1	2.5	250
2-Butanone (Methyl ethyl ketone)	0.7	10	0.6	10	1000
1,1,1-Trichloroethane	0.04	0.5	0.09	2.5	250
Carbon tetrachloride	0.03	0.5	0.1	2.5	250
Bromodichloromethane	0.02	0.5	0.2	2.5	250
1,2-Dichloropropane	0.05	0.5	0.3	2.5	250
cis-1,3-Dichloropropene	0.03	0.5	0.09	2.5	250
Trichloroethene	0.03	0.5	0.1	2.5	250
Dibromochloromethane	0.02	0.5	0.1	2.5	250

Table 5-4. *Laboratory MDLs and PQLs for volatile organic compounds by USEPA Method 8260B.*

Parameter	Water MDL (µg/L)*	Water PQL (µg/L)	Low Soil MDL (µg/kg), wet weight	Low Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
1,1,2-Trichloroethane	0.04	0.5	0.2	2.5	250
Benzene	0.02	0.5	0.08	2.5	250
trans-1,3-Dichloropropene	0.03	0.5	0.1	2.5	250
Bromoform	0.1	0.5	0.2	2.5	250
4-Methyl-2-pentanone (Methyl isobutyl ketone)	1	5	0.5	5	500
2-Hexanone	0.4	5	0.5	5	500
Tetrachloroethene	0.05	0.5	0.1	2.5	250
Toluene	0.02	0.5	0.2	2.5	250
1,1,2,2-Tetrachloroethane	0.05	0.5	0.2	2.5	250
Chlorobenzene	0.02	0.5	0.07	2.5	250
Ethylbenzene	0.03	0.5	0.08	2.5	250
Styrene	0.02	0.5	0.07	2.5	250
Xylene (total)	0.04	0.5	0.2	2.5	250

Notes:
MDL indicates method detection limit.
PQL indicates practical quantitation limit

Reference for MDLs and PQLs: O'Brien & Gere Laboratories, Inc.

Table 5-5. *Laboratory MDLs and PQLs for semivolatile organic compounds by USEPA Method 8270C.*

Parameter	Water MDL (µg/L)	Water PQL (µg/L)	Low Level Soil MDL (µg/kg), wet weight	Low Level Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
Phenol	0.1	10	2.7	330	10000
Bis(2-chloroethyl)ether	0.08	10	2.3	330	10000
2-Chlorophenol	0.08	10	4.9	330	10000
1,3-Dichlorobenzene	0.07	10	2.8	330	10000
1,4-Dichlorobenzene	0.08	10	2.7	330	10000
1,2-Dichlorobenzene	0.06	10	1.8	330	10000
2-Methylphenol	0.07	10	2.6	330	10000
Bis(2-chloroisopropyl)ether	0.04	10	2.6	330	10000
4-Methylphenol	0.06	10	2.4	330	10000
N-Nitroso-di-n-propylamine	0.07	10	3.6	330	10000
Hexachloroethane	0.2	10	7.8	330	10000
Nitrobenzene	0.2	10	6.5	330	10000
Isophorone	0.05	10	2.3	330	10000
2-Nitrophenol	0.08	10	3.7	330	10000
2,4-Dimethyl phenol	0.09	10	4.2	330	10000
Bis(2-chloroethoxy) methane	0.07	10	2.8	330	10000
2,4-Dichlorophenol	0.08	10	3.3	330	10000
1,2,4-Trichlorobenzene	0.1	10	3.2	330	10000
Naphthalene	0.07	10	1.4	330	10000
4-Chloroaniline	0.07	10	4.5	330	10000
Hexachlorobutadiene	0.1	10	3.9	330	10000

Table 5-5. *Laboratory MDLs and PQLs for semivolatile organic compounds by USEPA Method 8270C.*

Parameter	Water MDL (µg/L)	Water PQL (µg/L)	Low Level Soil MDL (µg/kg), wet weight	Low Level Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
4-Chloro-3-methylphenol	0.09	10	3.0	330	10000
2-Methylnaphthalene	0.07	10	1.5	330	10000
Hexachlorocyclopentadiene	2	10	20	330	10000
2,4,6-Trichlorophenol	0.08	10	3.0	330	10000
2,4,5-Trichlorophenol	0.1	50	18	1600	48000
2-Chloronaphthalene	0.1	10	2.0	330	10000
2-Nitroaniline	0.1	50	5.2	1600	48000
Dimethyl phthalate	0.08	10	2.2	330	10000
Acenaphthylene	0.07	10	1.0	330	10000
2,6-Dinitrotoluene	0.08	10	3.3	330	10000
3-Nitroaniline	0.1	50	10	1600	48000
Acenaphthene	0.08	10	2.6	330	10000
2,4-Dinitrophenol	0.6	50	75	1600	48000
4-Nitrophenol	0.3	50	8.0	1600	48000
Dibenzofuran	0.06	10	1.3	330	10000
2,4-Dinitrotoluene	0.07	10	3.6	330	10000
Diethylphthalate	0.08	10	2.1	330	10000
4-Chlorophenyl-phenyl ether	0.06	10	3.6	330	10000
Fluorene	0.07	10	1.9	330	10000
4-Nitroaniline	0.1	50	6.5	1600	48000
4,6-Dinitro-2-methylphenol	0.9	50	46	1600	48000
N-Nitrosodiphenylamine	0.2	10	1.9	330	10000

Table 5-5. *Laboratory MDLs and PQLs for semivolatile organic compounds by USEPA Method 8270C.*

Parameter	Water MDL (µg/L)	Water PQL (µg/L)	Low Level Soil MDL (µg/kg), wet weight	Low Level Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
4-Bromophenyl-phenyl ether	0.06	10	2.9	330	10000
Hexachlorobenzene	0.1	10	3.4	330	10000
Pentachlorophenol	0.3	50	130	1600	48000
Phenanthrene	0.05	10	2.5	330	10000
Anthracene	0.04	10	1.8	330	10000
Carbazole	0.05	10	1.3	330	10000
Di-n-butyl phthalate	0.2	10	4.2	330	10000
Fluoranthene	0.04	10	1.7	330	10000
Pyrene	0.04	10	1.9	330	10000
Butylbenzylphthalate	0.07	10	5.2	330	10000
3,3-Dichlorobenzidine	0.07	20	7.1	660	20000
Benzo(a)anthracene	0.06	10	2.2	330	10000
Chrysene	0.07	10	1.9	330	10000
Bis(2-ethylhexyl)phthalate	0.6	10	13	330	10000
Di-n-octylphthalate	0.1	10	4.3	330	10000
Benzo(b)fluoranthene	0.07	10	3.4	330	10000
Benzo(k)fluoranthene	0.05	10	3.2	330	10000
Benzo(a)pyrene	0.07	10	2.5	330	10000
Indeno(1,2,3-cd)pyrene	0.05	10	2.8	330	10000
Dibenz(a,h)anthracene	0.08	10	4.4	330	10000
Benzo(g,h,i)perylene	0.07	10	3.5	330	10000
Aniline	0.06	10	4.1	330	10000

Table 5-5. *Laboratory MDLs and PQLs for semivolatile organic compounds by USEPA Method 8270C.*

Parameter	Water MDL (µg/L)	Water PQL (µg/L)	Low Level Soil MDL (µg/kg), wet weight	Low Level Soil PQL (µg/kg), wet weight	Medium Level Soil PQL (µg/kg), wet weight
Diphenylamine	TBD	10	TBD	330	10000
2-Mercaptobenzothiazole	TBD	10	TBD	330	10000
Benzothiazole	TBD	10	TBD	330	10000
Phenothiazine	TBD	10	TBD	330	10000

Notes:
MDL indicates method detection limit.
PQL indicates practical quantitation limit.
TBD indicates that the method detection limit will be determined at a future date.

Reference for MDLs and PQLs: O'Brien & Gere Laboratories, Inc.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be extracted and analyzed within holding time.	VOCs: Analyze within 14 days from collection for preserved aqueous and solids; 7 days for unpreserved aqueous.	1. If holding times are exceeded for initial or any reanalyses required due to quality control (QC) excursions, notify Quality Assurance Officer (QAO) immediately since resampling may be required. 2. Document corrective action in the case narrative.
MS Tuning	Once every 12 hours prior to initial calibration and calibration verifications.	1. Bromofluorobenzene (BFB) key ions and abundance criteria listed in the method must be met for all 9 ions and analyses must be performed within 12 hours of injection of the BFB. 2. Part of the BFB peak will not be background subtracted to meet tune criteria. 3. Documentation of all bromofluorobenzene analyses and evaluation must be included in the data packages.	1. Tune the mass spectrometer. 2. Document corrective action in the case narrative - samples cannot be analyzed until control limit criteria have been met.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Initial Calibration	Prior to sample analysis and when calibration verifications criteria are not met. Initial calibration will contain all target analytes in each standard.	1. Five concentrations bracketing expected concentration range for all compounds of interest; one std must be at the PQL. It is recommended that a separate standard at the MDL level be analyzed after calibration is complete to check sensitivity. 2. Calibration Check Compounds (CCC) ≤ 30% RSD. 3. System performance check compound (SPCC) relative response factor (RRF) as listed in method, non-SPCC ≥ 0.050 response factor except for ketones and 2-chloroethyl vinyl ether with allowable response factor ≥ 0.010. 4. For compound with %RSD >15, quantitation must be performed using a separate calibration curve and the Coefficient of Determination (COD) must be ≥ 0.990.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action in the case narrative - samples cannot be analyzed until calibration control limit criteria are met. Contact QAO to discuss problem target analytes before proceeding with analysis.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Calibration Verification	Every 12 hours, following BFB. The calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	1. Within method specified criteria, and percent drift or percent difference (%D) ≤ 20 for CCC, ≤ 50% D for remaining compounds, SPCC RRF same as listed in initial calibration. 2. The internal standards areas and retention times must meet the method criteria.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action in the case narrative – samples cannot be analyzed until calibration control limit criteria are met.
Preparation Blank Analysis	Every 12 hours, following calibration verification	Common laboratory contaminants (methylene chloride, acetone) less than 3 x PQL; anything else less than PQL. PQLs will be provided along with the preparation blank results.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples if detected for same compounds as in blank. 3. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria have been met.
Field / Equipment Blank Analysis	Collected one per sampling equipment and after every 20 samples.	Common laboratory contaminants less than 3 x PQL; anything else less than PQL.	1. Investigate problem. 2. Document in the case narrative.
Trip Blank	1 per cooler containing VOC samples.	Common laboratory contaminants less than 3 x PQL; anything else less than PQL.	1. Investigate problem. 2. Document in the case narrative.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Laboratory Control Sample Analysis	Each analytical batch (every 12 hours). Prepared independently from calibration standards. Spike must contain all target analytes and should be at a concentration, which is in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, corrective action is not required. 2. If recovery failures are below control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.
Internal Standards	All samples and blanks (including MS/MSD)	1. Response -50% - +100% of internal standards from continuing calibration of the day. 2. Retention time must be ± 30 sec. from associated calibration verification standard of that sequence.	1. Reanalyze. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative. Special Circumstances: If matrix interferences is present (as demonstrated by the lab and documented in the case narrative): 1. Reanalyze (may be at a higher dilution) 2. If internal standard is >10%, report both runs. 3. If internal standard is <10%, report both runs.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Surrogate Spike	All samples and blanks (including MS/MSD)	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze any environmental or QC sample with surrogates that exceed control limits. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative. Special Circumstances: If matrix interference is present (as demonstrated by the lab and documented in the case narrative): 1. Reanalyze (may be at a higher dilution) 2. If surrogate recovery is >10%, report both runs. 3. If surrogate recovery is <10%, report both runs.
Matrix Spike/ Matrix Spike Duplicate (MS/MSD) Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. Spike must contain complete list of target analytes. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if <10%. 2. If reanalysis is still <10%, report both analyses and document in the case narrative. 3. If >10% and LCS criteria are met, document in case narrative; no additional corrective action required. 4. If LCS criteria are exceeded also, examine other QC data for source of problem; *i.e.,* surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. Re-extract or reanalyze samples and associated MS/MSD and LCSs as required. 5. Document corrective action in the case narrative

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Field Dup. Analysis	Collected 1 per matrix; every 20 samples of similar matrix	50% RPD for waters and 100% RPD for solids. For sample results that are less than or equal to five times the PQL, the criterion of plus or minus two times the PQL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.
Tentatively Identified Compound	If required, perform for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable
Dilutions	1. When target analyte concentration exceeds upper limit of calibration curve. 2. When matrix interference is demonstrated by the lab and documented in the case narrative (highly viscous samples or a large number of nontarget peaks on the chromatogram). 3. A reagent blank will be analyzed if an analyte saturates the detector or if highly concentrated analytes are detected. 4. Laboratory will note in the data deliverables which analytical runs were reported.	1. The reagent blank will meet the method blank criteria.	1. Reanalyze reagent blank until method blank criteria are met. 2. Document corrective action in the case narrative.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
pH Determination	Once sample aliquot is taken from the VOC vial, the pH of water samples must be determined.	Record pH and report in the case narrative.	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Laboratory control limits	1. Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
Percent solids	For soil/sediment samples, the percent solids will be determined and sample results will be corrected for percent solids.	Not applicable	Not applicable

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Deliverables	1. CLP-like deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures and any observations of bubbles in sample containers will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.

Table 12-1. *Volatile organic compounds using USEPA Method 8260B Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Method and QAPP requirements	The laboratory will perform the method as presented in this QAPP and will adhere to the QAPP requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QAPP in the data package case narrative.	Not applicable	Not applicable

Notes:
Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QAPP.
Communications with the QAO will be documented and included in the data packages.
Source: O'Brien & Gere Engineers, Inc.

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be extracted and analyzed within holding time.	SVOCs: Extract within 7 days for aqueous and 14 days for soil samples from collection. Analyze extracts within 40 days of extraction.	If holding times are exceeded for initial or any reanalyses required due to QC excursions, notify the QAO immediately since resampling may be required.
MS Tuning	Once every 12 hours prior to initial calibration and calibration verification.	1. DFTPP key ions and abundance criteria listed in the method must be met for all 13 ions and analyses must be performed within 12 hours of injection of the DFTPP. 2. Part of the DFTPP peak will not be background subtracted to meet tune criteria. 3. Documentation of all DFTPP analyses and evaluations must be included in the data packages.	1. Tune the mass spectrometer. 2. Document corrective action in the case narrative - samples cannot be analyzed until control limit criteria have been met.
Initial Calibration	Prior to sample analysis and when calibration verification criteria are not met. Initial calibration will contain all target analytes in each standard.	1. Five concentrations bracketing expected concentration range for all compounds of interest; one standard must be near the PQL. It is recommended that a separate standard at the MDL level be analyzed after calibration is complete to check sensitivity. 2. CCC must meet method RSD. 3. SPCC RRF factor as listed in method, non-SPCC ≥ 0.050 response factor. 4. For compounds with %RSD >15, quantification must be performed using a separate calibration curve and the COD must be ≥ 0.990.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action in the case narrative - samples cannot be analyzed until calibration control limit criteria are met. Contact QAO to discuss problem target analytes before proceeding with analysis.

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Calibration Verification	Every 12 hours, following DFTPP. Calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	1. Within method specified criteria, percent drift or percent difference (%D) ≤ 20 for CCC and ≤ 50 %D for remaining compounds, SPCC response factor as listed in method, non-SPCC ≥ 0.050. 2. The internal standards areas and retention times must meet the method criteria.	1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action in the case narrative - samples cannot be analyzed until calibration control limit criteria are met.
Preparation Blank Analysis	Prepared with each extraction batch of no more than 20 analytical samples.	1. Common laboratory contaminants (phthalate) less than 3 x PQL, anything else less than PQL. 2. PQLs will be provided along with the preparation blank results.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system and re-extract and reanalyze all samples if detected for same compounds as in the blank. 3. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria have been met.
Field / Equipment Blank Analysis	Collected one per sampling equipment and after every 20 samples.	Common laboratory contaminants less than 3 x PQL; anything else less than PQL.	1. Investigate problem. 2. Document in the case narrative.
Laboratory Control Sample Analysis	Prepared with each extraction batch, of no more than 20 analytical samples. Prepared independently from calibration standards. Spike must contain all target compounds and should be at a concentration that is approximately in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. For compounds without established laboratory control limits, 70 to 130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, no corrective action is required. 2. If recovery failures are below the control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Internal Standards	All samples and blanks (including MS/MSD).	1. Response -50% - +100% of the internal standards from the continuing cal of the day. 2. Retention time must be ± 30 sec. from calibration verification of that sequence.	1. Reanalyze. 2. If recovery is still outside criteria, report both analyses. 3. Document corrective action in the case narrative. Special Circumstances: If matrix interferences is present (as demonstrated by the lab and documented in the case narrative): 1. Reanalyze (may be at a higher dilution) 2. If internal standard is >10%, report both runs 3. If internal standard is <10%, report both runs.
Surrogate Spike	All samples and blanks (including MS/MSD).	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if more than 1 AE or 1 BN fails, or if any one surrogate %R is < 10%. 2. If recovery is still outside control limits and if the recovery is <10%, re-extract if still in holding time. 3. If recovery is still outside control limits, and if recovery is >10%, report both analyses. 4. Document corrective action in the case narrative. Special Circumstances: If matrix interference is present (as demonstrated by the lab and documented in the case narrative): 1. Reanalyze (may be at a higher dilution) 2. If surrogate recovery is >10%, report both runs. 3. If surrogate recovery is <10%, report both runs.

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Matrix Spike/ Matrix Spike Duplicate (MS/MSD) Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater. Spike must contain all target analytes.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze if <10%. 2. If reanalysis is still < 10%, report both analyses and document in the case narrative. 3. If >10%, and LCS criteria are met, document in the case narrative. 4. If LCS criteria are exceeded also, examine other QC data for source of problem; i.e. surrogate recoveries for extraction efficiency and calibration data for instrument performance issues; re-extract or reanalyze samples and associated MS/MSD and LCSs as required.
Field Dup. Analysis	Collected 1 per matrix; every 20 samples of similar matrix.	50% RPD for waters and 100% RPD for solids. For sample results that are less than or equal to five times the PQL, the criterion of plus or minus two times the PQL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.
Cleanup	Gel permeation chromatography (GPC) must be performed for all soils or water extracts with high molecular weight contaminants.	Calibrate according to method. Criteria must be met as listed in method for calibration and blank analysis.	Clean GPC column or replace.
Tentatively Identified Compounds	If required, for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. When matrix interference demonstrated by lab and documented in the case narrative (highly viscous samples or a large number of nontarget peaks on the chromatogram). 3. Samples should be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 4. Laboratory will note in the data deliverables which analytical runs were reported.	1. The reagent blank will meet the method blank criteria.	1. Reanalyze reagent blank until method blank criteria are met.

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Laboratory control limits	1. Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable
Percent solids	For soil/sediment samples, the percent solids will be determined and sample results will be corrected for percent solids.	Not applicable	Not applicable

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Deliverables	1. CLP-like deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QAPP requirements	The laboratory will perform the method as presented in this QAPP and will adhere to the QAPP requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QAPP in the data package case narrative.	Not applicable	Not applicable

Table 12-2. *Semivolatile organic compounds using USEPA Method 8270C Quality Control Requirements and Corrective Actions.*

Audit	Frequency	Control Limits	Corrective Action
Notes: Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QAPP. Communications with the QAO will be documented and included in the data packages. Source: O'Brien & Gere Engineers, Inc.			

Figure 1. ***Example chain-of-custody***

Project Name:_____
Project No. _____Sheet ____ of ___

Office: _____

Address:_____

Phone: _____

CHAIN OF CUSTODY

Cooler Temperature _____

CLIENT: LOCATION:			COLLECTED BY: (Signature)			
SAMPLE DESCRIPTION/LOCATION	Date	Time	Sample Matrix[1]	Sample Type[2]	No. of Containers	NALYSIS REQUESTED/COMMENTS[3]

[1] Matrix = Soil [2]Type = grab, composite [3] SVOC - 8270C

Relinquished by:_____ of:_____	Date	Time	Received by:_____ of:_____	Date	Time
Relinquished by:_____ of:_____	Date	Time	Received by:_____ of:_____	Date	Time
Use this space if shipped via courier (e.g., Fed Ex) Relinquished by:_____ of:_____	Date	Time	Courier Name and Airbill Number:_____ ***Attach delivery/courier receipt to Chain of Custody**	Date	Time
Relinquished by:_____ of:_____	Date	Time	Received by:_____ of:_____	Date	Time

Laboratory Quality Assurance Manual

Quality Assurance Program

Analytical Services
Quality Assurance/Quality Control
Description of Policy and Programs

Effective August 2004

O'BRIEN & GERE
LABORATORIES, INC.

O'Brien & Gere Laboratories, Inc.

Quality Assurance Program

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Manual Version:	Revision #10
Effective Date:	August 2004
Approved:	

Michael N. Petterelli
Vice President/Laboratory Director

Anthony Crescenzi
QA/QC Supervisor

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1. Statement of Policy

O'Brien & Gere Laboratories, Inc. (Laboratories) is located in the corporate headquarters of O'Brien & Gere Limited in Syracuse, New York. The firm is engaged in the chemical and radiological analysis of contaminants in a variety of matrices. The ability of the laboratory to accurately identify and quantify these contaminants is important. The decisions or conclusions based on these data are only as good as the documented quality of the data. The purpose of this Quality Assurance Program (QAP) is to describe the procedures used to verify the high quality of the data. This QAP is designed to satisfy the applicable requirements of several state and federal regulatory agencies, NELAP, ANSI/ASQC E-4 and applicable DOD Quality Systems standards.

O'Brien & Gere Laboratories management is committed to fully supporting the policies and procedures described and required by this QAP. Management acknowledges and is committed to having a managerial staff with the authority and resources to facilitate the production of analytical data of documented quality. Management shall provide the facilities, training and time necessary for employees to complete required tasks. Employees are responsible for performing work for clients in the most efficient manner possible, avoiding waste of resources. It is also the responsibility of the employees to proactively communicate to the appropriate member of management when unsafe or poor quality work practices exist. Management is responsible for investigating each allegation. It is against O'Brien & Gere Laboratories policy to improperly manipulate or falsify data. Any employee who knowingly manipulates and/or falsifies data or documents is subject to immediate release from employment.

O'Brien & Gere Laboratories' clients are served with impartiality and integrity. O'Brien & Gere Laboratories also recognizes that all employees of O'Brien & Gere Laboratories may be exposed to client's privileged information and materials. All O'Brien & Gere Laboratories' employees sign a pledge of confidentiality and are expected to uphold O'Brien & Gere's Data Integrity Program of October 14, 2002.

The laboratory is a subcontracted service providing analytical support for a number of different public and private clients. We have requirements placed upon us ranging from how we receive samples, documentation to verify results, how we order supplies and tracking of samples and activities of people. Our facility must be accessible both to our current clients and future clients. Therefore, a policy has been developed to address the security of our facility. There are three means of access to the facility, the front door, an emergency exit at the end of the main hallway and the loading dock area. The exit door and loading dock door and overhead door are locked at all times. The front door is unlocked during normal business hours 7:00 AM to 5:30 PM, Monday through Friday. Any individual not employed with O'Brien and Gere Laboratories or its affiliates entering the facility must be accompanied by an employee of the Firm. Visitors to the Laboratory must check in with the receptionist and sign the logbook. It is the responsibility of each employee to question anyone unfamiliar as to their reason for being in the facility. From time to time we will receive deliveries in the loading dock area. Vendors have left the door opened after delivery of supplies. When an employee finds the exit door or overhead door in the loading dock area opened, they are responsible to close and lock them to maintain security throughout the building. If a client or visitor to the facility requests access, the employee satisfying the request must remain with the respective individual until their task is complete and they have left the facility. If any visitor is uncooperative, notification will be made to their immediate supervisor, the Vice President or President in that order.

2. Organizational Chart

Figure 2-1 is an organization chart of the laboratory staff.

2.1 Organization and Responsibility

Any organization consists of a number of people whose skill and responsibilities determine the quality of the final product. The product of Laboratories is analytical services. The laboratory functions as a qualitative and quantitative laboratory only. Personnel have sufficient training in their appointed positions to contribute to the analysis and reporting of high quality data. The training is achieved through formal education, selected specialty courses, internal classes, or on-the-job training.

The laboratory functions in two distinct operations, Administrative and Production. Administrative includes sales, marketing, QA/QC and project management with all units reporting to the Administrative Officer. All production sections report to the Production Officer or designee. Quarterly meetings occur between QA/QC and the Administrative Officer. These meetings focus on operational issues; federal, state and client requirements; internal and external audits; and data quality issues including trending. The minutes of this meeting are summarized in writing and serve as a "QA Report to Management." The QA Report to Management is distributed to all officers and supervisors.

.The Officer and supervisors meet weekly to discuss customer expectations, the progress of in-house programs, prospective opportunities, current and anticipated workload, resource allocation, safety, and QA/QC related issues. The QA/QC agenda item for this weekly meeting addresses proficiency evaluations, SOP and MDL requirements, internal and external audit responses, project specific QA/QC requirements, and general comments related to QA/QC. The agenda for the weekly meeting is distributed to all employees. This serves as an additional tool (and transfer of information) to communicate the issues itemized above to all employees. This agenda can be used to confirm the delivery schedule, data deliverables, QA levels, and project specific requirements that are incorporated onto an individuals' work list. It is through these meeting and discussions that we resolve problems with candor and mutual confidence. This process also allows laboratory personnel to be free from undue pressures that could adversely affect the quality of their work.

Officers' responsibilities include the development and monitoring of the internal systems necessary to assure quality of the analytical data. Their duties include the planning necessary to support method development and for the acquisition of personnel and instrumentation.

Section Leaders responsibilities include the monitoring of daily workloads and the redirection of laboratory resources to complete project deadlines. They help coordinate the distribution of the project information and manage the day-to-day scheduling and operation of their analytical areas. They report to the Production Officer. Their responsibilities include verification that analyses are conducted within method/contract holding times and implementation of corrective action procedures recommended by the QA/QC Supervisor. The Section Leaders work daily with the QA/QC Supervisor to keep the quality control procedures accurate and up-to-date. Together the Section Leaders and the QA/QC Supervisor work on revisions of procedures. In addition, Section Leaders coordinate with the Project Supervisor to answer any questions related to the analytical requirements of the projects.

Project Supervisors are responsible for monitoring individual projects and communicating project specific QC. They handle client contact from proposal preparation through product

3. Personnel Training and Qualifications

Laboratories training program was developed to enable laboratory personnel to perform their assigned responsibilities in a manner that contributes to the analysis and reporting of high quality data.

3.1 Qualifications

Many positions in the lab require some level of experience or knowledge through the acquisition of either a high school or college degree. Depending on the position, a high school degree may be sufficient or someone with an advanced degree in chemistry or a scientific/engineering discipline (masters or doctorate) may be desired.

3.2 Training

Training is performed in accordance with SOP AP #800-05 "Training".

3.3 Documentation

The QA/QC section maintains a training file for every employee. This file will include copies of the employee's internal resume, transcript and diploma, any certificates from outside training classes, the SOP reading record (Figure 3-1), the training and proficiency record (Figure 3-2), Demonstration of Capability forms (Figure 3-3) and Record of Continuing Demonstration of Capability. All employees are responsible for keeping training records up to date. The file is accessible to employees for this purpose.

The file will be reviewed on a routine basis. QA/QC will review the file as part of the internal section audit process. Management may review the file as they deem necessary.

3.4 Retraining, Upgrades and Continuing Demonstration of Capability

Employees will undergo retraining annually or more frequently if it is determined to be necessary as evidenced by a failing result on a proficiency sample or repeated failures on a laboratory control sample. Retraining may consist of reviewing the processes and techniques with the analyst. The purpose of retraining is to determine that the analyst is following details of procedures and understands the procedure accurately.

Employees must demonstrate continuing capability on an annual basis. Documentation of this requirement will be placed in the Training and Proficiency Record (Figure 3-2) and serve as the Continuing Demonstration of Capability. Another facet of retraining will consist of all employees reading appropriate, revised SOPs and updating their SOP Reading Record (Figure 3-1).

Management is committed to providing the resources (*i.e.* external training classes, software and reference materials) necessary for initial training and training upgrades that are required to maintain analyst proficiency.

Figure 3-2

Training and Proficiency Record

Name: _____

Procedure (Method/AP #)	**QA/QC Check*/ Supervisor Comments**	**Employee** Initials/Date	**Supervisor** Initials/Date

* Attach results of QC Check. A QC Check can be an LCS, single blind or double blind proficiency.
c:\wpwin60\wpdocs\training\train.wpd

4. QA Limits for Precision and Accuracy

O'Brien & Gere Laboratories utilizes statistical, method, and client limits. If sufficient data does not exist for the determination of statistical limits, method based limits or standard default limits are used. The accuracy and precision limits listed in the tables are derived from in-house data. Sufficient points for some parameters may not be available at the time the limits are set due to the laboratory having analyzed only a reduced number of samples for a particular parameter. For these parameters, either the limits have been set based on previous lab experience or are derived from the applicable method. As more points are added to the database, the laboratory limits for these parameters will be established. The QA/QC Supervisor is responsible for updating the QA/QC limits in the laboratory's LIMS system. Limits are updated annually, at a minimum.

Laboratory control limits are included to give an indication of the laboratory capabilities. Method control limits, when required, will be used if they are more stringent than the laboratory limits. Limits included in the table may not be the most up-to-date limits since they are continually being updated. Laboratory SOP: AP # 800-10 "Generating Control Limits" explains the generation and updating of control limits. The most recent control limits are available from the QA/QC Supervisor.

Contract, method or QAPP specific control limits and requirements may take precedence over laboratory control limits. Section Leaders and Project Supervisors are responsible for reviewing proposed Contract/QAPP control limits and determining if the laboratory is capable of achieving these limits. The Project Supervisors are responsible for notifying clients if the Contract/QAPP control limits are not achievable. The QA/QC Supervisor is responsible for the input and review of Contract/QAPP control limits into the LIMS system.

Practical quantitation limits (PQLs) and methods used in the laboratory are included in Appendix A. PQLs are the minimum quantities routinely reported by Laboratories. PQLs are listed for guidance only. The required limits vary depending upon the governing regulation and matrix. Lower detection limits may be achieved and are available upon request. Method Detection Limit (MDL) and Instrument Detection Limit (IDL) studies are available from the laboratory.

Completeness may be described as a measure of the actual amount of usable data obtained from an analytical procedure to the expected amount. The goal of Laboratories' QA/QC program is to maintain a 90% completeness rate as defined in QAPP preparation guidelines.

5. Sample Receipt and Chain of Custody

A critical concern in any project, especially those where large numbers of samples and analyses are required, is the timely maintenance of sample integrity. A sample is physical evidence of a situation at a specific place and time. Therefore, an essential part of sampling projects is proper collection and handling of the samples. Representative samples are collected through well-defined protocols. The client performs most of the sampling and thus assumes responsibility for properly obtaining, handling, and shipping the sample. Laboratories provides sampling kits to the client upon request. These sampling kits contain sufficient packing material, instructions, site ID labels, sample containers properly labeled with preservative (if required), and chain-of-custody forms. Laboratory Standard Operating Procedure (SOP), AP #800-15 "Sample Management System," describes sample receipt and sample management procedures.

5.4 Chain of Custody Procedures

The laboratory follows a strict chain of custody procedure. This procedure creates an accurate and legally defensible document that can be used to trace possession of a sample from its collection through analysis and final disposal. The chain of custody form is signed by handlers of the sample. An example of a chain of custody is included as Figure 5-1. Chain of custody procedures are outlined in laboratory SOP: AP #800-15 "Sample Management System".

A sample is considered in custody if it is:

- In actual physical possession
- In view after being in physical possession
- In a locked repository
- In a secure, restricted area

During non-business hours, the storage cooler is locked, and the lab is monitored by professional security. The delivery and receipt of samples during non-business hours is addressed in laboratory SOP: AP #800-15 "Sample Management System".

Formal custody begins with the shipment of pre-cleaned, properly preserved containers. The client contacts a Project Supervisor for sample bottles, and the Project Supervisor submits to the sample custodian a form requesting the proper containers. After the request is completed and signed, the form is filed in a binder and kept in the sample receiving room for future reference.

Chain of custody forms are shipped with sample bottles. The field sampler/client is responsible for filling in the sample location, date and time sampled, sample matrix, and analysis required on the chain of custody. The field sampler signs the chain of custody when relinquishing custody and includes the form with the sample containers. Any comments that the sampler has are also listed on the chain of custody form. The field sampler is also responsible for filling in the sample labels that are provided with every shipment.

If required by the project, evidence tape can be applied to each sample container in the field. At a minimum, the cooler should be sealed with evidence tape or custody seal prior to shipping to the lab.

For CLP analyses, sample custody and handling are performed as required by NYSDEC and U.S. EPA CLP protocol.

5.5 Control of Incoming Samples

Laboratories employs sample custodian(s) who are responsible for verifying the receipt of samples. Sample acceptance criteria are outlined in laboratory SOP: AP #800-15 "Sample Management System". When samples are received, a sample custodian follows the general steps outlined below.

5.6 Scheduling

The purpose of scheduling is to notify appropriate personnel of the arrival of a sample; the tests to be performed; QC levels; deliverables; and expected delivery dates.

Analyses are scheduled on the LIMS by the sample custodians. A work schedule is printed every morning listing sample numbers, tests required, due dates, days left until the holding time expires, and location of a sample in storage. The analysts use the work schedule to identify what samples they are required to analyze and if there are any project specific requirements for the samples. The section leaders review the work schedule with the analysts to confirm that these priorities and holding times are being met and monitor that all questions have been answered.

5.7 Sample Tracking

Our tracking system relies on project numbers and sample numbers. Samples (including individual containers) are primarily tracked using the laboratory sample numbers. Project status is tracked using project numbers and sample numbers. The status of samples and projects can be obtained by utilizing the LIMS system. Laboratory SOP: AP #800-16 "Sample Tracking System" outlines the sample tracking system.

5.8 Storage and Disposal

All non-volatile water and solid samples are stored in a locked, walk-in cooler away from potentially contaminating sources (standards and reagents). Separate refrigerators are used for samples requiring volatile analysis. Air and biological samples are stored in a freezer. The temperatures of these systems are monitored at a minimum once a day. When required, samples are signed in and out of the cooler on the sample control record by the analyst performing the analysis. Sample extracts or digestates may be stored in refrigerators in the appropriate lab section. All storage systems are locked at the close of business hours.

Once analysis is completed and the results reported to the client, the samples are stored for one additional month. After one month of storage, the sample is removed from the cooler for return to the client or ultimate disposal. The samples may be stored longer if required by a client agreement or QAPP. Sample storage and disposal is addressed in laboratory SOP: AP #800-15 "Sample Management System".

5.9 Sample Transfer

If analysis of the samples is not possible at Laboratories, then the samples will be subcontracted to another approved laboratory (See Section 8, Procurement of Items and Services). The samples will be packed in coolers at 2-5°C or within 2°C of the required temperature and shipped by common carrier or delivered by Laboratory personnel. A subcontract letter and a chain of custody listing Laboratories sample number and/or client ID, sample collection date and tests required will accompany the samples.

Figure 5-2
CASE FILE FORM

PROGRAM INFORMATION

CLIENT: _____ Package No. _____

PROGRAM: _____

CUSTODY SEAL: _____ INTACT _____ NOT INTACT _____ NA

AFTER HOURS CUSTODY

[redacted]			[redacted]		
CLIENT:	DATE	TIME	SECURITY GUARD:	DATE	TIME
GUARD TO COOLER:	DATE	TIME	SAMPLE CUSTODIAN	DATE	TIME

COMMENTS/DISCREPANCIES:

RESOLUTION/CLIENT COMMENT:

SIGNED: _____ QA/QC APPROVAL: _____

DATE: _____ SIGNED: _____

DATE: _____

6. Analytical Procedures

6.1 Analytical Methods

A list of analytical methods used in the laboratory is included in Appendix A. Method numbers are cited from the following manuals:

- U.S. EPA, *Methods for Chemical Analysis of Water and Wastewater*, Revised March 1983, EPA 600/4-79-020, including all promulgated updates.
- U.S. EPA, T*est Methods for Evaluating Solid Waste, 3rd Ed.*, EPA SW-846, December 1996, including all promulgated updates.
- APHA, AWWA, WPCF. *Standard Methods for the Examination of Water and Wastewater, 18th Ed, 1992 and current editions.*
- U.S. EPA, *Methods for the Determination of Organic Compounds in Drinking Water*, December 1988, EPA 600/4-88/039, including all promulgated updates.
- U.S. EPA, Federal Register, 40CFR, Part 136, October 1984.
- U.S. EPA, Federal Register, 40CFR, Part 136, (1-1-87 edition).
- U.S. EPA, Federal Register, Appendix A, 29 CFR 1926.58.
- New York State Department of Health, *Environmental Laboratory Approval Program - Certification Manual.*
- NIOSH - NIOSH Manual of Analytical Methods, Fourth Edition.
- U.S. EPA, *Interim Method for the Determination of Asbestos in Bulk Insulation Samples,* 40CFR, Part 763, Subpart F, Appendix A.
- U.S. EPA, *Method for the Determination of Asbestos in Bulk Building Materials,* 1993, EPA/600/R-93/116.
- U.S. EPA, *Interim Transmission Electron Microscopy Analytical Methods - Mandatory and Non-mandatory to Determine Completion of Response Actions,* 40CFR, Part 763, Subpart E, Appendix A.
- U.S. EPA, Environmental Monitoring and Support Laboratory: Cincinnati, OH, *Prescribed Procedures for the Measurement of Radioactivity in Drinking Water*, August 1980, EPA 600/4-80-032.
- U.S. EPA, Environmental Monitoring and Support Laboratory: Las Vegas, NV, *Radiochemical Analytical Procedures for Analysis of Environmental Samples*, March 1979, EMSL-LV-0539-17.
- U.S. EPA, Eastern Environmental Radiation Facility: Montgomery AL, *Radiochemistry Procedures Manual*, August 1984, EPA 520/5-84-006.
- U.S. DOE, Las Alamos National Laboratory: Las Alamos, NM, *Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance*, updated yearly, LA-10300-M (Volumes 1 - 4).
- The laboratory also analyzes samples that require various CLP protocols including:
- United States Environmental Protection Agency Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Document Number OLM04.2.
- United States Environmental Protection Agency Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, Document Number ILM04.1.
- New York State Department of Environmental Conservation Analytical Services Protocol, Contract Laboratory Protocol, June 2000 update.

be solvent rinsed. Laboratory SOP: AP# 100-18 "Trace Organics Glassware Cleaning" details cleaning procedures.

6.3.2 Metals Glassware

Metals glassware is soaked in and scrubbed with an Alconox solution, followed by a de-ionized water rinse. The glassware is then rinsed with 1:1 HNO_3 and a final rinse is done with tap water. Glassware is stored inverted in the metals digestion lab in the appropriate drawer. Pipets and volumetric flasks are stored in the metals lab. Laboratory SOP: AP# 400-41 "Trace Metals Glassware Cleaning" details cleaning procedures.

6.3.3 Inorganic Glassware

The glassware is cleaned in an Alconox solution, if needed. It is then rinsed with tap water followed by de-ionized water and allowed to dry. Glassware is stored inverted in drawers or a cabinet in the wet chemistry lab.

Glassware for phosphorus analysis is washed separately from other inorganic glassware. It is rinsed in an HCl solution and then rinsed with distilled water and allowed to dry. It is stored inverted in the appropriate drawer in the wet chemistry lab.

6.3.4 Radiochemistry Glassware

Radiochemistry glassware is rinsed out with hot tap water then allowed to soak immersed in a tub containing a 0.1M NaOH / 0.05M EDTA solution. After soaking a sufficient time, the glassware is then scrubbed with an Alconox™ soap solution and rinsed in deionized water. Glassware is then stored inverted in the radiochemistry preparation areas. Laboratory SOP AP# 600-06, "Radiochemistry Glassware Cleaning", provides details of the cleaning procedure.

6.4 Quality of Lab Water

The Inorganic and Radiochemistry Sections of the laboratory use Reagent Grade (laboratory pure) de-ionized water. The conductivity of the de-ionized water is less than 1.0 micromho/cm and is used in the final rinses of glassware and to prepare reagents. The conductivity of the de-ionized water for the wet chemistry and trace metal sections are tested on a daily basis and recorded in a logbook.

The Organic Sections of the laboratory use organic-free water in the preparation of samples for organic analysis. De-ionized water is passed through a carbon filter system to remove organic compounds. The water is monitored daily for contamination from any organic compounds through the analysis of blanks.

7. Calibration Procedures and Frequency

7.1 Instrumentation

The laboratory is 14,500 sq. ft. in size with 9,600 sq. ft. dedicated to the preparation and analysis of samples and 1,200 sq. ft. dedicated to the receiving and storage of samples. Laboratories maintains state-of-the-art instrumentation. The following equipment is currently in use:

- Two Hewlett Packard 5890/5972 GC/MS systems for semivolatile analysis. The GC/MSs are connected to a PC with ChemStation software.
- One Hewlett Packard 5890/5970 GC/MS system with Tekmar Solatek closed-loop autosampler and LCS 3100 concentrator, one Hewlett Packard 6890/5973 GC/MS system with Tekmar Precept closed-loop autosampler and LCS 3100 concentrator, and one Hewlett Packard 6890/5973 GC/MS system with Tekmar Aquatek 70 autosampler and LSC 3000 concentrator for volatile analysis. The GC/MSs are connected to a PC with ChemStation software.
- Four Hewlett Packard HP5890 Series II GCs, one Hewlett Packard HP5880A GC, one Agilent 6890 GC, one Hewlett Packard HP5890A GC, ten Hewlett Packard ECD detectors and four Hewlett Packard FID detectors for semivolatile analysis. The GCs are connected to PCs with Perkin Elmer TurboChrom software.
- One Thermo-Jarrell Ash ICAP-61E Trace Vacuum Spectrometer, 32 channel 0.75 meter direct reading simultaneous spectrometer for metals analysis.
- One Perkin-Elmer 5100-PC Graphite Furnace Atomic Absorption Spectrometer, Zeeman system with an optical interface for metals analysis.
- One Perkin-Elmer FIMS 100 Atomic Absorption Spectrometer, used for mercury analysis by cold vapor atomic absorption techniques.
- One Rosemont Analytical Dohrmann DC-190 for TOC analysis.
- Two J2 Scientific Accuprep 170 GPCs with UV detector.
- Forty continuous one-step liquid-liquid extractors.
- Model 200 Wilt Electric Glass Annealing Oven, ID: 60" X 18" X 21" temperature range 0 to 800°C, utilized to remove trace organics from sample preparation glassware.
- One 12-vessel rotary agitation apparatus from Associated Design and Manufacturing Company, Model 3740-12, capable of rotating in an end-over-end fashion at 30 ± 2 rpm used for volatile TCLP extractions. Zeroheadspace extraction vessels of stainless steel from Associated Design and Manufacturing Company, model #3745-ZHE.
- One 24-vessel rotary agitation apparatus from Associated Design and Manufacturing Company, Model 3740-24-BRE-TM, capable of rotating in an end-over-end fashion at 30 ± 2 rpm used for non-volatile TCLP extractions.
- One YSI Model 32 conductivity meter.
- One Bran & Luebbe AutoAnalyzer3
- One WTW inoLab oxi level 2 dissolved oxygen meter.
- One Orion SA-720 and one Orion SA-710A pH meters.
- One Thermo Spectronic Genesys 20 spectrometer.

standardization is recorded by the analysts in laboratory logbooks, and is checked by the group's section leader. A reference standard is analyzed each analysis day to verify the concentration of the standard titrant.

7.2.2 Thermometers

Thermometers used in the lab are calibrated against an NIST-certified thermometer or thermocouple on site once a year. They are checked at the freezing point (if applicable), boiling point (if applicable), and point of use (the temperature at which they are used). Correction factors for each thermometer are calculated and the thermometers are tagged listing the thermometer number and the correction factors. Correction factors, date calibrated, calibration temperature, temperature recordings, and initials of person performing the calibration are documented in notebook maintained by the QA/QC Supervisor.

7.2.3 Balances

Analytical balances are professionally calibrated and cleaned once a year. When the balances are professionally calibrated, a document stating the specific balance model, serial number and the date calibrated is provided by the company performing the calibration. The balances are checked daily or as used with ASTM Class (1) weights. The analyst's initials, date, calibration check results and the weights at which the balance was checked are recorded in the daily readings laboratory notebook. The acceptance range for the weights is listed on the logbook pages. If the weight is out of the control limits, the balance will be re-calibrated.

7.2.4 pH Meter

A two-point calibration bracketing the pH of the samples analyzed is done daily on pH meters. The calibration is then verified with a third pH buffer. The calibration date, analyst's initials, calibration data and pH of verification buffer are recorded in a laboratory notebook.

Table 7-1 ***Instrument Calibration***

Instrument	Measurement or Check	Frequency
	Continuing Calibration	10%
	Interference Check Sample	At the start and end of each analytical sequence
GFAA	Initial Calibration (4 point)	Daily and/or instrument acceptance criteria are not met
	Initial Calibration Verification	After each initial calibration
	Continuing Calibration	10%
Cold Vapor AA	Initial Calibration (6 point)	Daily and/or instrument acceptance criteria are not met
	Initial Calibration Verification	After each initial calibration
	Continuing Calibration	10%
Gamma Spectroscopy	Efficiency Calibration for all Geometries (Efficiency Check/Verification)	Annually (Weekly or Prior to use)
	Energy Calibration (Energy Check/Verification)	Monthly or Prior to use (Daily or Prior to use)
	Resolution Check [3keV(FWHM) Max.@ 1.4 MeV	Daily or Prior to use
	Background Measurement(500 min. minimum) Background Check/Verification	Monthly Weekly or Prior to use
Alpha Spectroscopy	Efficiency Calibration (Efficiency Check/Verification)	Annually (Monthly or Prior to use)
	Energy Calibration (Energy Check/Verification)	Quarterly or Prior to use (Weekly or Prior to use)
	Resolution Check [100 keV(FWHM) Max.]	Weekly or Prior to use
	Background Measurement	Weekly or Prior to use
Alpha/Beta Proportional Counters	Efficiencies for Specific Radionuclides	Annually
	Efficiency Check	Daily or Prior to use
	Self-absorption Curves	Annually
	Plateau	Annually

The Section Leaders and chemist verify that the specified quality level or design specifications were met for the items received.

The sample custodian is notified of non-compliant products. Non-compliant products are returned to the sample custodian and documented in a logbook. The sample custodian is responsible for returning non-compliant materials back to the vendor or place of origin. The logbook is maintained by the sample custodian and is located in sample receiving.

9. Preventive Maintenance

9.1 Instrument Maintenance

The prevention of instrument failure is important to laboratory operation. The laboratory needs to meet certain analytical schedules and holding times, and this can only be accomplished by keeping instrument downtime to a minimum. Instruments are cleaned and maintained on a regular basis to help limit downtime. A preventive maintenance schedule is followed and a maintenance log is kept on major instruments. Routine maintenance is performed to the manufacturer's specifications. A list of routine maintenance is included as Table 9-1.

The lab has maintenance contracts on several major pieces of equipment. If the lab experiences a problem with an analytical instrument, a service call is made, and a certified technician is sent to correct the problem. The analysts are also trained in "troubleshooting" their instruments to determine if outside assistance is needed.

In the event that an instrument or piece of equipment cannot be calibrated or becomes inoperable, the item will be tagged "Out of Service" and removed from service until repair. Instruments are not placed into service until performance is satisfactory as demonstrated through an acceptable calibration, verification or test. (1) Equipment that cannot be repaired is permanently removed from service. (2) In many cases there is an alternate piece of equipment that can be substituted. If there is no alternate equipment available, the sampling will be delayed if possible, or samples will be subcontracted to an alternate approved laboratory (Section 8).

9.2 Maintenance Records and Logs

Maintenance records and logs are kept on every major instrument in the lab. Instrument records and logs are located near their respective instruments. Section Leaders shall be responsible for maintaining records and all reference materials significant to each major piece of equipment. Records include:

- Name of Item
- Manufacturer's name, model and serial number
- Date received
- Condition when received (new, used)
- Date placed in service
- Current location
- Manufacturer's instructions/specifications (instrument manuals)
- Contract, maintenance service receipts for work performed

Table 9-1 *Preventive Maintenance*

Instrument	Activity	Frequency
	Change gas filters	As needed
	Change trap on Tekmar	As needed/poor sensitivity
	Change GC column	As needed/poor sensitivity
	Clean MS ion source	As needed/poor sensitivity
	Replace ion source parts	When worn/poor sensitivity
	Check pump oil leaks/level	Weekly
	Check gas flows	Before initial calibration
	Cut capillary column	As needed/contamination susp.
	Replace liner	As needed/contamination susp.
	Replace BNA seal	As needed/contamination susp.
	Bake VOA autosampler	After high samples
	Clean Solatek syringe	As needed
	Replace syringe plungers	When worn
	Replace Tekmar transfer lines	As needed/poor sensitivity
	Clean or replace GC weldment	As needed/poor sensitivity
	Clean or replace split vent	As needed/poor sensitivity
	Clean injector housing	As needed/poor sensitivity
	Clean electron multiplier	As needed/poor sensitivity
	Manufacturer P.M. program	Annually
AutoAnalyzer3	Check pump tubes	Before use
	Replace pump tubes	As needed
	Clean platen and pump rollers	monthly
	Lube side rails, pump rollers and chain interfaces	monthly
	Lube pump foam pads and casting	Monthly
	Clean probe travel bars and lube	monthly
	Check filter for discoloration or darkening	Daily
TOC	Replace/repack quartz wool and copper in combustible tube	As needed
GPC	Repack column	When resolution criteria is not met
	Check system pressure	Check daily when operating
	Check calibration and solvent flow	Check weekly
Mercury Analyzer	Change pump tubing	As needed
Proportional Counters	Check gas pressure and flow	Daily
	Change gas	As needed
	Check for leaks	When gas cylinders are changed

of an external reference standard. The analytical method accuracy and matrix effects are determined by spiking a known amount of analyte into a sample. The percent recoveries are then calculated. The amount of analyte recovered from the sample reflects how the matrix effects the accuracy of the method. An acceptable trend over time indicates control of accuracy.

Method precision is the measurement of the spread of replicate measurements relative to their established value. One would expect the distribution to be random and therefore follow normal statistics. The analytical method precision is determined by analyzing equal amounts of a split sample. Ideally, the analytical results will be identical; however, differences occur due to random variations in the procedure. A quantitative measure of these differences is assessed by calculating the relative percent differences or relative error ratios between duplicate results for each analyte.

10.3 Intra-laboratory QA/QC Program

An integral part of a QA program includes participating in intra-laboratory QC programs which provide an independent mechanism where QC procedures can be documented for review.

A quality control program is a systematic attempt to monitor the precision and accuracy of analyses by detecting and preventing the recurrence of errors. By identifying the sources of errors, confidence in the precision and accuracy of analytical results can be established, and improvements in the analytical methods can be made.

In general, Laboratories quality control program incorporates the concepts of: a) calibration to attain accuracy, b) replication to establish precision limits, and c) use of independently prepared traceable standards and spikes to confirm accuracy.

Table 10-1 contains a list of laboratory QC checks and the frequency at which they are done. If method or QAPP-specific QC requirements are more stringent than O'Brien & Gere Laboratories' QC requirements, the method or QAPP-specific QC requirements will be followed.

10.3.1 Definitions of Basic Terms

There are some basic terms that are frequently used when discussing QA/QC. The definitions of some of these common laboratory and QA/QC terms can be found in SOP AP #800-46 "Laboratory Definitions/Terms".

10.3.2 Analytical Errors

The laboratory is dedicated to minimizing errors that cause inaccurate results. There are two categories of errors, which may occur, in analytical measurements: systematic and random. Systematic errors are caused by an incorrect or faulty procedure; these errors produce biased results. Having a rigorous QA/QC data evaluation program will allow the detection of these errors, and assist the analyst in making the necessary corrections.

$$RPD = \frac{|x_1 - x_2|}{((x_1 + x_2)/2)} * 100$$

Percent Recovery - Percent recovery is calculated by dividing the spike sample result by the spike added for or by dividing the spike sample result minus the sample by the spike added.

$$\%R = \frac{SS}{SA} * 100$$

$$\%R = \frac{SS - S}{SA} * 100$$

Where: SS = Spike sample
SA = Spike added
S = Sample

Relative Error Ration (RER) - RER values are calculated as follows:

$$RER = \frac{|x_1 - x_2|}{\sqrt{TPU^2_{(1\sigma)1} + TPU^2_{(1\sigma)2}}}$$

Where: x_1 = original sample result
x_2 = duplicate sample result
$TPU_{(1\sigma)1}$ = total propagated uncertainty of the original sample result (1σ)
$TPU_{(1\sigma)2}$ = total propagated uncertainty of the duplicate sample result (1σ)

10.5 Control Charts

Control charts provide the necessary tools for detecting quality variations in the various analytical methodologies used. They are a continuous graphic indication of the state of an analytical procedure with respect to quality. Control charts indicate when corrective action procedures are necessary and often assist in defining what corrective action procedures should be taken. The generation of quality control charts is detailed in laboratory SOP: AP# 800-13 "Generating Quality Control Charts".

The control limits on QC charts set the criteria for assessing the significance of variations in the analytical results. When the plotted QC data fall within these limits, the analytical methodologies are considered under control. If a data point falls outside the control limits, there is an indication that some assignable cause is present which has thrown the system out of control.

$$UCL = \overline{\%R} + 3s$$

$$UWL = \overline{\%R} + 2s$$

$$LWL = \overline{\%R} - 2s$$

$$LCL = \overline{\%R} - 3s$$

10.5.3 Matrix Spike Recovery QC Charts

Matrix spike recovery QC charts are used for graphing the percent recoveries of spiked samples. The warning and control limits are calculated by using the following procedures:

1. For each spiked sample, calculate the percent recovery (%R).
2. Calculate the mean %R by taking the %Rs and dividing by the total number (n) of %Rs.
3. Calculate the standard deviation (s) of the percent recoveries.
4. Set the warning and control limits using the procedure as stated for accuracy QC charts.

Table 10-1 *Laboratory QC Checks and Frequency*

Laboratory Section	QC Sample	Frequency
GC/MS Volatiles	Laboratory Control Sample	Daily or every batch
	BFB	Every 12/24 hours
	Continuing Cal. Check	After BFB
	Matrix Spike	5% or Every batch
	Matrix Spike Duplicate	5% or Every batch
	Preparation Blank	Daily or every batch
	Surrogates	Every sample
	Internal Standards	Every sample
	P.E. Samples	Semi-annually
GC/MS Semivolatiles	Laboratory Control Sample	Every batch
	DFTPP	Every 12/24 hours
	Continuing Cal. Check	After DFTPP
	Matrix Spike	5% or Every batch
	Matrix Spike Duplicate	5% or Every batch
	Preparation Blank	Every batch
	Surrogates	Every sample
	Internal Standards	Every sample
	P.E. Samples	Semi-annually
GC Semivolatiles	Laboratory Control Sample	5%
	Continuing Cal. Check	10% or 5% or every 12hrs. as per method

Table 10-1 *Laboratory QC Checks and Frequency*

Laboratory Section	QC Sample	Frequency
	Matrix Duplicate	5% or every batch
	For all analyses where an extraction is performed, either a carrier, tracer, or matrix spike analysis shall be performed	5% or every batch

11. Computers, Data Reduction, Validation and Reporting

11.1 Computers and Software

The laboratory uses computers and various types of software for the collection, processing, recording, reporting and storage of environmental data. Procedures for software verification and validation are found in SOP AP #800-22 "LIMS Software Testing and Validation", and were developed to comply with the EPA's Good Automated Laboratory practices. External software is validated through the manufacturer. Copies of manufacturer's validation documentation are obtained when software is purchased.

Laboratories has an on-site dedicated Computer Systems Analyst. The Computer Systems Analyst is responsible for the maintenance and security of data. Various levels of system access are designated to employees through the distribution of passwords by the Computer Systems Analyst. The Computer Systems Analyst is also responsible for the generation and review of electronic deliverable data specifications. Data and information on the LIMS are backed up daily. The server is backed up on a monthly basis.

11.2 Data Reduction

Data are generated from several different sources (scientific equipment, manual calculations, or computer generated). Some of the raw data are stored in hard copy form and some of the raw data are stored on electronic media (floppy disks or tapes).

Analytical results are either calculated manually, by computer program, or a combination of the two in accordance with the method employed. Calculations include such factors as sample matrix, sample size, method detection limits, client requested detection limits and dilutions or concentrations that may have been performed.

The analysts for all sections of the laboratory are responsible for documenting observations, measurements, and data in appropriate logbooks and are also responsible for entering their field sample and QC data into the LIMS. To ensure client confidentiality all client's are assigned a client number which is used for identification purposes.

11.3 Data Verification

The first step of the data verification process is when QC data are entered into the LIMS. The computer automatically compares the results to the established control limits. The analyst

- Client name, project and client identification number
- Client description and laboratory identification number of the sample
- Dates of sample collection, receipt, preparation and analysis
- Time of sample preparation and/or analysis for samples that have a required holding time of 48 hours or less
- Identification of method used and modifications to an accepted method
- Description of quality control failures and deviations from methods
- Identification of samples that do not meet sample acceptance criteria
- The minimum reporting limit for the test result (may not be on all forms)
- The test result and any supporting measurements and units
- Date of issue
- Identification of subcontracted laboratories and results
- Signature and title of person responsible for the quality of data

Reports are issued as a single identifiable document. Reports that include raw data are paginated. No logo other than the O'Brien & Gere corporate logo is used on any report.

11.5 Data Review

Laboratory data goes through various levels of review prior to being released to the client. The purpose of this review is to verify the results reported are accurate and meet the client's data quality objectives. The internal review of laboratory data is detailed below.

11.5.1 Criteria

Data are reviewed against the requirements listed in the laboratory standard operating procedures.

Individual projects may have specific QA/QC criteria or variances that are applicable. These program specific requirements are communicated through a combination of codes and comments which have been integrated into the LIMS by Laboratories' Project Supervisor. This communication will often direct the analyst to a Project Supervisor provided hard copy of appropriate requirements to be followed. For example, applicable AFCEE Version 3.0 requirements and variances can be found in the binder labeled "Program Specific Requirements" that is located with the SOP binders.

11.5.2 Procedure

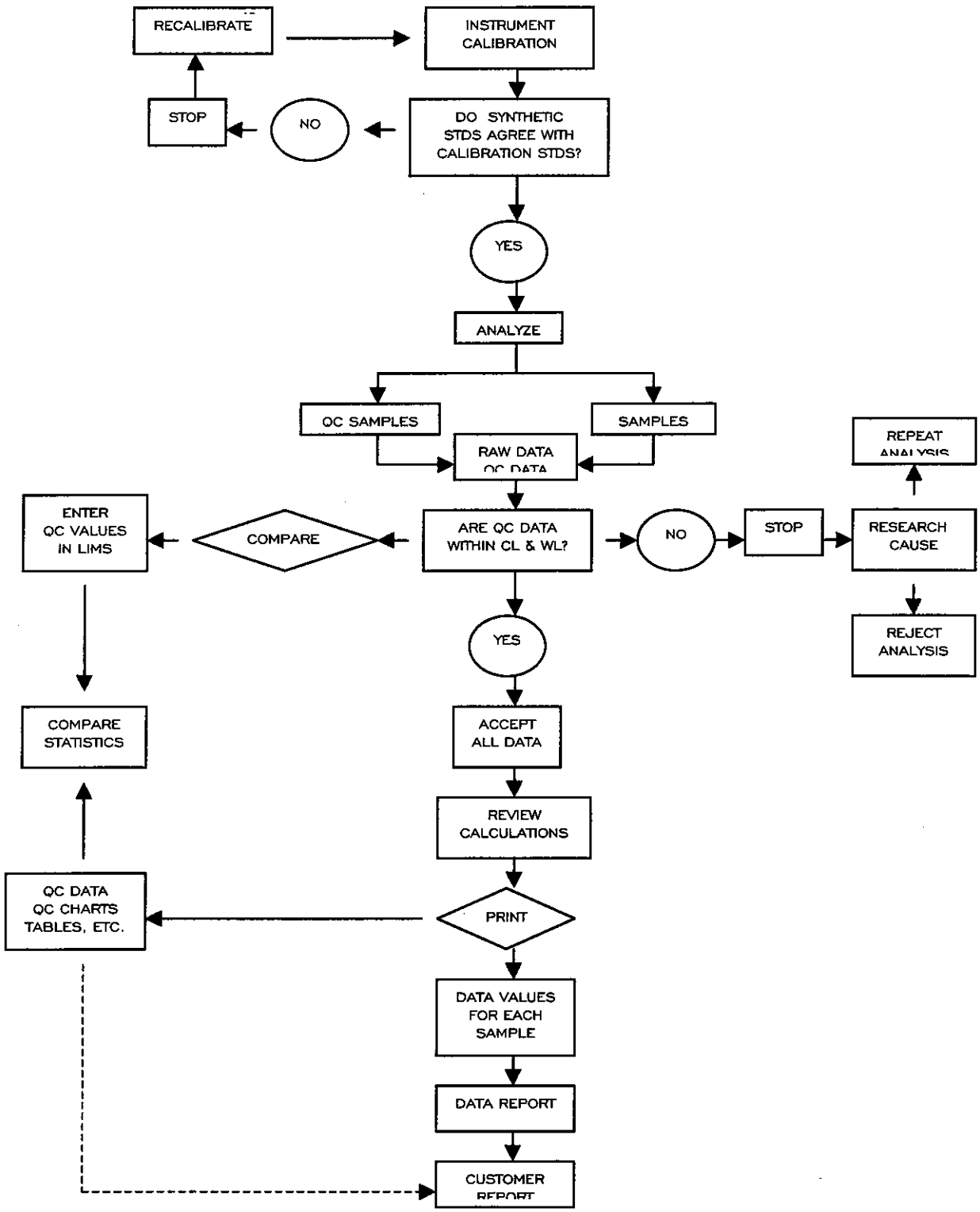
11.5.2.1 Section Responsibilities

The analyst is responsible for reviewing the data after analysis is completed. They are required to check that QC results are within QC limits. If the data are not within acceptance limits corrective action is initiated.

The analyst will complete a corrective action log (see Section 12) for analytical sequences. If there are any excursions or discrepancies, they will

Figure 11-1

Data Analysis & Verification Flow Chart



the corrective actions. A summary of this review will be included as an agenda item in the QA/QC Section Meeting.

Table 12-1 *Corrective Actions*

QC Activity	Acceptance Criteria	Corrective Action
Initial Calibration	Must be within limits set by the method and/or project QAPP	Prepare new standards and/or Recalibrate instrument
Calibration Check Standard	Must be within limits set by the method and/or project QAPP	Check for malfunction and rerun standard Prepare new standard Recalibrate instrument
Matrix Spike	Must be within laboratory QC limits or method limits and/or project QAPP	Investigate problem, document and qualify data
Lab Duplicate	Must be within laboratory QC limits or method limits and/or project QAPP	Investigate problem, document and qualify data
Method Blank	Must be less than the reporting limit	Investigate problem and reanalyze or re-extract
Laboratory Control Sample	Must be within laboratory QC limits or method limits and/or project QAPP	Investigate problem and reanalyze or re-extract
Surrogate Recoveries	Must be within laboratory QC limits or method limits and/or project QAPP	Investigate problem and reanalyze or re-extract
Internal Standards	Must be within laboratory QC limits or method limits and/or project QAPP	Investigate problem and reanalyze or re-extract
Result over highest std.	Results must be within the range of the instrument	Dilute and reanalyze
P.E. Samples	Results must be within preestablished limits	Investigate problem and document corrective action
Field Duplicate	Must be within limits specified by the client	Document
Field Blank	Must be less than the detection limit	Document

Figure 12-2
Client Inquiry/Nonconformance Resolution Form

O'BRIEN AND GERE LABORATORIES, INC.
Client Inquiry/Nonconformance Resolution Form

Client Information

Client/Project ID#: _____ Project Supervisor:_____ Tracking #:_____

Date of Inquiry/Nonconformance:_____ Date this Form Initiated:_____

Form of Inquiry/Nonconformance: Fax _____ Letter _____ Phone Call _____ Email _____

Person Receiving inquiry/Nonconformance: Signature:_____

Description of Inquiry/Nonconformance (Problem):

Submit&Discuss with Section Leader - Name of Leader _____

Copy to QC Supervisor

Copy to Administrative Supervisor

Source/Cause of the Problem:

Corrective Action Taken:

Final Resolution/Client Comment:

Date Client Contacted and form of contact: _____

Section Leader Signature: _____ **Date:** _____

Project Supervisor Signature: _____ **Date:** _____

QA/QC Approval: Signed: _____ **Date:** _____

G:\QAQC\forms\noncnfrm-clinq

PE samples are typically addressed to the QA/QC Supervisor, who hand delivers the samples to Sample Receiving. The QA/QC Supervisor acts as Project Supervisor for all regulatory PE samples. The PE samples are integrated into the laboratory as routine samples. Data related to the PE sample analysis and the results of the analysis are maintained by the QA/QC Supervisor and filed in three-ringed binders. If any parameters are deficient, the QA/QC Supervisor submits an internal memo to the laboratory section that analyzed the PE sample. The deficiency is investigated and a response/corrective action is generated in a return memo to the QA/QC Supervisor. A copy of the section's response is forwarded to the Production Officer. The laboratory responses are filed with the PE sample results.
O'Brien & Gere Laboratories analyzes a particular PE sample for each analyte/ method/matrix it is certified for twice a year. The laboratory must maintain a passing analyte score for 2 of the most recent 3 PE studies to comply with NELAP standards. If this requirement is not met, the analysis of a deficient analyte may be performed on an independent NELAP/NIST approved vendor's PE samples.

13.4 PE Studies

1. New York State Department of Health for air emissions, potable water, wastewater and hazardous waste (WP and WS)
2. New York State Department of Environmental Conservation - State Superfund
3. U.S. DOE Idaho Mixed Analyte Performance Evaluation Program
4. Corps of Engineers - Project specific approval
5. U.S. EPA - Project specific approval
6. U.S. DOE Environmental Measurements Laboratory Radiochemistry Quality Assessment Program.
7. Client required PE studies.

13.5 Certifications

Appendix D is a table listing the agencies with which Laboratories holds certifications. Complete certification information is available from the laboratory.

14. Quality Assurance Reports and Management Assessment

14.1 Quality Assurance Reports

The QA/QC Supervisor is responsible for making periodic reports to management concerning QA activities. These reports serve to document lab personnel adherence to QA requirements and to discuss any updates or changes necessary to the QC program. There are informal oral reports, formal written reports and QA/QC section meeting reports. Oral reports are given weekly during a meeting with the administrative manager. Formal written reports are given periodically and contain results of section audits and review of control charts. The QA/QC Supervisor keeps a copy of quality assurance reports, whether informal or formal.

Any significant trends in the QC data, such as data points running significantly above or below the average, may be discussed with Officers and Section Leaders (at any time) to detect any possible problems before data gets out of control.

ensure client confidentiality, reports may only be signed out by an O'Brien & Gere Laboratories employee.

The original chain of custody forms and case file forms are filed with the final report. Client-requested specific QC will also be filed with the report.

QC data is input into the LIMS. At the end of every year, QC data are copied onto disc and retained by the QA/QC Supervisor.

Raw data is organized by date, lab sections, and instrument. The data may be maintained in the laboratory for a period of up to 2 years. They are then stored in the secured warehouse for up to five years or as defined by project specific requirements.

Corrective action logs are maintained at the lab for one year and then stored in the secured warehouse for up to five years.

Electronic data and records are stored indefinitely in both the laboratory and secured warehouse. This data is stored away from other electronic and magnetic sources.

Current Standard Operating Procedures are maintained in the Quality Control Office. Archived SOPs are maintained by QC and stored indefinitely.

This document is also maintained by QC and archived manuals are stored indefinitely. A more detailed description of our record storage procedures can be found in SOP AP #800-42 "Record Storage".

15.2 Document Control

Laboratories has instituted a document control procedure on this document (QAP), the Radiochemistry Safety Manual and all laboratory SOPs. This is to ensure the staff is using the most current version of these documents. The QA/QC Supervisor is responsible for the distribution and maintenance of laboratory controlled documents.

SOPs that are not stamped with a controlled document stamp (in red) and numbered are not considered final versions ready for use. Any electronic copy of an SOP is not considered a final version. Laboratory SOP: AP #800-3 "Document Control" further details document control procedures.

Laboratory logbooks are bound, controlled and distributed as described in SOP: AP #800-04 "Laboratory Logbooks – Creation, Issue, Maintenance and Use." A few laboratory forms cannot be bound based upon practical use (i.e., training record checklists and instrument run logs). Three-ringed binders and individual file folders are used for unbound lab sheets. A listing of all laboratory-controlled logbooks may be found in the Quality Control Office.

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 310.1	Water	Alkalinity as $CaCO_3$	10. mg/L
SM 2320 B	Water	Alkalinity, Carbonate	10.mg/L
SM 2320 B	Water	Alkalinity, Bicarbonate	10.mg/L
SM 2320 B	Water	Alkalinity, Phenolphthalein	10. mg/L
EPA 350.1	Water	Ammonia as N	.05 mg/L
EPA 350.1 M	Solid	Ammonia as N	5. mg/kg
EPA 405.1	Water	5-day BOD	5. mg/L
SM 5210 B	Water	5-day CBOD	5. mg/L
EPA 410.4	Water	COD	10. mg/L
EPA 410.4 M	Solid	COD	1000. mg/kg
EPA 325.2, 300.0 EPA 9251, 9056	Water	Chloride	1. mg/L
EPA 9251 M	Solid	Chloride	100. mg/kg
EPA 330.5 SM 4500-Cl-G	Water	Total residual chlorine	.1 mg/L
EPA 110.2	Water	Color	5. PCU
EPA 335.2 EPA 9010B/9014 EPA 335.4 EPA 9012A	Water	Cyanide	.01 mg/L
EPA 335.2 EPA 9010B/9014 EPA 9012A EPA 335.4	Solid	Cyanide	.5 mg/kg
EPA 335.1 EPA 9010B/9014 EPA 9012A EPA 335.4	Water	Amenable cyanide	.01 mg/L
EPA 340.2 SM 4500 F-C	Water	Fluoride	.1 mg/L
EPA 300.0 EPA 9056	Solid	Fluoride	.1 mg/L
EPA 340.2M	Solid	Fluoride, total	10. mg/kg
EPA 300.0 EPA 9056	Solid	Fluoride	1. mg/kg
SM2340B	Water	Hardness as $CaCO_3$	6.6 mg/L
EPA 130.2	Water	Hardness as $CaCO_3$	10. mg/L
SM3500-Cr-D EPA 7196A	Water	Hexavalent Chromium	.01 mg/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 150.1 EPA 9040B	Water	Hydrogen Ion (pH)	.1 std. units
EPA 9045C	Solid	Hydrogen Ion (pH)	.1 std. units
EPA 351.2	Water	Kjeldahl nitrogen, total as N	.4 mg/L
EPA 351.2M	Solid	Kjeldahl nitrogen, total as N	40. mg/kg
EPA 353.2	Water	Nitrite plus nitrate	.05 mg/L
EPA 353.2	Solid	Nitrite plus nitrate	5. mg/kg
EPA 300.0 EPA 9056	Water	Bromide	0.05 mg/L
EPA 300.0 EPA 9056	Solid	Bromide	.5 mg/L
EPA 353.2 EPA 354.1 EPA 300.0 EPA 9056	Water	Nitrite	.05 mg/L
EPA 353.2 M EPA 300.0 EPA 9056	Solid	Nitrite	5. mg/kg
EPA 353.2 EPA 300.0 EPA 9056	Water	Nitrate	.05 mg/L
EPA 353.2 M EPA 300.0 EPA 9056	Solid	Nitrate	5. mg/kg
EPA 140.1	Water	Odor	1. TON
EPA 1664 A	Water	Oil and grease, total recoverable	5. mg/L
EPA 9071 B	Solid	Oil and grease, total recoverable	500. mg/kg
EPA 415.1	Water	Organic carbon, total	1. mg/L
EPA 365.1 EPA 365.3 EPA 300.0 EPA 9056	Water	Orthophosphate	.05 mg/L
EPA 365.1 M EPA 300.0 EPA 9056	Solid	Orthophosphate	5. mg/kg .5 mg/kg
EPA 360.1	Water	Oxygen dissolved	.1 mg/L
EPA 420.1 EPA 9065	Water	Phenols	.005 mg/L
EPA 9065 M	Solid	Phenols	.5 mg/kg
EPA 365.4 EPA 365.3	Water	Phosphorus, total	.1 mg/L 0.05 mg/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 365.4 M	Solid	Phosphorus, total	10. mg/kg
SW846 Ch.7 Vol 1C Sec 7.3.3.2	Waste	Reactive Cyanide	25. mg/kg
SW846 Ch.7 Vol 1C Sec 7.3.4.2	Waste	Reactive Sulfide	50. mg/kg
EPA 160.1 SM 2540 C	Water	Residue, dissolved	10. mg/L
EPA 160.3 SM 2540 B	Water	Residue, total	10. mg/L
SM2540-G	Solid	Residue, total	1. %
EPA 160.2 SM 2540 D	Water	Residue, suspended	5. mg/L
EPA 160.4 SM 2540 E	Water	Residue, volatile	10. mg/L
SM2540-G	Solid	Residue, volatile	1. %
EPA 160.5	Water	Residue, settable	.1 ml/L
EPA 120.1 EPA 9050A SM 2510B	Water	Specific Conductance	1 umho/cm
EPA 375.4	Water	Sulfate, as SO_4	5. mg/L
EPA 300.0			1. mg/L
EPA 9056			
EPA 375.4 M	Solid	Sulfate, as SO_4	500. mg/kg
EPA 300.0			10 mg/kg
EPA 9056			
EPA 376.1	Water	Sulfide	0.8 mg/L
EPA 376.1 M	Solid	Sulfide	80. mg/kg
EPA 377.1	Water	Sulfite, as SO_3	2. mg/L
EPA 425.1	Water	Surfactants	.1 mg/L
EPA 200.7 / 6010B	Water	Aluminum	.1 mg/L
		Antimony	.06 mg/L
		Arsenic	.005 mg/L
		Barium	.1 mg/L
		Beryllium	.01 mg/L
		Boron	.05 mg/L
		Calcium	1. mg/L
		Chromium	.01 mg/L
		Cobalt	.05 mg/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Copper	.01 mg/L
		Cadmium	.01 mg/L
		Iron	.05 mg/L
		Lead	.005 mg/L
		Magnesium	1. mg/L
		Manganese	.05 mg/L
		Molybdenum	.05 mg/L
		Nickel	.05 mg/L
		Potassium	5. mg/L
		Selenium	.005 mg/L
		Silver	.01 mg/L
		Sodium	1. mg/L
		Thallium	.01 mg/L
		Tin	.05 mg/L
		Vanadium	.05 mg/L
		Zinc	.01 mg/L
		Lithium	.01 mg/L
		Uranium	.20 mg/L
		Phosphorous	.05 mg/L
EPA 6010B	Solid	Aluminum	10. mg/kg
		Antimony	6. mg/kg
		Arsenic	.5 mg/kg
		Barium	10. mg/kg
		Beryllium	1. mg/kg
		Boron	5. mg/kg
		Calcium	100. mg/kg
		Chromium	1. mg/kg
		Cobalt	5. mg/kg
		Copper	1. mg/kg
		Cadmium	1. mg/kg
		Iron	5. mg/kg

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Lead	.5 mg/kg
		Magnesium	100. mg/kg
		Manganese	5. mg/kg
		Molybdenum	5. mg/kg
		Nickel	5. mg/kg
		Potassium	500. mg/kg
		Selenium	.5 mg/kg
		Silver	1. mg/kg
		Sodium	100. mg/kg
		Thallium	1. mg/kg
		Tin	5. mg/kg
		Vanadium	5. mg/kg
		Zinc	1. mg/kg
		Lithium	1. mg/kg
		Uranium	20. mg/kg
		Phosphorous	5. mg/kg
EPA 206.2 EPA 7060A EPA 200.9	Water	Arsenic	.002 mg/L
EPA 7060A	Solid	Arsenic	.2 mg/kg
EPA 239.2 EPA 7421 EPA 200.9	Water	Lead	.002 mg/L
EPA 7421	Solid	Lead	.2 mg/kg
EPA 245.1 EPA 7470A	Water	Mercury	.0002 mg/L
EPA 245.5 EPA 7471A	Solid	Mercury	0.1 mg/kg
EPA 270.2 EPA 7740 EPA 200.9	Water	Selenium	.002 mg/L
EPA 7740	Solid	Selenium	.2 mg/kg
EPA 279.2	Water	Thallium	.002 mg/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 7841 EPA 200.9			
EPA 7841	Solid	Thallium	.2 mg/kg
EPA 524.2	Water	Dichlorofluoromethane	.5 ug/L
		Chloromethane	.5 ug/L
		Bromomethane	.5 ug/L
		Vinyl Chloride	.5 ug/L
		Chloroethane	.5 ug/L
		Trichlorofluoromethane	.5 ug/L
		Methylene Chloride	.5 ug/L
		1,1-Dichloroethene	.5 ug/L
		1,1-Dichloroethane	.5 ug/L
		cis-1,2-Dichloroethene	.5 ug/L
		trans-1,2-Dichloroethene	.5 ug/L
		Methyl tert-Butyl ether	.5 ug/L
		Chloroform	.5 ug/L
		1,2-Dichloroethane	.5 ug/L
		1,1,1-Trichloroethane	.5 ug/L
		Carbon Tetrachloride	.5 ug/L
		Bromodichloromethane	.5 ug/L
		1,2-Dichloropropane	.5 ug/L
		cis-1,3-Dichloropropene	.5 ug/L
		Trichloroethene	.5 ug/L
		Dibromochloromethane	.5 ug/L
		1,1,2-Trichloroethane	.5 ug/L
		Benzene	.5 ug/L
		trans-1,3-Dichloropropene	.5 ug/L
		Bromoform	.5 ug/L
		Tetrachloroethene	.5 ug/L
		1,1,2,2-Tetrachloroethane	.5 ug/L
		Toluene	.5 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Chlorobenzene	.5 ug/L
		Ethylbenzene	.5 ug/L
		Styrene	.5 ug/L
		2,2-Dichloropropane	.5 ug/L
		Bromochloromethane	.5 ug/L
		1,1-Dichloropropene	.5 ug/L
		Dibromomethane	.5 ug/L
		1,2-Dibromoethane	.5 ug/L
		1,3-Dichloropropane	.5 ug/L
		1,1,1,2-Tetrachloroethane	.5 ug/L
		Isopropylbenzene	.5 ug/L
		1,2,3-Trichloropropane	.5 ug/L
		Xylene (total)	.5 ug/L
		Bromobenzene	.5 ug/L
		n-Propylbenzene	.5 ug/L
		2-Chlorotoluene	.5 ug/L
		4-Chlorotoluene	.5 ug/L
		1,3,5-Trimethylbenzene	.5 ug/L
		tert-Butylbenzene	.5 ug/L
		1,2,4-Trimethylbenzene	.5 ug/L
		sec-Butylbenzene	.5 ug/L
		1,3-Dichlorobenzene	.5 ug/L
		p-Isopropyltoluene	.5 ug/L
		1,4-Dichlorobenzene	.5 ug/L
		n-Butylbenzene	.5 ug/L
		1,2-Dichlorobenzene	.5 ug/L
		1,2-Dibromo-3-chloropropane	.5 ug/L
		1,2,4-Trichlorobenzene	.5 ug/L
		Hexachlorobutadiene	.5 ug/L
		Naphthalene	.5 ug/L
		1,2,3-Trichlorobenzene	.5 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 624	Water	Chloromethane	10. ug/L
		Bromomethane	10. ug/L
		Vinyl Chloride	10. ug/L
		Chloroethane	10. ug/L
		Methylene Chloride	5. ug/L
		Trichlorofluoromethane	5. ug/L
		1,1-Dichloroethene	5. ug/L
		1,1-Dichloroethane	5. ug/L
		cis-1,2-Dichloroethene	5. ug/L
		trans-1,2-Dichloroethene	5. ug/L
		Chloroform	5. ug/L
		1,2-Dichloroethane	5. ug/L
		1,1,1-Trichloroethane	5. ug/L
		Carbon Tetrachloride	5. ug/L
		Bromodichloromethane	5. ug/L
		1,2-Dichloropropane	5. ug/L
		cis-1,3-Dichloropropene	5. ug/L
		Trichloroethene	5. ug/L
		Benzene	5. ug/L
		Dibromochloromethane	5. ug/L
		trans-1,3-Dichloropropene	5. ug/L
		1,1,2-Trichloroethane	5. ug/L
		2-Chloroethylvinyl ether	10. ug/L
		Bromoform	5. ug/L
		Tetrachloroethene	5. ug/L
		1,1,2,2-Tetrachloroethane	5. ug/L
		Toluene	5. ug/L
		Chlorobenzene	5. ug/L
		Ethylbenzene	5. ug/L
		Xylene (total)	5. ug/L
		1,3-Dichlorobenzene	5. ug/L
		1,2-Dichlorobenzene	5. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		1,4-Dichlorobenzene	5. ug/L
EPA 8260B	Water	Dichlorofluoromethane	1. ug/L
		Chloromethane	1. ug/L
		Bromomethane	1. ug/L
		Vinyl Chloride	1. ug/L
		Chloroethane	1. ug/L
		Trichlorofluoromethane	1. ug/L
		Methylene Chloride	2. ug/L
		Acetone	10. ug/L
		Carbon Disulfide	.5 ug/L
		1,1-Dichloroethene	.5 ug/L
		1,1-Dichloroethane	.5 ug/L
		cis-1,2-Dichloroethene	.5 ug/L
		trans-1,2-Dichloroethene	.5 ug/L
		Chloroform	.5 ug/L
		1,2-Dichloroethane	.5 ug/L
		2-Butanone	10. ug/L
		1,1,1-Trichloroethane	.5 ug/L
		Carbon Tetrachloride	.5 ug/L
		Vinyl Acetate	2. ug/L
		Bromodichloromethane	.5 ug/L
		1,2-Dichloropropane	.5 ug/L
		cis-1,3-Dichloropropene	.5 ug/L
		Trichloroethene	.5 ug/L
		Dibromochloromethane	.5 ug/L
		1,1,2-Trichloroethane	.5 ug/L
		Benzene	.5 ug/L
		trans-1,3-Dichloropropene	.5 ug/L
		Bromoform	.5 ug/L
		Tetrachloroethene	.5 ug/L
		1,1,2,2-Tetrachloroethane	.5 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Toluene	.5 ug/L
		Chlorobenzene	.5 ug/L
		Ethylbenzene	.5 ug/L
		Styrene	.5 ug/L
		4-Methyl-2-pentanone	5. ug/L
		2-Hexanone	5. ug/L
		2,2-Dichloropropane	.5 ug/L
		Bromochloromethane	.5 ug/L
		1,1-Dichloropropene	.5 ug/L
		Dibromomethane	.5 ug/L
		1,2-Dibromoethane	.5 ug/L
		1,3-Dichloropropane	.5 ug/L
		1,1,1,2-Tetrachloroethane	.5 ug/L
		Isopropylbenzene	.5 ug/L
		1,2,3-Trichloropropane	.5 ug/L
		Xylene (total)	.5 ug/L
		Bromobenzene	.5 ug/L
		n-Propylbenzene	.5 ug/L
		2-Chlorotoluene	.5 ug/L
		4-Chlorotoluene	.5 ug/L
		1,3,5-Trimethylbenzene	.5 ug/L
		tert-Butylbenzene	.5 ug/L
		1,2,4-Trimethylbenzene	.5 ug/L
		sec-Butylbenzene	.5 ug/L
		1,3-Dichlorobenzene	.5 ug/L
		p-Isopropyltoluene	.5 ug/L
		1,4-Dichlorobenzene	.5 ug/L
		n-Butylbenzene	.5 ug/L
		1,2-Dichlorobenzene	.5 ug/L
		1,2-Dibromo-3-chloropropane	1. ug/L
		1,2,4-Trichlorobenzene	1. ug/L
		Hexachlorobutadiene	1. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Naphthalene	1. ug/L
		1,2,3-Trichlorobenzene	1. ug/L
		1,1,2-Trichloro-1,2,2-trifluoroethane	.5 ug/L
		Methyl acetate	.5 ug/L
		Methyl tert-Butyl ether	.5 ug/L
		Cyclohexane	.5 ug/L
		Methylcyclohexane	.5 ug/L
EPA 8260B	Solid	Dichlorofluoromethane	5. ug/kg
		Chloromethane	5. ug/kg
		Bromomethane	5. ug/kg
		Vinyl Chloride	5. ug/kg
		Chloroethane	5. ug/kg
		Trichlorofluoromethane	5. ug/kg
		Methylene Chloride	5. ug/kg
		Acetone	10. ug/kg
		Carbon Disulfide	2.5 ug/kg
		1,1-Dichloroethene	2.5 ug/kg
		1,1-Dichloroethane	2.5 ug/kg
		cis-1,2-Dichloroethene	2.5 ug/kg
		trans-1,2-Dichloroethene	2.5 ug/kg
		Chloroform	2.5 ug/kg
		1,2-Dichloroethane	2.5 ug/kg
		2-Butanone	10. ug/kg
		1,1,1-Trichloroethane	2.5 ug/kg
		Carbon Tetrachloride	2.5 ug/kg
		Vinyl Acetate	5. ug/kg
		Bromodichloromethane	2.5 ug/kg
		1,2-Dichloropropane	2.5 ug/kg
		cis-1,3-Dichloropropene	2.5 ug/kg
		Trichloroethene	2.5 ug/kg
		Dibromochloromethane	2.5 ug/kg
		1,1,2-Trichloroethane	2.5 ug/kg

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Benzene	2.5 ug/kg
		trans-1,3-Dichloropropene	2.5 ug/kg
		Bromoform	2.5 ug/kg
		Tetrachloroethene	2.5 ug/kg
		1,1,2,2-Tetrachloroethane	2.5 ug/kg
		Toluene	2.5 ug/kg
		Chlorobenzene	2.5 ug/kg
		Ethylbenzene	2.5 ug/kg
		Styrene	2.5 ug/kg
		4-Methyl-2-pentanone	5. ug/kg
		2-Hexanone	5. ug/kg
		2,2-Dichloropropane	2.5 ug/kg
		Bromochloromethane	2.5 ug/kg
		1,1-Dichloropropene	2.5 ug/kg
		Dibromomethane	2.5 ug/kg
		1,2-Dibromoethane	2.5 ug/kg
		1,3-Dichloropropane	2.5 ug/kg
		1,1,1,2-Tetrachloroethane	2.5 ug/kg
		Isopropylbenzene	2.5 ug/kg
		1,2,3-Trichloropropane	2.5 ug/kg
		Xylene (total)	2.5 ug/kg
		Bromobenzene	2.5 ug/kg
		n-Propylbenzene	2.5 ug/kg
		2-Chlorotoluene	2.5 ug/kg
		4-Chlorotoluene	2.5 ug/kg
		1,3,5-Trimethylbenzene	2.5 ug/kg
		tert-Butylbenzene	2.5 ug/kg
		1,2,4-Trimethylbenzene	2.5 ug/kg
		sec-Butylbenzene	2.5 ug/kg
		1,3-Dichlorobenzene	2.5 ug/kg
		p-Isopropyltoluene	2.5 ug/kg
		1,4-Dichlorobenzene	2.5 ug/kg

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		n-Butylbenzene	2.5 ug/kg
		1,2-Dichlorobenzene	2.5 ug/kg
		1,2-Dibromo-3-chloropropane	5. ug/kg
		1,2,4-Trichlorobenzene	5. ug/kg
		Hexachlorobutadiene	5. ug/kg
		Naphthalene	5. ug/kg
		1,2,3-Trichlorobenzene	5. ug/kg
		1,1,2-Trichloro-1,2,2-trifluoroethane	2.5 ug/kg
		Methyl acetate	2.5 ug/kg
		Methyl tert-Butyl ether	2.5 ug/kg
		Cyclohexane	2.5 ug/kg
		Methylcyclohexane	2.5 ug/kg
EPA 8270C	Water	Phenol	10. ug/L
		Bis(2-chloroethyl)ether	10. ug/L
		2-Chlorophenol	10. ug/L
		1,3-Dichlorobenzene	10. ug/L
		1,4-Dichlorobenzene	10. ug/L
		Benzyl Alcohol	10. ug/L
		1,2-Dichlorobenzene	10. ug/L
		2-Methylphenol	10. ug/L
		Bis(2-chloroisopropyl)ether	10. ug/L
		4-Methylphenol	10. ug/L
		N-Nitroso-di-n-propylamine	10. ug/L
		Hexachloroethane	10. ug/L
		Nitrobenzene	10. ug/L
		Isophorone	10. ug/L
		2-Nitrophenol	10. ug/L
		2,4-Dimethylphenol	10. ug/L
		Benzoic Acid	50. ug/L
		Bis(2-chloroethoxy)methane	10. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		2,4-Dichlorophenol	10. ug/L
		1,2,4-Trichlorobenzene	10. ug/L
		Naphthalene	10. ug/L
		4-Chloroaniline	10. ug/L
		Hexachlorobutadiene	10. ug/L
		4-Chloro-3-methylphenol	10. ug/L
		2-Methylnaphthalene	10. ug/L
		Hexachlorocyclopentadiene	10. ug/L
		2,4,6-Trichlorophenol	10. ug/L
		2,4,5-Trichlorophenol	50. ug/L
		2-Chloronaphthalene	10. ug/L
		2-Nitroaniline	50. ug/L
		Dimethylphthalate	10. ug/L
		2,6-Dinitrotoluene	10. ug/L
		3-Nitroaniline	50. ug/L
		Acenaphthylene	10. ug/L
		Acenaphthene	10. ug/L
		2,4-Dinitrophenol	50. ug/L
		4-Nitrophenol	50. ug/L
		Dibenzofuran	10. ug/L
		2,4-Dinitrotoluene	10. ug/L
		Diethylphthalate	10. ug/L
		4-Chlorophenyl phenyl ether	10. ug/L
		Fluorene	10. ug/L
		4-Nitroaniline	50. ug/L
		4,6-Dinitro-2-methylphenol	50. ug/L
		N-Nitrosodiphenylamine	10. ug/L
		4-Bromophenyl phenyl ether	10. ug/L
		Hexachlorobenzene	10. ug/L
		Pentachlorophenol	50. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Phenanthrene	10. ug/L
		Anthracene	10. ug/L
		Di-n-butylphthalate	10. ug/L
		Fluoranthene	10. ug/L
		Pyrene	10. ug/L
		Butylbenzylphthalate	10. ug/L
		3,3'-Dichlorobenzidine	20. ug/L
		Benzo(a)anthracene	10. ug/L
		Chrysene	10. ug/L
		Bis(2-ethylhexyl)phthalate	10. ug/L
		Di-n-octylphthalate	10. ug/L
		Benzo(b)fluoranthene	10. ug/L
		Benzo(k)fluoranthene	10. ug/L
		Benzo(a)pyrene	10. ug/L
		Indeno(1,2,3-cd)pyrene	10. ug/L
		Dibenz(a,h)anthracene	10. ug/L
		Benzo(g,h,i)perylene	10. ug/L
		acetophenone	10. ug/L
		Atrazine	10. ug/L
		Benzaldehyde	10. ug/L
		1,1'-Biphenyl	10. ug/L
		Caprolactum	10. ug/L
		Carbazole	10. ug/L
EPA 625	Water	N-Nitrosodimethylamine	10. ug/L
		Phenol	10. ug/L
		bis (2-Chloroethyl) ether	10. ug/L
		2-Chlorophenol	10. ug/L
		1,3-Dichlorobenzene	10. ug/L
		1,4-Dichlorobenzene	10. ug/L
		1,2-Dichlorobenzene	10. ug/L
		bis (2-Chloroisopropyl) ether	10. ug/L
		N-nitroso-di-n-	10. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		propylamine	
		Hexachloroethane	10. ug/L
		Nitrobenzene	10. ug/L
		Isophorone	10. ug/L
		2-Nitrophenol	10. ug/L
		2,4-Dimethylphenol	10. ug/L
		bis (2-Chloroethoxy) methane	10. ug/L
		2,4-Dichlorophenol	10. ug/L
		1,2,4-Trichlorobenzene	10. ug/L
		Naphthalene	10. ug/L
		Hexachlorobutadiene	10. ug/L
		4-Chloro-3-methylphenol	10. ug/L
		Hexachlorocyclopentadiene	10. ug/L
		2,4,6-Trichlorophenol	10. ug/L
		2-Chloronaphthalene	10. ug/L
		Dimethylphthalate	10. ug/L
		Acenaphthylene	10. ug/L
		Acenaphthene	10. ug/L
		2,4-Dinitrophenol	50. ug/L
		4-Nitrophenol	50. ug/L
		2,4-Dinitrotoluene	10. ug/L
		2,6-Dinitrotoluene	10. ug/L
		Diethylphthalate	10. ug/L
		4-Chlorophenyl phenylether	10. ug/L
		Fluorene	10. ug/L
		1,2-Diphenylhydrazide	10. ug/L
		4,6-Dinitro-2-methyphenol	50. ug/L
		N-Nitrosodiphenylamine	10. ug/L
		4-Bromophenyl phenylether	10. ug/L
		Hexachlorobenzene	10. ug/L
		Pentachlorophenol	50. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Phenanthrene	10. ug/L
		Anthracene	10. ug/L
		Di-n-butylphthalate	10. ug/L
		Fluoranthene	10. ug/L
		Benzidine	50. ug/L
		Pyrene	10. ug/L
		Butyl benzylphthalate	10. ug/L
		3,3'-Dichlorobenzidine	20. ug/L
		Benzo (a) anthracene	10. ug/L
		Bis (2-Ethylhexyl) phthalate	10. ug/L
		Chrysene	10. ug/L
		Di-n-octylphthalate	10. ug/L
		Benzo (b) fluoranthene	10. ug/L
		Benzo (k) fluoranthene	10. ug/L
		Benzo (a) pyrene	10. ug/L
		Indeno (1,2,3-cd) pyrene	10. ug/L
		Dibenzo (a,h) anthracene	10. ug/L
		Benzo (g,h,i) perylene	10. ug/L
EPA 8270C	Solid	Phenol	330. ug/kg
		Bis(2-chloroethyl)ether	330. ug/kg
		2-Chlorophenol	330. ug/kg
		1,3-Dichlorobenzene	330. ug/kg
		1,4-Dichlorobenzene	330. ug/kg
		Benzyl Alcohol	330. ug/kg
		1,2-Dichlorobenzene	330. ug/kg
		2-Methylphenol	330. ug/kg
		Bis(2-chloroisopropyl)ether	330. ug/kg
		4-Methylphenol	330. ug/kg
		N-Nitroso-di-n-propylamine	330. ug/kg
		Hexachloroethane	330. ug/kg

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Nitrobenzene	330. ug/kg
		Isophorone	330. ug/kg
		2-Nitrophenol	330. ug/kg
		2,4-Dimethylphenol	330. ug/kg
		Benzoic Acid	1700. ug/kg
		Bis(2-chloroethoxy)methane	330. ug/kg
		2,4-Dichlorophenol	330. ug/kg
		1,2,4-Trichlorobenzene	330. ug/kg
		Naphthalene	330. ug/kg
		4-Chloroaniline	330. ug/kg
		Hexachlorobutadiene	330. ug/kg
		4-Chloro-3-methylphenol	330. ug/kg
		2-Methylnaphthalene	330. ug/kg
		Hexachlorocyclopentadiene	330. ug/kg
		2,4,6-Trichlorophenol	330. ug/kg
		2,4,5-Trichlorophenol	1700. ug/kg
		2-Chloronaphthalene	330. ug/kg
		2-Nitroaniline	1700. ug/kg
		Dimethylphthalate	330. ug/kg
		Acenaphthylene	330. ug/kg
		2,6-Dinitrotoluene	330. ug/kg
		3-Nitroaniline	1700. ug/kg
		Acenaphthene	330. ug/kg
		2,4-Dinitrophenol	1700. ug/kg
		4-Nitrophenol	1700. ug/kg
		Dibenzofuran	330. ug/kg
		2,4-Dinitrotoluene	330. ug/kg
		Diethylphthalate	330. ug/kg
		4-Chlorophenyl phenyl ether	330. ug/kg
		Fluorene	330. ug/kg
		4-Nitroaniline	1700. ug/kg

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		4,6-Dinitro-2-methylphenol	1700. ug/kg
		N-Nitrosodiphenylamine	330. ug/kg
		4-Bromophenyl phenyl ether	330. ug/kg
		Hexachlorobenzene	330. ug/kg
		Pentachlorophenol	1700. ug/kg
		Phenanthrene	330. ug/kg
		Anthracene	330. ug/kg
		Di-n-butylphthalate	330. ug/kg
		Fluoranthene	330. ug/kg
		Pyrene	330. ug/kg
		Butylbenzylphthalate	330. ug/kg
		3,3'-Dichlorobenzidine	670. ug/kg
		Benzo(a)anthracene	330. ug/kg
		Chrysene	330. ug/kg
		Bis(2-ethylhexyl)phthalate	330. ug/kg
		Di-n-octylphthalate	330. ug/kg
		Benzo(b)fluoranthene	330. ug/kg
		Benzo(k)fluoranthene	330. ug/kg
		Benzo(a)pyrene	330. ug/kg
		Indeno(1,2,3-cd)pyrene	330. ug/kg
		Dibenz(a,h)anthracene	330. ug/kg
		Benzo(g,h,i)perylene	330. ug/kg
		Acetophenone	330. ug/kg
		Atrazine	330. ug/kg
		Benzaldehyde	330. ug/kg
		1,1'-Biphenyl	330. ug/kg
		Caprolactum	330. ug/kg
		Carbazole	330. ug/kg
EPA 8081A	Water	alpha-BHC	.05 ug/L
		gamma-BHC	.05 ug/L
		beta-BHC	.05 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Heptachlor	.05 ug/L
		delta-BHC	.05 ug/L
		Aldrin	.05 ug/l
		Heptachlor Epoxide	.05 ug/L
		Endosulfan I	.05 ug/L
		4,4'-DDE	.1 ug/L
		Dieldrin	.1 ug/L
		Endrin	.1 ug/L
		4,4'-DDD	.1 ug/L
		Endosulfan II	.1 ug/L
		4,4'-DDT	.1 ug/L
		Endosulfan Sulfate	.1 ug/L
		Endrin Aldehyde	.1 ug/L
		Methoxychlor	.5 ug/L
		alpha-Chlordane	.05 ug/L
		gamma-Chlordane	.05 ug/L
		Toxaphene	.5 ug/L
		Endrin Ketone	.1 ug/L
EPA 608	Water	4,4-DDD	.1 ug/L
		4,4-DDE	.1 ug/L
		4,4-DDT	.1 ug/L
		Aldrin	.05 ug/L
		Chlordane	.5 ug/L
		Dieldrin	.1 ug/L
		Endosulfan I	.05 ug/L
		Endosulfan II	.1 ug/L
		Endosulfan Sulfate	.1 ug/L
		Endrin	.1 ug/L
		Endrin Aldehyde	.1 ug/L
		Heptachlor	.05 ug/L
		Heptachlor Epoxide	.05 ug/L
		Lindane	.05 ug/L
		PCB-1016	.5 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		PCB-1221	.5 ug/L
		PCB-1232	.5 ug/L
		PCB 1242	.5 ug/L
		PCB-1248	.5 ug/L
		PCB-1254	.5 ug/L
		PCB-1260	.5 ug/L
		Toxaphene	1. ug/L
		a-BHC	.05 ug/L
		b-BHC	.05 ug/L
		d-BHC	.05 ug/L
EPA 8081A	Solid	alpha-BHC	1.666 ug/kg
		gamma-BHC	1.666 ug/kg
		beta-BHC	1.666 ug/kg
		Heptachlor	1.666 ug/kg
		delta-BHC	1.666 ug/kg
		Aldrin	1.666 ug/kg
		Heptachlor Epoxide	1.666 ug/kg
		Endosulfan I	1.666 ug/kg
		4,4'-DDE	3.33 ug/kg
		Dieldrin	3.33 ug/kg
		Endrin	3.33 ug/kg
		4,4'-DDD	3.33 ug/kg
		Endosulfan II	3.33 ug/kg
		4,4'-DDT	3.33 ug/kg
		Endosulfan Sulfate	3.33 ug/kg
		Endrin Aldehyde	3.33 ug/kg
		Methoxychlor	16.66 ug/kg
		alpha-Chlordane	1.666 ug/kg
		gamma-Chlordane	1.666 ug/kg
		Toxaphene	16.66 ug/kg
		Endrin Ketone	3.33 ug/kg
EPA 8082	Water	PCB-1016	.5 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		PCB-1221	.5 ug/L
		PCB-1232	.5 ug/L
		PCB-1242	.5 ug/L
		PCB-1248	.5 ug/L
		PCB-1254	.5 ug/L
		PCB-1260	.5 ug/L
EPA 8082	Solid	PCB-1016	16.6 ug/kg
		PCB-1221	16.6 ug/kg
		PCB-1232	16.6 ug/kg
		PCB-1242	16.6 ug/kg
		PCB-1248	16.6 ug/kg
		PCB-1254	16.6 ug/kg
		PCB-1260	16.6. ug/kg
EPA 8082	Oil	PCB-1016	0.5 mg/kg
		PCB-1221	0.5 mg/kg
		PCB-1232	0.5 mg/kg
		PCB-1242	0.5 mg/kg
		PCB-1248	0.5 mg/kg
		PCB-1254	0.5 mg/kg
		PCB-1260	0.5 mg/kg
EPA 8082	Wipe	PCB-1016	5. ug/wipe
		PCB-1221	5. ug/wipe
		PCB-1232	5. ug/wipe
		PCB-1242	5. ug/wipe
		PCB-1248	5. ug/wipe
		PCB-1254	5. ug/wipe
		PCB-1260	5. ug/wipe
EPA 8151A	Water	Dalapon	50. ug/L
		MCPP	2000. ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
		Dicamba	2. ug/L
		MCPA	2000. ug/L
		Dichloroprop	20. ug/L
		2,4-D	20. ug/L
		2,4,5-TP (Silvex)	2. ug/L
		2,4,5-T	2. ug/L
		Dinoseb	10. ug/L
		2,4-DB	20. ug/L
EPA 8151A	Solid	Dalapon	1.67 mg/kg
		MCPP	66.7 mg/kg
		Dicamba	.0667 mgkg
		MCPA	66.7 mg/kg
		Dichloroprop	.667 mg/kg
		2,4-D	.667 mg/kg
		2,4,5-TP (Silvex)	.0667 mg/kg
		2,4,5-T	.0667 mg/kg
		Dinoseb	.333 mg/kg
EPA 8310	Water	Naphthalene	1. ug/L
	Water	Acenaphthylene	1. ug/L
	Water	Acenaphthene	1. ug/L
	Water	Fluorene	2. ug/L
	Water	Phenanthrene	1. ug/L
	Water	Anthracene	1. ug/L
	Water	Fluoranthene	1. ug/L
	Water	Pyrene	1. ug/L
	Water	Benzo (a) Anthracene	1. ug/L
	Water	Chrysene	0.5 ug/L
	Water	Benzo (b) Fluoranthene	0.2 ug/L
	Water	Benzo (k) Fluoranthene	0.2 ug/L
	Water	Benzo (a) Pyrene	0.2 ug/L
	Water	Dibenzo (a, h) Anthracene	0.2 ug/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
	Water	Benzo (g,h.i) Perylene	0.5 ug/L
	Water	Indeno (1,2,3-cd) Pyrene	0.2 ug/L
EPA 8310	Solid	Naphthalene	0.2 mg/Kg
	Solid	Acenaphthylene	0.1 mg/Kg
	Solid	Acenaphthene	0.2 mg/Kg
	Solid	Fluorene	0.2 mg/Kg
	Solid	Phenanthrene	0.1 mg/Kg
	Solid	Anthracene	0.1 mg/Kg
	Solid	Fluoranthene	0.1 mg/Kg
	Solid	Pyrene	0.1 mg/Kg
	Solid	Benzo (a) Anthracene	0.01 mg/Kg
	Solid	Chrysene	0.1 mg/Kg
	Solid	Benzo (b) Fluoranthene	0.01 mg/Kg
	Solid	Benzo (k) Fluoranthene	0.01 mg/Kg
	Solid	Benzo (a) Pyrene	0.015 mg/Kg
	Solid	Dibenzo (a,h) Anthracene	0.015 mg/Kg
	Solid	Benzo (g,h,I) Perylene	0.05 mg/Kg
	Solid	Indeno (1,2,3-cd) Pyrene	0.03 mg/Kg
EPA 504	Water	EDB	.02 ug/l
		DBCP	.02 ug/l
EPA 8011	Water	EDB	.02 ug/l
		DBCP	.02 ug/l
FL-PRO	Water	TRPH	.366 mg/l
RSK 175 (Mod.)	Water	Ethane	.004 mg/l
		Ethene	.004 mg/l
		Methane	.002 mg/l
		Propane	.004 mg/l
EPA 8015	Water	Diesel (DRO)	.5 mg/l
EPA 8015	Water	Gasoline (GRO)	0.1 mg/l

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
EPA 8015	Solid	Diesel (DRO)	16.7 mg/kg
EPA 8015	Solid	Gasoline (GRO)	1 mg/kg
Campbell May98	Water	Methane	0.0007 mg/l
		Ethane	0.0013 mg/l
		Ethene	0.0013 mg/l
TCLP Volatiles			
EPA 1311/8260B	Leachate	Vinyl Chloride	.020 mg/L
		1,1-Dichloroethene	.010 mg/L
		Chlorobenzene	.010 mg/L
		1,2-Dichloroethane	.010 mg/L
		Chloroform	.010 mg/L
		Benzene	.010 mg/L
		Trichloroethene	.010 mg/L
		2-Butanone	.040 mg/L
		Tetrachloroethene	.010 mg/L
		Carbon Tetrachloride	.010 mg/L
TCLP Semivolatiles			
EPA 1311/8270C	Leachate	Pyridine	.5 mg/L
		1,4-Dichlorobenzene	.1 mg/L
		2-Methylphenol	.1 mg/L
		(3+4)-Methylphenol	.1 mg/L
		Hexachloroethane	.1 mg/L
		Nitrobenzene	.1 mg/L
		Hexachlorobutadiene	.1 mg/L
		2,4,6-Trichlorophenol	.1 mg/L
		2,4,5-Trichlorophenol	.5 mg/L
		Hexachlorobenzene	.1 mg/L
		Pentachlorophenol	.5 mg/L
		2,4 Dinitrotoluene	.1 mg/L
TCLP Herbicides			
EPA 1311/8151A	Leachate	2,4-D	.1 mg/L
		2,4,5-TP (Silvex)	.01 mg/L

Table A-1 *Practical Quantitation Limits, Minimum Detectable Concentrations and Methods*

Method #	Matrix	Analyte/Component	PQL
TCLP Pesticides			
EPA 1311/8081A	Leachate	Lindane	.00025 mg/L
		Heptachlor	.00025 mg/L
		Heptachlor Epoxide	.00025 mg/L
		Endrin	.0005 mg/L
		Methoxychlor	.0025 mg/L
		Chlordane	.0025 mg/L
		Toxaphene	.0025 mg/L
TCLP Metals			
EPA 1311/6010B	Leachate	Arsenic	.5 mg/L
		Barium	.5 mg/L
		Cadmium	.1 mg/L
		Chromium	.5 mg/L
		Lead	.5 mg/L
		Selenium	.1 mg/L
		Silver	.5 mg/L
EPA 1311/7470A		Mercury	.0004 mg/L

Table A-2 *Minimum Detectable Concentrations* and Methods*

Method #	Matrix	Analyte/Component	MDC
EPA 900.0/9310	Water	Gross Alpha/Beta	2.0 pCi/L
EPA 900.0/9310	Solid	Gross Alpha/Beta	5.0 pCi/g
EPA 904.0	Water	Radium-228	3.0 pCi/L
EPA 901.1	Solid	Radium-228	0.5 pCi/g
EPA 903.0	Water	Radium (total alpha)	3.0 pCi/L
EPA 905.0	Water	Strontium-90 (total)	2.0 pCi/L
EPA 905.0	Solid	Strontium-90 (total)	0.5 pCi/g
EPA 905.0	Water	Strontium-89,90	2.0 pCi/L
EPA 905.0	Solid	Strontium-89,90	0.5 pCi/g
EPA EERF C-01	Water	Carbon-14	2.0 pCi/L
EPA EERF C-01	Solid	Carbon-14	0.5 pCi/g
EPA 908.0	Water	Uranium (total)	5.0 pCi/L
EPA 908.0	Solid	Uranium (total)	1.0 pCi/g
EPA 907.0	Water	Uranium-233/234, 235/236, 238	1.0 pCi/L
EPA 907.0	Solid	Uranium-233/234, 235/236, 238	0.4 pCi/g
EPA 907.0	Water	Thorium-228, 230, 232	1.0 pCi/L
EPA 907.0	Solid	Thorium-228, 230, 232	0.4 pCi/g
EPA 907.0	Water	Plutonium-238, 239/240	1.0 pCi/L
EPA 907.0	Solid	Plutonium-238, 239/240	0.4 pCi/g
EPA 907.0	Water	Americium-241	1.0 pCi/L
EPA 907.0	Solid	Americium-241	0.4 pCi/g
	Water	Neptunium-237	1.0 pCi/L
	Solid	Neptunium-237	0.4 pCi/g
EPA 901.1	Water	gamma emitters (MDCsrelative to Cs-137)	10.0 pCi/L
EPA 901.1	Solid	gamma emitters (MDCsrelative to Cs-137)	0.1 pCi/g
EPA 402-R-92-004	Air	Radon-222 (charcoal canisters)	50.0 pCi/L
EPA 906.0	Water	Hydrogen-3 (tritium)	500.0 pCi/L
EPA 906.0	Solid	Hydrogen-3 (tritium)	1.0 pCi/g
EPA 913.0	Water	Radon-222	50.0 pCi/L
	Water	Technetium-99	20.0 pCi/L
	Solid	Technetium-99	0.2 pCi/g
	Water	Plutonium-241	20.0 pCi/L
	Solid	Plutonium-241	8.0 pCi/g
EPA 903.1	Water	Radium-226	1.0 pCi/L
EPA 901.1	Solid	Radium-226	0.3 pCi/g

Table A-2 *Minimum Detectable Concentrations* and Methods*

Method #	Matrix	Analyte/Component	MDC
ASTM D5174-91	Water	Uranium(total)	0.8 pCi/L
ASTM D5174-91	Solid	Uranium(total)	0.2 pCi/g

***Radiochemistry Detection Levels**

Detection levels associated with radiochemistry analyses are generally expressed as minimum detectable concentrations (MDCs). MDCs are determined on a sample-specific rather than method-specific basis. Therefore, each sample in an analytical batch for a given radiochemistry analysis may have a different detection level.

Furthermore, radiochemistry MDCs may be tailored to the client's contract required detection level (CRDL). That is to say, by varying the sample aliquot size and the counting time for example, a particular client's CRDL may be attained and that MDC may be different than the level commonly reported.

Therefore, it shall be understood that, for radiochemistry analyses, we do not determine nor maintain MDLs in a manner similar to stable chemical analyses.

$$MDC = \frac{(3.29 \bullet S_{BKG})}{K} + \frac{2.71}{T_S \bullet K}$$

Unless otherwise specified by the client, radiochemistry MDCs are calculated as follows:

where: S_{BKG} = Standard deviation of the background count rate

K = 2.22 dpm/pCi EFF • ALI • REC • ABN • $e^{-\lambda t}$

$$S_{BKG} = \sqrt{\frac{2 B_{SD}}{T_S}}$$

T_S = Sample count time (minutes)

where: B_{SD} = Sample detector background count rate

T_S = Sample count time (minutes)

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
Organics - Drinking Water					
THM Formation Potential	Bost Round/none	mod. EPA 510.1	14 days to dose, 7 days incubation, 14 days analysis after quenching	250 mL (2)	Cool 4° C, set QC trip blanks in dup.
THM	40 ml vial/Ascorbic Acid	EPA 502.2	14 days from coll.	40 mL (2)	Cool 4° C, set QC trip blanks in dup.
EDB/DBCP	40 ml vial/$Na_2S_2O_3$ 1:1 HCl/Teflon Liner	EPA 504	28 days from coll.	40 mL (3)	Cool 4° C, set QC trip blanks in dup.
Volatile Organic Chemicals	40 ml vial/Ascorbic Acid [1:1 HCl, pH<2]	EPA 502.2 EPA 524.2	14 days from coll. 14 days from coll.	40 mL (3)	Cool 4° C, set QC trip blanks in dup.
Organics - Non-potable Water and Hazardous Waste					
Volatiles (water)	40 ml vial/1:1 HCl Teflon Lined Septum	EPA 601/602 EPA 8021 EPA 624	14 days from coll. 14 days from coll. 14 days from coll. 14 days from coll.	40 mL (2) 40 mL (2) 40 mL (3) 40 mL (3)	Cool 4° C
	3 mg Sodium Thiosulfate if residual chlorine is present	EPA 8260B ASP CLP 95-1 EPA CLP OLM04.2 ASP CAT A or B (all methods)	14 days from coll. 10 days VTSR 10 days VTSR 10 days VTSR	40 mL (3) 40 mL (2) 40 mL (2) 40 mL (3)	
Volatiles (solid)	4 oz glass/none Teflon Lined Cap	EPA 8021B EPA 8260B ASP CLP current version EPA CLP current version ASP CAT A or B (all methods)	14 days from coll. 14 days from coll. 14 days from coll. 10 days VTSR 10 days VTSR 10 days VTSR	Fill with minimal headspace without compaction	Cool 4° C
AE/BN (water)	Glass Liter/none Teflon Liner	EPA 625 EPA 8270C	7 days extraction (from coll.) 40 days analysis from extr. 7 days extraction (from coll.) 40 days analysis from extr.	1 L	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
		ASP CLP current method	5 days extraction (from VTSR) (start) 40 days analysis (from extr.)		
		EPA CLP current method	5 days extraction (from VTSR) (start) 40 days analysis (from extr.)		
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis (from extr.)		
AE/BN (solid)	Sed. Jar/none Teflon Liner	EPA 8270C	14 days extraction (from coll.) 40 days analysis from extr.	200 g	Cool 4° C
		ASP CLP current method	10 days extraction (from VTSR) (comp.) 40 days analysis from extr.		
		EPA CLP current method	10 days extraction (from VTSR) (comp.) 40 days analysis from extr.		
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis from extr.		
Volatile Petroleum Hydrocarbons (water)	40 ml vial/1:1 HCl Teflon Lined Septum	EPA 8021B ASP CAT A or B	14 days from coll. 10 days (from VTSR)	40 mL (2)	Cool 4° C
Volatile Petroleum Hydrocarbons (solid)	4 oz Glass/none Teflon Lined Cap	EPA 8021B ASP CAT A or B	14 days from coll. 10 days (from VTSR)	Fill with minimal headspace without compaction	Cool 4° C
Pesticide/PCB (water)	Glass Liter/none Teflon Liner	EPA 608	7 days extraction (from coll.) 40 days analysis from extr.	1 L	Cool 4° C
		EPA 8081	7 days extraction (from coll.) 40 days analysis from extr.		
		EPA 8082	7 days extraction (from coll.) 40 days analysis from extr.		
		ASP CLP current method	5 days extraction (from VTSR) (start) 40 days analysis from extr.		
		EPA CLP current method	5 days extraction (from VTSR) (start) 40 days analysis from extr.		
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis from extr.		
Pesticide/PCB (solid)	Sed. Jar/none Teflon Liner	EPA 8081	14 days extraction (from coll.) 40 days analysis from extr.	200 g	Cool 4° C
		EPA 8082	14 days extraction (from coll.) 40 days analysis from extr.		
		ASP CLP current method	10 days extraction (from VTSR) (comp.) 40 days analysis from extr.		

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
		EPA CLP current method	10 days extraction (from VTSR) (comp.) 40 days analysis from extr.		
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis from extr.		
PCB (oil)	40 ml vial/none Solid Cap	EPA 8082	14 days extraction (from coll.) 40 days analysis from extr.	5 mL	Cool 4° C
Herbicides (water)	Glass Liter/none Teflon Liner	EPA 8151	7 days extraction (from coll.) 40 days analysis from extr.	1 L	Cool 4° C
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis from extr.		
Herbicides (solid)	Sed. Jar/none Teflon Liner	EPA 8151	14 days extraction (from coll.) 40 days analysis from extr.	200 g	Cool 4° C
		ASP CAT A or B (all methods)	5 (7) days extraction (from VTSR) 40 days analysis from extr.		
PAH (water)	Glass Liter/none Teflon Liner	mod. EPA 8100 EPA 8310	7 days extraction (from coll.) 40 days analysis from extr.	1 L	Cool 4° C
PAH (solid)	Sed. Jar/none Teflon Liner	mod. EPA 8100 EPA 8310	14 days extraction (from coll.) 40 days analysis from extr.	200 g	Cool 4° C
Petroleum Fingerprint (water)	Glass Liter/none Teflon Liner	NYSDOH 310.13	7 days extraction from coll. 40 days analysis from extr.	1 L	Cool 4° C
Petroleum Fingerprint (solid)	Sed. Jar/none Teflon Liner	NYSDOH 310.13	14 days extraction from coll. 40 days analysis from extr.	200 g	Cool 4° C
Alcohols (water)	40 ml vial/none Teflon Liner	mod. EPA 8015	14 days analysis from coll.	40 mL (2)	Cool 4° C
Alcohols (solid)	Sed. Jar/none Teflon Liner	mod. EPA 8015	14 days analysis from coll.	200 g	Cool 4° C
DRO (water)	Glass liter	EPA 8015	7 days extraction from coll. 40 days analysis from extr.	1L	Cool 4° C
DRO (solid)	Sed. Jar	EPA 8015	14 days extraction from coll. 40 days analysis from extr.	200 g	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
EDB/DBCP (water)	40 ml vial/$Na_2S_2O_3$ 1:1 HCl/Teflon Liner	EPA 8011	28 days from collection	40 mL (3)	Cool 4° C, set QC trip blanks in dup.
Dissolved Gases (water)	40 ml vial/1:1 HCl	RSK 175 (Mod.)	14 days from collection	40 mL (3)	Cool 4° C
	60 ml vial/1:1 HCl	Campbell May 98	14 days from collection	60 mL (3)	Cool 4° C
Ethylene Glycol (water)	40 ml vial	EPA 8015	14 days from collection	40 mL (4)	Cool 4° C
TRPH (water)	40 ml vial pre-weighed	TNRCC 1005	14 days analysis from coll.	30 mL	Cool 4° C
TRPH (solid)	40 ml vial pre-weighed	TNRCC 1005	14 days analysis from coll	10 g	Cool 4° C
PCB (wipe)	16 oz. glass jar with 1 wipe & hexane	8082	14 days extraction from coll. 40 days analysis from extr.	1 wipe	Cool 4° C
Air - Solvents	Carbon tubes, 5 spare for QC and from same Lot #	NIOSH 1501, 1003	Undetermined	1 tube	Freeze
Trace Metals					
Trace Metals (water)	P or G/HNO_3 pH < 2	EPA 200 series EPA 6000/7000 series ASP – current method EPA CLP current method	6 months from coll. 6 months from coll. 6 months from VTSR 6 months from VTSR	300 mL	Cool 4° C
Trace Metals (solid)	Sed. Jar/none	EPA 6000/7000 series ASP – current method EPA CLP current method	6 months from coll. 6 months from VTSR 6 months from VTSR	200 g	Cool 4° C
Mercury (water)	P or G/HNO_3 pH < 2	EPA 245.1 EPA 7470A ASP CLP – current method EPA CLP current method	28 days from coll. 28 days from coll. 26 days VTSR 26 days VTSR	300 mL	Cool 4° C
Mercury (solid)	Sed. Jar/none	EPA 7471A ASP CLP - All methods	28 days from coll. 26 days from VTSR	200 g	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
		EPA CLP current method	26 days from VTSR		
Chromium-Hexavalent (water)	P or G/none	SM3500-Cr-D EPA 7196A	24 hours from coll.	200 mL	Cool 4° C
Chromium-Hexavalent (solid)	G/none	EPA 7196 A EPA 7196 A (ASP)	30 days from coll. 24 hours from VTSR	100 g	Cool 4° C
Inorganics - Non-Metallics					
Acidity	P or G/none	EPA 305.1 EPA 305.1 (ASP)	14 days from coll. 12 days from VTSR	100 mL	Cool 4° C
Alkalinity	8 oz. Glass/none Teflon Liner	SM2320B, EPA 310.1 SM2320B, EPA 310.1 (ASP)	14 days from coll. 12 days from VTSR	100 mL	Cool 4° C
Ammonia as N (water)	P or G/1 ml H_2SO_4 pH < 2	EPA 350.1 EPA 350.1 (ASP)	28 days from coll. 26 days from VTSR	400 mL	Cool 4° C
Ammonia as N (solid)	Sed. jar/none	mod. EPA 350.1 mod. EPA 350.1 (ASP)	28 days from coll. 26 days from VTSR	100 g	Cool 4° C
BOD	P or G/none	EPA 405.1 EPA 405.1 (ASP)	48 hours from coll. 24 hours from VTSR	1000 mL	Cool 4° C
Bromide (water)	P or G/none	EPA 300.0 EPA 9056	28 days from coll	100 ml	Cool 4° C
		EPA 300.0 (ASP) EPA 9056 (ASP)	26 days from VTSR		
Bromide (solid)	Sed. jar/none	EPA 300.0, EPA 956 EPA 300.0, EPA 9056 (ASP)	26 days from coll 26 days from VTSR	100 g.	Cool 4° C
CBOD	P or G/none	SM 5210B SM 5210B (ASP)	48 hours from coll. 24 hours from VTSR	1000 mL	Cool 4° C
COD (water)	P or G/1 ml H_2SO_4 pH<2	EPA 410.4 EPA 410.4 (ASP)	28 days from coll. 26 days from VTSR	100 mL	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
COD (solid)	Sed. jar/none	mod. EPA 410.4 mod. EPA 410.4 (ASP)	28 days from coll. 26 days from VTSR	100 g	Cool 4° C
Chloride (water)	P or G/none	SM4500-Cl-D, EPA 325.2, EPA 9251, EPA 300.0 ASP-All methods	28 days from coll. 26 days from VTSR	50 mL	Cool 4° C
Chloride (solid)	Sed. jar/none	EPA 9251, EPA 300.0 EPA 9056 EPA 9251 (ASP EPA 300.0 (ASP), EPA 9056 (ASP)	28 days from coll. 26 days from VTSR	50g	Cool 4°C
Residual chlorine (water)	P or G/none	SM4500-Cl-G, EPA 330.5	Analyze immediately	200 mL	Cool 4° C
Residual chlorine (solid)	Sed. jar/none	mod. EPA 330.5	Analyze immediately	200 g	Cool 4° C
Cyanide (total - water)	Plastic/1 ml NaOH pH > 12 [if res. Cl, then ascorbic acid, NaOH pellets]	EPA 335.2, EPA 335.4 EPA 9010B/9014, 9012A ASP – All methods EPA CLP ILM04.0	14 days from coll. (24 hrs if S^-) 14 days from coll. (24 hrs if S^-) 12 days from VTSR 12 days from VTSR	500 mL	Cool 4° C
Cyanide (solid)	Sed. jar/none	EPA 9010B/9014, 9012A, EPA 335.4, EPA 335.2 ASP – All methods EPA CLP ILM04.0	14 days from coll. 12 days from VTSR	100 g	Cool 4° C
Cyanide - amenable (water)	Plastic/1 ml NaOH pH > 12	EPA 335.1, EPA 335.4 EPA 335.1, 9010B, 9012A (ASP)	14 days from coll. 12 days from VTSR	500 mL	Cool 4° C
Cyanide - amenable (solid)	Sed. jar/none	EPA 9010B/9014, 9012A EPA 9010B/9014, 9012A (ASP)	14 days from coll. 12 days from VTSR	100 g	Cool 4° C
Fluoride (water)	P or G/none	SM4500-F-C, EPA 340.2, EPA 300.0, EPA 9056 ASP - All methods	28 days from coll. 26 days from VTSR	300 mL	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
Fluoride (solid)	Sed. jar/none	mod. EPA 340.2, EPA 300.0, EPA 9056	28 days from coll.	100 g	Cool 4° C
		mod. EPA 340.2 (ASP)	26 days from VTSR		
Kjeldahl nitrogen, total (water)	P or G/1 ml H_2SO_4 pH < 2	EPA 351.2	28 days from coll.	100 mL	Cool 4° C
		EPA 351.2 (ASP)	26 days from VTSR		
Kjeldahl nitrogen, total (solid)	Sed. jar/none	mod. EPA 351.2	28 days from coll.	100 g	Cool 4° C
		mod. EPA 351.2 (ASP)	26 days from VTSR		
Nitrite plus Nitrate (water)	P or G/1 ml H_2SO_4	EPA 353.2	28 days from coll.	100 mL	Cool 4° C
	pH < 2	EPA 353.2 (ASP)	26 days from VTSR		
Nitrite plus Nitrate (solid)	Sed. jar/none	mod. EPA 353.2	28 days from coll.	100 g	Cool 4° C
		mod. EPA 353.2 (ASP)	26 days from VTSR		
Nitrite (water)	P or G/none	EPA 353.2, EPA 354.1 EPA 300.0, EPA 9056	48 hours from coll.	100 mL	Cool 4° C
		EPA 353.2 (ASP), EPA 354.1 (ASP), EPA 300.0 (ASP), EPA 9056 (ASP)	24 hours from VTSR		
Nitrite (solid)	Sed. jar/none	mod. EPA 353.2, EPA 300.0, EPA 9056	48 hours from coll.	100 g	Cool 4° C
		mod. EPA 353.2 (ASP), EPA 300.0 (ASP), EPA 9056 (ASP)	24 hours from VTSR		
Oil and Grease (water)	Glass Quart/1 ml H_2SO_4 pH < 2; Teflon Liner	1664A	28 days from coll.	1000 mL	Cool 4° C
		1664A (ASP)	26 days from VTSR		
Oil and Grease (solid)	Sed. jar/none Teflon Liner	EPA 9071B	28 days from coll.	100 g	Cool 4° C
		EPA 9071B (ASP)	26 days from VTSR		
Organic Carbon, total	P or G/1 ml H_2SO_4 pH < 2	EPA 415.1, EPA 9060	28 days from coll.	100 mL	Cool 4° C
		EPA 415.1, EPA 9060 (ASP)	26 days from VTSR		
Orthophosphate (water)	P or G/none	EPA 365.1, EPA 365.3, EPA	48 hours from coll.	100 mL	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
		300.0, EPA 9056			
		EPA 365.3 (ASP), EPA 365.1 (ASP) EPA 300.0 (ASP), EPA 9056 (ASP)	24 hours from VTSR		
Orthophosphate (solid)	Sed. jar/none	mod. EPA 365.1, EPA 300.0, EPA 9056	48 hours from coll.	100 g	Cool 4° C
		mod. EPA 365.1 (ASP), EPA 300.0 (ASP), EPA 9056 (ASP),	24 hours from VTSR		
Phenols	Glass Quart/1 ml H_2SO_4 Ph < 2; Teflon Liner	EPA 420.1, EPA 9065 EPA 420.1, EPA 9065 (ASP)	28 days from coll. 26 days from VTSR	500 mL	Cool 4° C
Phenols	Sed jar./none Teflon Liner	EPA 9065 EPA 9065 (ASP)	28 days from coll. 26 days from VTSR	100 g	Cool 4° C
Total Phosphorous (water)	P or G/1 ml H_2SO_4 pH < 2	EPA 365.3, EPA 365.4	28 days from coll.	100 mL	Cool 4° C
		EPA 365.4 , EPA 365.3 (ASP)	26 days from VTSR		
Total Phosphorous (solid)	Sed. jar/none	mod. EPA 365.4 mod. EPA 365.4 (ASP)	28 days from coll. 26 days from VTSR	100 g	Cool 4° C
Sulfate (water)	P or G/none	EPA 375.3, 375.4 ASP - All methods	28 days from coll. 26 days from VTSR	100 mL	Cool 4° C
Sulfate (solid)	Sed. jar/none	mod. EPA 375.4 mod. EPA 375.4 (ASP)	28 days from coll. 26 days from VTSR	100 g	Cool 4° C
Sulfide (water)	P or G/1 ml ZnAc+NaOH pH > 9	EPA 376.1, , EPA 376.1 (ASP)	7 days from coll. 5 days from VTSR	500 mL	Cool 4° C
Sulfide (solid)	Sed. jar/none	mod. EPA 376.1	7 days from coll.	100 g	Cool 4° C

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
		mod EPA 376.1 (ASP)	5 days from VTSR		
Sulfite	P or G/none	EPA 377.1	Analyze Immediately	100 mL	-
Surfactants (MBAS) (water)	P or G/none	EPA 425.1 EPA 425.1 (ASP)	48 hours from coll. 24 hours from VTSR	100 mL	Cool 4° C
Physical Properties					
Color	Plastic/none	EPA 110.2 EPA 110.2 (ASP)	48 hours from coll. 24 hours from VTSR	100 mL	Cool 4° C
Conductance	Plastic/none	SM2510B, EPA 120.1,9050A SM2510B, EPA 120.1, 9095A (ASP)	28 days from coll. - filtered 24 hours from coll. - unfiltered 26 days from VTSR	100 mL	Cool 4° C
Hardness	Plastic/HNO_3 pH < 2	SM2340B EPA 130.2	6 months from coll.	200 mL	
Odor	Glass/none	EPA 140.1	24 hours from coll.	200 mL	Cool 4° C
pH	P or G/none	EPA 150.1 EPA 9040B & 9045C	Analyze Immediately	100 mL/100 g	-
Residue - Dissolved	Plastic/none	SM2540C, EPA 160.1 SM2540C, EPA 160.1 (ASP)	7 days form coll. 24 hours from VTSR	500 mL	Cool 4° C
Residue - Total	Plastic/none	EPA 160.3 SM 2540B EPA 160.3 (ASP)	7 days from coll. 5 days from VTSR	500 mL	Cool 4° C
Residue - Suspended	Plastic/none	EPA 160.2, SM 2540D EPA 160.2 (ASP)	7 days from coll. 5 days from VTSR	500 mL	Cool 4° C
Residue - Volatile	Plastic/none	EPA 160.4, SM 2540E EPA 160.4 (ASP)	7 days from coll. 5 days from VTSR	500 mL	Cool 4° C
Residue – Settleable	P or G/none	EPA 160.5 EPA 160.5 (ASP)	48 hours from coll. 24 hours from VTSR	1000 mL	Cool 4° C
Characteristic Testing					

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
TCLP	Sed. jar/none Teflon liner	Volatiles	14 days TCLP prep from coll. 14 days analysis from TCLP	200 g	Cool 4° C
	Sed. jar/none Teflon liner (one container for sv & metals)	Semivolatiles	14 days TCLP prep from coll. 7 days extraction from TCLP 40 days analysis from extraction	200 g (one container for sv & metals)	
		Mercury	28 days TCLP prep from coll. 28 days analysis from TCLP		
		Metals	180 days TCLP prep from coll. 180 days analysis from TCLP		
	Sed. jar/none Teflon liner	ASP Volatiles	7 days TCLP prep from VTSR 7 days analysis from TCLP	200 g	
	Sed. jar/none Teflon liner (one container for sv & metals)	ASP Semivolatiles	5 days TCLP prep from VTSR 7 days extraction from TCLP 40 days analysis from extraction	200 g (one container for sv & metals)	
		ASP Mercury	5 days TCLP prep from VTSR 28 days analysis from TCLP		
		ASP Metals	180 days prep extraction from VTSR 180 days analysis from TCLP		
Reactive Cyanide (water)	Plastic/none	SW-846 Ch. 7	Not specified - as soon as possible	100 mL	Cool 4° C
Reactive Cyanide (solid)	Sed. jar/none	SW-846 Ch. 7	Not specified - as soon as possible	100 g	Cool 4° C
Reactive Sulfide (water)	P or G/none	SW-846 Ch. 7	Not specified - as soon as possible	100 mL	Cool 4° C
Reactive Sulfide (solid)	Sed. jar/none	SW-846 Ch. 7	Not specified - as soon as possible	100 g	Cool 4° C
Waste Ignitability (water)	P or G/none	EPA 1010	Not specified - as soon as possible	100 mL	Cool 4° C
Waste Ignitability (solid)	Sed. jar/none	EPA 1010/1030	Not specified - as soon as possible	100 g	Cool 4° C
Waste Corrosivity (water)	P or G/none	EPA 9040B	Not specified - as soon as possible	100 mL	Cool 4° C
Waste Corrosivity (solid)	Sed. jar/none	EPA 9045C	Not specified – as soon as possible	100 g	Cool 4° C
Radiological					
Gross Alpha	P or G/HNO_3 pH<2	EPA 900 EPA 9310	6 months	1 L	-

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
Gross Beta	P or G/HNO_3 pH<2	EPA 900 EPA 9310	6 months	1 L	-
Uranium	Plastic/HNO_3 pH<2	SM17th 7500	6 months	1 L	-
Gross Alpha /Beta	P or G/HNO_3 pH<2	EPA 900.0 / 600-30	6 months	200 mL 10 g	-
Total Alpha Radium	P or G/HNO_3 pH<2	EPA 900.0 / 600-32	6 months	1000 mL see gamma	-
Radium-228	P or G/HNO_3 pH<2	EPA 904.0 / 600-33	6 months	1000 mL see gamma	-
Strontium-90	P or G/HNO_3 pH<2	ASTM D 5811-95 / 600-35	6 months	500 mL 10 g	-
Carbon-14	P or G/no pres.	EPA EERF C-01 / 600-38	6 months	200 mL 20 g	-
Uranium (total)	P or G/HNO_3 pH<2	EPA 908.0 / 600-39	6 months	1000 mL NA	-
Uranium (isotopic)	P or G/HNO_3 pH<2	EPA 907.0 / 600-60	6 months	200 mL 10 g	-
Thorium (isotopic)	P or G/HNO_3 pH<2	EPA 907.0 / 600-60	6 months	200 mL 10 g	-
Plutonium (isotopic)	P or G/HNO_3 pH<2	EPA 907.0 / 600-60	6 months	200 mL 10 g	-
Americium-241	P or G/HNO_3 pH<2	EPA 907.0 / 600-60	6 months	200 mL 10 g	-

Table B-1 *Sample Containers, Preservations and Holding Times*

Parameter	Container/Pres.	Method Numbers	Holding Time	Volume Required	Comments
Neptunium-237	P or G/HNO_3 pH<2	600-62	6 months	200 mL 10 g	-
Gamma Spec	P or G/HNO_3 pH<2	EPA 901.1 / 600-50	6 months	1000 mL 1000 g	-
Tritium	P or G/no pres.	EPA 906.0/ 600-72	6 months	200 mL 50 g	-
Technetium-99	P or G/no pres.	ASTM Z4557Z (draft) 600-70	6 months	1000 mL 10 g	-
Plutonium-241	P or G/HNO_3 pH<2	600-78	6 months	200 mL 10 g	-

Table C-1 *Laboratory Standard Operating Procedures*

Organic Extractions/Semivolatile-GC

100-01	**5**	The Toxicity Characteristic Leaching Procedure for Volatile Organic Compounds
100-05	**2**	1,2-Dibromomethane and 1,2-Dibromo-3-chloropropane by Microext. & GC
100-06	**4**	Microextractables - EDB and DBCP
100-09A	**4**	Organochlorine Pesticides and PCBs Sample Extraction - Continuous Extractor
100-12A	**5**	Organochlorine Pesticides and PCBs Sample Extraction - Sonication
100-15	**4**	Organochlorine Pesticides and PCBs Sample Extraction- Separatory Funnel
100-18	**5**	Trace Organics Glassware Cleaning
100-21	**4**	Petroleum Products in Environmental Matrices by GC FID
100-24	**5**	Organochlorine Pesticides and Aroclors - USEPA CLP
100-27	**4**	Extraction of Chlorinated Herbicides - Method 8151A
100-33	**5**	Organochlorine Pesticides and Aroclors - NYSDEC ASP CLP 95-3
100-36	**4**	Organochlorine Pesticides and PCBs - Method 608
100-46	**4**	Chlorinated Herbicides - Method 8151A
100-49	**3**	PCBs Sample Extraction - Oil
100-50	**1**	Method 3540C, Soxhlet Extraction of Solids for Organochlorine Pest and PCBs
100-52	**3**	PCBs Sample Extraction - Surface Area
100-55A	**4**	Organochlorine Pesticides - Method 8081A
100-55B	**4**	PCBs - Method 8082
100-66	**1**	Dissolved Gasses
100-67	**2**	Waste Dilution
100-68	**3**	Diesel Range Organic
100-70	**0**	Soil and Solids Sub-sampling
100-72	**0**	Core Cutting
100-73	**1**	Total Petroleum Hydrocarbons by TNRCC 1005
100-74	**0**	Polynuclear Aromatic Hydrocarbons-Sonication
100-75	**0**	Polynuclear Aromatic Hydrocarbons - Liquid-Liquid Extraction
100-76	**0**	Polynuclear Aromatic Hydrocarbons
100-77	**0**	Biota Grinding Procedure
100-78	**0**	Diesel Range Organics (DRO) Sample Extraction – Continuous Extractor

Classical Chemistry

200-06	**6**	Alkalinity (Total, Phenolphthalein, Carbonate, Bicarbonate, and Hydroxide)
200-12	**5**	Biochemical Oxygen Demand
200-13	**0**	The Determination Of Inorganic Anions In Water By Ion Chromatography
200-14	**0**	Chromium-Hexavalent in Soils
200-15	**0**	Orthophosphate (Colorimetric, Ascorbic Acid, Two Reagent)
200-18	**4**	Chemical Oxygen Demand (COD)
200-21	**4**	Chloride
200-24	**4**	Chlorine, Residual and Free
200-27	**5**	Chromium-Hexavalent
200-30	**4**	Color
200-33	**5**	Total Cyanide - Method 335.2
200-34	**5**	Total Cyanide - Method 9010B/9014
200-35	**6**	Total Cyanide - Method 335.2 CLP-M*
200-36	**3**	Dissolved Oxygen (Winkler Azide Modification)
200-37	**2**	Method 5 - Determination of Particulate Matter Emissions From Stationary Sources
200-39	**5**	Flashpoint

200-40	**3**	Ignitability of Solids
200-42	**5**	Fluoride
200-48	**7**	Ammonia
200-54	**4**	Methylene Blue Active Substances (MBAS)
200-57	**5**	Nitrite Nitrogen
200-58	**2**	Nitrogen, Nitrite (Spectrophotometric)
200-60	**6**	Nitrate-Nitrite Nitrogen
200-66	**4**	Odor
200-69	**5**	Oil and Grease
200-72	**6**	Orthophosphate
200-75	**7**	pH
200-81	**5**	Total and Volatile Solids in Solid and Semisolid Samples
200-84	**5**	Phenol
200-87A	**4**	Reactivity
200-88	**2**	Paint Filter Liquids Test - Method 9095A
200-96	**4**	Settable Matter
200-99	**8**	Specific Conductance
200-102	**7**	Total and Volatile Suspended Solids
200-105	**4**	Sulfate
200-106	**5**	Sulfate, Turbidimetric
200-108	**4**	Sulfite
200-111	**6**	Sulfide
200-114	**6**	Total Kjeldahl Nitrogen
200-115	**4**	Digestion Procedure for TKN and TP
200-117	**6**	Total Organic Carbon
200-120	**6**	Total Phosphorus
200-126	**6**	Total and Volatile Dissolved Solids
200-129	**5**	Total and Volatile Solids
200-135	**4**	Cyanide Amenable to Chlorination
200-147	**3**	Hardness-Titrimetric, EDTA
200-150	**1**	Free Carbon Dioxide (Titrimetric)
		GC/MS Volatile/Semivolatile
300-01	**2**	Measurement of Purgeable Organic Compounds in Water by Capillary Column GC/MS - 524.2
300-03	**6**	Volatile Organic Compounds by GC/MS - Method 624
300-10	**2**	Method 3540C, Soxhlet Extraction of Solids for GC/MS Analysis
300-12A	**5**	Semivolatile Organic Compounds by GC/MS - Method 8270C
300-15A	**4**	Semivolatile Organic Compounds by GC/MS Sample Extraction - Continuous Extractor
300-18A	**5**	Semivolatile Organic Compounds by GC/MS Sample Extraction - Sonication
300-27A	**5**	Volatile Organics by GC/MS - Method 8260B
300-33	**5**	Semivolatile Organic Compounds by GC/MS - Method 625
300-39	**5**	Volatile Organics by GC/MS - Method EPA-CLP & Method NYSDEC ASP 6/2000
300-41	**5**	Semivolatile Organics by GC/MS - Method USEPA-CLP & Method NYSDEC ASP 6/2000
300-44	**2**	Low-Level Volatile Organics by GC/MS - Method OLC02.1

Table C-1 *Laboratory Standard Operating Procedures*

		Inorganic
400-06	**9**	Furnace Atomic Absorption (SW-846)
400-09	**9**	Trace Metals Sample Preparation (NYSASP and USEPA Superfund CLP)
400-15A	**5**	ICP Atomic Emission - Method 6010B
400-21	**8**	Cold Vapor Mercury - Methods 7470A and 7471A
400-24A	**4**	Trace Metals Sample Preparation (SW-846 Method 3005A)
400-24B	**2**	Trace Metals Sample Preparation (SW-846 Method 3010A)
400-24C	**2**	Trace Metals Sample Preparation (SW-846 Method 3020A)
400-24D	**3**	Trace Metals Sample Preparation (SW-846 Method 3050B)
400-24E	**1**	Trace Metals Sample Preparation (Arsenic & Selenium)
400-24F	**1**	Trace Metals Sample Preparation (EPA-600/4-79-020 Section 4.1.4.200.7)
400-24G	**1**	Trace Metals Sample Preparation (EPA-600/4-79-020 Section 4.1.3.200.7)
400-24H	**1**	Trace Metals Sample Preparation (200.2)
400-30	**4**	Filtering
400-33	**3**	Jaw Crushing
400-36	**3**	Trace Metals Air Sample Preparation
400-39	**4**	Toxicity Characteristic Leaching Procedure (TCLP) - Non-Volatiles
400-41	**5**	Trace Metals Glassware Cleaning
400-56	**5**	Furnace Atomic Absorption - Method USEPA-CLP & Method NYSDEC ASP 6/2000
400-59	**3**	ASTM - Shake Extraction of Solid Waste with Water
400-62	**3**	Synthetic Precipitation Leaching Procedure (SPLP) - Non-Volatiles
400-65	**5**	ICP Atomic Emission Method - USEPA-CLP & Method NYSDEC ASP 6/2000
400-68	**5**	Cold Vapor Mercury - Method USEPA-CLP & Method NYSDEC ASP 6/2000
		GC Volatile
500-04	**5**	Volatile Halogenated and Aromatic Hydrocarbons by Purge and Trap/GC - Methods 601/602
500-07	**2**	Volatile Organic Compounds in Water by Purge & Trap/GC - EPA Method 502.2
500-24	**3**	Volatile Halogenated and Aromatic Hydrocarbons by Purge & Trap/GC - EPA Method 8021B
500-25	**2**	Petroleum Hydrocarbon/Gasoline range Organic (GRO) by Purge and Trap-GC/FID. Modified EPA Method 8015
		Radiochemistry
600-02	**1**	The Acquisition, Preparation, and Use of Standard Reference Materials
600-06	**0**	Radiochemistry Glassware Cleaning
600-10	**5**	Sample Preparation Procedures
600-20	**2**	Calibration of Low-Background Alpha/Beta Proportional Counters
600-21	**0**	Calibration of Gamma Spectrometers
600-22	**1**	Calibration of Alpha Spectrometers
600-23	**0**	Calibration of Liquid Scintillation Counters
600-30	**2**	Determination of Gross Alpha/Beta Activity
600-32	**1**	Determination of Total Alpha Radium Activity in Aqueous Samples
600-33	**1**	Determination of Radium-228 Activity in Aqueous Samples
600-34	**1**	Determination of Chlorine-36 by Proportional Counting
600-35	**1**	Determination of Strontium-89/90 Activity
600-38	**1**	Determination of Carbon-14 by Proportional Counting - Distillation Method

Table C-1 *Laboratory Standard Operating Procedures*

600-50	**3**	Determination of Gamma Emitting Isotopes
600-60	**1**	Determination of Selected Actinide by Alpha Spectrometry
600-62	**1**	Determination of Neptunium-237 by Solvent Extraction and Alpha Spectrometry
600-66	**1**	Determination of Polonium-210 Activity -Galvanic Deposition
600-70	**1**	Determination of Technetium-99 by Solid-Phase Disk Ext - LSC
600-72	**1**	Determination of Tritium-Distillation Method
600-78	**1**	Determination of Plutonium-241 by Liquid Scintillation Counting
		Administrative
800-01	**4**	Preparation of Analytical Standard Operating Procedures
800-02	**2**	Preparation of Administrative Standard Operating Procedures
800-03	**2**	Document Control
800-04	**2**	Laboratory Logbooks - Creation, Issue, Maintenance and Use
800-05	**3**	Training
800-06	**3**	Corrective Action
800-10	**4**	Generating Control Limits
800-13	**4**	Generating Quality Control Charts
800-15	**8**	Sample Management System
800-16	**2**	Sample Tracking System
800-20	**1**	Electronic Disk Deliverables (EDD)
800-22	**1**	LIMS Software Testing and Validation
800-23	**0**	LIMS Modification Requests
800-24	**1**	LIMS Backup/ARchiving
800-26	**1**	Calculation of Method Detection Levels
800-27	**0**	Inspection and Verification of Thermometers
800-28	**0**	LIMS Software Version Control
800-30	**1**	Acceptance Criteria for Samples Classified as Radiological Materials
800-31	**4**	Laboratory Hazardous Waste Management System
800-32	**2**	Classification and Handling Protocols for Radioactive Samples
800-33	**3**	Preparation of Laboratory Data Reports
800-34	**1**	Laboratory Radioactive Waste Management System
800-36	**2**	Internal Review of Laboratory Data
800-39	**1**	SW-846 Update III Low/High Level Soil Field Preservation Container Kit
800-40	**2**	Calibration and Operation of Laboratory Balances
800-41	**2**	Calibration and Operation of Mechanical Pipets
800-42	**2**	Record Storage
800-43	**1**	Defacing of Labels on Applicable Containers
800-44	**0**	Filing, Submission, and Retrieval of In-house Records
800-45	**0**	Cylinder Gas Ordering
800-46	**0**	Laboratory Definitions/Terms
800-47	**0**	Supply Ordering
QAP	**8**	Quality Assurance/Quality Control Description of Policy and Programs
CHP	**0**	Chemical Hygiene Plan
QUALS	**0**	Laboratory Services - Qualifications
800-50	**1**	Radiation safety Procedures Descriptions of Policies and Practices

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Table D-1 *Certifications / Approvals*

Agency	Cert. No.	Category*							Comments
		WS	WP	HW	SW	M	R	A	
Connecticut	PH0634	X	X	X	X		X		
Florida	E87280			X	X				
Kansas	E-10342			X	X				
Maryland	239	X					X		Drinking Water certification only
Massachusetts	NY034	X	X				X		Hazardous/Solid Waste certification not available
New Jersey	NY361		X	X	X		X		
New York	10155	X	X	X	X		X		
Pennsylvania	68-285	X		X	X				
Utah	3154370200		X	X	X		X		
Tennessee	02942	X							Drinking Water certification only
Virginia	00244	X							Drinking Water certification only
AFCEE	-		X	X	X		X		
USDOE ICPT	020516-OGL		X	X	X		X		
USACE	3/26/03*		X	X	X		X		*indicates Date of Certification

***Indicates date of letter & certification** **NELAP States are listed in bold**

WS=Water Supply, WP=Water Pollution, HW=Hazardous Waste, SW=Solid Waste, M=Microbiological, R=Radiochemistry, A=Asbestos

Appendix B

Health and Safety Plan

HEALTH & SAFETY PLAN

Site Characterization & Interim Remedial Measure Kozdranski Site Wheatfield, New York

The Goodyear Tire & Rubber Company

January 2005

5540/35090

HEALTH & SAFETY PLAN

Site Characterization & Interim Remedial Measure
Kozdranski Site
Wheatfield, New York

The Goodyear Tire & Rubber Company
Akron, Ohio

James R. Heckathorne, P.E.
Vice President

January 2005

O'BRIEN & GERE
ENGINEERS, INC.

Revision Summary

Revision Date	Description of Changes (Section Title or Number – Description)	Reason For Change (Individual Name or Title, Company/Agency Name, Document Reference and Date)
December 13, 2004	NA – Original Document	NA

Preface

This document describes the minimum anticipated protective measures necessary to ensure worker health and safety during the activities associated with this project. O'Brien & Gere employees and subcontractors must read and understand the contents of this document. We do not intend the contents of this document to cover all situations that may arise nor to waive any provisions specified in Federal, State, and local regulations or site owner/contractor health and safety requirements. During this project, if any task occurs that is not covered in this Health & Safety Plan, the individual responsible for that task will inform O'Brien & Gere's Corporate Health & Safety Department. Site personnel affected by the new activity and its associated hazards must ensure that they follow necessary safety procedures and use appropriate protective equipment.

Subcontractors are accountable for the health and safety of their employees.

Reviewed By

Jeffrey R. Parsons, CIH Date

Manager of Corporate Health & Safety

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1. General

1.1. Scope and purpose

The requirements and guidelines presented in this Health and Safety Plan (HASP) are based on a review of available information and an evaluation of potential on-site hazards. This HASP incorporates by reference the applicable Occupational Safety and Health Administration (OSHA) requirements in 29 CFR Part 1910 and 29 CFR Part 1926. The protective equipment selection was made in accordance with Subpart I of 29 CFR 1910. O'Brien & Gere personnel are required to read this HASP before beginning work on-site. This HASP will be available for inspection and review by O'Brien & Gere employees while work activities are underway. O'Brien & Gere personnel will comply with this HASP when conducting the activities associated with implementation of the workplan. On-site O'Brien & Gere personnel will notify the O'Brien & Gere Site Safety and Health Coordinator (SSHC) of matters of health and safety. The SSHC is responsible to the Project Manager for monitoring activities, monitoring compliance with the provisions of this HASP, and for modifying this HASP to the extent necessary if site conditions change. This HASP is specifically intended for the conduct of O'Brien & Gere activities as described in the Scope of Work section of this HASP. Although this HASP can be made available to interested persons for informational purposes, O'Brien & Gere does not assume responsibility for the interpretations or activities of any persons or entities other than employees of O'Brien & Gere and its subcontractors.

1.2. Project Personnel

O'Brien & Gere personnel, with the following health and safety designations and general responsibilities, will direct implementation of HASP requirements.

1.2.1. Project Manager

The Project Manager (PM) is Al Farrell. The PM and has overall responsibility for ensuring that the policies and procedures of this HASP are implemented by the Site Safety and Health Coordinator (SSHC). The PM is also responsible for resourcing the project with personnel and equipment so HASP requirements can be implemented.

1.2.2. Health and Safety Manager

The HSM is Jeffrey R. Parsons, CIH. The HSM will develop and/or review the project-specific HASP. Changes to this HASP must be approved by the HSM. The HSM also has final authority to resolve health and safety issues that are not resolved at the Site or through the PM.

1.2.3. Site Safety and Health Coordinator

The SSHC is **[TBD]**. Alternate SSHCs may be designated by the PM when the SSHC must be absent from the site. The PM will designate a person as the SSHC at the Site. The duties of the SSHC will be as follows:

- Implementation of the HASP in accordance with the Health and Safety Program.
- Conducting safety inspections.
- Inspection of accidents, illnesses and incidents occurring on-site.
- Conducting safety briefings and Site-specific training for on-site personnel.
- Accompany NYSDEC, Occupational Safety and Health Administration ("OSHA"), or other governmental agency personnel visiting the Site in response to health and safety issues.
- Updating and modifying the HASP for the Site in consultation with the HSM due to changes in Site or environmental conditions.

The SSHC is given the authority to stop Site operations (STOP WORK AUTHORITY) if the SSHC determines that an imminent health or safety hazards or other potentially dangerous situation exists. The SSHC is to immediately notify the PM or HSM of Stop Work Orders when they are issued. The SSHC may also recommend to the PM or HSM that work authorization for individual Site personnel be revoked due to health and/or safety concerns.

The SSHC will document that personnel entering the work areas at the Site are qualified in accordance with the requirements of 29 CFR 1910.120 and this HASP.

1.3. Key Definitions

INTRUSIVE WORK ZONE (IWZ) - The work area(s) where intrusive tasks or work activities will be conducted, areas where contamination may be present and contact workers, and areas subject to dust, vapor, and odors created as a result of intrusive tasks. IWZs will include areas designated as Exclusion Zones, Contamination Reduction Zones, and

other work areas where access is limited to personnel with Hazardous Waste Operations training. For purposes of this HASP, a IWZ also includes work areas with a 20' radius of well sampling and development, drilling, soil sampling and similar investigative-type activities. The SSHC may increase or decrease this radius as necessary based on site conditions. Barricades such as safety fence, rope, caution tape, or traffic cones are not necessary unless such activities are in an area where unauthorized persons may approach the work area.

CONTACT VISITOR or SUBCONTRACTOR - A visitor or subcontractor who may have contact with potential or known contamination within a IWZ, but is not an employee of the O'Brien & Gere. A minimum of 24 hours of HAZWOPER training is required.

NON-CONTACT VISITOR or SUBCONTRACTOR - A visitor or subcontractor who is not expected to come into contact with contamination and is restricted to designated areas including Non-Intrusive Work Zones. Examples would include delivery personnel, sales reps, etc. HAZWOPER training is not required.

NON-INTRUSIVE TASKS - Non-intrusive tasks are those that do NOT have the potential to jeopardize the health and safety of site workers, the public, or the environment with respect to site contaminants. Hazardous waste operations training per 29CFR1910.120 or 29CFR1926.65 is NOT required. However, all other applicable health and safety regulations, site owner requirements, and HASP requirements must be followed.

NON-INTRUSIVE WORK ZONE - The work area(s) where non-intrusive tasks or work activities will be conducted. These may include activities like office work, grass cutting, inspections , surveying, non-intrusive construction work, non-intrusive maintenance, and non-intrusive investigation work.

INTRUSIVE TASKS - Intrusive activities within O'Brien & Gere's scope of work are those that have the potential to cause health and safety concerns to site workers, the public, or the environment. Intrusive tasks typically have the potential to create exposures to site contaminants above HASP action levels, regulatory limits, or published guidelines or may result in direct contact with contaminated materials. These activities and any non-intrusive activities conducted within an Exclusion Zone require training per 29CFR1910.120 or 29CFR1926.65.

1.4. Training

Training requirements as provided by the Health and Safety Program and 29 CFR 1910.120, will be required for personnel entering work areas at the Site. Personnel working within Intrusive Work Zones (IWZs) must have completed OSHA hazardous waste training and a hazardous waste refresher course within the last twelve months. IWZs include any activities within former dump areas and solid waste staging areas.

Personnel without required training certification will not be within these areas. All personnel will be required to attend a project safety orientation during which this HASP is reviewed.

Type of Work	Intrusive (Y/N)	HAZWOPER Training
General Site Inspection, Surveying, or Support Activities outside designated Intrusive Work Zones (IWZs).	N	Not required.
General Site Inspection or Surveying within designated IWZs	Y	24 or 40 Hr
Clearing & Grubbing in former dump areas where waste material was observed.	Y	40 Hr
Clearing & Grubbing inside IWZs	Y	40-Hr
Soil Boring	Y	40-Hr
Excavation Work	Y	40-Hr
Soil and Groundwater Sampling	Y	24 or 40 Hr

1.5. Medical surveillance program

O'Brien & Gere has implemented a medical monitoring program in accordance with 29 CFR 1910.120. The O'Brien & Gere program is designed to monitor and reduce health risks to employees potentially exposed to hazardous materials and to provide baseline medical data for each employee involved in work activities. It is also designed to determine the employee's ability to wear personal protective equipment such as chemical resistant clothing and respirators.

Medical examinations are administered on a post-employment and annual basis and as warranted by symptoms of exposure or specialized activities. The examining physician is required to make a report to O'Brien & Gere of any medical condition that would increase the employee's risk when wearing a respirator or other PPE. O'Brien & Gere maintains site personnel medical records as required by 29 CFR 1910.120 and by 29 CFR 1910.1020, as applicable.

O'Brien & Gere employees performing the activities listed in the workplan have or will receive medical tests as regulated by 29 CFR 1910.120. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

1.6. Respirator clearance

Employees who wear or may wear respiratory protection have been provided respirators as required by 29 CFR 1910.134. This standard

requires that an individual's ability to wear respiratory protection be medically certified before performing designated duties.

2. Site characterization and analysis

2.1. Site description

The Kozdranski site is located on a triangular piece of property between River, Liberty, Williams, Jagow, and Witmer roads in the Town of Wheatfield, New York. The property is immediately south of the Niagara Mohawk right-of-way and approximately 300 feet east of the Conrail right-of-way.

The surrounding properties to the north and west are utilized for agricultural purposes. Black Creek lies approximately 400 feet north of the Site, and a designated wetland (TW-26) lies approximately 1,000 feet to the west.

In the May 3, 1994 Hazardous Substance Disposal Site Nomination Form prepared by the NYSDEC, the nearest water supply is indicated as being 2,600 ft away (Note: In the Registry Site Classification Decision prepared by the NYSDEC on June 14, 1993, the nearest water supply is instead indicated as being 3,600 ft away). The nearest building is identified to be 2,200 ft away. The nearest surface water is noted as being 50 ft away.

The Site is landlocked, meaning that access to public roads is not available without a right-of-way across private property held by others. The property to the west and south is presently owned by Forest City Enterprises. A dirt road (former railroad bed) extends from Jagow Road toward the northwest corner of the Site east of the Conrail tracks and west of property owned by Forest City Enterprises that is presently used for agricultural purposes. The former railroad bed, which runs alongside the west border of the Kozdranski site is owned by Empire State Pipeline.

2.2. Scope of work

The work activities which may be performed under this HASP will consist of the following:

1. **Clearing & Grubbing in the Former Dump Locations** – Clearing and Grubbing is considered intrusive work since it will be performed

in areas where drum carcasses were observed and potentially contaminated materials may be encountered.

2. **Removal & Disposal of Drum Carcasses and Solid Waste** – Drum carcasses and solid waste would be removed to a depth of 2 feet below ground surface as an interim remedial measure (IRM).

3. **Soil & Groundwater Sampling** – Soil samples will be collected once drum carcasses, solid waste, and stained soil have been remove to a depth of 2 feet. Samples will be collected using hand tools and sampling equipment. A drill rig will be used to perform soil boring to a depth at which clay or groundwater is encountered. Monitoring wells will be constructed and used to collect groundwater samples.

4. **Excavation of Test Pits** – If staining is encountered at 2 feet below ground surface, test pits will be excavated in the stained areas.

2.3. Site hazards and controls

An assessment of the hazards has been made for each of the activities specified. Suspected physical, biological, chemical, flammable, explosive and reactive hazards were evaluated. The following paragraphs summarize the potential risks that have been identified.

For the activities listed in Section 2.2, the following hazards have been identified:

- Physical or general safety hazards associated with the use of the drilling, sampling, and support equipment;
- Biological hazards such as poisonous plants, mosquitoes, and ticks (minimal during the winter);
- Skin and eye contact with constituents of concern, if any
- Inhalation of low concentrations of organic vapors, or potentially contaminated dusts.

2.3.1. Chemical Health Hazards & Controls

Low levels of a variety of metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) were detected on site. However, the primary contaminants of concern (COCs) from a potential health perspective are aniline, mercaptobenzothiazole, benzothiazole, and diphenylamine. This is based on their potential health effects and elevated concentrations detected in soil samples. Although these compounds are not particularly volatile, three of them can be absorbed through skin contact. Health effects for each COC is summarized below.

ANILINE :
Physical Description - Colorless to brown, oily liquid with an aromatic amine-like odor. [Note: A solid below 21°F.]
OSHA PEL: TWA 5 ppm (19 mg/m^3) [skin]
IDLH: 100 ppm
Ionization Potential (IP): 7.70 eV
Lower Explosive Limit (LEL): 1.3%
Exposure Routes: Inhalation, Skin Absorption, Skin/Eye Contact
Symptoms of Exposure: Headache, lassitude (weakness, exhaustion), dizziness; cyanosis; ataxia; dyspnea (breathing difficulty) on effort; tachycardia; irritation eyes; methemoglobinemia; cirrhosis;
Carcinogen: Potential Human Carcinogen

MERCAPTOBENZOTHIAZOLE:
Physical Description – Yellowish powder with "unpleasant" odor
OSHA PEL: Not Available
IDLH: Not Available
Ionization Potential (IP): Not Applicable (solid)
Lower Explosive Limit (LEL): Not Applicable (solid)
Exposure Routes: Skin/Eye Contact
Symptoms of Exposure: Severe irritant to the eyes and skin and may cause dermatitis. Is also a know skin sensitizer, especially to those who have allergies to rubber products like latex and spandex;
Carcinogen: No

BENZOTHIAZOLE:
Physical Description – Yellow liquid with an aromatic odor
OSHA PEL: Not Available [skin]
IDLH: Not Available
Ionization Potential (IP): Not Available
Lower Explosive Limit (LEL): Not Available, has vapor pressure of 33 mg Hg at 266F so is not volatile at room temperature and does not ignite easily. NFPA Fire Hazard level 1.
Exposure Routes: Skin absorption, Skin/Eye Contact
Symptoms of Exposure: Mild irritant to the eyes and skin and may cause dermatitis. Inhalation of vapors may also cause respiratory tract irritation. Can be absorbed through the skin;
Carcinogen: No

DIPHENYLAMINE:
Physical Description – Amber flake or crystal solid
OSHA PEL: 10 ppm [skin]
IDLH: Not Available
Ionization Potential (IP): Not Applicable (solid)
Lower Explosive Limit (LEL): Not Applicable (solid)
Exposure Routes: Skin absorption, Skin/Eye Contact
Symptoms of Exposure: Mild irritant to the eyes and skin and may cause dermatitis. Inhalation of vapors may also cause respiratory tract irritation. Can be absorbed through the skin;
Carcinogen: No

Chemical hazard controls consist primarily of donning protective clothing to prevent skin contact with the above materials. PPE will be upgraded to Modified Level D when handling potentially contaminated materials, when walking in potentially contaminated (stained) soils, or if odors are encountered during excavation activities that may suggest the presence of COCs. Inhalation hazards are not anticipated due to the low volatility of COCs and the relatively cool weather.

2.3.2. Safety Hazards & Controls

The initial safety hazard identification is outlined in the following table. If work methods or equipment change, then the SSHC and/or H&S Manager may modify this table as necessary.

	Clearing & Grubbing	Solid Waste & Drum Removal	Soil & Ground Water Sampling	Test Pit Excavation
Trips & Falls	X	X	X	X
Lifting/Back Injury	X	X		
Hand Cuts	X	X	X	X
Eye Injury	X	X	X	X
Head Injury	X	X	X[1]	X
Foot Injury	X	X	X	X
Chainsaw Injury	X			
Struck by	X (falling debris & heavy equip)	X (heavy equip)		X (heavy equip)
Electrical shock			X	
Power Lines	X (falling trees)	X (heavy equip)	X (drilling)	X (heavy equip)
Underground Utilities		X (excavation)	X (drilling)	X (excavation)
Rotating or moving equip.			X (drilling)	
Falls from height			X (drilling)	X
Excavation Cave-in				X
Confined Space Entry				X (unlikely)
Heat/Cold Stress	X (cold)	X (cold)	X (cold)	X (cold)
1. If heavy equipment or clearing & grubbing conducted nearby.				

Safety hazard controls are summarized below:

TRIPS & FALLS – Trips and falls are best prevented by maintaining proper housekeeping and wearing safety shoes with good treads. Icy areas where there is significant pedestrian traffic should be salted.

LIFTING/BACK INJURY – Any task that involves lifting heavy tools, equipment, or materials. The tasks with the highest risk for lifting injuries include Clearing & Grubbing and Solid Waste & Drum Disposal. Safety controls include the following:

- Do not manually lift more than 75 lbs under good conditions
- Do not manually lift more than 55 lbs under "typical" conditions.

- Use two people to lift heavy or bulky objects
- Use heavy equipment to transport heavy materials whenever possible
- Do NOT twist at the waist when lifting

HAND CUTS – Wear cut-resistant gloves at all times unless it is not feasible to wear gloves. The only tasks exempt from cut resistant gloves at the current time include the operation and calibration of sampling and test equipment. However, chemical gloves may still be required.

EYE INJURY – All tasks are subject to potential eye injuries. There is a risk of physical injury resulting from contact with heavy equipment. Field personnel should be aware of the presence of these hazards and take steps to avoid contact with them.

HEAD INJURY – All tasks have some potential for head injury due to being struck by heavy equipment or falling debris. Sampling and surveying activities conducted within IWZs (former dump sites) will require a hard hat due to the operation of heavy equipment or clearing and grubbing. Surveying and general site inspections outside of the former dump sites may not require hard hats at the discretion of the SSHS. Equipment operators in cabs with overhead protection may take their hard hats off.

FOOT INJURY – Safety shoes are required for all work activities.

CHAINSAW INJURY – The following clearing and grubbing safety requirements must be implemented:

- All chainsaw use requires the use of kevlar chaps, kevlar jacket, hard hat, face shield, ear protection, and cut resistant gloves
- Use heavy equipment to clear trees and brush to the extent feasible.
- Use a face shield during chipping
- All tree-felling within 20' of power lines must only be done by qualified professional tree-trimmers or arborists.
- Chainsaws must be equipped with all chain guards, anti-kickback devices and other safety features originally installed by the manufacturer.

STRUCK BY – Struck by injuries may occur when falling limbs or trees, heavy equipment, or falling tools/equipment during drilling strike site personnel. Non-essential personnel shall stay clear of clearing and grubbing and drilling activities. Only qualified and experienced persons will be permitted to operate heavy equipment. Site workers must also ensure that operators are aware of their location when walking near heavy equipment.

ELECTRICAL SHOCK – All extension cords and power tools must be protected by GFCIs. All tools and equipment must be in good condition where the outer insulation on cords is not cut through.

POWER LINES – Power lines are present on site. At this time, site activities should be clear of power lines but all equipment must drive under power lines to access the site. A 20' safety zone must be maintained around power lines at all times. If a 20' safety zone cannot be maintained then additional safety controls outlined by O'Brien & Gere's Power Line procedure must be implemented. These may include a dedicated spotter, shielding, barricades and distance markers, etc. Power lines must be de-energized if at least 10' of clearance can't be maintained to un-insulated power lines. Drill rigs must not be relocated with the mast in an upright position.

UNDERGROUND UTILITIES – Underground utilities must be identified prior to excavation work. The site owner should identify known underground utilities if possible. Utility companies and the local municipality must be contacted regarding any rights-of-way for electrical conduits, gas, telephone, sewer, and water.

ROTATING OR MOVING EQUIPMENT – Drilling equipment must be operated in a manner consistent with the manufactuer's safe operating guidelines and with all of the safety features functioning as intended by the manufacturer. Additional rod, bits, or other equipment may be installed while the auger is rotating. Outriggers must be fully extended prior to raising the drilling mast unless the drill rig is designed for use without outriggers. Drill rigs must be in good conditions with manufacturer's warning labels in readable condition.

FALLS FROM HEIGHT – No elevated work is anticipated. However, if persons must climb the drill rig mast, then 3 point contact must be maintained on an OSHA-approved ladder OR personal fall arrest equipment must be used. Also, test pits must be backfilled immediately or protected by safety fence if left open overnight.

EXCAVATION CAVE-IN – **General excavations** at an approximate depth of 2 feet do not represent a cave-in hazard but could cause injury to unauthorized personnel who may enter the area operating a snowmobile or ATV. Therefore, the excavation should be sloped back to at least 1.5V:1H or enclosed by a fence. If the general excavation exceeds 2 feet, then fencing should be the preferred. **Test pits** represent a cave in hazard if they are 5' in depth OR if a person must enter a shallow (<5') test pit where their face will below the ground surface. Safety controls include designating an excavation competent person to ensure that the test pit is properly sloped or shielded OR use the excavator to collect a sample from the bottom of the test pit without having to enter.

CONFINED SPACE ENTRY – Permit-required confined space entry is not anticipated during this project. If test pits exceed 4' in depth, they will be considered a confined space. Entry into test pits is not anticipated. However, if test pits >4' deep must be entered, they will be monitored with a PID. If volatile organic vapors (VOCs) are <25 ppm, Oxygen is 19.5-23.5, and explosive vapors are <10% LEL, then a serious hazard is not present. The test pit can then be downgraded to a non-

permit confined space in accordance with O'Brien & Gere's confined space entry procedure which is located in the Corporate Health and Safety Manual. Excavation safety must also be maintained as outlined above.

HEAT/COLD STRESS – Heat stress is not anticipated to be a problem. Cold stress is easily prevented through the use of dry cold weather clothing. Equipment and vehicles will be available to provide re-warming breaks as necessary.

2.3.3. Biological Hazards & Controls

Biological hazards are not anticipated to be a significant problem at this time due to the onset of cold weather.

3. Site control

3.1. Zone control

Areas of the Site at which field work will be conducted will be subdivided into three zones: an Exclusion Zone ("EZ"), a Contamination Reduction Zone ("CRZ"), and a Support Zone ("SZ"). These zones will be maintained according to the requirements of this HASP and OSHA regulations provided in 29 CFR 1910.120. The SSHC or a designee will maintain a log of personnel entering the work areas at the site. Refer to the *Entry/Exit Log* in **Exhibit 1**.

3.1.1. Exclusion zone

The EZ is the area surrounding intrusive work activities including excavation, drilling, and sampling. For this project, the EZ is defined as a 20' radius surrounding intrusive activities, excavations, and staging areas. The SSHC may adjust this distance depending on site conditions. The EZ is demarcated by a tape line, demarcation cones, or physical barrier. Personnel entering the EZ must:

- Have the appropriate Hazwoper training as outlined in Section 1.4
- Wear the prescribed level of protection as outlined in Section 4.2.
- Be otherwise authorized to enter the EZ by the SSHC.

Personal protective equipment or other contaminated materials exiting the EZ will be deemed to require decontamination. Equipment and materials will either be subject to decontamination or containerized in uncontaminated devices for decontamination at the designated off-site location.

Within the EZ, specific locations or restricted areas (clearly marked or identified) will be established as necessary for particular locations or around specific Site operations. In the course of drilling operations, a restricted area will be established that includes an appropriate area for the drill rig to operate. Other restricted areas will be designated as necessary. Specific access for emergency services to areas of Site operations will be established.

3.1.2. Contamination reduction zone

The Contamination Reduction Zone (CRZ) or decon pad is the transition area between the Exclusion Zone and the Support Zone where equipment and personnel are decontaminated. Decon pads may range from mobile boot washes/equipment rinse stations to permanent decon facilities with pressure washing equipment depending on site activities. When equipment and personnel move from one Intrusive Work Zone to another Intrusive Work Zone within a much larger site, it is acceptable to conduct gross decontamination at mobile decon pads when moving from work area to work area. A thorough decontamination must be conducted prior to leaving the site, including heavy equipment, vehicle tires, and tools. Wash water must be contained or allowed to drain back into areas already considered contaminated. The SSHC will setup decon pads based on feedback from the site owner, oversight personnel, and current site conditions.

3.1.3. Support zone

A SZ will be established adjacent to the CRZ and will contain the necessary support facilities (including personal hygiene facilities) for Site operations. It also serves as the communications center and source of emergency assistance for operations in the EZ and CRZ. A log of personnel entering the work areas at the Site will be maintained by the SSHC or a designee.

3.2. Medical assistance

Medical assistance may be obtained at the Niagara Falls Memorial Health Medical Center (716) 278-4000. Additional information is provided in Section 7.6. of this HASP.

3.3. Site security

Site security will be monitored and controlled by the Site Supervisor and/or the SSHC. Their duties will include limiting access to the work area to authorized personnel, overseeing project equipment and materials, and overseeing work activities. The procedures specified below will be followed to control access to each work site to prevent persons who may be unaware of site conditions from exposure to hazards. Work area control procedures may be modified as required by site conditions.

3.4. Site access procedures

Access during field activities will be limited to those personnel required. Such personnel are anticipated to include, but will not necessarily be limited to, O'Brien & Gere employees or subcontractors and those representatives as designated by Goodyear and state or local agencies. Site access will be monitored by the SSHC, who will maintain a log-in sheet. The log will include O'Brien & Gere and other personnel on the site, their arrival and departure times and their destination on the site.

3.5. Site communication

A portable cellular telephone will be used during activities to facilitate communications for emergency response and other purposes and to serve as the primary off-site communication network.

4. Work practices and personal protective equipment

4.1. Work practices

Workers will adhere to established safe work practices for their respective specialties (i.e., drilling, laboratory analysis or construction). The need to exercise caution in the performance of specific work tasks is made more acute due to:

- weather conditions;
- restricted mobility and reduced peripheral vision caused by the PPE itself;
- increased difficulty communicating due to respirators, if required.

Work at the Site will be conducted according to established protocols and guidelines for the safety and health of all involved. Among the most important of these principles for working at a potentially hazardous waste site are the following:

- In unknown situations, assume the worst conditions and plan accordingly;

- Use the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals, because conditions may impair verbal communications.

- Because no PPE is 100 percent effective, personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment on drums. Do not sit on drums or other materials. Avoid standing in or walking through puddles or stained soil.

- Smoking, eating, drinking, chewing tobacco gum or toothpicks, application of cosmetics, storing food or food containers, and having open fires shall not be permitted within the EZ or CRZ. Good personal hygiene should be practiced by field personnel to avoid ingestion of contaminants.

- Approach or entry into areas or confined spaces where toxic or explosive concentrations of gases or dusts may exist without proper equipment is prohibited. No confined space entry is anticipated at this Site.

- Avoid heat or cold stress related to wearing protective gear and local weather conditions. Work breaks should be planned to prevent stress-related accidents or fatigue.

- Personnel must be aware of not only their own immediate environment but also those of others. A team effort is required to detect and alert personnel of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while utilizing personal protective gear because vision, hearing, and communication can be restricted.

- Personnel must be aware that compounds of concern may mimic or enhance symptoms of other illnesses or intoxication. Avoid working while ill during field investigation assignments. Consumption of alcohol during work hours is strictly prohibited.

- The SSHC and sampling personnel will maintain project records in a bound notebook (i.e., daily activities, meetings, incidents, and data). Notebooks will remain on-site for the duration of the project so that replacement personnel may add information, thereby maintaining continuity. These notebooks and daily records will become part of the permanent project file.

- Whenever possible, field personnel should work in a position upwind of intrusive work activities.

- The PPE specified in this plan must be provided to field personnel. The following requirements are in accordance with OSHA regulations:

  - facial hair that interferes with proper fit of respirators must not be present;
  - contact lenses must not be worn; and,
  - eyeglasses that interfere with proper fit of full-face respirators must not be worn.

4.2. Personal protective equipment

The initial level of protection at the Site is **Level D** based on information from previous site investigations. **Nitrile gloves** will be worn with Level D PPE during sampling activities. However, protective equipment may be upgraded to **"Lightweight" Modified Level D** if extensive stained soil areas are encountered and contact cannot otherwise be avoided. **Full Modified Level D** will be required for manual handling of potentially contaminated solid waste or drum carcasses. **Level C** is not anticipated but will be used if air monitoring action levels are exceeded.

The following descriptions provide the basic composition of the generally recognized protective ensembles to be used for Site operations.

Specific components for levels of protection will be selected based on hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves, and other equipment, exclusive of respirators, should be used when feasible to minimize risks during decontamination and possible cross-contamination during sample handling.

Level D Personal Protective Equipment
- Long sleeve shirts/long pants or coveralls
- Hard hat (if overhead hazard exists such as during drilling)
- Hearing protective equipment (if noise hazard exists such as during drilling)
- Safety glasses or goggles
- ANSI-approved Steel-toed and steel shank work boots
- Cut-Resistant Gloves(1)
- Nitrile gloves(2)
- Faceshield –during chainsaw use, chipping, pressure washing
- Kevlar chaps and jacket – during chainsaw use

(1) To be worn by all personnel unless tasks cannot be performed with gloves on. At the present time, the only tasks exempt from cut-resistant outer gloves is the use and calibration of sampling and testing equipment.
(2) to be worn during sampling activities.

Lightweight Modified Level D PPE
- Level D PPE plus the following:
- Nitrile gloves
- Rubber overboots or disposable "booties"

Full Modified Level D PPE
- Lightweight Modified Level D PPE plus Tyvek or Saranex coveralls (taped at cuffs)

Level C Personal Protective Equipment
- Full Modified Level D PPE plus half or full face air purifying respirator with organic vapor cartridges and N95 prefilter.

4.3. Respirator maintenance

Respirators shall be cleaned daily, if used, according to procedures prescribed by the manufacturer. Combination cartridges will be used and replaced either daily or if break-through is detected at any time while in use. Negative pressure tests will be performed daily on each individual respirator. The following checks shall be performed on a daily basis in addition to the above:

- Exhalation valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve (which could cause leakage);

- Inhalation valves (two) - screw off cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place;
- Make sure protective lens cover is attached to the lens. Lenses are expensive to replace and should be protected;
- Make sure you have the right cartridge;
- Make sure that the face piece harness is not damaged. The serrated portion of the harness can fragment. This will prevent proper face seal adjustments; and,
- Make sure the speaking diaphragm retainer ring is hand tight.

4.4. Protective equipment failure

If an individual experiences a failure or other alteration of PPE that may affect its protective ability, that person is to leave the work area immediately. The Project Manager or the SSHC must be notified and, after reviewing the situation, are to determine the effect of the failure on the continuation of on-going operations. If the Project Manager or the SSHC determine that the failure affects the safety of workers, the work site, or the surrounding environment, workers are to be evacuated until corrective actions have been taken. The SSHC will not allow re-entry until the equipment has been repaired or replaced and the cause of the failure has been identified.

5. Monitoring

Real time monitoring of these substances will be conducted on-site by, or under the supervision of, the SSHC. The SSHC will evaluate whether the personal protective measures employed during field activities are appropriate and will modify the protective measures accordingly. Field personnel will record readings in a notebook at the site. The SSHC will be responsible to maintain monitoring instruments throughout the investigation.

5.1. Field instrumentation and calibration

On-site air monitoring equipment will primarily consist of a **PID**. If entry is anticipated into test pits >4' deep, a **gas meter** for oxygen and flammable vapors will also be used.

5.1.1. Photoionization detector (PID)

Hazard Monitored: Many organic and some inorganic gases and vapors

Application: Detects the presence and total concentration of many organic and some inorganic gases and vapors

Detection Method: Ionizes molecules using UV radiation, produces a current that is proportional to the number of ions present

General Care and Maintenance: Recharge daily or replace the battery. Regularly clean the lamp window. Regularly clean and maintain the instrument and its accessories. Turn the function switch to "stand-by" and allow the instrument to "warm up" for 5 min. Calibrate once a day using an isobutylene gas standard according to the manufacturer's instructions. Repeat the procedure to validate calibration.

Typical Operating Time: 10 hr, 5 hr with strip chart recorder.

5.2. Air monitoring

The air will be monitored with a portable PID equipped with a 10.2 eV bulb to determine the presence and concentration of VOCs. The meter will be used to periodically check VOC concentrations during drilling,

excavation, and sampling activities. The PID will also be used to investigate odors associated with site activities.

5.3. Quality control – field sampling

The SSHC, or someone under the direct supervision of the SSHC, will collect field monitoring data (PID). Bound log books and appropriate data sheets will be used to document the collection of samples and data so that an individual data set can be traced to its point of origin, the sampler, and the sampling equipment used. Sampling will be performed according to the manufacturer's instructions.

5.4. Action levels

Action levels are used to determine when activities should stop, to determine when site evacuation is necessary, to select emergency response levels, and to change PPE levels. Air monitoring action levels are outlined in the table below.

Contaminant (equipment or method)	Frequency	Action Level	SSHC Action/Response
Volatile Organic Vapors (VOCs) (PID with 10.6 eV lamp)	1. Periodically in work areas during intrusive activities (excavating, drilling, and sampling).	*5 ppm	1. Increase to Level C PPE (full-face or half face respirator) or reduce VOC concentrations below 5 ppm. 2. The SSHC shall notify the Manager of Corporate H&S.
	2. Prior to and continuous during confined space entry (i.e., excavations >4 ft. and tanks). *NOTE: a trench or pit with limited access over 4' will be considered a confined space.*	*50 ppm	1. STOP work. 2. Notify the H&S Manager and evaluate the potential causes or sources of VOC exposures. 3. Implement additional controls based on the above evaluation. Modify the HASP as necessary.
COMBUSTIBLE VAPORS Gas Meter (Neotronics Minigas or equiv.)	1. Prior to and continuous during confined space entry (i.e., excavations >4 ft. and tanks). *NOTE: a trench or pit over 4' deep and with limited access may be considered a confined space.*	10% LEL	1. **STOP** work 2. Use ventilation or other controls to reduce combustible vapors to keep combustible vapors <10% LEL.
OXYGEN Gas Meter (Neotronics Minigas or equiv.)	1. Prior to and continuous during confined space entry (i.e., excavations >4 ft. and tanks). *NOTE: a trench or pit over 4 ft deep and with limited access may be considered a confined space.*	<19.5% O_2 and >23.5% O_2 *Note: Air is normally 20.8% O_2*	1. **STOP** work 2. Use ventilation to restore acceptable oxygen levels OR use Level B PPE. 3. Notify the O'Brien & Gere H&S Manager **prior** to confined space entry under oxygen deficient conditions.
DUST	1. Continuous observations during intrusive activities.	Visible Dust Leaving the Site (except	1. Use dust suppression techniques and task-specific JSAs (if any) that may have been developed.

Contaminant (equipment or method)	Frequency	Action Level	SSHC Action/Response
SSHC Observations		Dust associated with traffic over road shoulders and similar areas	
* Sustained readings for 5 minutes above background. Background readings are taken at upwind locations relative to Work Areas.			

6. Decontamination/disposal

Personnel and/or equipment leaving the Site work areas are to be decontaminated.

6.1. Personnel decontamination

Decontamination procedures are followed by personnel leaving Site work areas. Decontamination of personnel will take place only in the CRZ, which will consist of personal and equipment decontamination pads setup and moved as necessary to accommodate site activities. Only under emergency evacuation circumstances will personnel be allowed to leave the Site work areas prior to decontamination. Generalized procedures for removal of protective clothing are as follows:

1. Drop tools, monitors, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).

2. Step into the designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.

3. Scrub outer boots and outer gloves with decontamination solution or detergent and water in tub. Rinse with water in tub and discard water in approved 55-gallon drum.

4. Remove tape from outer boots and remove boots; discard in approved 55-gallon drum.

5. Remove tape from outer gloves and remove gloves; discard in disposal container.

6. Remove outer garments and discard in the disposal container.

7. Remove respirator and place or hang in the designated area.

8. Remove inner gloves and discard in the disposal container.

NOTE: Disposable items (i.e., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis at a minimum. Dual respirator canisters will be changed as required.

Spray bottles or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples, and equipment.

Respirators, if utilized, will be decontaminated daily and taken from the drop area. The masks will be disassembled, the cartridges set aside, and other parts placed in a cleansing solution. Parts will be pre-coded (e.g., #1 on parts of Mask #1). After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be marked to indicate length of usage or will be discarded in the contaminated trash container for disposal. When re-used, the masks will be reassembled and new cartridges installed, if necessary. Personnel will inspect their own respirators and readjust the straps for proper fit.

6.2. Small equipment decontamination

Small equipment will be protected from exposure as much as possible by wrapping, draping, masking, or otherwise covering the instruments with plastic (to the extent feasible) without hindering operations of the unit. For example, the PID meter can be placed in a clear plastic bag to allow reading the scale and operating the knobs. The PID sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

Decontamination of small equipment will take place in the CRZ. Equipment will be taken from the drop area and the protective coverings removed and disposed of in appropriate containers. This equipment will be brushed or wiped with a disposable paper wipe.

The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

6.3. Heavy equipment decontamination

Heavy equipment decontamination will take place at a predetermined on-Site location. Drilling rigs will be utilized during boring activities. They will be cleaned with high pressure water or steam and brushed to remove loose material. The person performing this activity will be required to use the level of PPE utilized by the personnel who operated the equipment being decontaminated. A decontamination pad will be set up at the decontamination location to allow collection and storage of contaminated decontamination fluids in DOT approved 55-gallon drums or a staged baker tank.

6.4. Disposal of contaminated materials

PPE, decontamination fluids (for both personnel and small equipment), and other disposable materials will be collected in the CRZ, properly containerized and stored at a designated on Site location. Decontamination fluids (i.e., acetone used to decontaminate sampling equipment) will be collected into approved drums and stored at the designated on Site location. Disposable materials will be collected, and placed in drums at the designated on Site location. Disposable materials and fluids will be disposed of pursuant to applicable federal and state regulations.

7. Emergency response plan

The purpose of this section of the HASP is to address how site personnel will respond to emergencies. The types of potential emergencies that are addressed by this plan include:

- Fire
- Chemical exposures to site personnel
- Physical injuries to site personnel.

The release of chemicals to the environment which would impact the general public, property, or the environment is not anticipated during this project since the work will take place in areas which contain relatively low levels of contamination, if any. Normal decontamination procedures as specified in Section 6 will be followed to prevent the spread of contamination.

7.1. Emergency Recognition & Reporting

All incidents involving fire, explosion, property damage >$1,000, and personal injury will require completion of an *Accident Report* in **Exhibit 2**. Accident Reports must be submitted to the H&S Manager and client representative within 24 hours.

7.1.1. Fires

Fires are possible whenever flammable gases or vapors are present in proper concentrations and an ignition source is present. The construction equipment itself provides an ignition source.

7.1.2. Chemical exposures

Where possible, work shall be performed in such a manner that exposure to contaminants, if any, through skin or eye contact, inhalation or ingestion is minimized. Work practices that shall be followed to reduce chemical exposures include:

- PPE, as specified in Section 4, for the appropriate work activities and areas as defined by the SSHC, shall be used by all personnel and subcontractor personnel. A formal revision to the HASP must be made by the HSM
- Keep hands away from face during work activities
- Minimize skin and eye contact with contaminants, if any.

Early recognition of chemical exposure symptoms is essential to the prevention of serious chemical exposure incidents. During the project safety orientation, all site personnel should review symptoms of exposure associated with COCs at this site which are outlined in Section 2.3.1.

If a person experiences these symptoms, or others, or recognizes the symptoms in a fellow worker, the person experiencing the symptoms will stop work and report the symptoms to the SSHC. If the symptoms persist, the SSHC will make arrangements to take the individual to a hospital for medical treatment. Work activities in the area where the person was exposed will be suspended until more is known about the incident. Incident reporting procedures will be initiated.

7.1.3. Physical injury

Site personnel will constantly look for potential safety hazards such as holes or ditches; precariously positioned objects, such as drums or equipment that may fall; sharp objects, such as nails, metal shards, or broken glass; protruding objects at eye or head level; slippery surfaces; steep grades; uneven terrain or unstable surfaces, such as walls that may cave in or flooring that may give way. Site personnel should inform the SSHC of potential hazards identified so that corrective actions can be taken.

7.2. Emergency procedures

The SSHC will alert the appropriate work groups (and nearby residents, if any) when and if an emergency occurs relating to the Site investigation activities through the use of radios or by directly contacting the work group and nearby residents. The SSHC and any isolated work group will carry radios if direct contact cannot be maintained. If radios fail, a single blast from an air horn will be used to signal workers to stop work.

7.3. Evacuation procedures and routes

Normally, personnel should evacuate through the Contamination Reduction Zone. Evacuation from the Contamination Reduction Zone will proceed in an upwind direction from the emergency. The SSHC will establish an evacuation route from each sampling location prior to the start of work at that location.

7.4. Hospital Route

Directions to hospital (see attached Figure 1)

7.5. Emergency Telephone Numbers

The telephone numbers of local emergency services are given below.

Emergency Service	Telephone Number
Ambulance	911
Fire Department	911
Police Dept (Niagara Falls City)	911 or (716) 286-4711
Niagara Falls Memorial Med Ctr	(716) 278-4000 (general info)
Poison Control Center	(800) 962-1253
USEPA National Response Center	(800) 438-2427
O'Brien & Gere H&S Manager	office – (315) 437-6400 cell – (315) 391-0631
O'Brien & Gere SSHC	cell - **[TBD]**

7.6. Emergency response personnel

The SSHC will have the primary role in responding to on-site emergencies. Site personnel will contact the SSHC in case of emergency. The SSHC, or his designee, must be present during on-site work. If an emergency such as a fire, chemical exposure, or physical injury occurs, the SSHC shall be immediately contacted. The SSHC will have certification in First Aid. Site personnel will take direction from the SSHC in cases of emergency response.

7.7. Emergency Decontamination Procedures

Decontamination of an injured or exposed worker shall be performed only if decontamination does not interfere with essential treatment.

If decontamination can be done; wash, rinse, and/or cut off protective clothing and equipment.

If decontamination cannot be done:

- Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel;
- Alert emergency and off-site medical personnel to potential contamination, and,

- SSHC or other personnel familiar with the incident and Site contaminants shall accompany the victim to the hospital.

7.8. First aid procedures

On-site medical treatment or first aid may be administered by those certified in First Aid.

- Call an ambulance for transport to local hospital immediately. This procedure should be followed even if there is no apparent serious injury.
- Evacuate other on-site personnel to a safe place until the SSHC determines that it is safe to resume work.
- Remove the injured or exposed person(s) from immediate danger.
- Decontaminate affected personnel, if necessary.
- Render first aid, if necessary.

8. General

8.1. Compliance agreement

The Project Manager, HSS and SSHC shall hold meetings with field personnel before work commences. During the meetings, personnel shall be provided with a copy of this HASP; the plan shall be reviewed and discussed and questions answered; and use, fit testing, and care of respirators documented. Signed Pre-Work Briefing forms (**Exhibit 3**) shall be collected by the HSS and filed. Individuals refusing to sign the form will not be allowed to work on the Site. Subcontractor personnel involved in field activities are required to comply with the provisions of this HASP. However, they are considered separately responsible for enforcement and/or modification of safety measures applied to their employees.

The outline of the Pre-Work Briefing will include the following at a minimum:

1. Preliminary
   - Medical clearances for participants
   - Written HASP availability (copies to participants)
   - Personal protective equipment and decontamination equipment availability for checkout, demonstration and fit testing (if necessary).

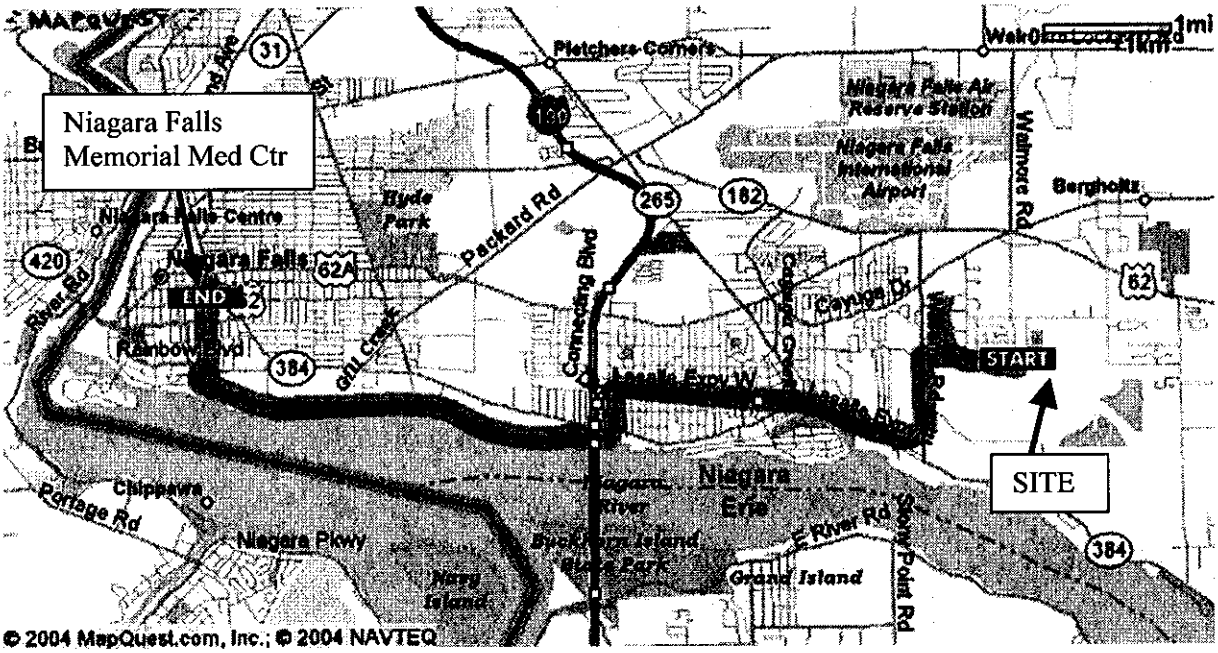
2. Training topics
   - Delineation of on-site personnel responsibilities
   - Review of HASP including:
     - Safety Hazards
     - Chemical Hazards (symptoms and pathways of exposure)
     - PPE requirements (levels of protection)
     - contamination avoidance
     - decontamination
     - emergency procedures
     - specific on-site area/work tasks of concern.
   - Decontamination review including:
     - delineation of work zones
     - set-up and dry run of equipment and maintenance.
   - Monitoring equipment review
   - Questions and answers

- Signing an acknowledgment of having read the HASP on the Pre-Work Briefing form.

8.2. Site safety meetings

Daily safety meetings will be held by the SSHC during field operations to review and plan specific health and safety aspects of scheduled work.

FIGURE 1 – HOSPITAL LOCATION MAP



Directions		Distance
START	1. Start out going WEST on LANCELOT DR toward WALMORE RD.	0.7 miles
	2. Turn LEFT onto WILLIAMS RD.	0.6 miles
	3. Merge onto LASALLE EXPY W.	2.1 miles
EXIT	4. Take the ROBERT MOSES PKY exit.	0.4 miles
	5. Merge onto ROBERT MOSES STATE PKWY N.	3.3 miles
EXIT	6. Take the exit.	0.1 miles
	7. Turn RIGHT onto BUFFALO AVE.	<0.1 miles
	8. Turn LEFT onto 10TH ST.	0.7 miles
END	9. End at Niagara Falls Memorial Med Ctr 716-278-4000 621 10th St, Niagara Falls, NY 14301 US	

Distance: 8.43 miles

Total Estimated Time: 16 minutes

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Exhibit 1 - Entry/Exit Log

File Name: ENTRY_LOG
Revised: June 1, 2001

Project Name		Date	
Project Location		Job & Phase #	

	Name	Company	Time In	Time Out	Reason
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

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Exhibit 2 - Accident Investigation Form

File Name: ACCIDENT
Revised: March 10, 2003

Corporate H&S to complete:	☐ Restricted Workday (_____ days)	☐ Near Miss
☐ First Aid / Notification	☐ Lost Workday (_____ days)	☐ Property Damage >$1,000
☐ Med. Treatment Only	☐ Fatality	☐ Other:_____

PROJECT INFORMATION

Client:					
Client Contact:					
Project Name:					
Project Address:		**State:**		**Zip:**	
Project Manager:		**Site Supervisor:**			
Project Supervisor:		**Foreman:**			
Project #:		**SSHC:**			
Project Phone #:		**Today's Date:**			

INJURED PERSON INFORMATION

(get written statement – bottom page 3)

Name:		**Employment Category:**			
Home Address:		☐ Craft, Temporary, Contract ☐ Regular Status Employee		☐*Other ☐*Subcontractor	
Home Phone #:		☐ Engineers ☐ OGINA * Name of Company:		☐ Labs ☐ Limited	
Soc - Sec - Num:		**Experience w/ OBG**	years	months	
Gender:	M / F	**DOB:**	**Total Experience:**	years	months

ACCIDENT INFORMATION

DATE and TIME (hrs) of Accident:	
Nature of Injury, and Part of Body:	
Specific Location of Accident On-site:	
Specific Task at Time of Accident:	
Occupation/Craft at Time of Accident:	
Supervisor at Time of Accident:	
Treatment Provided By Hospital or Clinic?	☐ No ☐ Yes – specify:
Hospital/Clinic Street Address:	
Employee was Working:	☐ Alone ☐ With Crew or Fellow Worker (get witness names)
Witness #1 Name (get written statement – page 4)	
Witness #2 Name (get written statement – page 4)	
Witness #3 Name (get written statement – page 4)	

FULLY COMPLETE THIS FORM AND SEND TO THE CORPORATE SAFETY MANAGER WITHIN 24 HOURS
Phone: (315) 437-6400 x2871 / Fax: (315) 463-7554
Attach All Applicable Medical Reports

cc: Project Manager, Legal Department, Service Line Manager _____

DESCRIBE HOW THE ACCIDENT OCCURRED

Describe **in detail**, and in chronological order, the events that lead to the accident, and how the accident occurred.

CAUSAL FACTORS

Check all that apply and identify corrective actions for each factor. Beginning with the most apparent or most direct cause of the accident, **ask "WHY" five times** to identify the sequence of events or conditions that contributed to the accident.

PROCEDURES	COMMUNICATION	MANAGEMENT/ORGANIZATION	HUMAN FACTORS
☐ Not available	☐ Misunderstood verbal directions	☐ Inadequate work planning	☐ Lack of experience or skill
☐ Difficult to use / understand	☐ No communication or untimely	☐ Unclear reporting relationship	☐ Infrequent performance
☐ Use of procedure was not required but should be	☐ Standard terminology or signals not used or are misunderstood	☐ Unclear assignment of responsibility or authority	☐ Operating equipment without authority
☐ Followed Incorrectly	☐ Interference from noisy environment	☐ Improper delegation	☐ Operating equipment unsafely
☐ Not followed	☐ Notifications late or not provided	☐ Inadequate audits/inspections	☐ Taking unsafe position/posture
☐ Inadequate details	☐ Job/task safety analysis not reviewed with personnel	☐ Inadequate incident reporting	☐ Poor judgement or Inappropriate risk taking
☐ Situation not covered		☐ Inadequate incident investigation	
☐	☐	☐ Corrective actions not complete	☐ Physical impairment (explain)
WORK ENVIRONMENT	**EQUIPMENT & TOOLS & PPE**	☐ Corrective actions inadequate	☐ Drugs/alcohol (explain)
☐ Housekeeping poor	☐ Wrong equip/tool/PPE for the task	☐ Inadequate purchasing	☐
☐ Hot / Cold	☐ Defective equipment/tools	☐ Wrong person assigned to job	☐
☐ Poor lighting	☐ PM not done or inadequate	☐ Lack of supervisor knowledge	**TRAINING**
☐ High Noise	☐ Inadequate / removed guards	☐ Inadequate/lack of safety mtgs	☐ Training not provided
☐ High Radiation/Contamination	☐ Inadequate isolation (LOTO)	☐ Inadequate control of change	☐ Training inadequate
☐ Cramped quarters	☐ No inspection of tools / equipment	☐ Mgmt resources inadequate	☐ Did not attend training
☐	☐	☐ Excessive work hours (fatigue)	☐ Training not appropriate for the job or task
ENGINEERING/DESIGN	☐	☐ No or Inadequate enforcement	
☐ Inadequate technical design	☐	☐ No pre-task safety analysis	☐
☐ Inadequate specifications	☐	☐	☐
☐ Inadequate change mgmt	☐	☐	☐

CORRECTIVE ACTIONS

List the corrective actions taken to minimize the possibility of a similar accident from occurring in the future. Assign specific individuals and completion dates for each corrective action. The "Safety Audit Closeout" form can be used to help track completion of corrective actions.

Prepared by: (print)		**Sign:**		**Date:**	
CHS Review: (print)		**Sign:**		**Date:**	

O'BRIEN & GERE EMPLOYEE INFORMATION RELEASE

To be completed by O'Brien & Gere Employees requiring Hospital/Clinic Treatment or ANY Back Injury

Employee Name:	
Social Sec. Number:	
Date of Injury:	

I hereby authorize O'Brien & Gere or any of its representatives to be furnished any information and facts regarding this injury, including reports and records, results and diagnosis, treatment and prognosis, estimates of disability, and recommendations for further treatment. This information is to be used for the purpose of evaluating and handling my claim for injury as a result of an incident occurring on or about the above-noted date of injury and for no other purpose, now or in the future.

O'Brien & Gere Employee Signature: _____ **Date:** _____

INJURED PERSON STATEMENT

To be completed by O'Brien & Gere Employees and Subcontractors for ALL Accident Reports

Please describe what happened with respect to the incident that occurred on _____ **(date) at the following location,** _____ .

Injured Person Signature: _____ **Date:** _____

Injured Person Name (print): _____

WITNESS STATEMENT

Please describe what happened with respect to the incident that occurred on _____(date) at the following location, _____.

Company Name: _____ **Phone #:** _____

Witness Signature: _____ **Date:** _____

Witness Name (print): _____

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Exhibit 3 - Pre-Work Briefing

File Name: PREWORK_BRIEFING
Revised: January 29, 2002

Client:			
Project Name:		Project No.:	
Project Location:			
SSHC:			
Main Points of Briefing:	☐ OGINA Safety Requirements (CHS Manual Overview) ☐ Site-Specific Safety Pan ☐ Site Owner Safety Requirements	Other:	

The purpose of the Pre-Work Briefing is to provide **site-specific safety orientation** to employees and subcontractors. This certifies that undersigned individuals have read, understand, and agree to comply with applicable **site-specific safety requirements** that can be obtained from site safety plans, site Job Safety Analyses (JSAs), site owner requirements, and/or other site safety documents furnished to me by OGINA. I understand that these safety requirements are not "all-inclusive" and that I will be expected to follow any additional safe work practices applicable to my specific scope of work.

Print Name:	Signature	Company	Date

-- Have EACH employee sign this form before they begin work on site --