MALCOLM PIRNIE

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ARCS II

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Contract No. 68-W9-0051

LI TUNGSTEN
GLEN COVE, NEW YORK

Work Assignment No. 025-2L4L

REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
PART II OF II - APPENDICES

Remedial Planning Activities at Selected Uncontrolled Hazardous Substance Disposal Sites USEPA Region II (NY, NJ, PR, VI)

Malcolm Pirnie, Inc.
2 Corporate Park Drive
White Plains, New York 10602

March 1993

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FINAL WORK PLAN
PART II OF II - APPENDICES

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

LI TUNGSTEN

GLEN COVE, NEW YORK

MARCH, 1993

ARCS Contract No. 68-W9-0051

USEPA Work Assignment No. 025-2L4L

MALCOLM PIRNIE, INC.
2 Corporate Park Drive
White Plains, New York 10602

LI TUNGSTEN SITE
GLEN COVE, NEW YORK
WORK ASSIGNMENT #025-2L4L
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APPENDIX A

ARARs AND TBCs

EXHIBIT 1-1

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical Name	Requirements	Prerequisites for Applicability	Citation
CHAPTER 1 - CLEAN AIR ACT			
[illegible]			
Mercury	Not more than 2,300 g/day	Mercury smelters, chloroalkali plants	Clean Air Act (CAA) 40 CFR Part 61
	Not more than 3,200 g/day	Sewage sludge incinerators/dryers	40 CFR Part 61 (CAA)
Arsenic 1/	Not more than 2.5 Mg/yr, or achieve 85% emission reduction	Existing glass manufacturing plants	40 CFR Part 61 (CAA)
	Not more than 0.4 Mg/yr, or achieve 85% emission reduction	New glass manufacturing plants	40 CFR Part 61 (CAA)
	Not more than 11.6 mg/m^3 particulate matter, design and operating requirements	Primary copper smelters	40 CFR Part 61 (CAA)
	Inspection, maintenance, and housekeeping	Arsenic trioxide and metallic arsenic production facilities	40 CFR Part 61 (CAA)
Asbestos	No visible emissions	Asbestos mills	40 CFR Part 61 (CAA)
	No surfacing with asbestos	Roadways	40 CFR Part 61 (CAA)
	No visible emissions	Manufacturing plants	40 CFR Part 61 (CAA)
	Notification, wet and remove friable asbestos	Demolition activities	40 CFR Part 61 (CAA)
	Limitations on concentration of asbestos, no visible emissions	Spraying operations	40 CFR Part 61 (CAA)
	No visible emissions	Fabricating shops	40 CFR Part 61 (CAA)
	No asbestos	Insulation operations	40 CFR Part 61 (CAA)
	No visible emissions	Mill waste disposal sites	40 CFR Part 61 (CAA)
	No visible emissions	Waste disposal--manufacturing, demolition/renovation, spraying, fabricating	40 CFR Part 61 (CAA)
	No visible emissions, design/work practice standards	Inactive waste disposal sites for mills, manufacturing, fabricating	40 CFR Part 61 (CAA)
	No visible emissions, design/work practice standards	Active waste disposal sites	40 CFR Part 61 (CAA)
Beryllium	Not more than 10 g/day or 0.01 g/m^3 ambient concentration (with 3 years of monitoring data)	Extraction plants, ceramic plants, foundries, incinerators, rocket propellant plants, machine shops	40 CFR Part 61 (CAA)
	Not more than 2 g/hr, maximum 10 g/day	Rocket motor test sites, collection of combustion products	40 CFR Part 61 (CAA)
Vinyl chloride	Not more than 10 ppm, equipment standards, work practice standards	Ethylene dichloride, vinyl chloride, and vinyl chloride polymer plants	40 CFR Part 61 (CAA)

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EXHIBIT 1-1 (Continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical Name	Requirements	Prerequisites for Applicability	Citation
CHAPTER 1 - CLEAN AIR ACT			
NESHAPS			
Benzene 1/	No detectable emissions (approximately 500 ppm)	Fugitive leaks from equipment containing 10% benzene	40 CFR Part 61 (CAA)
Radionuclides 1/	10 mrem/year (whole body) 10 mrem/year (any critical organ)	DOE facilities, NRC licensees, and non-DOE Federal facilities, except from doses from radon-220, radon-222, and their decay products; facilities regulated under 40 CFR 190-192; and low-energy accelerators and users of sealed sources.	40 CFR Part 61 (CAA)
		Elemental phosphorus	
Radon 222	20 pCi/m^2-s	Uranium mill tailings piles	40 CFR Part 61 (CAA)
Coke oven emissions	No visible emissions; operation and maintenance standards	Coke ovens	40 CFR Part 61 (CAA)
NAAQS 2/			
Carbon monoxide	Not to exceed 9 ppm over 8-hour period and not to exceed 35 ppm over a 1-hour period (primary); no secondary standards.	Major stationary and mobile sources.	40 CFR Part 50 (CAA)
Lead	Not to exceed 1.5 $\mu g/m^3$ based on a quarterly average.	Major stationary sources.	40 CFR Part 50 (CAA)
Nitrogen dioxide	Not to exceed 0.053 ppm annually.	Major stationary and mobile sources.	40 CFR Part 50 (CAA)
Particulate matter (PM_{10})	Not to exceed 50 $\mu g/m^3$ annually. Not to exceed 150 $\mu g/m^3$/24-hour period.	Major stationary sources.	40 CFR Part 50 (CAA)
Ozone	Not to exceed 0.12 ppm/hr.	Major stationary and mobile sources.	40 CFR Part 50 (CAA)
Sulfur oxides	Not to exceed 0.03 ppm annually. Not to exceed 0.14 ppm/24-hour period. Not to exceed 0.5 ppm/3-hour period.	Major stationary sources.	40 CFR Part 50 (CAA)

1/ The NESHAPs for arsenic, benzene, and radionuclides are being reexamined and may be revised as a result of a July 1987 court ruling on a vinyl chloride NESHAPs. The court required EPA to first consider only human health in determining a safe level of risk, and only then consider costs and technical feasibility in establishing an ample margin of safety.

2/ NAAQS are translated into source-specific requirements in State Implementation Plans (SIPs).

300734

EXHIBIT 1-1 (Continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical Name	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTE			
Protection of Drinking Water Supplies from Radioactive Pollutants	Maximum contaminant levels for radioactivity in community water systems are set as follows: • 5 pCi/l of combined radium-226 and radium-228; or • 15 pCi/l of gross alpha particle activity (including radium-226 but excluding radon and uranium).	Applicable to community water systems, which are defined as public water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents.	Safe Drinking Water Act (SDWA) 40 CFR section 141.15
	The average annual concentration of beta particle and photon (i.e., gamma) radioactivity from man-made radionuclides in drinking water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 mrem.	Applicable to community water systems, which are defined as public water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents.	40 CFR section 141.16 (SDWA)
Discharge of Radioactive Pollutants to Surface Waters	Best Available Technology: The concentration of pollutants discharged in drainage from mines that produce uranium ore shall not exceed: • 10 pCi/l of dissolved radium-226 in any one day or 3 pCi/l of dissolved radium-226 averaged over 30 consecutive days; • 30 pCi/l of total radium-226 in any one day or 10 pCi/l of total radium-226 averaged over 30 consecutive days; and • 4 mg/l of uranium in any one day or 2 mg/l of uranium averaged over 30 consecutive days.	Applicable to discharges of radium-226 and uranium from open-pit or underground mines from which uranium, radium, and vanadium ores are produced, including mines that use in-situ leach methods.	Clean Water Act (CWA) 40 CFR section 440.33

EXHIBIT 1-1 (Continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical Name	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTE			
Protection of Individuals in Restricted Areas (i.e., Workers) from Radiation Exposure	A variety of different radiation exposure limits are set for individuals in restricted areas, including a dose limit of 1.25 rem/ quarter (which is equivalent to 5 rem/year) to the whole body and radioactivity concentration limits for air and water in restricted areas (designed to limit worker exposures to 1.25 rem/quarter).	Applicable to all categories of NRC licensees; also applicable to Agreement State licensees. Applicable to exposures to source, byproduct, and special nuclear material, as well as to NARM released from facilities licensed to possess source, byproduct, and special nuclear material.	Atomic Energy Act (AEA) 10 CFR sections 20.101 through 20.104
Protection of Individuals in Unrestricted Areas from Radiation Exposure	Radiation exposure to members of the public is limited to: • A whole body dose of 0.1 rem/year • 0.002 rem/hour in any one hour • 0.1 rem in any 7 consecutive days; and • The dose limits in 40 CFR Part 190 for operations within the uranium fuel cycle (see Section 4.1.1.3 of Chapter 4 of Part II).	Applicable to all categories of NRC licensees; also applicable to Agreement State licensees. Applicable to exposures to source, byproduct, and special nuclear material, as well as to NARM released from facilities licensed to possess source, byproduct, and special nuclear material.	10 CFR section 20.1301 (AEA)
Discharge of Radionuclides to Unrestricted Areas (Air and Water)	Airborne and liquid discharges to unrestricted areas shall meet radionuclide-specific concentration limits in 10 CFR Part 20, Appendix B, Table II. These concentrations are designed to limit radiation exposure to members of the public to 0.5 rem/year to the whole body, blood-forming organs, and gonads; 3 rems/year to the bone and thyroid, and 1.5 rems/year to other organs.	Applicable to all categories of NRC licensees; also applicable to Agreement State licensees. Applicable to releases of source, byproduct, and special nuclear material, as well as to NARM released from facilities licensed to possess source, byproduct, and special nuclear material.	10 CFR section 20.1302 (AEA)

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EXHIBIT 1-1 (Continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical Name	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTE			
Radioactive Waste Treatment and Disposal	A variety of waste disposal requirements are set, including those specifying how licensees may dispose of licensed material (see Section 4.2.1.1 of Chapter 4 of Part II), as well as concentration limits for disposal of radioactive waste into sanitary sewerage systems, requirements for treatment and disposal by incineration, and specific requirements for the disposal of radioactively contaminated animal tissue and liquid scintillation media.	Applicable to all categories of NRC licensees; also applicable to Agreement State licensees. Applicable to releases of source, byproduct, and special nuclear material.	10 CFR sections 20.301 through 20.311 (AEA)
		Certain requirements also apply to other radioactive materials, i.e., NARM released from facilities licensed to possess source, byproduct, and special nuclear material.	10 CFR sections 20.302(a) and 20.302(b) (AEA)
Control of Uranium or Thorium Mill Tailings	Control measures shall be designed to ensure that release of radon-222 from residual radioactive material to the atmosphere will not exceed an average (applied over the entire surface of the disposal site and over at least a one-year period) release rate of 20 pCi/m^2/sec or increase the average annual concentration of radon-222 in the atmosphere at or above any location outside the disposal site by more than 0.5 pCi/l.	Applicable to certain inactive uranium processing sites designated for remedial action under Title I of UMTRCA (see Chapter 4 for more detail).	Uranium Mill Tailings Radiation Control Act (UMTRCA) 40 CFR section 192.02(b)

14/ These dose limits are considered high relative to recent EPA standards (see discussion in Section 4.2.1.1 of this chapter).

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EXHIBIT 1-2

SELECTED LOCATION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Location	Requirements	Prerequisites for Applicability	Citation
CHAPTER 1 - CLEAN AIR ACT			
NAAQS Attainment Areas	New major stationary sources shall apply best available control technology for each pollutant, subject to regulation under the Act, that the source would have potential to emit in significant amounts. Owner or operator of proposed source or modification shall demonstrate that allowable emissions increases or reductions (including secondary emissions) will not cause or contribute to a violation of the NAAQS or applicable maximum allowable increase over baseline concentrations.	Major stationary sources as identified in 40 CFR section 52.21(b)(1)(i)(a) that emits, or has the potential to emit, 100 tons per year or more of any regulated pollutant; any other stationary source that emits, or has the potential to emit, 250 tons per year or more of any regulated pollutant.	40 CFR section 52.21(j) (CAA)
NAAQS Non-Attainment Areas	Source must obtain emission offsets in Air Quality Control Region of greater than one-to-one. Source subject to "lowest achievable emission rate (LAER)" as defined in 40 CFR section 51.18(j)(xii). All major stationary sources owned or operated by the person in the State are in compliance, or on a schedule for compliance, with all applicable emission standards.	Any stationary facility or source of air pollutants that directly emits, or has the potential to emit, 100 tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutants). [CAA §302(j)].	CAA Part D, §173(1) CAA Part D, §173(2) CAA Part D, §173(3)
CHAPTER 2 - OTHER RESOURCE PROTECTION STATUTES			
Historic district, site, building, structure, or object.	Avoid impacts on cultural resources. Where impacts are unavoidable, mitigate through design and data recovery.	Properties listed in the National Register of Historic Places, or eligible for such listing.	National Historic Preservation Act (NHPA) 16 CFR Part 470, et. seq.
Critical habitat of/or an endangered or threatened species	Identify activities that may affect listed species. Actions must not threaten the continued existence of a listed species. Actions must not destroy critical habitat.	Species or habitat listed as endangered or threatened.	Endangered Species Act (ESA) 50 CFR section 402.04 50 CFR section 402.01 50 CFR section 402.01

EXHIBIT 1-2 (Continued)

SELECTED LOCATION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Location	Requirements	Prerequisites for Applicability	Citation
CHAPTER 3 - OTHER RESOURCE PROTECTION STATUTES			
Wild and Scenic Rivers	Determine if project will affect the free-flowing characteristics, scenic, or natural values of a designated river;	Any river, and the bordering or adjacent land, designated as "wild and scenic or recreational."	Wild and Scenic Rivers Act (WSRA) 36 CFR section 297.4
	Not authorize any water resources project or any other project that would directly or indirectly impact any designated river without notifying DOE or Forest Service.		
Coastal zone or an area that will affect the coastal zone	Federal activities must be consistent with, to the maximum extent practicable, State coastal zone management programs.	Wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	Coastal Zone Management Act (CZMA) 15 CFR section 930.30
	Federal agencies must supply the State with a consistency determination.		15 CFR section 930.34 (CZMA)
Wilderness Area	The following are not allowed in a Wilderness area: • commercial enterprises • permanent roads, except as necessary to administer the area • motor vehicles • motorized equipment • motorboats • aircraft • mechanized transport • structures or buildings	Any unit of the National Wildlife Refuge System.	Wilderness Act (WA) 50 CFR section 35.5
CHAPTER 5 - MINING, MILLING SMELTING SITES			
Surface Mining Sites	Remove and segregate topsoil from site before remedial action. After cleanup redistribute original soil on site.	Applies to all surface coal mining operations except for non-commercial use, extraction of 250 tons or less, extraction as an incidental part of government-financed construction or of mining of other minerals, or extraction of coal that affects less than 2 acres (30 CFR section 700.11).	Surface Mining Control and Reclamation Act (SMCRA) 30 CFR section 816.22
	Minimize disturbance of the hydrologic balance within the permitted and adjacent areas.		30 CFR section 816.41 (SMCRA)
	Implement sediment control measures to minimize erosion and prevent additional contributions of sediment to streamflow or runoff. Measures instituted must attain State and Federal effluent limits.		30 CFR section 816.41 (SMCRA)
	Backfill and grade disturbed areas to approximate original contour, minimize erosion, and achieve a stable slope.		30 CFR section 816.102 (SMCRA)
	Revegetate disturbed area with species native to the area.		30 CFR section 816.11 (SMCRA)

EXHIBIT 1-3

SELECTED ACTION SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 1 - CLEAN AIR ACT			
New Source Performance Standards			
Incineration (general)	Particulate emissions shall be less than 0.08 grains per dry standard cubic foot corrected to 12% carbon dioxide.	Incinerator burning solid waste, more than 50% of which is municipal-type waste, for the purpose of reducing waste volume by removing combustible matter.	40 CFR section 60.52 (CAA)
Statutory Gas Turbines	Standard for NO_x emissions. SO_2 emissions shall be less than 0.015% by volume at 15% oxygen and on a dry basis.	Stationary gas turbines with load heat input equal to or greater than 10.7 gigajoules per hour, based on the lower heating value of the fuel fired.	40 CFR section 60.332 (CAA) 40 CFR section 60.333 (CAA)
Storage of Petroleum Liquids	Floating roof, vapor recovery system, or their equivalents.	Storage vessel constructed after 6/11/73 and prior to 5/19/78 having storage capacity greater than 40,000 gallons, storing petroleum liquids with vapor pressure equal to or greater than 1.5 psia.	40 CFR section 60.112 (CAA)
	Floating roof or vapor recovery system.	Storage vessels constructed after 5/18/78 having storage capacity greater than 40,000 gallons, storing petroleum liquids with vapor pressure equal to or greater than 1.5 psia.	40 CFR section 60.112(a) (CAA)
CHAPTER 2 - TOXICS/PESTICIDES			
PCB Storage Prior to Disposal	All Storage Areas 1/ Storage facilities must be constructed: • With an adequate roof and walls. • With a floor and curb of impervious materials. • Without drain valves, floor-drains, expansion joints, sewer lines or other openings. • Above the 100-year flood water level.	Storage of PCBs at concentrations of 50 ppm or greater and PCB items with PCB concentrations of 50 ppm or greater.	Toxic Substances Control Act (TSCA) 40 CFR section 761.65

1/ Bulk storage requires the preparation and implementation of an SPCC Plan (see 40 CFR section 761.65(c)(7)(ii) for specifications of container sizes that are considered "bulk" storage containers). Substantive requirements may be ARARs if bulk storage is performed on-site.

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
PCB Storage Prior to Disposal (continued)	Temporary Storage (30 days or less) Temporary storage (up to 30 days from the date of initial storage) need not comply with above storage regulations for the following items: • PCB articles and equipment that are non-leaking. • Leaking articles and equipment placed in non-leaking containers. • PCB containers containing non-liquid PCBs, such as contaminated soil, rags, debris. • Liquid PCB containers containing PCBs between 50-500 ppm if covered by a spill prevention, control, and countermeasure plan.		40 CFR section 761.65 (TSCA)
	All Storage Areas		
	Storage area must be properly marked.		40 CFR section 761.65 (TSCA)
	No item of movable equipment used to handle PCBs that comes into contact with PCBs shall be moved from the storage area unless it has been decontaminated under section 761.79.		40 CFR section 761.65 (TSCA)
	All stored articles must be checked for leaks every 30 days.		40 CFR section 761.65 (TSCA)
PCB Storage Prior to Disposal	Containers must be dated when they are placed in storage.		40 CFR section 761.65 (TSCA)
	All PCB articles or containers must be removed and disposed of within 1 year of storage.		40 CFR section 761.65 (TSCA)
			40 CFR sections 761.65 and 761.180 (TSCA).

300742

EXHIBIT 1-3 (Continued)

SELECTED ACTION SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Incineration of Liquid PCBs	Combustion requirements: • Either: 2-second dwell time at 1200° C(± 100°C) and 3 percent excess oxygen in stack gas; or 1.5 second dwell time at 1600° C and 2 percent excess oxygen in stack gas; • Combustion efficiency of at least 99.9999 percent. • Rate and quantity of PCBs fed to the combustion system shall be measured and recorded at regular intervals no longer than 15 minutes. • Temperature of incineration shall be continuously measured and recorded. • Flow of PCBs to incinerator must stop automatically whenever the combustion temperature drops below specified temperature.	Incineration of liquid PCBs at concentrations of 50 ppm or greater unless specified in 40 CFR section 761.70. 2/	40 CFR section 761.70 (TSCA)

2/ An approved incinerator (under section 761.70) can be used to destroy any concentration of PCBs; a high-efficiency boiler approved under section 761.60(a)(2)(iii) can be used for mineral oil dielectric fluid from PCB-contaminated electrical equipment containing PCBs in concentrations greater than or equal to 50 ppm but less than 500 ppm; and a RCRA-approved incinerator (under RCRA §3005(a)) can be used for PCBs that are not subject to the incineration requirements of TSCA (i.e., at concentrations less than 50 ppm). Except as provided in section 761.75(b)(ii), liquid PCBs shall not be processed into non-liquid forms to circumvent the high-temperature incineration requirements of section 761.60(a).

300744

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Incineration of Liquid PCBs (continued)	Monitoring must occur: • When the incinerator is first used or modified; monitoring must measure for O_2, CO, CO_2, Oxides of Nitrogen, HCl, RCl, PCBs, Total Particulate Matter. • Whenever the incinerator is incinerating PCBs, the O_2 and CO levels must be continuously checked. CO_2 must be periodically checked.		40 CFR section 761.70 (TSCA) 40 CFR section 761.70 (TSCA)
	Water scrubbers must be used for HCl control.		
	Treatment standards under RCRA land disposal restrictions (LDRs): • Incineration; or • Burning in high efficiency boilers. 2/	Incineration of liquid PCBs under the California List Waste land disposal restrictions, assuming that HOC wastes are mixed with a RCRA-listed or -characteristic waste and total HOC concentration is equal to or greater than 1,000 mg/kg or PCB concentration alone is 50 ppm.	Resource Conservation and Recovery Act (RCRA) 40 CFR section 268.42
Incineration of Non-Liquid PCBs, PCB Articles, PCB Equipment, and PCB Containers	Same as for liquid PCBs.	Incineration of non-liquid PCBs, PCB articles, PCB equipment, and PCB containers at concentrations of 50 ppm or greater unless specified in 40 CFR section 761.60 3/	40 CFR section 761.70 (TSCA)
	Mass air emissions from the incinerator shall be no greater than 0.001g PCB per kg of the PCBs entering the incinerator.		40 CFR section 761.70 (TSCA)
	Monitoring is required.		40 CFR sections 761.70 and 761.100 (TSCA)
	Same as for liquid PCBs.	Incineration of non-liquid PCBs regulated as HOCs under the California List Wastes land disposal restrictions, provided that HOC wastes are mixed with a RCRA-listed or RCRA-characteristic waste and total HOC concentrations equal to or greater than 1,000 mg/kg.	40 CFR section 268.42 (RCRA)

2/ The incineration requirements of 40 CFR Part 264, Subpart O, and Part 265, Subpart O, are listed in Exhibit 1-3 of Part I of this Guidance, pp. 1-44 and 1-45.

3/ Incineration of non-liquid PCBs can only be carried out in TSCA-approved incinerators (under section 761.60), which may be used to destroy any concentration of PCBs.

300746

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Chemical Landfilling of PCBs	Landfill must be located in thick, relatively impermeable soil formation or on soil with high clay and silt content with: • Soil thickness of 4 feet, or compacted soil liner thickness of 3 feet. • Permeability (cm/sec), less than $1x10^{-7}$. • Percent soil passing No. 200 sieve, greater than 30. • Liquid limit, greater than 30. • Plasticity Index greater than 15.	Disposal of PCBs and PCB Items in a chemical waste landfill. • Mineral oil dielectric fluid from PCB-contaminated electrical equipment or other liquids containing PCBs at a concentration of 50 ppm or greater but less than 500 ppm. • Non-liquid PCBs at concentrations of 50 ppm or greater. • PCB Transformers, other PCB articles, PCB small capacitors, and PCB containers at concentrations of 500 ppm or greater.	40 CFR section 761.75 (TSCA)
	Synthetic membranes must be used when landfill conditions cannot fulfill permeability requirement.		40 CFR section 761.75 (TSCA)
	Avoid placing landfill in floodplain, shoreline, or ground-water recharge areas and below the historical high ground-water table.		40 CFR section 761.75 (TSCA)
	Provide surface-water diversion dikes around the landfill if the site is below the 100-year flood-water elevation.		40 CFR section 761.75 (TSCA)
	Provide diversion structures capable of diverting all surface water from a 24-hour, 25-year storm.		
	Locate landfill in an area of low to moderate relief.		40 CFR section 761.75(6) (TSCA)
	Monitor ground water and surface water in disposal area prior to building a landfill.		
	Sample surface-water courses designated by the Regional Administrator, at least monthly.		40 CFR section 761.65(a) (TSCA)
	Analyze all samples for the following parameters: • PCBs • pH • Specific conductance • Chlorinated organics		

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Chemical Landfilling of PCBs (continued)	Install a leachate monitoring system.		40 CFR section 761.75(7) (TSCA)
	Place containers in landfill without damaging other containers.		40 CFR section 761.75(8) (TSCA)
	Segregate PCB wastes from wastes not chemically compatible with PCBs.		40 CFR section 761.75(8) (TSCA)
Marking of PCBs	The following must be marked as designated in 40 CFR section 761.45: • PCB containers containing greater than 50 ppm PCBs, PCB transformers, PCB Large High-Voltage Capacitors, equipment containing a PCB transformer or a PCB Large High-Voltage Capacitor, PCB Large Low-Voltage Capacitor at time of removal, electric motors using PCB coolants, hydraulic systems using PCB hydraulic fluid, heat transfer systems using PCBs, PCB article containers containing any of the above, storage areas used to store PCBs and PCB items for disposal.	PCB article described in 40 CFR section 761.45	40 CFR section 761.40 (TSCA)
	All marks must be on exterior of PCB container and must be clearly visible.		40 CFR section 761.40 (TSCA)
Disposal of Pesticides	Unacceptable disposal methods: • Those inconsistent with label • Open dumping • Open burning • Disposal into any body of water • Those inconsistent with applicable law.		Federal Insecticide Fungicide and Rodenticide Act (FIFRA) 40 CFR section 165.7
	Incinerate pesticide at a specified temperature/dwell time that will ensure that all emissions meet requirements of CAA relating to gaseous emissions.	Incineration (recommended) of organic pesticides, except organic mercury, lead, cadmium, and arsenic.	40 CFR section 165.8(a) (FIFRA)

300748

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Disposal of Pesticides (continued)	Dispose of liquids, sludges, or solid residues generated by incineration in accordance with applicable Federal, State, and local pollution control requirements.		40 CFR section 165.8(a) (FIFRA)
	If incineration facilities are not available, dispose of pesticides by: • Burial in a designated landfill • Chemical degradation and burial • Storage • Well injection, if all other alternatives are more harmful to the environment.		
	Chemically or physically treat pesticides to recover heavy metals then incinerate the pesticides in compliance with CAA.	Incineration (recommended) of metallic-organic pesticides (except mercury, lead, cadmium, or arsenic compounds).	40 CFR section 165.8(b) (FIFRA)
	If appropriate treatment and incineration are not available, the pesticides may be: • Chemically degraded and buried • Stored • Injected into the ground only if there is no alternative offering more protection to the environment.		
	Chemically deactivate pesticide and recover the heavy metals. If chemical deactivation facilities are not available, encapsulate the pesticide and bury it.	Treatment recommended for organic mercury, lead, cadmium, arsenic, and all inorganic pesticides.	40 CFR section 165.8(c)
	Store pesticide if neither deactivation nor burial are available.		

EXHIBIT 1-3 (Continued)

SELECTED ACTION SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 2 - TOXICS AND PESTICIDES			
Disposal of Pesticide Containers and Residue	Incinerate or bury in a designated landfill.	Combustible containers that formerly held organic or metallic-organic pesticides, except organic mercury, lead, arsenic, and cadmium.	40 CFR section 165.9(a) (FIFRA)
	Non-combustible containers must be: • Triple-rinsed. • Returned to the pesticide manufacturer for reuse if in good condition. • Returned to a facility for recycling as scrap metal if in poor condition.	Non-combustible containers that formerly held organic or metallic-organic pesticides (with exceptions noted above)	40 CFR section 165.9(b) (FIFRA)
	Triple puncture containers to facilitate drainage, and dispose of in a sanitary landfill.	Combustible and non-combustible containers that formerly held organic, mercury, lead, cadmium, or arsenic, or inorganic pesticides.	40 CFR section 165.9(c) (FIFRA)
Labeling of Pesticides	Label pesticides legibly, and prominently, to show: • Ingredients; • Warnings and precautionary statements; • Toxicity; • Directions for use, including storage and disposal methods.	Labeling requirements may apply when pesticides are considered products, and not RCRA hazardous wastes.	40 CFR section 162.10 (FIFRA)
Handling of Pesticides	Individuals handling certain pesticides must be State- or Federally-approved applicators.		40 CFR section 171.4 (FIFRA)

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EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT OR APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Discharge of Radioactive Pollutants to Air	Airborne emissions shall not cause members of the public to receive doses greater than: • 25 mrem/yr to the whole body; or • 75 mrem/yr to the critical organ. 1/	Applicable to airborne emissions from DOE, NRC-licensed, and non-DOE Federal facilities during their operational period. Not applicable to doses caused by radon-220, radon-222, and their respective decay products; facilities regulated under 40 CFR Parts 190, 191, or 192; and low-energy accelerators and users of sealed radiation sources.	Clean Air Act (CAA) 40 CFR Part 61, Subparts B and I 2/
Discharge of Radioactive Pollutants to Surface Waters	**Best Available Technology:** The concentration of pollutants discharged in drainage from mines that produce uranium ore shall not exceed: • 10 pCi/l of dissolved radium-226 in any one day or 3 pCi/l of dissolved radium-226 averaged over 30 consecutive days; 3/ • 30 pCi/l of total radium-226 in any one day or 10 pCi/l of total radium-226 averaged over 30 consecutive days; and • 4 mg/l of uranium in any one day or 2 mg/l of uranium averaged over 30 consecutive days.	Applicable to discharges of radium-226 and uranium from open-pit or underground mines from which uranium, radium, and vanadium ores are produced, including mines that use in-situ leach methods. 3/	Clean Water Act (CWA) 40 CFR section 440.33
	Best Practicable Control Technology: The concentration of pollutants discharged in drainage from mines from which uranium, radium, and vanadium ores are produced shall not exceed the same concentration criteria noted above for the Best Available Technology.	Applicable to discharges of radium-226 and uranium from open-pit or underground mines from which uranium, radium, and vanadium ores are produced, excluding mines that use in-situ leach methods. 3/	40 CFR section 440.32(a) (CWA)

1/ A millirem (mrem) = 0.001 rem, where a rem is a measure of dose equivalence for the biological effect of radiation of different types and energies on people.

2/ Lead agencies are cautioned that the radionuclide NESHAPs are being reexamined subject to a voluntary remand and that they may be revised in the future.

3/ A curie, or Ci, is the amount of radioactive material that produces 37 billion nuclear disintegrations per second. A picocurie, or pCi, is equal to 1×10^{-12} curies.

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Discharge of Radioactive Pollutants to Surface Waters (continued)	**Best Practicable Control Technology:**		
	The concentration of pollutants discharged from mills shall not exceed the concentration criteria for radium-226 noted above for the Best Available Technology.	Applicable to mills using the acid leach, alkaline leach, or combined acid and alkaline leach process for the extraction of uranium, radium, and vanadium, including mill-mine facilities and mines using in-situ leach methods. 1/	40 CFR section 440.32(b) (CWA)
	New Source Performance Standards:		
	The concentration of pollutants discharged in mine drainage from mines that produce uranium ore shall not exceed the same concentration criteria noted above for the Best Available Technology.	Applicable to discharges of radium-226 and uranium from open-pit or underground mines from which uranium, radium, and vanadium ores are produced, excluding mines using in-situ leach methods. 1/	40 CFR section 440.34(a) (CWA)
	There shall be no discharge of process wastewater to navigable waters.	Applicable to discharges of radium-226 and uranium from mills using the acid leach, alkaline leach, or combined acid and alkaline leach processes for the extraction of uranium and from mines and mills using in-situ leach methods. 1/	40 CFR section 440.34(b) (CWA)
Discharge of Radionuclides to Unrestricted Areas (Air and Water)	Airborne and liquid discharges to unrestricted areas shall meet radionuclide-specific concentration limits in 10 CFR Part 20, Appendix B, Table II. These concentrations are designed to limit radiation exposure to members of the public to 0.5 rem/year to the whole body, blood-forming organs, and gonads; 3 rems/year to the bone and thyroid; and 1.5 rems/year to other organs. 2/	Applicable to all categories of Nuclear Regulatory Commission (NRC) licensees; also applicable to Agreement State licensees.	Atomic Energy Act 1/ (AEA) 10 CFR section 20.106
		Applicable to releases of source, byproduct, and special nuclear material, as well as to naturally occurring and accelerator-produced radioactive material (NARM) released from facilities licensed to possess source, byproduct, and special nuclear material. 3/	

1/ Applicable only to vanadium byproduct production from uranium ores.

2/ These dose limits are considered high relative to recent EPA standards (see discussion in Section 4.2.1.1 of Chapter 4 of Part II).

3/ Section 104(a)(3)(A) of CERCLA as amended by SARA prohibits response to releases "of a naturally occurring substance in its unaltered form or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found." NARM possessed and used by a nuclear material licensee, in almost all cases, would not qualify as a naturally occurring substance as it is defined in this section.

1/ These standards are potentially applicable only for CERCLA actions at sites licensed by the NRC, but may be relevant and appropriate to radioactively contaminated sites not licensed by the NRC.

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EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE [illegible]

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Protection of Ground Water from Radioactive Contamination	Uranium mill tailings shall be managed so as to conform to the ground-water protection standard in 40 CFR section 264.92, except that for the purpose of this standard: • Molybdenum, uranium, and thorium are added to the list of hazardous constituents referenced in 40 CFR section 264.93; • Radioactivity concentration limits for radium and gross alpha particle activity are added to Table 1 of 40 CFR section 264.94; and 1/ • Detection monitoring programs required under section 264.98 to establish the standards required under section 264.92 shall be completed within one year of promulgation. 2/	Applicable to active commercial uranium and thorium processing sites licensed by the NRC or States	Uranium Mill Tailings Radiation Control Act (UMTRCA) 40 CFR section 192.32(a)(2) and 192.41
Corrective Action of Radioactively Contaminated Ground Water	If the ground-water standards established under 40 CFR section 192.329(a)(2) are exceeded at a licensed site, a corrective action program as specified in 40 CFR section 264.100 shall be put into operation as soon as is practicable, and in no event later than 18 months after a finding of exceedance. 2/	Applicable to active commercial and thorium processing sites licensed by the NRC or States.	40 CFR section 192.33 and 192.41 (UMTRCA)
Cleanup of Radioactively Contaminated Land	If the above-background concentration of radium-226 in land averaged over any area of 100 m^2 is: • <5 pCi/g, no further cleanup is needed; • Between 5 and 15 pCi/g, a decision concerning the need for further cleanup should be made based on the volume and depth of the contamination, as well as other site-specific characteristics (further guidance from EPA's ORP should be sought in these cases); or • >15 pCi/g, the contamination should be removed.	Applicable to certain inactive uranium processing sites designated for remedial action under Title I of UMTRCA (see Chapter 4 of Part II for more detail), as well as active commercial uranium and thorium processing sites licensed by the NRC or States.	40 CFR section 192.12(a), 192.32(b)(2), and 192.41 (UMTRCA)

1/ Gross alpha particle radioactivity means the total radioactivity due to all alpha particle emitters, excluding (for the purpose of 40 CFR section 141.15) radon and uranium.

2/ Refer to Chapter 2 of Part I of this guide for guidance on CERCLA compliance with RCRA.

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Cleanup of Radioactively Contaminated Buildings	Remedial actions should attempt to achieve an annual average radon decay product concentration (including background) of less than 0.02 WL in any occupied or habitable building. In any case, the radon decay product concentration shall not exceed 0.03 WL. 10/	Applicable to certain inactive uranium processing sites designated for remedial action under Title I of UMTRCA (see Chapter 4 of Part II for more detail).	40 CFR section 192.12(b)(1) (UMTRCA)
	The level of gamma radiation shall not exceed the background level by more than 20 microroentgens/hour in any occupied or habitable building. 11/		40 CFR section 192.12(b)(2) (UMTRCA)
Control of Uranium or Thorium Mill Tailings	Control measures shall be designed to be effective for up to 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years.	Applicable to certain inactive uranium processing sites designated for remedial action under Title I of UMTRCA (see Chapter 4 for more detail).	40 CFR section 192.02(a) (UMTRCA)
	Control measures shall be designed to ensure that releases of radon-222 from residual radioactive material to the atmosphere will not exceed an average (applied over the entire surface of the disposal site and over at least a one-year period) release rate of 20 $pCi/m^2/sec$ or increase the average annual concentration of radon-222 in the atmosphere at or above any location outside the disposal site by more than 0.5 pCi/l.		40 CFR section 192.02(b) (UMTRCA).
	At the end of the closure period, disposal areas shall be designed to be effective for up to 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years.	Applicable to active commercial uranium and thorium processing sites licensed by the NRC or States.	40 CFR section 192.32(b)(1)(i), and 192.41 (UMTRCA).
	At the end of the closure period, disposal areas shall be designed to ensure that releases of radon-222 from residual radioactive material to the atmosphere will not exceed an average (applied over the entire surface of the disposal site and over at least a one-year period) release rate of 20 $pCi/m^2/sec$.		40 CFR section 192.32(b)(1)(ii) and 192.41 (UMTRCA).

10/ A working level, or WL, means any combination of short-lived radon decay products (through polonium-214) in one liter of air that will result in the emission of alpha particles with a total energy of 130 billion electron volts. An activity concentration of 10 picocuries per liter of radon-222 in equilibrium with its daughters corresponds approximately to one WL.

11/ A microroentgen = 1×10^{-6} roentgen, where a roentgen is a unit of exposure to gamma or X-rays, equivalent to an absorbed dose in tissue of approximately 0.9 rad. A rad is a measure of the energy imparted to matter by ionizing radiation, defined as 100 ergs/g.

300754

EXHIBIT 1-9 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Closure of Uranium and Thorium Mill Tailings Sites	At the end of the closure period, disposal areas shall each comply with the closure performance standard in 40 CFR section 261.111 with respect to non-radiological hazards (see Exhibit 1-3 in Part I for more discussion on 261.111). 12/	Applicable to active commercial and thorium processing sites licensed by the NRC or States.	40 CFR section 192.32(b) and 192.41 (UMTRCA)
Radioactive Waste Treatment and Disposal	A variety of waste disposal requirements are set, including those specifying how licensees may dispose of licensed material (see Section 4.2.1.1 of Chapter 4 of Part II), as well as concentration limits for disposal of radioactive waste into sanitary sewerage systems, requirements for treatment and disposal by incineration, and specific requirements for the disposal of radioactively contaminated animal tissue and liquid scintillation media.	Applicable to all categories of NRC licensees; also applicable to Agreement State licensees. Applicable to releases of source, byproduct, and special nuclear material Certain requirements also apply to other radioactive materials, i.e., NARM released from facilities licensed to possess source, byproduct, and special nuclear material.	10 CFR sections 20.301 through 20.311 (AEA) 10 CFR sections 20.302(a) and 20.302(b) (AEA)
Closure and Post-closure Observation and Maintenance of a Low-Level Radioactive Waste Disposal Site	Closure designs must assure that long-term performance objectives of 10 CFR sections 61.41-61.44 (see below) are met, taking into account site-specific geologic, hydrologic, and other conditions. Following completion of closure, the disposal site must be monitored and maintained for 5 years (longer or shorter periods may be allowed) and then responsibility is transferred to a Federal or State government agency, which will implement institutional care requirements in 10 CFR section 61.23(g).	Applicable to NRC-licensed land disposal facilities that receive low-level wastes from others (i.e., commercial disposal facilities). Not applicable to disposal of: • High-level waste and spent fuel (addressed in 10 CFR Part 60 and 40 CFR Part 191); • Transuranic waste (addressed in 40 CFR Part 191); • Uranium and thorium mill tailings (addressed in 10 CFR Part 40 and 40 CFR Part 192); and • Radioactive waste by an individual licensee, as provided for in 10 CFR Part 20.	10 CFR section 61.20 (AEA, LLWPA, and LLRWPAA) 13/ 10 CFR sections 61.29 and 61.30 (AEA, LLWPA, and LLRWPAA)

12/ Refer to Chapter 2 of Part I of this guide for guidance on CERCLA compliance with RCRA.

13/ Part 61 was promulgated primarily under the authority of the Atomic Energy Act, but two other statutes from which authority was derived are the Low-Level Waste Policy Act of 1980 (LLWPA) and the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA).

300755

EXHIBIT 1-3 (Continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action	Requirements	Prerequisites for Applicability	Citation
CHAPTER 4 - MANAGEMENT OF RADIOACTIVE WASTES			
Siting, Designing, Operation, Closure, and Control of a Low-Level Radioactive Waste Disposal Site	A variety of performance objectives are established, including standards that set limits on radiation exposures by members of the public, protect people from inadvertently intruding onto a radioactive waste site, and stabilize the site after closure. The public exposure limits are the same dose limits as in 40 CFR Part 190.	Same prerequisites as specified above for 10 CFR Part 61.	10 CFR sections 61.41 through 61.44 (Subpart C of Part 61) (AEA, LLWPA, and LLRWPAA)
	A variety of technical requirements are established, i.e., minimum characteristics a disposal site must have to be acceptable.	Same prerequisites as specified above for 10 CFR Part 61, except that existing technical requirements are applicable only to the near-surface disposal of radioactive waste. A near surface disposal facility is defined as one that disposes of waste in or within the upper 30 meters of the earth's crust.	10 CFR sections 61.50 through 61.59 (Subpart D of Part 61) (AEA, LLWPA, and LLRWPAA).
Siting, Operation, Decontamination, Decommissioning, and Reclamation of Uranium Mills and Mill Tailings	Numerous technical, financial, ownership, and long-term surveillance criteria are established.	Applicable to active uranium or thorium mills and inactive mills that are not covered under the remedial action program of UMTRCA'S Title I (see Chapter 4 of Part II for more discussion on this remedial action program).	10 CFR Part 40, Appendix A (AEA and UMTRCA)

BIBI

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

RCRA AND SDWA MCLS

Chemical Name	Potential ARARs b/ RCRA Maximum Concentration Limits (mg/l)	SDWA Maximum Contaminant Levels (mg/l)
Arsenic	5.0×10^{-2}	5.0×10^{-2}
Barium	1.0	1.0
Benzene		5.0×10^{-3}
Beta Particle Photon Radioactivity		4 millirems
Cadmium	1.0×10^{-2}	1.0×10^{-2}
Carbon Tetrachloride		5.0×10^{-3}
Chromium	5.0×10^{-2}	5.0×10^{-2}
Coliform Bacteria		1 per 100 ml
p-Dichlorobenzene		7.5×10^{-2}
1,2-Dichloroethane		5.0×10^{-3}
1,1-Dichloroethylene		7.0×10^{-3}
2-4-Dichlorophenoxyacetic Acid (2,4-D)	1.0×10^{-1}	1.0×10^{-1}
Endrin	2.0×10^{-4}	2.0×10^{-4}
Fluoride		4.0
Lead	5.0×10^{-2}	5.0×10^{-2}
Lindane	4.0×10^{-3}	4.0×10^{-3}
Total Mercury	2.0×10^{-3}	2.0×10^{-3}
Methoxychlor	1.0×10^{-1}	1.0×10^{-1}
Nitrate (as N)		10
Radionuclides, gross alpha particle activity		15 pCi/l
Radium-226 + Radium-228		5 pCi/l
Selenium	1.0×10^{-2}	1.0×10^{-2}
Silver	5.0×10^{-2}	5.0×10^{-2}
Toxaphene	5.0×10^{-3}	5.0×10^{-3}
2,4,5-TP Silvex	1.0×10^{-2}	1.0×10^{-2}
1,1,1-Trichloroethane		2.0×10^{-1}
Trichloroethylene		5.0×10^{-3}
Total Trihalomethanes		1.0×10^{-1}
Turbidity		1 Tu
Vinyl Chloride		2.0×10^{-3}

EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Chemical Name	Potential ARARs b/				For Use In Special Circumstances
	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/		
	Water and Fish Ingestion (mg/l)	Fish Consumption Only (mg/l)	Freshwater Acute/Chronic (mg/l)	Marine Acute/Chronic (mg/l)	SDWA/MCL Goal (mg/l) d/
Acenaphthene			1.7*/0.5*	0.9*/0.7*	
Acenaphthylene				3.0x10-01*	
Acrolein	3.2x10-01	7.8x10-01	6.0x10-02*/2.1x10-02*	5.5x10-02*	
Acrylonitrile	5.8x10-05	6.5x10-04	7.5*/2.6*		
Aldrin	7.4x10-08	7.9x10-08	3.0x10-03	1.3x10-03	
Anthracene					
Antimony and Compounds	1.5x10-01	45	9.0/1.6		
Arsenic and Compounds	2.2x10-06	1.8x10-05			
Arsenic (V) and Compounds			0.0*/4.8x10-02*	2.3*/1.3x10-02	
Arsenic (III) and Compounds			0.3/0.1	6.9x10-02/3.6x10-02	
Asbestos					
Barium and Compounds	1				
Benz(a)anthracene					
Benz(c)acridine					0
Benzene	6.6x10-04	4.0x10-02	5.3*	5.1*/0.7*	
Benzidine	1.2x10-04	5.3x10-04	2.5*		
Benzo(a)pyrene					
Benzo(b)fluoranthene					
Benzo(ghi)perylene					
Benzo(k)fluoranthene					
Beryllium and Compounds	6.8x10-06	1.2x10-04	0.1*/5.3x10-03*		
Bis(2-chloroethyl)ether					
Bis(2-chloroisopropyl)ether					
Bis(chloromethyl)ether					

EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Chemical Name	Potential ARARs b/: CWA Water Quality Criteria for Protection of Human Health: Water and Fish Ingestion (mg/l)	Potential ARARs b/: CWA Water Quality Criteria for Protection of Human Health: Fish Consumption Only (mg/l)	Potential ARARs b/: CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/: Freshwater Acute/Chronic (mg/l)	Potential ARARs b/: CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/: Marine Acute/Chronic (mg/l)	For Use In Special Circumstances: SDWA/MCL Goal (mg/l) d/
Cadmium and Compounds	1.0x10-02		3.9x10-03+/1.1x10-03+	4.3x10-02/9.3x10-02	
Carbon Tetrachloride	4.0x10-04	6.9x10-03	3.5x10+01	5.0x10+01	0
Chlordane	4.6x10-07	4.0x10-07	2.4x10-03/4.3x10-06	9.0x10-03/4.0x10-06	
Chlorinated Benzenes			2.5x10-01*/5.0x10-02*	1.6x10-01*/1.2x10-01*	
Chlorinated Naphthalenes			1.6*	7.5x10-03*	
Chloroalkyl Ethers			2.3x10+02*		
Chlorobenzene (Mono)					
Chlorodibromomethane					
Chloroform	1.9x10-04	1.0x10-02	2.0x10+01*/1.2*		
2-Chlorophenol			4.3*/2.0*		
Chromium III and Compounds	170	3433	1.7+/0.2+	1.0x10+01	
Chromium VI and Compounds	5.0x10-02		1.6x10-02/1.1x10-02	1.1/5.0x10-02	
Copper and Compounds			1.0x10-02+/1.2x10-02+	2.9x10-03/2.9x10-03	
Cyanides	2x10-01		2.2x10-02/5.2x10-03	1.0x10-03/1.0x10-03	
DDT	2.4x10-08	2.4x10-08	1.1x10-03/1.0x10-06	1.3x10-04/1.0x10-06	
Dibutyl Phthalate	35	154			
Dichlorobenzenes	4x10-01	2.6	1.1*/7.6x10-01*	1.9*	
1,2-Dichlorobenzene					
1,3-Dichlorobenzene					
1,4-Dichlorobenzene					7.5x10-01
3,3'-Dichlorobenzidine	1x10-04	2x10-05			
1,2-Dichloroethane (EDC)	9.4x10-04	2.4x10-01	1.1x10+02*/2.0x10+01*	1.1x10+02*	0
Dichloroethylenes	3.3x10-05	1.9x10-03	1.1x10+01*	2.2+02*	

EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

	Potential ARARs b/				For Use In Special Circumstances
	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/		
Chemical Name	Water and Fish Ingestion (mg/l)	Fish Consumption Only (mg/l)	Freshwater Acute/Chronic (mg/l)	Marine Acute/Chronic (mg/l)	SDWA/MCL Goal (mg/l) d/
1,1-Dichloroethylene	3.1		1.1x10+01*	2.2x10+02*	7.0x10-03
2,4-Dichlorophenol			2.0*/0.3*		
2,6-Dichlorophenol					
3,4-Dichlorophenol					
2,3-Dichlorophenol					
2,5-Dichlorophenol					
2,4-Dichlorophenoxyacetic Acid (2,4-D)					7.0x10-03
1,3-Dichloropropene	8.7x10-02	14.1	6.0*/0.2*	0.7*	
Dieldrin	7.1x10-08	7.6x10-08	2.5x10-03/1.9x10-06	0.7x10-03/1.9x10-06	
Diethylphthalate	350	1800			
Bis(2-ethylhexyl)phthalate (BEHP)					
Diethylnitrosamine					
7,12-Dimethylbenz(a)anthracene					
Dimethylnitrosamine					
2,4-Dimethylphenol			2.1*		
Dimethylphthalate	313	2900			
4,6-Dinitro-o-cresol					
2,4-Dinitrophenol					
1,2-Diphenylhydrazine					
Endosulfan	7.4x10-02	1.6x10-01	2.2x10-04/5.6x10-05	3.4x10-05/8.7x10-06	
Endrin	1x10-03		1.8x10-04/2.3x10-06	3.7x10-05/2.3x10-06	
Ethylbenzene	1.4	3.3	3.2x10+01	4.3x10-01*	
Fluoranthene	4.2x10-02	3.4x10-02	3.9*	4.0x10-02*/1.6x10-02*	
Fluorides		[illegible]			

EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Chemical Name	Potential ARARs b/				Circumstances
	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/		
	Water and Fish Ingestion (mg/l)	Fish Consumption Only (mg/l)	Freshwater Acute/Chronic (mg/l)	Marine Acute/Chronic (mg/l)	SDWA/MCL Goal (mg/l) d/
Heptachlor	2.8x10-07	2.9x10-07	5.2x10-04/3.8x10-06	5.3x10-05/3.6x10-06	
Hexachlorobenzene	7.2x10-07	7.4x10-07			
Hexacelorobutadiene	4.5x10-04	5x10-02	9.0x10-02/9.3x10-03*	3.2x10-02*	
alpha-Hexachlorocyclohexane (HCCH)	9.2x10-06	3.1x10-05			
gamma-HCCH (Lindane)					
Technical-HCCH	1.2x10-05	4.1x10-05			
Hexachlorocyclopentadiene	2.1x10-01		7.0x10-03*/5.2x10-03*	7.0x10-03*	
Hexachloroethane	1.9x10-03	8.74x10-03	9.8x10-01*/5.4x10-01*	9.4x10-01*	
Iodomethane					
Isophorone			1.17x10+02*	1.2x10+01*	
Lead and Compounds (Inorganic)	5x10-02		8.0x10-02/3.2x10-03+	8.1/5.6x10-03	
Mercury and Compounds (Alkyl)			2.4x10-03/1.2x10-05	2.14x10-03/2.5x10-05	
Mercury and Compounds (Inorganic)	1.4x10-04	1.5x10-04	2.4x10-03/1.2x10-05	2.1x10-03/2.5x10-05	
Methoxychlor	1x10-01		0.3x10-04*	0.3x10-04*	
Methyl Chloride					
2-Methyl-4-chlorophenol					
3-Methyl-4-chlorophenol					
3-Methyl-6-chlorophenol					
3-Monochlorophenol					
4-Monochlorophenol					
Nickel and Compounds	1.3x10-10	1x10-01	1.4+/1.6x10-01+	7.5x10-02/8.3x10-03	
Nitrate (as N)	10				
Nitrobenzene	20		2.7x10+01*	6.6	
Nitrophenols			2.3x10-01*/1.5x10-01*	4.8*	

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EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

	Potential ARARs b/				For Use In Special Circumstances
	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/		
Chemical Name	Water and Fish Ingestion (mg/l)	Fish Consumption Only (mg/l)	Freshwater Acute/Chronic (mg/l)	Marine Acute/Chronic (mg/l)	SDWA/MCL Goal (mg/l) d/
Nitrosamines			5.0*	3.3x10+03*	
n-Nitrosodiphenylamine	4.9x10-03	1.6x10-02			
N-Nitrosopyrrolidine	1.6x10-05	9.2x10-02			
Para Dichlorobenzene					
Pentachlorinated Ethanes			7.2*/1.1*	3.9x10-01*/2.0x10-01*	
Pentachlorobenzene	7.4x10-02	8.5x10-02			
Pentachlorophenol	1		2.0x10-02/1.3x10-02	1.3x10-02/7.9x10-03	
Phenanthrene					
Phenol	3.5		1.0x10+01/2.5	5.8	
Phthalate Esters			9.4x10-01*/3.0x10-03*	2.9*/3.4x10-03*	
Polychlorinated Biphenyls (PCBs)	7.9x10-08	7.9x10-08	2.0x10-03/1.4x10-05	1.0x10-02/3.0x10-05	
Radionuclides, Gross alpha activity		15 pCi/l			
Radium 226 and 228		5 pCi/l			
Selenium and Compounds	1.0x10-02	1.0x10-02	2.6x10-01/3.5x10-02	4.1x10-01/5.4x10-02	
Silver and Compounds	5.0x10-02	5.0x10-02	4.1x10-03+/1.2x10-04	2.3x10-03	
Strontium-90		8 pCi/l			
2,3,7,8-TCDD (Dioxin)			<1.0x10-05*/<1.0x10-08		
Tetrachlorinated Ethanes			9.3*		
1,2,4,5-Tetrachlorobenzene	3.8x10-02	4.8x10-02			
1,1,2,2-Tetrachloroethane	1.7x10-04	1.1x10-02	2.4*	9.0*	
Tetrachloroethanes			9.3*		
Tetrachloroethylene	8x10-04	8.9x10-03	5.2*/8.4x10-01*	1.0x10+01*/4.5x10-01*	
2,3,4,6-Tetrachlorophenol				4.4x10-01	
Thallium and Compounds	1.3x10-02	4.8x10-02	1.4*/4.8x10-02*	2.1x10-03*	

EXHIBIT 1-1 (continued)

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

	Potential ARARs b/				For Use In Special Circumstances
	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life c/		
Chemical Name	Water and Fish Ingestion (mg/l)	Fish Consumption Only (mg/l)	Freshwater Acute/Chronic (mg/l)	Marine Acute/Chronic (mg/l)	SDWA/MCL Goal (mg/l) d/
Toluene	14	420	1.7x10+01*	6.3*/5.0*	
Toxaphene	7.1x10-07	7.3x10-07	7.3x10-04/2.0x10-07	2.1x10-04/2x10-07	
Tribromomethane (Bromoform)					
Trichlorinated Ethanes			1.8x10+01*		
1,1,1-Trichloroethane	18	1000		3.1x10+01*	2.0x10-01
1,1,2-Trichloroethane	6x10-04	4.2x10-02	9.4*		
Trichloroethylene	2.7x10-03	8.1x10-02	4.5x10+01*/2.1x10+01*	2.0*	0
Trichlorotrifluoromethane					
2,4,5-Trichlorophenol	2.8				
2,4,6-Trichlorophenol	1.2x10-03	3.6x10-03	9.7x10-01*		
2,4,5-Trichlorophenoxypropionic Acid					
Trihalomethanes (Total) b					
Tritium					
Vinyl Chloride	2x10-03	5.3x10-01			0
Zinc and Compounds			1.3x10-01/1.1x10-01	9.6x10-02/9.6x10-02	

a/ Additional chemical-specific requirements will be added (e.g. National Ambient Air Quality Criteria) after analysis of additional statutes.

b/ When two or more values conflict, the lower value generally should be used.

c/ Federal water quality criteria (FWQC) are not legally enforceable standards, but are potentially relevant and appropriate to CERCLA actions. CERCLA §121(d)(2)(B)(i) requires consideration of four factors when determining whether FWQC are relevant and appropriate: 1) the designated or potential use of the surface or groundwater, 2) the environmental media affected, 3) the purposes for which such criteria were developed, and 4) the latest information available.

d/ For water that is to be used for drinking, the MCLs set under the SDWA are generally the applicable or relevant and appropriate standard. A standard for drinking water more stringent than an MCL may be needed in special circumstances, such as where multiple contaminants in ground water or multiple pathways of exposure present extraordinary risks. In setting a level more stringent than the MCL in such cases, a site-specific determination should be made by considering MCLGs, the Agency's policy on the use of appropriate risk ranges for carcinogens (10-4 to 10-7 individual lifetime risk), levels of quantification, and other pertinent guidelines. Prior consultation with Headquarters is encouraged in such cases.

* Lowest Observed Effect Level.
+ Hardness dependent criteria (100 mg/l used); refer to specific criteria documents for equations to calculate criteria based on other water hardness values.

Sources: U.S. EPA, Superfund Public Health Evaluation Manual, EPA 540/1-86/060 (OSWER Directive 9285.4-1) October 1986 and U.S. EPA, Quality Criteria for Water 1986, EPA 440/5-86-001, May 1986 (51 Federal Register 43665).

EXHIBIT 1-2

SELECTED LOCATION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Location	Requirement	Prerequisite	Citation
Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited	RCRA hazardous waste; treatment, storage, or disposal	40 CFR 264.18(a)
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout	RCRA hazardous waste; treatment, storage, or disposal	40 CFR 264.18(b)
Within floodplain b/	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood prone areas	Protection of floodplains, b/ (40 CFR 6, Appendix A); Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302
Within salt dome formation, underground mine, or cave	Placement of non-containerized or bulk liquid hazardous waste prohibited	RCRA hazardous waste; placement	40 CFR 264.18(c)
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alteration of terrain that threatens significant scientific, prehistorical, historical or archaeological data	National Historical Preservation Act (16 USC Section 469); 36 CFR Part 65
Historic project owned or controlled by Federal agency	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks	Property included in or eligible for the National Register of Historic Places	National Historic Preservation Act, Section 106 (16 USC 470 et seq.); 36 CFR Part 800
Critical habitat upon which endangered species or threatened species depends	Action to conserve endangered species or threatened species, including consultation with the Department of Interior	Determination of presence of endangered or threatened species	Endangered Species Act of 1973 (16 USC 1531 et seq.); 50 CFR Part 200, 50 CFR Part 402 Fish and Wildlife Coordination Act (16 USC 661 et seq.); 33 CFR Parts 320-330.

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EXHIBIT 1-2 (Continued)

SELECTED LOCATION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Location	Requirement	Prerequisite	Citation
Wetlands b/	Action to prohibit discharge of dredged or fill material into wetlands without permit	Wetlands as defined in U.S Army Corps of Engineers regulations	Clean Water Act section 404; 40 CFR Parts 230, 33 CFR Parts 320-330.
	Action to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible (see discussion in section 3.4.4.1)	Action involving construction of facilities or management of property in wetlands, as defined by 40 CFR Part 6, Appendix A, section 4 (j)	40 CFR Part 6, Appendix A
Wilderness area	Area must be administered in such manner as will leave it unimpaired as wilderness and to preserve its wilderness	Federally-owned area designated as wilderness area	Wilderness Act (16 USC 1131 et seq.); 50 CFR 35.1 et seq.
Wildlife refuge	Only actions allowed under the provisions of 16 USC Section 668 dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System	Area designated as part of National Wildlife Refuge System	16 USC 668dd et seq.; 50 CFR Part 27
Area affecting stream or river	Action to protect fish or wildlife	Diversion, channeling or other activity that modifies a stream or river and affects fish or wildlife	Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302
Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river	Activities that affect or may affect any of the rivers specified in section 1276(a)	Wild and Scenic Rivers Act (16 USC 1271 et seq. section 7 (a)); 40 CFR 6.302(c)
Within coastal zone	Conduct activities in manner consistent with approved State management programs	Activities affecting the coastal zone including lands therein and thereunder and adjacent shorelands	Coastal Zone Management Act (16 USC Section 1451 et seq.)
Within designated coastal barrier	Prohibits any new Federal expenditure within the Coastal Barrier Resource System	Activity within the Coastal Barrier Resource System	Coastal Barrier Resources Act (16 USC 3501 et seq.)

a/ Additional location-specific requirements will be added after analysis of additional sources and will be included in a subsequent draft of this manual.

b/ 40 CFR Part 6 Subpart A sets forth EPA policy for carrying out the provisions of Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Executive orders are binding on the level (e.g., Federal, State) of government for which they are issued.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Capping (continued)	Eliminate free liquids, stabilize wastes before capping (surface impoundments).		40 CFR 264.228(a)
	Restrict post-closure use of property as necessary to prevent damage to the cover.		40 CFR 264.117(c)
	Prevent run-on and run-off from damaging cover.		40 CFR 264.228(b) 40 CFR 264.310(b)
	Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles).		40 CFR 264.310(b)
Closure with No Post-Closure Care (e.g. Clean Closure)	General performance standard requires elimination of need for further maintenance and control; elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products.	Applicable to land-based unit containing hazardous waste.d/ Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ, or consolidated within area of contamination. Designed for cleanup that will not require long-term management. Designed for cleanup to health-based standards.	40 CFR 264.111
	Disposal or decontamination of equipment, structures, and soils. Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply to surface impoundments and container or tank liners and hazardous waste residues, and to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.258(c)(1) and 40 CFR 264.258
	Meet health-based levels at unit.		40 CFR 244.111

d/ Some action-specific requirements listed may be relevant and appropriate even if RCRA definitions of storage, disposal, or hazardous waste are not met, or if the waste at the site is similar to but not identifiable as a RCRA hazardous waste. See Chapter 2 for information on relevant and appropriate RCRA requirements.

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EXHIBIT 1-3

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Air Stripping	[CAA requirements to be provided.]		
Capping (See also Closure with Waste in Place for additional associated requirements)	Placement of a cap over waste (e.g., closing a landfill, or closing a surface impoundment or waste pile as a landfill, or similar action) requires a cover designed and constructed to: • Provide long-term minimization of migration of liquids through the capped area; • Function with minimum maintenance; • Promote drainage and minimize erosion or abrasion of the cover; • Accommodate settling and subsidence so that the cover's integrity is maintained; and • Have a permeability less than or equal to the permeability of any bottom liner system or natural sub-soils present.	RCRA hazardous waste placed at site after the effective date of the requirements, or placement of hazardous waste into another unit will make requirements applicable when the waste is being covered with a cap for the purpose of leaving it behind after the remedy is completed. Capping without such placement will not make requirements applicable. d/	40 CFR 264.228(a) (Surface Impoundments) 40 CFR 264.258(b) (Waste Piles) 40 CFR 264.310(a) (Landfills)

a/ Currently only RCRA, CWA, and SDWA requirements are included. Additional action-specific requirements will be added as additional statutes are analyzed.

b/ Action alternatives from ROD keyword index, FY1986 Record of Decision Annual Report, January 1987, Hazardous Site Control Division, EPA.

c/ Requirements have been proposed but not promulgated for air stripping, hybrid closure, gas collection and miscellaneous unit treatment. When these regulations are promulgated, they will be included in the matrix.

d/ Some action-specific requirements listed may be relevant and appropriate even if RCRA definitions of storage, disposal, or hazardous waste are not met, or if the waste at the site is similar to but not identifiable as a RCRA hazardous waste. See Chapter 2 for information on relevant and appropriate RCRA requirements.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Consolidation between Units	With respect to the waste that is moved, see requirements in the following sections: Capping, Closure with Waste in Place, Container Storage, Construction of a New Landfill On-Site, Construction of a New Surface Impoundment On-Site, Incineration (On-Site), Land Treatment, Operation and Maintenance, Tank Storage, and Treatment.	Movement of hazardous waste and placement into another unit.	See Capping, Closure with Waste in Place, Container Storage, Construction of a New Landfill On-Site, Construction of a New Surface Impoundment On-Site, Incineration (On-Site), Land Treatment, Operation and Maintenance, Tank Storage, and Treatment in this exhibit.
Container Storage	Containers of RCRA hazardous waste must be:	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264.10), in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4) is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90 day limit (40 CFR 262.34(c),(d), and (e)).	
	• Maintained in good condition;		40 CFR 264.171
	• Compatible with hazardous waste to be stored; and		40 CFR 264.172
	• Closed during storage (except to add or remove waste).		40 CFR 264.173
	Inspect container storage areas weekly for deterioration.		40 CFR 264.174
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175

a/ In many cases, there are no defined "units" at a CERCLA site. Instead, there are areas of contamination with differing concentration levels (including hot spots) of hazardous substances, pollutants, or contaminants. When RCRA hazardous wastes are moved into or out of an area of contamination, RCRA disposal requirements are applicable to the waste being managed and certain treatment, storage, or disposal requirements (such as for closure) are applicable to the area where the waste is received.

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EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Closure with Waste In Place	Eliminate free liquids by removal or solidification. Stabilization of remaining waste and waste residues to support cover.	Applicable to land disposal of hazardous waste.d/ Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ or consolidated within area of contamination.	40 CFR 264.228(a)(2) 40 CFR 264.228(a)(2) 40 CFR 264.258(b)
	Installation of final cover to provide long-term minimization of infiltration (see Capping).		40 CFR 264.310
	30-year post-closure care and ground-water monitoring.g/		40 CFR 264.310
Closure of Land Treatment Units	Maximize degradation, transformation, or immobilization of hazardous constituents within the treatment zone, minimize run-off of constituents, maintain run-on control system and run-off management system, control wind dispersal of hazardous waste, maintain unsaturated zone monitoring, establish vegetative cover, and establish background soil values to determine consistency with permit values.	Closure of land treatment units.	40 CFR 264.280
Consolidation within a Unit	None applicable.d/	Consolidation within a unit.d/	

g/ Regional administrator may revise length of post-closure care period (40 CFR 264.117).

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Construction of New Landfill (see Closure with Waste in Place) (continued)	Construct run-on and run-off control systems capable of handling the peak discharge of a 25-year storm.		40 CFR 264.301
	Control wind dispersal of particulates.		40 CFR 264.301
	Operation and maintenance.		40 CFR 264.303-304
	Close each cell with a final cover after the last waste has been received.		40 CFR 264.310
	Ground-water Monitoring		
	Establish a detection monitoring program (264.98). Establish a compliance monitoring program (264.99) and corrective action monitoring program (264.100) when required by 40 CFR 264.91. All monitoring programs must meet RCRA general ground-water monitoring requirements (264.97)	Creation of a new landfill unit to treat, store, or dispose of RCRA hazardous wastes as part of a response action.	40 CFR 264.91- 264.100

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/,d/	Citation
Container Storage (continued)	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.		40 CFR 268.50
Construction of New Landfill On-Site (see Closure with Waste in Place).	Minimum Technology Requirements:	RCRA hazardous waste (listed or characteristic) currently being placed in a new, replacement, or expanded landfill.	40 CFR 264.301
	Install two liners or more, a top liner that prevents waste migration into the liner, and a bottom liner that prevents waste migration through the liner.h/		
	Install leachate collection systems above and between the liners.		40 CFR 264.301

h/ Landfill units meeting the requirements of 40 CFR 264.301(f) are not subject to RCRA minimum technology requirements.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Dike Stabilization	Design and operate facility to prevent overtopping due to overfilling: wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error.	Existing surface impoundment containing hazardous waste, or creation of a new surface impoundment.	40 CFR 264.221
	Construct dikes with sufficient strength to prevent massive failure.		40 CFR 264.221
	Inspect liners and cover systems during and after construction.		40 CFR 264.226
	Inspect weekly for proper operation and integrity of the containment devices.		40 CFR 264.226
	Remove surface impoundment from operation if the dike leaks or there is a sudden drop in liquid level.		40 CFR 264.227
	At closure, remove or decontaminate all waste residues and contaminated materials. Otherwise, free liquids must be removed, the remaining wastes stabilized, and the facility closed in the same manner as a landfill.		40 CFR 264.228
	Manage ignitable or reactive wastes so that it is protected from materials or conditions that may cause it to ignite or react.		40 CFR 264.227

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EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/,d/	Citation
Construction of a New Surface Impoundment (see Closure with Waste in Place and Closure with no Post-Closure Care)	**Minimum Technology Requirements:**		
	Use two liners, a top liner that prevents waste migration into the liner and a bottom liner that prevents waste migration through the liner (throughout the post-closure period).	RCRA hazardous waste (listed or characteristic) currently being placed in a new surface impoundment, or use of replacement or lateral extension of existing landfills or surface impoundments.	40 CFR 264.220
	Design liners to prevent failure due to pressure gradients, contact with the waste, climatic conditions, and the stress of installation and daily operations.		40 CFR 264.221
	Provide a leachate collection system between the two liners.		40 CFR 264.221
	Use a leak detection system that will detect leaks at the earliest possible time.		40 CFR 264.221
	Ground-water Monitoring		
	Establish a detection monitoring program (264.98). Establish a compliance monitoring program (264.99) and corrective action monitoring program (264.100) when required by 40 CFR 264.91. All monitoring programs must meet RCRA general ground-water monitoring requirements (264.97)	Creation of a new landfill unit to treat, store, or dispose of RCRA hazardous wastes as part of a remedial action.	40 CFR 264.91-264.100

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Discharge of Treatment System Effluent (continued)	The Best Management Practices program must: • Establish specific procedures for the control of toxic and hazardous pollutant spills. • Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure. • Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.	Discharge to waters of the U.S. j/	40 CFR 125.104
	Monitoring Requirements:		
	Discharge must be monitored to assure compliance. Discharge will monitor: • The mass of each pollutant • The volume of effluent • Frequency of discharge and other measurements as appropriate		40 CFR 122.41(i)
	Approved test methods for waste constituent to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided. Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.		40 CFR 136.1-136.4

j/ Section 121 of SARA exempts on-site CERCLA activities from obtaining permits. However, the substantive requirements of a law or regulation must be met. In particular, on-site dischargers to surface waters are exempt from procedural NPDES permit requirements. Off-site dischargers would be required to apply for and obtain an NPDES permit.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/,d/	Citation
Discharge of Treatment System Effluent	**Best Available Technology:**		
	Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.	Point source discharge to waters of the United States. i/ j/	40 CFR 122.44(a)
	Water Quality Standards:		
	Applicable Federally approved State water quality standards must be complied with. These standards may be in addition to or more stringent than other Federal standards under the CWA. h/		40 CFR 122.44 and State regulations approved under 40 CFR 131
	Discharge limitations must be established at more stringent levels than technology-based standards for toxic pollutants.		40 CFR 122.44(a)
	Best Management Practices:		
	Develop and implement a Best Management Practices program to prevent the release of toxic constituents to surface waters.		40 CFR 125.100

i/ "Waters of the U.S." is defined broadly in 40 CFR 122.2 and includes essentially any water body and wetland.

j/ Section 121 of SARA exempts on-site CERCLA activities from obtaining permits. However, the substantive requirements of a law or regulation must be met. In particular, on-site discharges to surface waters are exempt from procedural NPDES permit requirements. Off-site dischargers would be required to apply for and obtain an NPDES permit.

h/ Federal Water Quality Criteria may be relevant and appropriate depending on the designated or potential use of the water, the media affected, the purposes of the criteria, and current information. (CERCLA §121(d)(2)(B)(i)) Federal Water Quality Criteria for the protection of aquatic life will be relevant and appropriate when environmental factors (e.g., protection of aquatic organisms) are being considered. (50 FR 30784 (July 29, 1985)).

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Direct Discharge to Ocean (continued)	• Applicable requirements of the Coastal Zone Management Plan (see Vol. 3 of this manual); and • Marine Water Quality Criteria developed under CWA §304(a)(1).		
	Comply with the limiting permissible concentrations (LPCs) at the mixing zone boundary that are established in the permit.		40 CFR 125.123(d)(1)
Discharge to Publicly Owned Treatment Works (POTW) (off-site activity, see footnote m/)	Discharge of pollutants that pass-through the POTW without treatment, interfere with POTW operation, contaminate POTW sludge, or endanger health/safety of POTW workers, is prohibited. Specific prohibitions preclude the discharge of pollutants to POTWs that: • Create a fire or explosion hazard in the POTW; • Will cause corrosive structural damage to POTW; • Obstruct flow resulting in interference; • Are discharged at a flow rate and/or concentration that will result in interference; and • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104°F (40°C).	Indirect discharge to a POTW.	40 CFR 403.5

m/ Discharge to POTWs is considered an off-site activity (see p. 3-21 for discussion of requirements); therefore, requirements related to discharge to a POTW are not ARARs, but are included in this exhibit for reference. Off-site actions must comply with all legally applicable requirements, both substantive and administrative. The concept of "relevant and appropriate" is not available for off-site actions.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/,d/	Citation
Discharge of Treatment System Effluent (continued)	Comply with additional substantive conditions such as: • Duty to mitigate any adverse effects of any discharge; and • Proper operation and maintenance of treatment systems.		40 CFR 122.41(i)
Direct Discharge to Ocean	Discharges causing "unreasonable degradation of the marine environment" are not permitted.	Discharge to the marine environment. 1/	40 CFR 125.123(b)
	A determination of whether a discharge will cause reasonable degradation of the marine environment must be made, based on consideration of: • Quantity, composition, or persistence of pollutants to be discharged; • Potential transport of pollutants by biological, chemical, or physical processes; • Composition and vulnerability of exposed communities; • Importance of the receiving water to spawning, migratory paths, and surrounding biological community; • Existence of special aquatic sites; • Impact on human health and commercial fishing;		40 CFR 125.122

1/ CWA §403 requires that an NPDES permit be issued for discharges into marine waters, including territorial seas, the contiguous zone, and the oceans. (40 CFR 122.2.) A permit is not required if point of discharge is on-site.

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Discharge to Publicly Owned Treatment Works (POTW) (continued)	• Discharge must comply with local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.		40 CFR 403.5 and local POTW regulations
	• RCRA permit-by-rule requirements (including corrective action where the NPDES permit was issued after November 8, 1984) must be complied with for discharges of RCRA hazardous wastes to POTWs.	Transport of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe (i.e., pipe solely dedicated for hazardous waste [as defined in 40 CFR 264] which discharges from within the boundaries of the CERCLA site to within the boundaries of the POTW).	40 CFR 270.60
Discharge of Dredge and Fill Material to Waters of the U.S. or Ocean Waters	The four conditions that must be satisfied before dredge and fill is an allowable alternative are: • There must be no practical alternative. • Discharge of dredged or fill material must not cause a violation of State water quality standards, violate any applicable toxic effluent standards, jeopardize an endangered species, or injure a marine sanctuary. • No discharge shall be permitted that will cause or contribute to significant degradation of the water. • Appropriate steps to minimize adverse effects must be taken. Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem.	Capping, dike stabilization, construction of berms and levees, and disposal of contaminated soil, waste material or dredged material are examples of activities that may involve a discharge of dredged or fill material.	40 CFR 230 33 CFR 320-330

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Dredging	Removal of all contaminated soil.	RCRA hazardous waste placed at site after the effective date of the requirements, or placed into another unit.	See Closure in this Exhibit.
	Dredging must comply with Section 10 of the Rivers and Harbors Act and U.S. Army Corps of Engineers regulations.	Dredging in navigable waters of the United States.	33 U.S.C. 403 33 CFR 320-330
Excavation	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 (Subpart D)
	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this Exhibit.
Gas Collection	[CAA requirements to be provided.]		
Ground-Water Diversion	Excavation of soil for construction of slurry wall may trigger closure or land disposal restrictions.	Materials containing RCRA hazardous waste subject to land disposal restrictions are placed into another unit.	See Consolidation in this Exhibit.
Incineration	Analyze the waste feed.	RCRA hazardous waste.	40 CFR 264.341
	Dispose of all hazardous waste and residues, including ash, scrubber water, and scrubber sludge.		40 CFR 264.351
	No further requirements apply to incinerators that only burn wastes that are listed as hazardous solely by virtue of combination with other wastes, and if the waste analysis demonstrates that no Appendix VII constituent is present that might reasonably be expected to be present.		40 CFR 264.340

[illegible] A : (continued)

[illegible]

Actions b/	Requirements	Requirements for applicability	Citation
[illegible] (continued)	Performance [illegible]	[illegible]	[illegible]
	[illegible]		[illegible]
	[illegible]		264 [illegible]
	[illegible]		264 [illegible]
	[illegible]		264 [illegible]
	[illegible]		
	[illegible]		
	[illegible]		
	[illegible]		
	Control [illegible]		40 CFR 264.[illegible]
	[illegible]		
	[illegible]		
	[illegible]		
	[illegible]		

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Incineration (continued)	Special performance standard for incineration of PCBs: • Achieve a destruction and removal efficiency of 99.9999 percent; • Either 2 second dwell time at 1200 degrees C° (±100) and 3 percent excess oxygen in stack gas; or 1.5 second dwell time at 1600 degrees C. and 2 percent excess oxygen in stack gas; and • For non-liquid PCBs, mass air emissions from the incinerator shall be no greater than 0.001 g. HB per kg of the PCBs entering the incinerator.	Liquid and non-liquid PCBs at concentrations of 50 ppm or greater.	40 CFR 761.70
Land Treatment	Prior to land treatment, the waste must be treated to BDAT levels or meet a no migration standard.	RCRA hazardous waste being treated or placed into another unit.	
	Ensure that hazardous constituents are degraded, transformed, or immobilized within the treatment zone.		40 CFR 264.271
	Maximum depth of treatment zone must be no more than 1.5 meters (5 feet) from the initial soil surface and more than 1 meter (3 feet) above the seasonal high water table.		40 CFR 264.271
	Demonstrate that hazardous constituents for each waste can be completely degraded, transformed, or immobilized in the treatment zone.		40 CFR 264.271
	Minimize run-off of hazardous constituents.		40 CFR 264.273
	Maintain run-on/run-off control and management system.		40 CFR 264.273

EXHIBIT 1-2 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Land Treatment (continued)	Special application conditions if food-chain crops are grown in or on treatment zone.		40 CFR 264.276
	Unsaturated zone monitoring.		40 CFR 264.278
	Special requirements for ignitable or reactive waste.		40 CFR 264.281
	Special requirements for incompatible wastes.		40 CFR 264.282
	Special testing and location requirements for certain hazardous wastes.	RCRA waste fn F020, F021, F022, F023, F026, F027 (dioxin-containing wastes).	40 CFR 264.283
Operation and Maintenance (O&M)	30-year post-closure care to ensure that site is maintained and monitored.	Land disposal closure.	40 CFR 264.310
Placement of Liquid Waste in Landfill	Liquids in Landfills Prohibition:		
	No bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids may be disposed of in landfills.	Placement of a bulk or non-containerized RCRA hazardous waste in a landfill.	40 CFR 264.314
	Containers holding free liquids may not be placed in a landfill unless the liquid is mixed with an absorbent or solidified.		40 CFR 264.314
Placement of Waste in Land Disposal Unit	Land Disposal Restrictions:		
	Attain land disposal "treatment standards" before putting waste into landfill in order to comply with land ban restrictions. A treatment standard can be either: (1) a concentration level to be achieved (performance-based) or (2) a specified technology that must be used (technology-based). If the standard is performance-based, any technology can be used to achieve the standard. (See Treatment when Waste will be Land Disposed.)	Placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave.	40 CFR 268 (Subpart D)

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/,d/	Citation
Slurry Wall	Excavation of soil for construction of slurry wall may trigger land disposal restrictions.	Materials containing RCRA hazardous waste subject to land disposal restrictions are placed in another unit. (See Treatment section for LDR schedule. Also see Consolidation, Excavation sections in this Exhibit.)	
Surface Water Control	Prevent run-on and control and collect run-off from a 24-hour 25-year storm (waste piles, land treatment facilities, landfills).	RCRA hazardous waste treated, stored, or disposed after the effective date of the requirements.	40 CFR 264.251(c),(d) 40 CFR 264.273(c),(d) 40 CFR 264.301(c),(d)
	Prevent over-topping of surface impoundment.		40 CFR 264.221(c)
Tank Storage (On-Site)	Tanks must have sufficient structural strength to ensure that they do not collapse, rupture, or fail.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264.10), in a tank (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4) is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90 day limit (40 CFR 262.34(c),(d), and (e)).	40 CFR 264.190
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191
	Tanks must be provided with secondary containment and controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.193-194
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195
	Repair any corrosion, crack, or leak.		40 CFR 264.196

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Tank Storage (On-Site) (continued)	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.		40 CFR 264.197
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981).		40 CFR 264.198
	<u>Storage Prohibitions</u>: Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment and disposal.		40 CFR 268.50
Treatment (in a unit)	Design and operating standards for unit in which hazardous waste is treated. (See citations at right for design and operating requirements for specific unit.)	Treatment of hazardous waste in a unit.	40 CFR 264.190- 264.192 (Tanks) 40 CFR 264.221 (Surface Impoundments) 40 CFR 264.251 (Waste Piles) 40 CFR 264.273 (Land Treatment Unit) 40 CFR 264.343-.345 (Incinerators) 40 CFR 264.601 (Miscellaneous Treatment Units) 40 CFR 265.373 (Thermal Treatment Units)

* * * AUGUST 8, 1988 DRAFT * * *

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EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/		Citation
Treatment (then Waste will be Land Disposed)	Treatment of waste subject to ban on land disposal must attain levels achievable by best demonstrated available treatment technologies (BDAT) for each hazardous constituent in each listed waste, if residual is to be land disposed. If residual is to be further treated, initial treatment and any subsequent treatment that produces residual to be treated need not be BDAT, if it does not exceed value in CONE (Constituent Concentration in Waste Extract) Table for each applicable water. (See 51 FR 40642, November 6, 1986.)	Disposal of contaminated soil and debris resulting from CERCLA response actions or RCRA corrective actions is not subject to land disposal prohibitions and/or treatment standards for solvents, dioxins, or California list wastes until November 8, 1990 (and for certain first third wastes until August 8, 1990).		40 CFR 268.10 40 CFR 268.11 40 CFR 268.12 40 CFR 268.41 40 CFR 268 (Subpart D)
		All wastes listed as hazardous in 40 CFR Part 261 as of November 8, 1984, except for spent solvent wastes and dioxin-containing wastes, have been ranked with respect to volume and intrinsic hazards, and are scheduled for land disposal prohibition and/or treatment standard determinations as follows:		51 FR 40641 52 FR 25760
		Solvents and dioxins	Nov. 8, 1986	
		California list wastes	July 8, 1987	
		One-third of all ranked and hazardous wastes	Aug. 8, 1988	
		Underground injection of solvents and dioxins and California list wastes	Aug. 8, 1988	
		CERCLA response action and RCRA corrective action soil and debris	Nov. 8, 1988	
		Two-thirds of all ranked and listed hazardous wastes	July 8, 1989	
		All remaining ranked and listed hazardous wastes identified by characteristic under RCRA section 3001	May 8, 1990	
		Any hazardous waste listed or identified under RCRA section 3001 after November 8, 1984	Within 6 mos. of the date of identification or listing.	

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Treatment (when Waste will be Land Disposed) (continued)	BDAT standards for spent solvent wastes and dioxin-containing wastes are based on one of four technologies or combinations: for waste waters, (1) steam stripping, (2) biological treatment, or (3) carbon absorption [alone or in combination with (1) or (2)]; and for all other wastes, (4) incineration. Any technology may be used, however, if it will achieve the concentration levels specified.		40 CFR 268.38 RCRA Sections 3004(d)(3), (e)(3) 42 U.S.C. 6924(d)(3), (e)(3)
Underground Injection of Wastes and Treated Ground Water	UIC program prohibits: • Injection activities that allow movement of contaminants into underground sources of drinking water which may result in violations of MCLs or adversely affects health. • Construction of new Class IV wells, and operation and maintenance of existing wells.	Approved UIC program is required in States listed under SDWA section 1422. (All States have been listed.) Class I wells and Class IV wells are the relevant classifications for CERCLA sites. Class I wells are used to inject hazardous waste, beneath the lowermost formation containing, within one quarter mile, an underground source of drinking water (USDW). g/ Class IV wells are used to inject hazardous or radioactive waste into or above a formation which contains, within one quarter mile of the well, an underground source of drinking water.	40 CFR 144.12 40 CFR 144.13
	Class IV wells are banned except for reinjection of treated ground water into the same formation from which it was withdrawn, as part of a CERCLA cleanup or RCRA corrective action.		40 CFR 144.13(c)

g/ An underground source of drinking water (USDW) is a non-exempted aquifer or its portion which: (1) supplies any public water system, or (2) which contains a sufficient quantity of ground water to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 mg/l total dissolved solids. (40 CFR 144.3.)

EXHIBIT 1-9 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS g/

Actions h/	Requirements	Prerequisites for Applicability g/,d/	Citation
Underground Injection of Wastes and Treated Ground Water (continued)	The Director of the UIC program in a state may lessen the stringency of 40 CFR 144.52 construction, operation, and monitoring requirements for a well if injection does not occur into, through, or above a USDW or if the radius of endangering influence (see 40 CFR 146.06(a)) is less than or equal to the radius of the well.		40 CFR 144.16
	• Report non-compliance orally within 24 hours.	Class I wells.	40 CFR 144.28(b) 40 CFR 144.51(b)
	• Prepare, maintain, and comply with plugging and abandonment plan.		
	Monitor Class I wells by:	Class I wells are used to inject hazardous waste, beneath the lowermost formation containing, within one quarter mile, an underground source of drinking water (USDW).	40 CFR 144.28(g)(1)
	• frequent analysis of injection fluid;		
	• continuous monitoring of injection pressure, flow rate, and volume; and		
	• installation and monitoring of ground-water monitoring wells.		
	Applicants for Class I permits must:		40 CFR 144.55
	• Identify all injection wells within the area of review.		
	• Take action as necessary to ensure that such well are properly sealed, completed, or abandoned to prevent contamination of USDW.		
	Criteria for determining whether an aquifer may be determined to be an exempted aquifer include current and future use, yield, and water quality characteristics.		40 CFR 146.4

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability c/,d/	Citation
Underground Injection of Wastes and Treated Ground Water (continued)	Case and cement all Class I wells to prevent movement of fluids into USDW, taking into consideration well depth, injection pressure, hole size, composition of injected waste, and other factors.	(See above)	40 CFR 144.28(e)(1)
	Conduct appropriate geologic drilling logs and other tests during construction.		40 CFR 146.12(d)
	Injection pressure may not exceed a maximum level designed to ensure that injection does not initiate new fractures or propagate existing ones and cause the movement of fluids into a USDW.		40 CFR 146.13
	Continuous monitoring of injection pressure, flow rate, and volume, and annual pressure, if required.		
	Demonstration of mechanical integrity is required every 5 years.		
	Ground-water monitoring may also be required.		
	Comply with State underground injection requirements.		40 CFR 147
	Hazardous waste to be injected is subject to land ban regulations. (See section 4.2.2.1 of this manual.) Treated ground water that meets the definition of hazardous waste and is to be injected also is subject to land ban regulations.		40 CFR 268.2

EXHIBIT 1-3 (continued)

SELECTED ACTION-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

Actions b/	Requirements	Prerequisites for Applicability g/.d/	Citation
Waste Pile	Use a single liner and leachate collection system.	RCRA hazardous waste, non-containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	40 CFR 264.251
	Waste put into waste pile subject to land ban regulations (see Appendix of this manual).		40 CFR 268.2

Radiological Data Review and Validation Guidelines
Isotopic Analyses by Alpha Spectroscopy

U.S. Radium Remedial Investigation/Feasibility Study

Scope and Applicability

This document provides guidance for the review of laboratory data packages and the validation of analytical results for alpha particle activities of thorium-230, thorium-232, and uranium-238 from samples collected for the U.S. Radium Remedial Investigation/ Feasibility Study (RI/FS).

Purpose

The purpose of review and validation is to assure that the quality of each data point is known, and that each data point is flagged with a qualifier indicating the quality of that data point. In addition, data validation provides a review of laboratory quality control (QC) measures so that corrections to laboratory procedures can be implemented if necessary. It is assumed that field samplers and analytical laboratories have followed approved methods and adhere to good laboratory practices. This procedure provides guidelines for review and validation of radioanalytical data packages, and establishes criteria for applying appropriate data qualifiers to individual data points.

Criteria

The criteria used to evaluate data are based on the examination of instrument calibration, calibration verification, internal laboratory spike analysis, energy calibration, duplicate/replicate analysis, blank analysis, radiochemical yield analysis, and quantitative review.

Currently, there are no standard methods for radiological data evaluation or validation that are equivalent to the Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) methods for chemical data. This document suggests areas for review of data packages and acceptance limits for the assessment and validation of radiochemistry results, based on accepted nuclear industry standards and draft data validation protocols used at Department of Energy (DOE) sites.

Instrument Calibration

For alpha particle measurements, the detectors must be calibrated to obtain the counting efficiency for each of the radionuclides with a standard traceable to the National Institute of Standards and Technology (NIST). Each detector should have been calibrated with an alpha standard representative of the target radionuclides within 1 year of the analysis date. The standard should have been prepared in the geometry and weight ranges expected to be encountered.

Results for all samples analyzed on an instrument that was not properly calibrated should be flagged "estimated" (J).

Calibration Verification

A calibration verification should have been performed weekly with an independently prepared verification standard. The measured efficiency value should not be more than three standard deviations (3σ) from the value determined at the time of calibration. Alpha spectrometers require a weekly energy vs channel calibration verification with a source having at least two alpha emitters. The results from any detector where the energy calibration is more than three channels out of calibration should be flagged "estimated" (J).

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Results for samples analyzed after a verification beyond control limits and before the next adjacent acceptable verification should be flagged "estimated" (J). If the calibration verification was not performed, all results should be flagged "estimated" (J).

Internal Laboratory Spike Analysis

Internal laboratory spikes (ILS) should have been analyzed for each target isotope at a frequency of 1 per batch of 20 samples. The ILS samples provide an indication of laboratory accuracy.

The ILS acceptance criteria are shown below:

- Water—80 to 120 percent of known value
- Urine—65 to 135 percent of known value
- Soil and Sediments—70 to 130 percent of known value
- Building Materials—70 to 130 percent of known value if the building material matrix is similar to soil (crushed concrete). Otherwise, exercise professional judgment.

All values associated with an ILS beyond the acceptance criteria should be flagged "estimated" (J).

Duplicate/Replicate Analysis

A laboratory duplicate should have been analyzed for each batch of 20 samples. The duplicate samples provide an indication of laboratory precision.

A control limit of ± 20 percent for water samples and ± 35 percent for urine, soil, sediment, and building materials samples for the relative percent difference (RPD) shall be used for samples values $>5\times$ contract-required detection limit (CRDL).

A control limit of $\pm$CRDL for water samples and $\pm 2\times$ CRDL for urine, soil, sediment, and building materials samples shall be used for sample values $<5\times$ CRDL, including the case when only one of the duplicate sample values is $<5\times$ CRDL.

Check the raw data and recalculate one or more RPD using the following equation to verify that results have been correctly reported.

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

Where:

S = First sample value (original)

D = Second sample value (duplicate or replicate)

Verify that the field blank was not used for duplicate analysis. If the field blank was used for duplicate analysis, all other QC data must be carefully checked and professional judgment exercised when evaluating the data.

If duplicate analysis results for a particular radionuclide fall outside the appropriate control windows, qualify the results for that radionuclide in all associated samples of the same matrix as "estimated" (J).

All results associated with a field replicate beyond control limits should be flagged "estimated" (J).

Blank and Background Analysis

One laboratory blank sample should have been prepared and analyzed for each batch of 20 samples. Blanks are used to determine background counts due to environmental and reagent radiation sources. High blank sample results may also indicate the presence of laboratory or counter contamination.

The results for all blanks should be recorded and plotted on a QC chart. Control limits should be set at 3 standard deviations (3σ) from the mean for each QC chart. If the blank QC results fall outside the appropriate tolerance limits (3σ) for the set of samples covered by the blank, qualify the results in all associated samples as "estimated" (J).

If radionuclides are detected in blanks, then sample results for the same radionuclides should be considered as positive only if they exceed 5 times the blank concentration. Samples that show positive results less than 5 times the blank values (for radionuclides detected in blanks) should be flagged estimated (J).

If a compound is found in a blank but not in the sample, no action should be taken.

Backgrounds should be run on each detector at least monthly for alpha spectrometer systems. The current background should be within ± 3 standard deviations of the previous background.

Sample Spike Analysis

Sample spike analysis is required to determine radiochemical recovery (yield). The tracer used should have chemical behavior similar to the target radionuclides. For most procedures, the recovery is determined using an isotope of the analyte of

interest. This isotope is one that is not expected to occur in the samples to be analyzed.

The quantity of tracer material used should be adequate to provide a maximum of 10 percent uncertainty at the 95 percent confidence level in the measured recovery.

Check the raw data to verify that recoveries are accurately reported. Recalculate one or more of the recoveries (%R) using the following equation:

$$\%R = \frac{C_{Found}}{C_{True}} \times 100$$

Where:

C_{Found} = Concentration (in pCi/l for aqueous, pCi/g for solid) of each spiked analyte measured in the analysis of sample solution

C_{True} = Concentration (in pCi/l for aqueous, pCi/g for solid) of each analyte in the spike source

Review the radiological yields and set appropriate recovery limits. The following approaches are suggested for qualification of the data, but may be modified based on a review of all data from the case, especially considering the apparent complexity of the sample matrix.

- 50 to 100 percent: Acceptable for use
- >100 percent: Estimated (J)
- 10 to 50 percent: Estimated (J)
- <10 percent: Unusable (R)

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The criteria shown above will be applied to water and soil/sediment samples. These criteria may be modified slightly for building materials and urine samples. The data validator will exercise professional judgment in qualifying the data from complex matrices such as building materials and urine.

Quantitative Review

Results should be reported in pCi/g solids (dry weight) and pCi/l water. Sample results should be reported to two significant figures. "Less Than" (LT) results should be reported to one significant figure.

Radionuclide quantitation must be calculated according to the appropriate procedures specified in the contractual Scope of Work (SOW). Detection limits specified in the specific procedures must be met unless other detection limits are specified in the SOW. Analytical uncertainties should be reported with all results in order to qualify the data. Results and uncertainties should be reported for all required analyses regardless of the size or sign of the result. The reported uncertainty should be the standard 2 sigma counting error.

The raw data should be examined to verify the correct calculation of sample results reported on the summary form by the laboratory.

A. Examine the raw data for any anomalies (i.e., omissions, legibility, etc).

B. Verify that there are no transcription or reduction errors (e.g., dilutions, percent solids, sample weights) on one or more samples.

C. Verify that counting uncertainties have been reported or otherwise documented.

D. Verify on one or more samples that minimum detectable activity (MDA) has been properly calculated as shown below:

$$MDA\ (pCi/g\ solids,\ pCi/l\ water) = \frac{4.66\ (Bkg/T)^{0.5}}{(E)(Vol)(2.22)(R)}$$

Where:

Bkg =	Background count rate in cpm
T =	Count time
E =	Counting efficiency
Vol =	Volume of sample (liters for water, grams for solids)
R =	Chemical recovery

Closely evaluate net negative results that have uncertainties smaller than the absolute value of the negative result. This may be an indication of improper blank subtraction. Such results should be flagged as estimated (J). The laboratory should be contacted to determine if there is evidence of a background subtraction problem. If there is additional evidence of a background subtraction problem, flag the results as "rejected" (R).

If any discrepancies are found. the laboratory may be contacted by the designated representative to obtain additional information that could resolve any differences. If a discrepancy remains unresolved, the reviewer may determine that qualification of the data is warranted.

Radiological Data Review and Validation Guidelines
Isotopic Analyses by Alpha Spectroscopy

U.S. Radium Remedial Investigation/Feasibility Study

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APPENDIX C

DATA VALIDATION PROTOCOLS FOR RADIOLOGICAL DATA

FEDERAL DRINKING WATER STANDARDS

40 CFR Parts 141 & 142

(as of January, 1991)

ORGANIC
all units are micrograms per liter (ppb)

Chemical	MCL *	PMCL *	MCLG *
Acrylamide @	Treatment Technique	-	0
Benzene	5	-	0
Carbon Tetrachloride	5	-	0
o-Dichlorobenzene @	600	-	600
p-Dichlorobenzene	75	-	75
1,2-Dichloroethane	5	-	0
1,1-Dichloroethylene	7	-	7
cis-1,2-Dichloro-ethylene @	70	-	70
trans-1,2-Dichloro-ethylene @	100	-	100
1,2-Dichloropropane @	5	-	0
Dichloromethane (methylene chloride)	-	5	0 (P)
Di(ethylhexyl)adipate	-	500	500 (P)
Di(ethylhexyl)phthalate	-	4	0 (P)
Epichlorohydrin @	Treatment Technique	-	0
Ethylbenzene @	700	-	700
Ethylene dibromide @	0.05	-	0
Hexachlorobenzene	-	1	0 (P)
Hexachlorocyclopentadiene	-	50	50 (P)
Monochlorobenzene @	100	-	100
PAHs[Benzo(a)pyrene] +	-	0.2	0 (P)
PCBs @	0.5	-	0
Pentachlorophenol	-	1	0 (P)
Styrene @	100	-	100
Tetrachloroethylene @	5	-	0
Toluene	1000	-	1000
1,2,4-Trichlorobenzene	-	9	9 (P)
1,1,1-Trichloroethane	200	-	200
1,1,2-Trichlorethane	-	5	3 (P)
Trichloroethylene	5	-	0
Trihalomethanes (total)	100	-	-
2,3,7,8-TCDD	-	$5x10^{-8}$	0 (P)

Chemical	MCL	PMCL	MCLG
Vinyl Chloride	2	-	0
Xylenes (total) @	10000	-	10000
PESTICIDES/HERBICIDES			
Alachlor @	2	-	0
Aldicarb	-	3	1 (P)
Aldicarb Sulfoxide	-	3	1 (P)
Aldicarb Sulfone	-	3	2 (P)
Atrazine @	3	-	3
Carbofuran @	40	-	40
Chlordane @	2	-	0
Dalapon	-	200	200 (P)
Dibromochloropropane @	0.2	-	0
Dinoseb	-	7	7 (P)
Diquat	-	20	20 (P)
2,4-D ** @	70	-	70
2,4,5-TP *** @	50	-	50
Endothall	-	100	100 (P)
Endrin	0.2	2	2 (P)
Glyphosate	-	700	700 (P)
Heptachlor @	0.4	-	0
Heptachlor epoxide @	0.2	-	0
Lindane @	0.2	-	0.2
Methoxychlor @	40	-	40
Oxamyl (Vydate)	-	200	200 (P)
Picloram	-	500	500 (P)
Simazine	-	1	1 (P)
Toxaphene @	3	-	0

* MCL: Maximum Contaminant Level
PMCL: Proposed Maximum Contaminant Level
MCLG: Maximum Contaminant Level Goal
(P): Proposed MCLG

** 2,4-D: 2,4-Dichlorophenoxypropionic acid

*** 2,4,5-TP: 2,4,5-Trichlorophenoxypropionic acid (Silvex)

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

+ EPA is also considering the establishment of MCLGs and MCLs for six additional Polycyclic Aromatic Hydrocarbons (PAHs).

INORGANIC

all units are milligrams per liter (ppm), except as noted

Chemical	MCL	PMCL	MCLG
Arsenic	0.05	-	
Antimony	-	0.01/0.005[1]	0.003 (P)
Asbestos[2] @	7	-	7
Barium	1.0	2.0	2.0
Beryllium	-	0.001	0 (P)
Cadmium @	0.005	-	0.005
Chromium @	0.1	-	0.1
Copper[3]	-	1.3	1.3 (P)
Cyanide	-	0.2	0.2 (P)
Fluoride	4	-	4
Lead	0.05	0.005	0 (P)
Mercury	0.002	-	-
Nickel	-	0.1	0.1 (P)
Nitrate (as N) @	10	-	10
Nitrite (as N) @	1.0	-	1.0
Nitrate+Nitrite(as N)@	10	-	10
Selenium @	0.05	-	0.05
Silver	0.05	-	-
Sulfate[4]	-	400/500	400/500(P)
Thallium	-	0.002/0.001[1]	0.0005 (P)

[1] EPA is considering two alternative MCLs based upon a Practical Quanitative Level (PQL) of five times the Method Detection Limit (MDL) or ten times the MDL.

[2] The PMCL and MCLG for asbestos apply to fibers longer than 10 micrometers, and are in units of million fibers per liter.

[3] A current Secondary MCL exists for this compound.

[4] Sulfate is being regulated for its acute short-term effects. EPA is considering alternative MCLGs and MCLs for sulfate.

RADIOLOGICAL

Radon 200 Radon 222	200-2000 pCi/l	Proposed
Radium 226/228 (total)	5 pCi/l	Current
Radium 226 Radium 228	2-20 pCi/l	Proposed
Uranium	5-40 pCi/L	Proposed
Beta Particle & Photon emitters	4 mrem/yr	
Gross Alpha	15 pCi/L	under investigation

MICROBIOLOGICAL

Total Coliform Membrane Filter Method:	1 per 100 milliliter sample (monthly mean) and/or 4 per 100 milliliter sample (one sampling event)
Fermentation Tube Method:	coliform shall not be present in any of the following: a) more than 10% of the tubes in any month; b) three or more tubes in more than one sample (less than 20 samples per month) or more than 5% of the samples (more than 20 samples per month).
Giardia lamblia, viruses, Legionella, & heterotrophic plate count bacteria: Effective 12/31/90	Treatment technique requirements in lieu of MCLs. See 40 CFR 141 subpart H - Filtration & Disinfection; also Federal Register, Vol. 54, No. 124, Thursday June 29,1989

MCLGs for Giardia lamblia, viruses, Legionella, & total coliform are zero.

TURBIDITY

Maximum allowable levels:	1 Nephelometric Turbidity Unit (NTU), based on monthly mean; and 5 NTUs, based on average of two consecutive days' samples.

FEDERAL SECONDARY MCLS

CONTAMINANT	LEVEL	PROPOSED LEVEL
Aluminum	-	0.05
Chloride	250 mg/l	-
Color	15 Color Units	-
Copper	1 mg/l	-
Corrosivity	non-corrosive	-
Fluoride	2.0 mg/l	-
Foaming agents	0.5 mg/l	-
Iron	0.3 mg/l	-
Manganese	0.05 mg/l	-
Odor	3 Threshold Odor Number	-
pH	6.5 - 8.5 pH units	-
Silver	-	0.09
Sulfate	250 mg/l	-
Total Dissolved Solids (TDS)	500 mg/l	-
Zinc	5 mg/l	-
o-Dichlorobenzene	-	0.01
p-Dichlorobenzene	-	0.005
Ethylbenzene	-	0.03
Hexachlorocyclopentadiene	-	0.008
Pentachlorophenol	-	0.03
Styrene	-	0.01
Toluene	-	0.04
Xylenes (total)	-	0.02

APPENDIX B

COMPARISON OF FEDERAL AND STATE MCLs

COMPARISON OF FEDERAL TO STATE MCLS FOR REGION II
(as of January 1991)

ORGANIC

all units are micrograms per liter (ppb)

Chemical	FEDMCL	NJMCL	NYMCL+
Acrylamide @	treatment	-	-
Benzene	5	1	5
Bromobenzene	-	-	5
Bromochloromethane	-	-	5
Bromomethane	-	-	5
n-Butylbenzene	-	-	5
sec-Butylbenzene	-	-	5
tert-Butylbenzene	-	-	5
Carbon Tetrachloride	5	2	5
Chlorobenzene	-	4	5
Chloroethane	-	-	5
Chloromethane	-	-	5
2-Chlortoluene	-	-	5
4-Chlortoluene	-	-	5
Dibromomethane	-	-	5
o-Dichlorobenzene (1,2)@	600	600	5
m-Dichlorobenzene (1,3)	-	600	5
p-Dichlorobenzene (1,4)	75	75	5
Dichlorodifluoromethane	-	-	5
1,2-Dichloroethane	5	2	5
1,1-Dichloroethane	-	-	5
1,1-Dichloroethylene	7	2	5
cis-1,2-Dichloroethylene@	70	10	5
trans-1,2-Dichloroethylene@	100	10	5
1,2-Dichloropropane	5	-	5
1,3-Dichloropropane	-	-	5
2,2-Dichloropropane	-	-	5
1,1-Dichloropropene	-	-	5
cis-1,3-Dichloropropene	-	-	5
trans-1,3-Dichloropropene	-	-	5
Epichlorohydrin @	treatment	-	-
Ethylbenzene @	700	-	5
Ethylene dibromide @	0.05	-	-
Hexachlorobutadiene	-	-	5
Isopropylbenzene	-	-	5
p-Isopropyltoluene	-	-	5
Methylene chloride	-	2	5

Chemical	FEDMCL	NJMCL	NYMCL+
Monochlorobenzene @	100	-	-
PCB'S @	0.5	0.5	-
n-Propylbenzene	-	-	5
Styrene @	100	-	5
1,1,1,2-Tetrachloroethane	-	-	5
1,1,2,2-Tetrachloroethane	-	-	5
Tetrachloroethylene @	-	1	5
Toluene	-	-	5
1,2,3-Trichlorobenzene	-	8	5
1,2,4-Trichlorobenzene	-	8	5
1,1,1-Trichloroethane	200	26	5
1,1,2-Trichloroethane	-	-	5
Trichloroethylene	5	1	5
Trichlorofluoromethane	-	-	5
1,2,3-Trichloropropane	-	-	5
1,2,4-Trimethylbenzene	-	-	5
1,3,5-Trimethylbenzene	-	-	5
Vinyl Chloride	2	2	2
Xylenes (total) @	10000	44	5
Trihalomethanes (total)	100	100	100
Unspecified organic contaminant (UOC)	N/A	N/A	50
Total Principal organic (POCs)+ and UOCs++	N/A	N/A	100
PESTICIDES/HERBICIDES			
Alachlor @	2	-	-
Atrazine @	3	-	-
2,4-D * @	70	100	50
2,4,5-TP ** @	50	10	10
Carbofuran @	40	-	-
Chlordane @	2	0.5	-
Dibromochloropropane @	0.2	-	-
Endrin	0.2	0.2	0.2
Heptachlor @	0.4	-	-
Heptachlor epoxide @	0.2	-	-
Lindane @	0.2	4	4
Methoxychlor @	40	100	50
Toxaphene @	3	5	5

* 2,4-D: 2,4-Dichlorophenoxypropionic acid

** 2,4,5-TP: 2,4,5-Trichlorophenoxypropionic acid (Silvex)

N/A = not applicable

\+ Principal organic contaminant (POC) means any organic chemical compound belonging to the following classes, <u>except for</u> Total Trihalomethanes, Vinyl Chloride and regulated Pesticides/Herbicides:

1) Halogenated alkane
2) Halogenated ether
3) Halobenzenes and substituted halobenzenes
4) Benzene and alkyl- or nitrogen-substituted benzenes
5) Substituted, unsaturated hydrocarbons
6) Halogenated nonaromatic cyclic hydrocarbons

Further definition of the POCs is contained in Chapture I of the New York Sanitary Code Part 5, Subpart 5-1.1(ab). A table listing the POCs is found in Table 9A of the same document.

++ Unspecified organic contaminant (UOC) means any organic chemical compound not otherwise specified in Chapture I of the New York Sanitary Code Part 5, Subpart 5-1.

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWSS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

OTHER

The standards for Radiological, Coliform Bacteria and Turbidity have been adopted from the federal MCLs by the states (including VI & PR).

INORGANIC

all units are milligrams per liter (ppm), except as noted

Chemical	FEDMCL	NJMCL	NYMCL
Arsenic	0.05	0.05	0.05
Asbestos[1] @	7	-	-
Barium	1.0	1.0	1.0
Cadmium @	0.005	0.010	0.01
Chromium @	0.1	0.05	0.05
Fluoride (ppm)	4	4	2.2
Lead	0.05	0.05	0.05
Mercury	0.002	0.002	0.002
Nitrate (as N) @	10	10	10
Nitrite (as N) @	1.0	-	-
Nitrate+Nitrite(as N)@	10	-	-
Selenium @	0.05	0.01	0.01
Silver	0.05	0.05	0.05

@ Phase II MCLs promulgated 1/30/91 in 56 FR 3526 and will take effect for PWSS in 7/92. These MCLs must be adopted or made more stringent by the States by 7/92.

[1] The MCL for asbestos apply to fibers longer than 10 micrometers, and are in units of million fibers per liter.

Radiological Data Review and Validation Guidelines
Isotopic Analyses by High Resolution Gamma Spectroscopy

U.S. Radium Remedial Investigation/Feasibility Study

Scope and Applicability

This document provides guidance for the review of laboratory data packages and the validation of analytical results for the gamma activity of radium-226 from the U.S. Radium Remedial Investigation/Feasibility Study (RI/FS).

Purpose

The purpose of review and validation is to assure that the quality of each data point is known, and that each data point is flagged with a qualifier indicating the quality of that data point. In addition, data validation provides a review of laboratory quality control (QC) measures so that corrections to laboratory procedures can be implemented if necessary. It is assumed that field samplers and analytical laboratories have followed approved methods and adhere to good laboratory practices. This procedure provides guidelines for review and validation of radioanalytical data packages, and establishes criteria for applying appropriate data qualifiers to individual data points.

Criteria

The criteria used to evaluate data are based on the examination of instrument calibration, calibration verification, internal laboratory spike analysis, duplicate/ replicate analysis, blank analysis, sample spike analysis, instrument background, and quantitative review.

Radiological Data Review and Validation Guidelines
Isotopic Analyses by High Resolution Gamma Spectroscopy

U.S. Radium Remedial Investigation/Feasibility Study

OROR35/036.51

300813

Currently, there are no standard methods for radiological data evaluation or validation that are equivalent to the Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) methods for chemical data. This document outlines areas for review of data packages and acceptance limits for the assessment and validation of radiochemistry results, based on accepted nuclear industry standards and draft data validation protocols used at Department of Energy (DOE) sites.

Instrument Calibration

For gamma activity measurements, the detectors must be calibrated to obtain the counting efficiency for each of the target radionuclides in the geometries to be used for sample analysis. The calibration standard should be traceable to the National Institute of Standards and Technology (NIST).

Results for all samples analyzed on an instrument that was not properly calibrated should be flagged "estimated" (J).

Calibration Verification

A weekly instrument calibration verification should have been performed. This calibration should have been done with a radionuclide source with a minimum of two gamma emitters. This weekly check should verify the efficiencies of the instrument and be used to adjust the energy calibration. The measured efficiency values should fall within ± 3 standard deviations (3σ) of the values determined at the time of calibration.

All samples analyzed after a verification beyond control limits and before the next adjacent acceptable verification should be flagged "estimated" (J).

If the calibration verification was not performed, all results should be flagged "estimated" (J).

Any sample result with one or more gamma peaks varying by more than ± 3 channels from the calibrated value should be flagged "estimated" (J).

Internal Laboratory Spike Analysis

Internal laboratory spikes (ILS) should have been analyzed for each target isotope at a frequency of 1 per batch of 20 samples. The ILS samples provide an indication of laboratory accuracy.

The ILS acceptance criteria are shown below:

- Water—80 to 120 percent of known value
- Urine—65 to 135 percent of known value
- Soil and Sediments—70 to 130 percent of known value
- Building Materials—70 to 130 percent of known value if the building material matrix is similar to soil (crushed concrete). Otherwise, exercise professional judgment.

All values associated with an ILS beyond control limits should be flagged "estimated" (J).

Duplicate/Replicate Analysis

A laboratory duplicate should have been prepared and analyzed for each batch of 20 samples. The duplicate samples provide an indication of laboratory precision.

A control limit of ±20 percent for water samples and ±35 percent for urine, soil, sediment, and building materials samples for the relative percent difference (RPD) shall be used for samples values >5× contract-required detection limit (CRDL).

A control limit of ±CRDL for water samples and ±2× CRDL for urine, soil, sediment, and building materials samples shall be used for sample values <5× CRDL, including the case when only one of the duplicate sample values is <5× CRDL.

Check the raw data and recalculate one or more RPD using the following equation to verify that results have been correctly reported.

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

Where:

S = First sample value (original)
D = Second sample value (duplicate)

Verify that the field blank was not used for duplicate analysis. If the field blank was used for duplicate analysis, all other QC data must be carefully checked and professional judgment exercised when evaluating the data.

If duplicate analysis results for a particular radionuclide fall outside the appropriate control windows, qualify the results for that radionuclide in all associated samples of the same matrix as "estimated" (J).

All results associated with a field replicate beyond control limits should be flagged "estimated" (J).

Blank and Background Analysis

At least one of every 20 samples (5 percent of samples) should be a blank. Blanks are used to determine background counts due to environmental and reagent radiation sources. Blank sample results should be examined to determine that the activities for blanks are less than or equal to the minimum detectable activity (MDA) for each gamma emitter of interest.

If radionuclides are detected in blanks, then sample results for the same radionuclides should be considered as positive only if they exceed 5 times the blank concentration. Samples that show positive results less than 5 times the blank value (for radionuclides detected in blanks) should be flagged "estimated" (J).

A background spectra should be obtained for each detector at least once every two weeks. Background counts should be subtracted from the sample counts. High background counts may indicate the presence of laboratory or counter contamination. The latest background spectra should agree to within 3 standard deviations (3σ) of the long-term average background spectra of the detector. Any sample value determined when the background was outside these limits should be flagged "estimated" (J).

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Quantitative Review

Results should be reported in pCi/g solids (dry weight) and pCi/l water. Sample results should be reported to two significant figures. "Less Than" (LT) results should be reported to one significant figure.

Radionuclide quantitation must be calculated according to the appropriate procedures specified in the contractual Scope of Work (SOW). Detection limits specified in the specific procedures must be met unless other detection limits are specified in the SOW. Analytical uncertainties should be reported with all results in order to qualify the data. Results and uncertainties should be reported for all required analyses regardless of the size or sign of the result. The reported uncertainty should be the standard 2 sigma counting error.

The raw data should be examined to verify the correct calculation of sample results reported on the summary form by the laboratory.

A. Examine the raw data for any anomalies (i.e., omissions, legibility, etc).

B. Verify that there are no transcription or reduction errors (e.g., dilutions, percent solids, sample weights) on one or more samples.

C. Verify that counting uncertainties have been reported or otherwise documented.

D. Verify on one or more samples that minimum detectable activity has been properly calculated as shown below:

$$MDA\ (pCi/g\ solids,\ pCi/l\ water) = \frac{4.66\ (Bkg/T)^{0.5}}{(E)(Vol)(2.22)(R)}$$

Where:

Bkg =	Background count rate in cpm
T =	Count time
E =	Counting efficiency
Vol =	Volume of sample (liters for water, grams for solids)
R =	Chemical recovery

Closely evaluate net negative results that have uncertainties smaller than the absolute value of the negative result. This may be an indication of improper blank subtraction. Such results should be flagged as "estimated" (J). The laboratory should be contacted to determine if there is evidence of a background subtraction problem. If there is additional evidence of a background subtraction problem, flag results as "rejected" (R).

Validation Flags

Data results that do not meet the acceptance criteria are qualified with flags, which are single letter abbreviations that indicate a problem with the data. The following flags are used in this guide:

J	=	Indicates the analyte is present but the reported value may not be accurate or precise because the associated quality assurance (QA)/QC was unacceptable.
R	=	Indicates the data is unusable. This flag is used when the data results should not be used to support project decisions.

UJ = The sample was analyzed, but the analyte was not detected above the stated concentration. The associated value is an estimated detection limit.

The following subqualifiers give further detail of the type and amount of qualification a given result has received.

-D = Qualified because laboratory duplicate control limits were exceeded

-S = Qualified because matrix spike recovery control limits were exceeded

-C = Qualified due to instrument calibration problems

-B = Qualified due to blank contamination problems

-Q = Qualified due to reasons not stated above—refer to the text of the report

References

Sample Preparation SOPs from Controls for Environmental Pollution.

QA—Standard Operating Procedure for Accepting Spike and Duplicate Results (CEP-QA-102, revised 1-20-89).

Radiochemical Data Validation Guidelines—Analyses by High Resolution Gamma Spectrometry. Rocky Flats Plant, Golden, Colorado. Version 1.1. Rev. January 1991.

Radiological Data Review and Validation Guidelines
Ra-226 by Radon Emanation

U.S. Radium Remedial Investigation/Feasibility Study

OROR35/03651

300821

Radiological Data Review and Validation Guidelines
Ra-226 by Radon Emanation

U.S. Radium Remedial Investigation/Feasibility Study

Scope and Applicability

This document provides guidance for the review of laboratory data packages and the validation of analytical results for Ra-226 by radon emanation from samples collected for the U.S. Radium Remedial Investigation/Feasibility Study (RI/FS).

Purpose

The purpose of review and validation is to assure that the quality of each data point is known and that each data point is flagged with a qualifier indicating the quality of that data point. In addition, data validation provides a review of laboratory quality control (QC) measures so that corrections to laboratory procedures can be implemented if necessary. It is assumed that field samplers and analytical laboratories have followed approved methods and adhere to good laboratory practices.

This procedure provides guidelines for review and validation of radioanalytical data packages, and establishes criteria for applying appropriate data qualifiers to individual data points.

Criteria

The criteria used to evaluate data are based on the examination of holding times, instrument calibration, calibration verification, internal laboratory spike analysis, energy calibration, duplicate/replicate analysis, blank analysis, radiochemical yield analysis, and quantitative review.

Currently, there are no standard methods for radiological data evaluation or validation that are equivalent to the Environmental Protection Agency (EPA) methods for chemical data. This document suggests areas for review of data packages and acceptance limits for the assessment and validation of radiochemistry results, based on accepted nuclear industry standards and draft data validation.

Instrument Calibration

Alpha scintillation counters must be calibrated with a standard traceable to the National Institute of Standards and Technology (NIST).

Calibration should be performed at least quarterly for each photomultiplier tube.

Results for all samples analyzed on an instrument that was not properly calibrated should be flagged "estimated" (J).

Calibration Verification

A calibration verification should have been performed weekly for each photomultiplier tube with an independently prepared verification standard. The measured efficiency should not be more than 3 standard deviations (3σ) from the efficiency determined at the time of calibration. For any counter where the calibration verification result is more than 3 standard deviations from the value determined at calibration, the results should be flagged "estimated" (J).

All samples analyzed after a verification beyond control limits and before the next adjacent acceptable verification should be flagged "estimated" (J).

If the calibration verification was not performed, all results should be flagged "estimated" (J).

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Internal Laboratory Spike Analysis

Internal laboratory spikes (ILS) should have been analyzed for each target isotope at a frequency of 1 per batch of 20 samples. The ILS samples provide an indication of laboratory accuracy.

The acceptance criteria are based on the ILS value being within 3 standard deviations (3σ) of the known value. The calculated uncertainty of each observed value of the ILS samples should be used to establish the 3σ control limit. All values associated with an ILS beyond the 3σ control limits should be flagged "estimated" (J).

Duplicate/Replicate Analysis

A laboratory duplicate should have been prepared and analyzed for each batch of 20 samples. The duplicate samples provide an indication of laboratory precision.

A control limit of ± 20 percent for water samples, and ± 35 percent for urine, soil, sediment, and building materials samples for the relative percent difference (RPD) shall be used for samples values $\geq 5\times$ contract-required detection limit (CRDL).

A control limit of $\pm$CRDL for water samples, and $\pm 2\times$ CRDL for urine, soil, sediment, and building materials samples shall be used for sample values $<5\times$ CRDL, including the case when only one of the duplicate sample values is $<5\times$ CRDL.

Check the raw data and recalculate one or more RPD using the following equation to verify that results have been correctly reported.

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

Where:

S = First sample value (original)

D = Second sample value (duplicate)

Verify that the field blank was not used for duplicate analysis. If the field blank was used for duplicate analysis, all other QC data must be carefully checked and professional judgment exercised when evaluating the data.

If duplicate analysis results for a particular radionuclide fall outside the appropriate control windows, qualify the results for that radionuclide in all associated samples of the same matrix as "estimated" (J).

All results associated with a field replicate beyond control limits should be flagged "estimated" (J).

Blank and Background Analysis

One laboratory blank sample should have been prepared and analyzed for each batch of 20 samples. Blanks are used to determine background counts due to environmental and reagent radiation sources. High blank sample results may indicate the presence of laboratory or counter contamination.

The results for all blanks should be recorded and plotted on a QC chart. Control limits should be set at 3 standard deviations from the mean. If the blank QC results fall outside of the appropriate tolerance limits (3σ) for the set of samples covered by the blank, qualify the results for all associated samples as "estimated" (J).

The occurrence of background counts above minimum detectable activity in laboratory blanks should be documented. If radionuclides are detected in blanks,

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then sample results for the same radionuclides should be considered as positive only if they exceed 5 times the blank concentration. Samples that show positive results less than 5 times the blank values (for radionuclides detected in blanks) should be flagged "estimated" (J).

If a compound is found in a blank but not in the sample, no action should be taken.

Backgrounds should be run on each scintillation cell weekly or prior to each use. The current background should be within ± 3 standard deviations of the previous background.

Quantitative Review

Results should be reported in pCi/g solids (dry weight) and pCi/l water. Sample results should be reported to two significant figures. "Less Than" (LT) results should be reported to one significant figure.

Radionuclide quantitation must be calculated according to the appropriate procedures specified in the contractual Scope of Work (SOW). Detection limits specified in the specific procedures must be met unless other detection limits are specified in the SOW. Analytical uncertainties should be reported with all results in order to qualify the data. Results and uncertainties should be reported for all required analyses regardless of the size or sign of the result. The reported uncertainty should be the standard 2 sigma counting error.

The raw data should be examined to verify the correct calculation of sample results reported on the summary form by the laboratory.

A. Examine the raw data for any anomalies (i.e., omissions, legibility, etc).

B. Verify that there are no transcription or reduction errors (e.g., dilutions, percent solids, sample weights) on one or more samples.

C. Verify that counting uncertainties have been reported or otherwise documented.

D. Verify on one or more samples that minimum detectable activity has been properly calculated as shown below:

$$MDA\ (pCi/g\ solids,\ pCi/l\ water) = \frac{4.66\ (Bkg/T)^{0.5}}{(E)(Vol)(2.22)(R)}$$

Where:

Bkg =	Background count rate in cpm
T =	Count time
E =	Counting efficiency
Vol =	Volume of sample (liters for water, grams for solids)
R =	Chemical recovery

Closely evaluate net negative results that have uncertainties smaller than the absolute value of the negative result. this may be an indication of improper blank subtraction. Such results should be flagged as estimated (J). The laboratory should be contacted to determine if there is evidence of a background subtraction problem. If there is additional evidence of a background subtraction problem, flag results as rejected (R).

If any discrepancies are found, the laboratory may be contacted by the designated representative to obtain additional information that could resolve any differences. If a discrepancy remains unresolved, the reviewer may determine that qualification of the data is warranted.

Validation Flags

Data results that do not meet the acceptance criteria are qualified with flags, which are single letter abbreviations that indicate a problem with the data. The following flags are used in this guide:

J	=	Indicates the analyte is present, but the reported value may not be accurate or precise because the associated quality assurance (QA)/QC was unacceptable.
R	=	Indicates the data is unusable. This flag is used when the data results should not be used to support project decisions.
UJ	=	The sample was analyzed, but the analyte was not detected above the stated concentration. The associated value is an estimated detection limit.

The following subqualifiers give further detail of the type and amount of qualification a given result has received.

-D	=	Qualified because laboratory duplicate control limits were exceeded
-S	=	Qualified because matrix spike recovery control limits were exceeded
-C	=	Qualified due to instrument calibration problems
-B	=	Qualified due to blank contamination problems

-Q = Qualified due to reasons not stated above—refer to the text of the report

References

Sample Preparation SOPs from Controls for Environmental Pollution.

QA—Standard Operating Procedure for Accepting Spike and Duplicate Results (CEP-QA-102, revised 1-20-89).

Radiochemical Data Validation Guidelines—Radium-226 Analyses of Soil and Water by Radon Emanation. Rocky Flats Plant, Golden, Colorado. Version 2.1. Rev. September 1990.

Validation Flags

Data results that do not meet the acceptance criteria are qualified with flags, which are single letter abbreviations that indicate a problem with the data. The following flags are used in this guide:

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R	=	Indicates the data is unusable. This flag is used when the data results should not be used to support project decisions.
UJ	=	The sample was analyzed, but the analyte was not detected above the stated concentration. The associated value is an estimated detection limit.

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References

Sample Preparation SOPs from Controls for Environmental Pollution.

QA—Standard Operating Procedure for Accepting Spike and Duplicate Results (CEP-QA-102, revised 1-20-89).

Radiochemical Data Validation Guidelines—Isotopic Analysis by Alpha Spectrometry. Rocky Flats Plant, Golden, Colorado. Version 2.1. Rev. September 1990.

APPENDIX D

DATA FORMAT EXAMPLES

MALCOLM PIRNIE

PROJECT # _____ DATE _____

PROJECT NAME _____ SAMPLERS _____

SITE LOCATION _____ _____

SAMPLE COLLECTION LOG

WELL ID _____

WELL PURGING EQUIPMENT _____

TIME PURGING FINISHED _____ TIME SAMPLING STARTED _____

SAMPLING EQUIPMENT _____

WELL DEPTH (FT. FROM TOC) = _____

DEPTH TO WATER (FT. FROM TOC) = _____ TIME _____

HEIGHT OF WATER IN WELL (FT) = _____

ONE WELL VOLUME (GALLONS) = _____

VOLUME WATER REMOVED (GALLONS) = _____

SAMPLE APPEARANCE _____

FIELD PARAMETERS	FIRST	SECOND	THIRD	FOURTH	FIFTH
TEMP (°C)					
SPEC COND. (umhos/cm)					
pH					
VOLUME PURGED (gal)					

SAMPLES COLLECTED (PARAMETERS AND PRESERVATIONS) _____

WEATHER CONDITIONS _____

OTHER NOTES _____

CASING DIAMETER (IN.)	CASING VOLUME (GALLONS/LINEAR FT.)
1.25	0.0637
1.50	0.0918
2	0.1632
2.5	0.2550
3	0.3672
3.5	0.4998
4	0.6528
6	1.4687

300833

MALCOLM PIRNIE, INC.

LOG OF BORING_____

PROJECT NAME:	ELEVATION AND DATUM:
LOCATION:	START DATE: FINISH DATE:
DRILLING CONTRACTOR:	HYDROGEOLOGIST:
DRILLING RIG:	DRILLER:
DRILLING METHOD:	DRILLING ASSISTANT:
SAMPLING DEVICES:	COMPLETION DEPTH:

SPLIT SPOON INFO.						HNU READINGS			
No.	Recov. (in.)	Blows per 6"	DEPTH	STRATA	SOIL DESCRIPTION	BKGD (PPM)	SAMP (PPM)	TIME	REMARKS
			1						
			2						
			3						
			4						
			5						
			6						
			7						
			8						
			9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:

APPENDIX E

BORING LOGS AND WELL CONSTRUCTION DETAILS
GERAGHTY & MILLER (G&M) SERIES WELLS

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-1 Project/No. N1222LI1 Page 1 of 1

Site Location Glen Cove, NY Drilling Started 11 30 Am 4-9-87 Drilling Completed

Total Depth Drilled 15 feet Hole Diameter 6 inches Type of Sample/Coring Device split spoon

Length and Diameter of Coring Device 2' x 1.6" Sampling Interval 0-16 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used — Drilling Method Hollow Stem Aug Mobile B Jig

Drilling Contractor Slacke Test Boring, Inc. Driller Danny O'Shea Helper Pete + Jim C

Prepared By V J Glasser Hammer Weight 145 Hammer Drop 30 inches

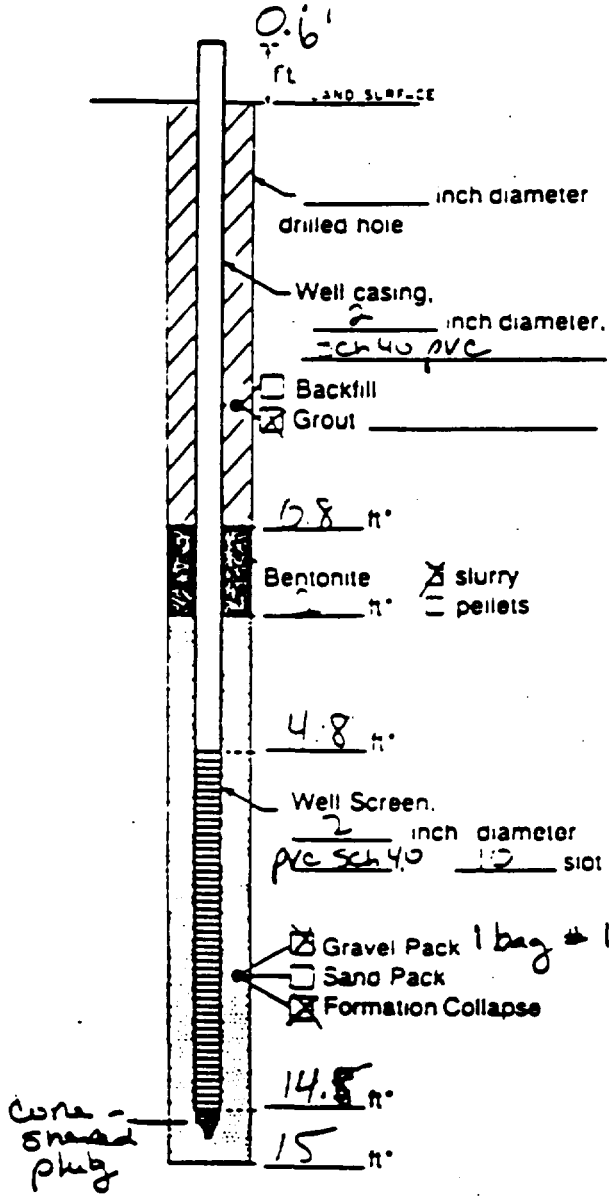
Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1	3-2-2-4	Top 6" = Topsoil/Fill, silty sand-fine, some clay, dark brown moist cohesive, soft. Bottom 6" -
				Sand f-m, some fine gravel, trace silt, tan, moist loose
4	6	1	3-2-2-4	Sand f-m, gravel f-m, rounded pebbles (½-1") some silt, tr. clay dk tan somewhat loose wet
9	11	2	11-11-24-3	Sand f-c, gravel f-c, pebbles (½-1.3") rounded, light tan very loose wet
14	16	1.5	6-6-8-12	Sand, f-m, on top well sorted, grading to coarse on bottom well sorted tan, very loose, wet
				— END BORING —
			Note:	① no odors or evidence of
				contamination observed
				② After removing augers from
				hole, OVA reading = 0 at land surfac

G&M Form 03 6-86 Southern 87-1718

300836

MIGHTY WATER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1222 LI 1 Well GM-1
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-09-87
Drilling Method Hollow Stem Auger Mobile B
Drilling Contractor Slocka
Drilling Fluid —

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gal
Water Removed During Development _____ gal
Static Depth to Water _____ feet below l
Pumping Depth to Water _____ feet below l
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks

Prepared by V. T. Glasser

W Form 05 5 87

300837

GEOLOGISTS & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-2 Project/No. N1222LI1 Page 1 of 1

Site Location Glen Cove NY Drilling Started 4-14-87 Drilling Completed

Total Depth Drilled 16 feet Hole Diameter ____ inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 1.6" Sampling Interval 0-16 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used ____ Drilling Method Mobile B Hollow Stem auger

Drilling Contractor Slack Test Borings Driller Danny Osha Helper Jim, Pete

Prepared By V J. Glasser Hammer Weight 145 Hammer Drop 30 inches Safety Hammer

OVA ppm benzene	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
	0	0.8			Reinforced concrete
	1	3	0.3	1-2-5-3	Till-like sand f-m, silt, some clay + f. gravel (round mottled m.dk gray + blck, soft, semi-cohesive, wet
4-6*	4	6	1.5	7-7-3-2	Till-like vf sand + silt w/ tr. of f. gravel and occasional pebble (½") tr-some clay, mottled lt. gray + brown, wet.
20-100*	9	11	2	1-1-29-32	Top 1': Sand f-m, some silt - Tr. clay + f. gravel m. gray soft fairly loose, wet bottom 1ft - same. orange - brown.
0	14	16	2	75-50-38-27	Sand f-c, gravel f-m, assorted pebbles (6-1") Tr. silt + clay, H. orange/brn, loose, wet

* Also used charcoal filter and got reading of zero indicating reading of 20-100 ppm benzene is not methane

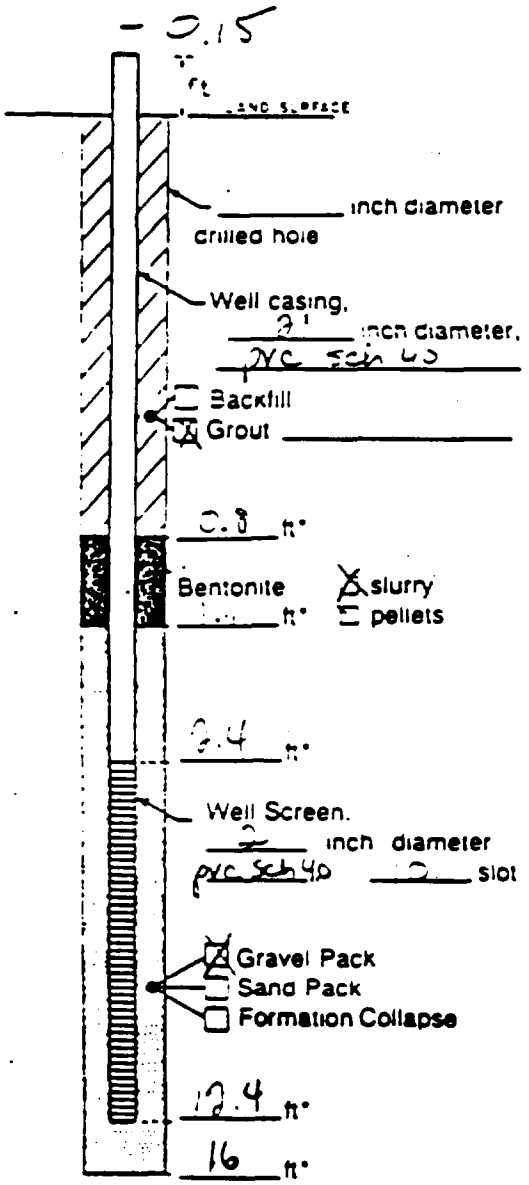
Note: no visual sign of contamination

G&M Form 00 6-86 Southern 87-1716

300838

AGHTY
ER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project N1222 LI1 Well GM-2
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-14-87
Drilling Method Hollow Stem Auger Mobile B
Drilling Contractor Slack
Drilling Fluid —

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gallo
Water Removed During Development _____ gallo
Static Depth to Water _____ feet below M.
Pumping Depth to Water _____ feet below M.
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks

Prepared by V. J. Glassy

Form 05 5 87

Southern 87 1778

300839

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-30 Project/No. N1222LE1 Page 1 of 1

Site Location Glen Cove NY Drilling Started 4-14-87 2:40 pm Drilling Completed 4:15

Total Depth Drilled 26 feet Hole Diameter _____ inches Type of Sample/Coring Device split spoon

Length and Diameter of Coring Device 2' x 1.6" Sampling Interval 0-26 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used — Drilling Method Hollow Stem Auger

Drilling Contractor Slack Driller Denny Helper Jim + Pete

Prepared By V J Glasser Hammer Weight 145 Hammer Drop 30 inches

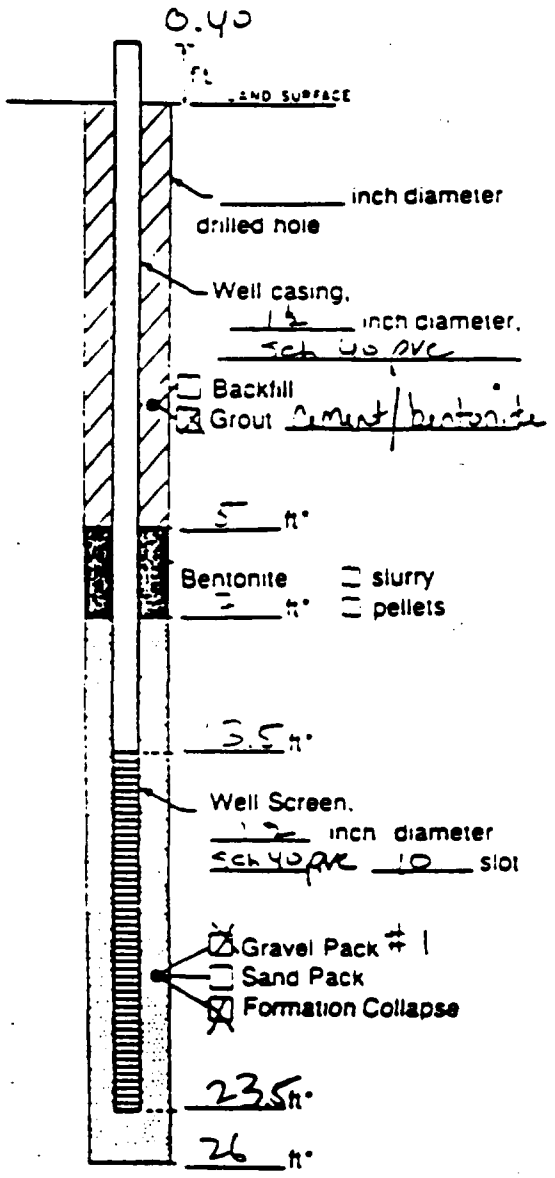
OVA ppm benzene	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	0	2	1	2-9-27	Top 6" - topsoil, loamy, sand f-m, some silt, tr. clay dk brn loose damp Bottom: sand m-c f-m gravel + rounded pebbles, orange, v. loose, dry
0	4	6	0.3	30-25-39-50	Wash? similar to top 6" of 0-2' sample. wet
Tips needle	9	11	1.4	5-12-12-18	Silty sand, vf-f, tr. clay, gray/brn, dense, tight, cohesive moist.
0	14	16	18	9-14-18-26	same as above (less silty) for 0.5 ft top. Bott: gravel f-c well rounded, f-m sand whitish tan, v. loose, wet.
—	19	21	0	9-12-17-20	Wash = f-c sand, white/tan, v. loose, wet.
0	24	26	2	18-23-25-27	Sand m-c, f. gravel, lt. tan, v. loose, wet.

Note: no visual evidence of contamination

300840

RAGHTY
...LLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1222 LI1 Well CoM-3D
Town/City Glen Cove
County Nassau State NY
Permit No. _____
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-14-87
Drilling Method Hollow Stem Auger Mobile B
Drilling Contractor Slacke
Drilling Fluid —

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gallo
Water Removed During Development _____ gallo
Static Depth to Water _____ feet below M.
Pumping Depth to Water _____ feet below M.
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks

Prepared by V. J. Glazer

SM Form 05 5 87

300841

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-4 Project/No. N12226E1 Page 1 of 1

Site Location Glen Cove NY Drilling Started 9:50 11-15-87 Drilling Completed 10:50

Total Depth Drilled 16 feet Hole Diameter 6 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 1.6" Sampling Interval 0-16 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used — Drilling Method Hollow Stem Auger Mobile B

Drilling Contractor Stack Driller Danny O'Shea Helper Jim Pete

Prepared By V. J. Glasser Hammer Weight 140 Hammer Drop 30 inches

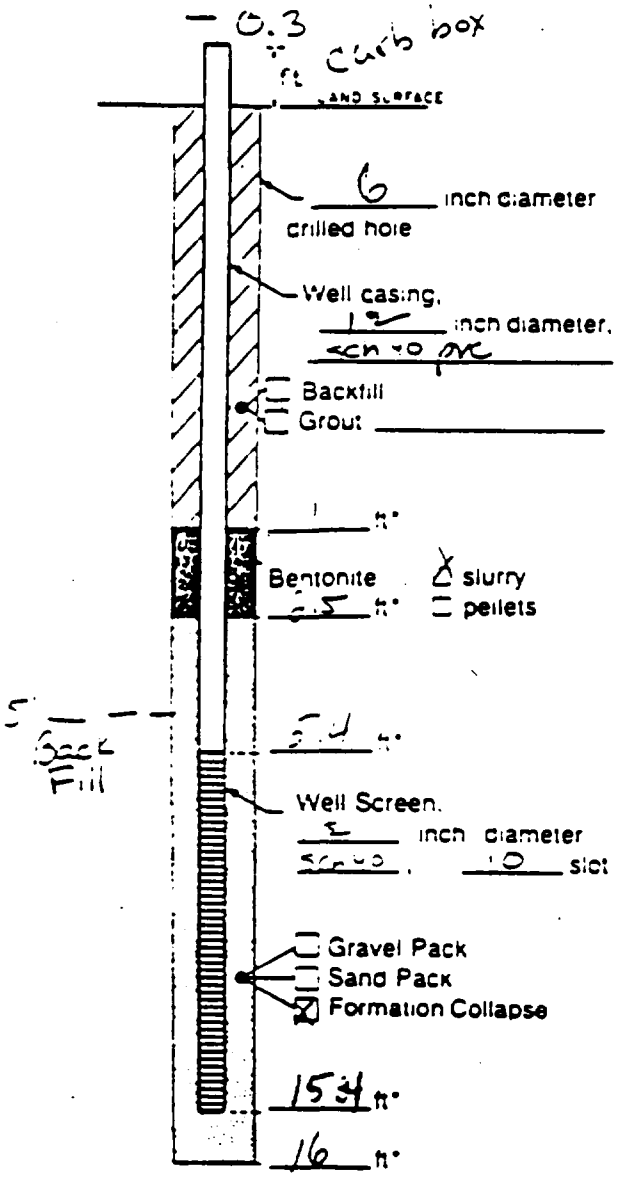
Safety Hammer

OVA ppm sample	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	1	3	1.7	7-6-6-7	Till-like: sand vf-f, some silt, tr. f. gravel - clay, various, orange brn - grayish variable cohesiveness + looseness
0	4	6	1.7	5-8-26-33	Same as above w/ parts more homogeneous - v.f sand mottled gray + brn grades into orange f-m sand
					mixed w/ f. gray sand - wet @ ~ 3-4ft bls.
0	9	11	1.5	7-7-8-9	Basically silty sand, vf-f, tr-some clay, mottled gray-brownish grades to till-like silty sand w/ some clay
					tr. some f. gravel - place of blood-red rock - nodules of different colored sands + silts (green
					brown, white) variable colors, gray, red, brown, pockets of green + white etc. basically cohesive
					somewhat firm + soft in spots
0	14	16	1.6	6-8-10-10	overall - clayey, silty sand, vf-m, tr. f-m gravel, gray, sample cut in half reveals greenish sand +
					f. gravel near top, reddish brn areas, and nodules of pink sand - some red; cohesive, somewhat
					firm + soft, wet.
				NOTE:	no visual evidence of contamination
					such as odor sheen etc

300842

TRAGHTY
...ER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1222LI1 Well GM-4
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-15-87
Drilling Method Hollow Stem Auger Mobile B
Drilling Contractor Slacke
Drilling Fluid —

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ ga
Water Removed During Development _____ ga
Static Depth to Water _____ feet below
Pumping Depth to Water _____ feet below
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks

Prepared by V. J. Glasser

M Form 05 5 87

300843

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-5 Project/No. [illegible] Page 1 of 1

Site Location Glen Cove, NY Drilling Started 10 AM 4-21-87 Drilling Completed

Total Depth Drilled 27 feet Hole Diameter 6 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 1.6" Sampling Interval 0-27 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum

Drilling Fluid Used — Drilling Method Hollow Stem Auger

Drilling Contractor Slacke Driller Danny O'Shea Helper Jim-Pete

Prepared By V J Glasser Hammer Weight 140 Hammer Drop 30 inches

Safety

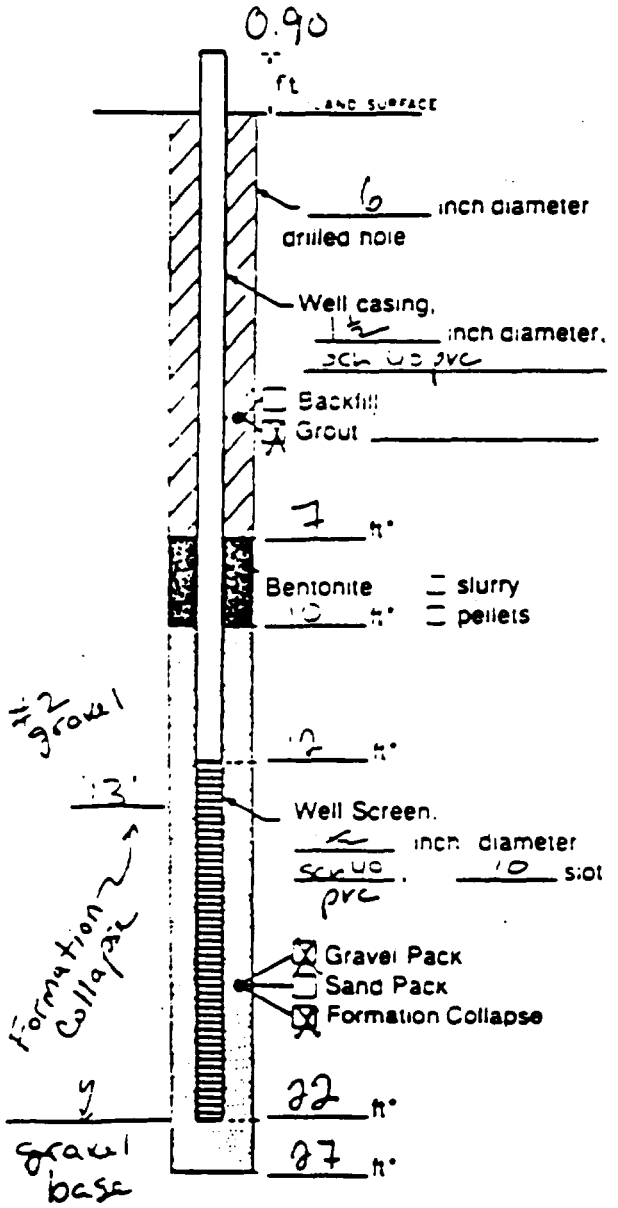
GVA ppm benzene

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.5	1-2-4-7	Top 0.3' = topsoil - organic material, moist, dk brown grading suddenly to sand f-m, tr. - some silt, orange/tan, moist, fairly loose
4	6	1.0	4-6-8-12	Silty sand f-m, tr. clay + gravel, alternating orange/tan and gray somewhat cohesive, slightly moist
9	11	1.2	11-15-13-18	Top 0.4' = same as above, changes to sand medium tr. gravel tan v. loose, dry
14	16	1.0	2-9-11-13	Sand m-c, some gravel f-m, reddish tan, v. loose, wet throughout
19	21	1.3	1-1-2-2	Same as above - spoon tip = layered, silty sand, f. clay alt. orange + gray fairly firm sticky + fairly dry
24	26	1.5	2-2-6-8	Top 1' = wash probably = f-c sand, tr. gravel Bott 1' = clayey silt, v.f sand gray - streaks of orange - mottled, soft to med. firm, slightly moist.
26	27	1.0	Hand pushed	Silt, tr. - some clay, dk gray, soft, wet.

300844

PAGHTY
...LER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project N1222LI1 Well GM-5
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum _____ feet ☐ Surveyed
☐ Estimated
Installation Date(s) 4-21-87
Drilling Method Hollow Stem Auger - Mobile B
Drilling Contractor Slecke
Drilling Fluid —

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gal
Water Removed During Development _____ gal
Static Depth to Water _____ feet below
Pumping Depth to Water _____ feet below
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks

Prepared by V J Glasser

NM Form CS 5 87

300845

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-6 Project/No. N1342L I01 Page 1 of 1

Site Location Glen Cove NY Drilling Started 3:00 PM 3-31-88 Drilling Completed 5 PM

Total Depth Drilled 13 feet Hole Diameter 8" inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2 ft x 2" Sampling Interval 0-12 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method Hollow Stem Auger

Drilling Contractor Empire Soils Investigations, Inc. Driller Boo Helper Jim + Greg

Prepared By A. Baker Hammer Weight _____ Hammer Drop _____ inches

Rig = CME-45C
Auger size - 4¼" ID x 8" OD

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2'	1'	7-12-17-12	organic debris + fill, black, fill material, dark brown, sand, f to c, silt, some gravel, orange to dark brown, loose, dry
5'	7'	0.5'	4-4-5-2	sand, fine to med, silt, trace gravel, some slag, dark tan, loose, wet.
10'	12'	0.5'	30-15-14-12	sand f-m, silt, trace fine gravel, pebbles. Med. tan, loose, trace clay in water
				END BORING

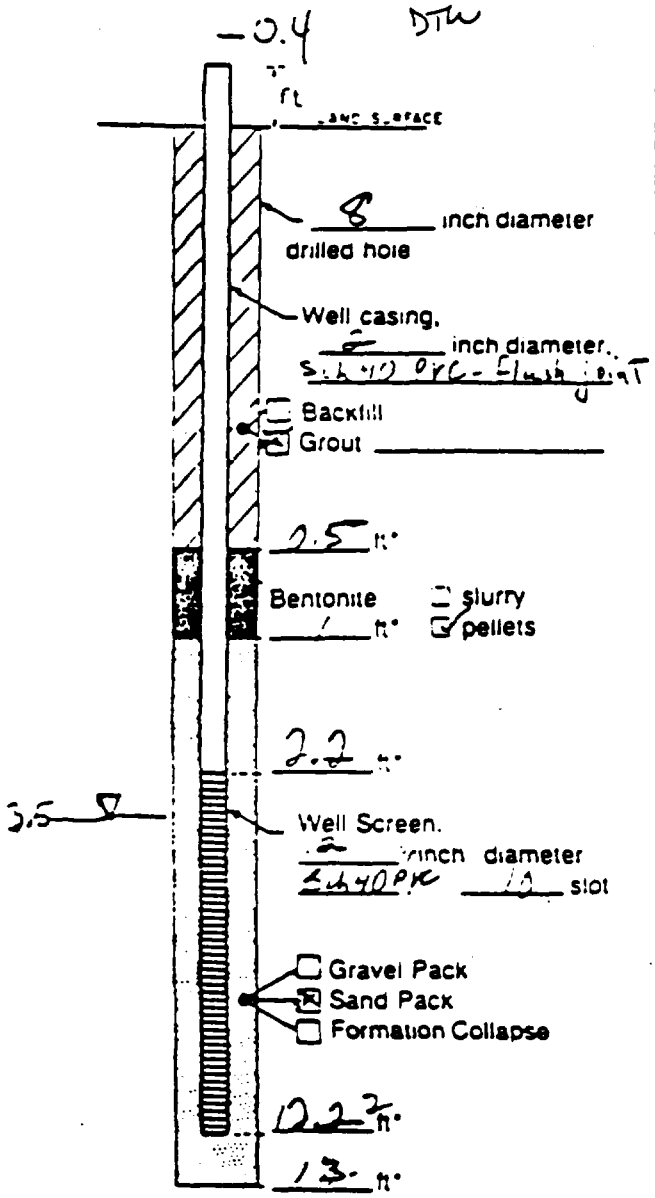
G&M Form 03 6-86 Southern 87-1718

300846

P.AGHTY
...LER, INC.
Ground-Water Consultants

0.010

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342LI01 Well GM-6
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum _____ feet ☐ Surveyed
☐ Estimated
Installation Date(s) 3/31/88
Drilling Method Hollow Stem Auger 4¼" ID X 2'
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)

Fluid Loss During Drilling
Water Removed During Development
Static Depth to Water 3.5 ft bls 3-31-88 feet belc
Pumping Depth to Water feet belc
Pumping Duration hours
Yield gpm Date
Specific Capacity gpm/ft
Well Purpose monitoring leading edge of alleged plume

Remarks No odors or visual evidence of contamination

Prepared by AB + VG

GSM Form 05 5 87

300847

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-2 Project/No. [illegible] Page 1 of 1

Site Location Glen Cove NY Drilling Started 8:30 AM 4/1/89 Drilling Completed 10 AM

Total Depth Drilled 1.5 feet Hole Diameter 8 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2 ft x 2 in Sampling Interval 0-14' feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method Hollow stem Auger

Drilling Contractor Empire Driller Boo Helper Greg + Jim

Prepared By A. Baker Hammer Weight _____ Hammer Drop _____ inches

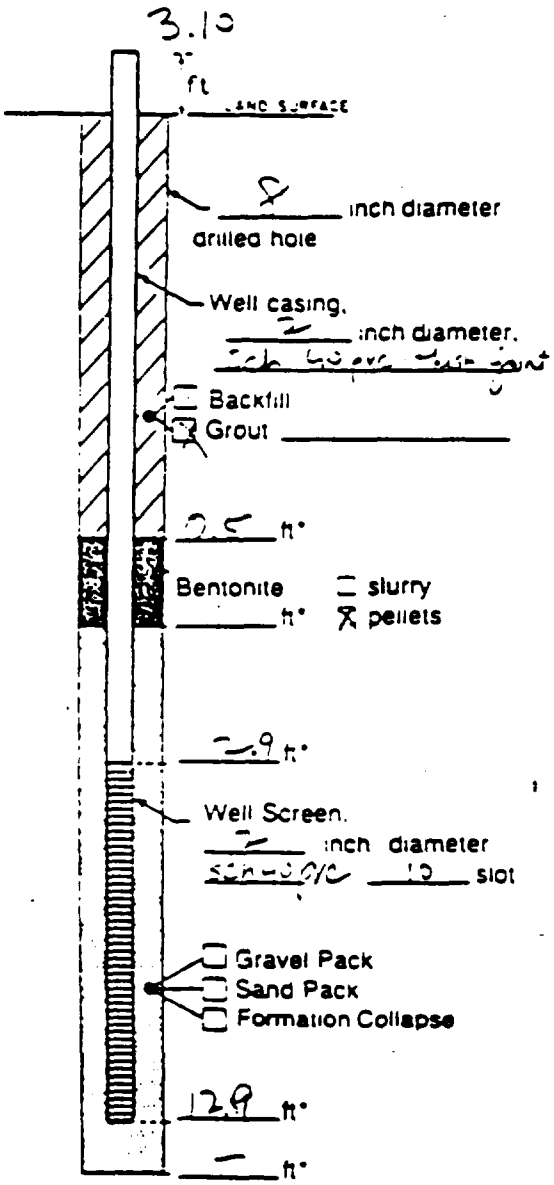
Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2'	1'	4-8-8-12	Sand f-vf, silt, some clay, trace pebbles, dark orange cohesive, damp.
4'	6'	1.5'	12-16-16-22	Sand vf, some silt, gray clay cohesive, damp. Sharp change to fill material - sand f-c, some gravel, orange, loose, wet
8'	10'	1'	15-40-20-12	Silt, light gray, cohesive, wet, tr. pebbles. Sharp change to dark green to black dry sand, red clayey silt, wet
12'	14'	1.5	20-15-18-12	Sand m-c, trace gravel, tan to light orange, wet.
				End of boring

G&M Form 03 6-86 Southern 87 1718

300848

TRAGHTY
...LLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N13U2LI01 Well GM-7
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4/1/88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal pump 4-5-88

Fluid Loss During Drilling _____ ga
Water Removed During Development 90 ga
Static Depth to Water 7.5' on 4/1/88 feet below
Pumping Depth to Water _____ feet below
Pumping Duration 0.5 hours
Yield 3.0 gpm Date 4-5-
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks Water table is most likely at 3' but unable to recover quickly enough due to silt matrix. Screen was set at 2' below grade

Prepared by _____

GM Form 05 5 87

300849

G&M MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well GM-8 Project/No N1342L201 Page 1 of 1

Site Location Glen Cove, NY Drilling Started 10 AM Drilling Completed 10 50

Total Depth Drilled 13 feet Hole Diameter 8 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0-12 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor Empire Driller Boo Helper Jim + Greg

Prepared By A Baker Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2'	0.5	10-25-20-18	Sand, m-c, some gravel, trace pebbles. Dark orange, semi-cohesive, damp.
5'	7'	1.0	25-15-15-12	Sand, f-m, dark brown, dry, then sand m-c, gravel, some pebbles, orange, wet
10'	12'	1.5	5-10-12-16	Sand, m-c, some gravel, trace pebbles, brown to orange, loose, wet
				END BORING

G&M Form 03 6-86 Southwind 87 1718

300850

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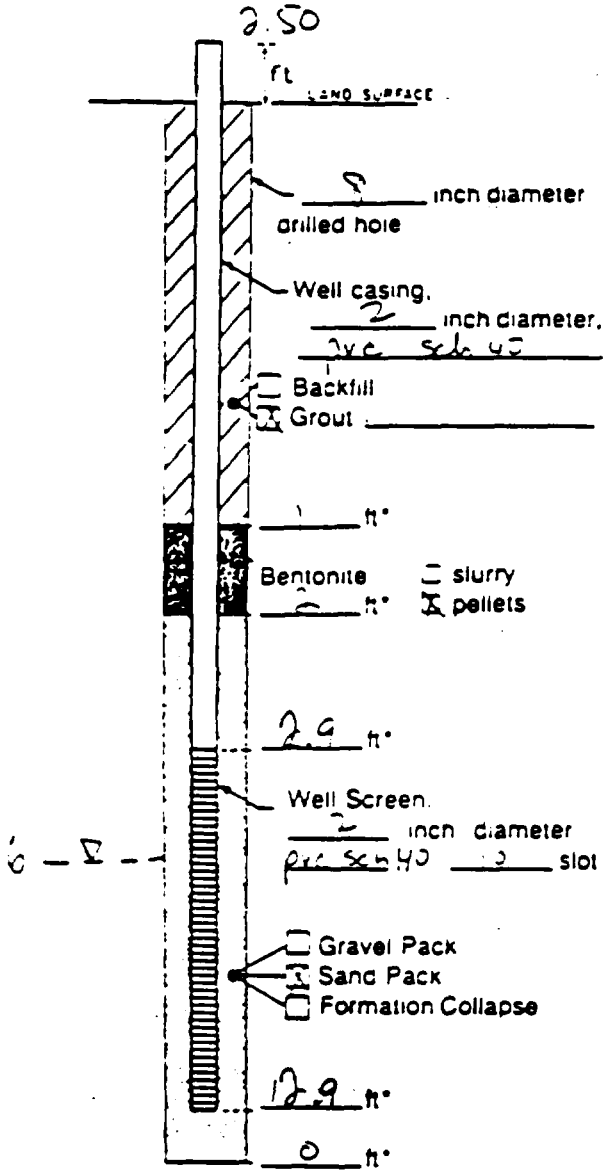
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342L-01 Well GM-8

Town/City Glen Cove

County Nassau State NY

Permit No.

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 4-4-88

Drilling Method Hollow Stem Auger

Drilling Contractor Empire

Drilling Fluid —

Development Technique(s) and Date(s)
Centrifugal pump 4-5-88

Fluid Loss During Drilling — gal

Water Removed During Development 192 gal

Static Depth to Water _____ feet below

Pumping Depth to Water _____ feet below

Pumping Duration 1 hours

Yield 3.2 gpm Date 4-5-8

Specific Capacity _____ gpm/ft

Well Purpose Monitor

Remarks

Prepared by D. Baker

GAM Form 05 5 87

300851

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SAMPLE/CORE LOG

Boring/Well GMLG Project/No. N1342-L-01 Page 1 of 1

Site Location Glen Cove NY Drilling Started 3 30 4-4-88 Drilling Completed 4 00

Total Depth Drilled 12 feet Hole Diameter ____ inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0-12 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor Empire Driller Boo Helper Jim + Greg

Prepared By A. Baker Hammer Weight ____ Hammer Drop ____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	OVA
0	2'	1.5	5-7-9-9	Sand, f-vf, silt, tan, cohesive, damp. Black sand at top and bottom of sample w/ spots in middle	0
5'	7'	1.5	5-5-7-7	Sand f-m, silt, trace gravel, then sand f-c. Bright orange loose. wet trace clay in water	
10'	12'	1'	4-4-4-7	Sand, f-c, grey clay (6"), trace gravel, orange, loose, wet	
				END BORING	

G&M Form 03 6-86 Southprint 87-1718

300852

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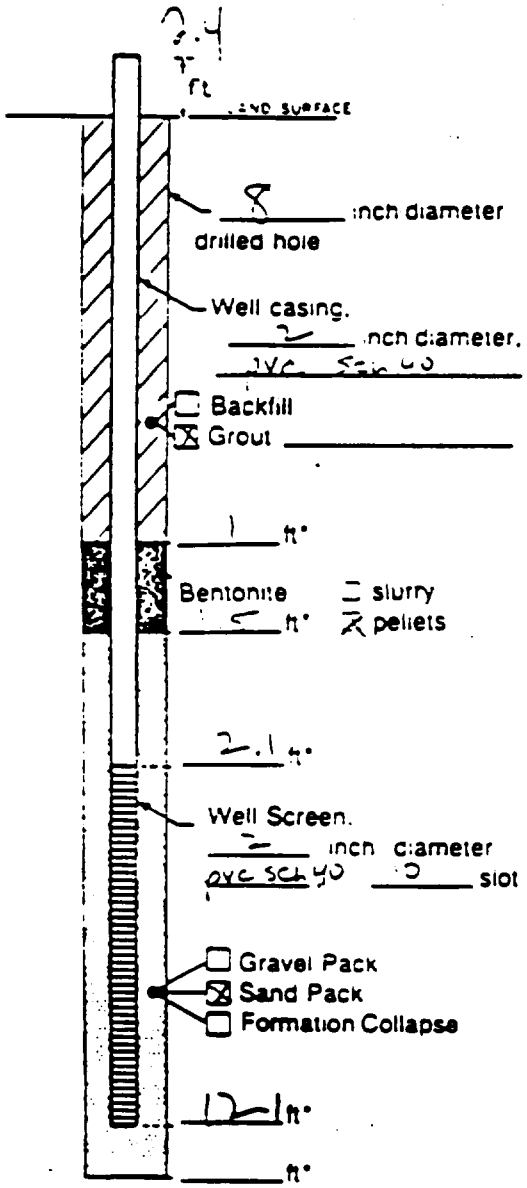
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted

*Depth Below Land Surface

Project V1342LE01 Well GM-9
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum _____ feet ☐ Surveyed
☐ Estimated
Installation Date(s) 4-4-88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid none

Development Technique(s) and Date(s)
Centrifugal pump 4-5-88

Fluid Loss During Drilling — gallon
Water Removed During Development 69 gallon
Static Depth to Water 4.37' (4-5-88) ~~feet below M.~~
Pumping Depth to Water _____ feet below M.
Pumping Duration 0.5 hours
Yield 2.3 gpm Date
Specific Capacity _____ gpm/ft
Well Purpose monitor

Remarks Took VOC samples from 3 spoons.

Prepared by G. Baker

GAM Form 05 5 87

300853

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SAMPLE/CORE LOG

Boring/Well [illegible] Project/No [illegible] Page 1 of 1

Site Location Colon Cove Drilling Started 4-6-88 7:45 Drilling Completed 5:00 pm

Total Depth Drilled 54 feet Hole Diameter 8 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0-52 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used None Drilling Method Hollow-Stem Auger

Drilling Contractor Empire Driller Boo Helper Jim

Prepared By A. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	
OVA reading out of hole	0	2	2"		Organic debris, topsoil, dark brown, loose, dry.	9ppm
	5	7	2'	2-5-15-15	wash. Sand, f, silt, clay, grey, cohesive, damp. Sand m-c orange, loose, damp	0
	10	12	1.5'	4-6-6-10	Silt, clay, grey, cohesive, damp then sand-f-light grey loose to cohesive, damp	0
	15	17	1.5'	4-6-6-8	Sand f-m, orange, cohesive, damp. Some areas of rusty color at 16.5'-17' -red	10ppm
	20	22	2'	6-9-12-12	Sand f-m, some clay pockets (red) deep orange, loose, damp	0
	25	27	1.5'	7-8-9-12	Sand-f, orange to tan, loose, damp	0
	30	32	1'	6-10-10-12	Sand-f-m, tr. gravel, tr. pebbles, orange, loose dry	
	35	37	1'	10-8-8-6	Sand m-c, sand f, orange to tan, loose, dry	
10ppm	40	42	1.5'	10-10-8-8	Sand f-m, tan, some silt, cohesive, damp.	
3ppm	45	47	2'	10-8-9-12	Sand m-c, silt, orange, cohesive, damp. Then sand f-m tan orange + black + clay deposits wet	
5-7ppm	50	52	2'	6-10-20-50	Sand f-m, orange, wet. Then sand-m, tan, wet, some silt.	
					END BORING	

Form 03 6-86 Sentrex 87-174

300854

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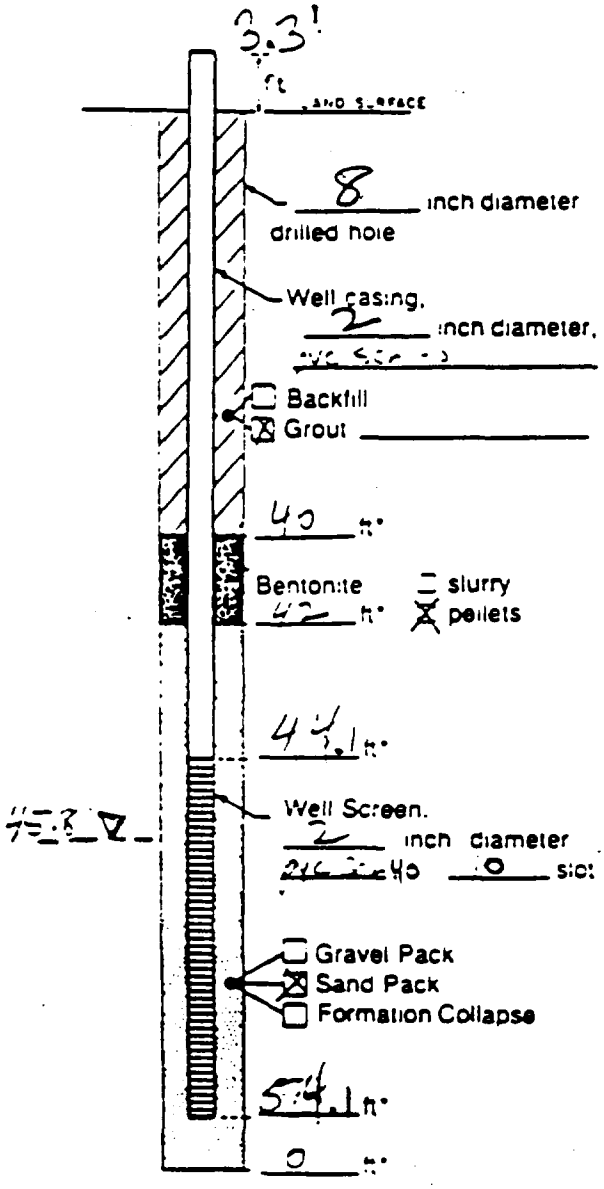
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342LI01 Well GM-
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum _____ feet ☐ Surveyed
☐ Estimated
Installation Date(s) 4-6-88 - 4-7-88
Drilling Method Hollow Stem Auger
Drilling Contractor Emaco
Drilling Fluid none

Development Technique(s) and Date(s)
[illegible] 4-14-88

Fluid Loss During Drilling —
Water Removed During Development 1
Static Depth to Water [illegible] feet bel
Pumping Depth to Water _____ feet bel
Pumping Duration 0.25 hours
Yield _____ gpm Date
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks [illegible]
4-14-88 total sounded depth = 54'
couldn't develop - too deep for pump

Prepared by

300855

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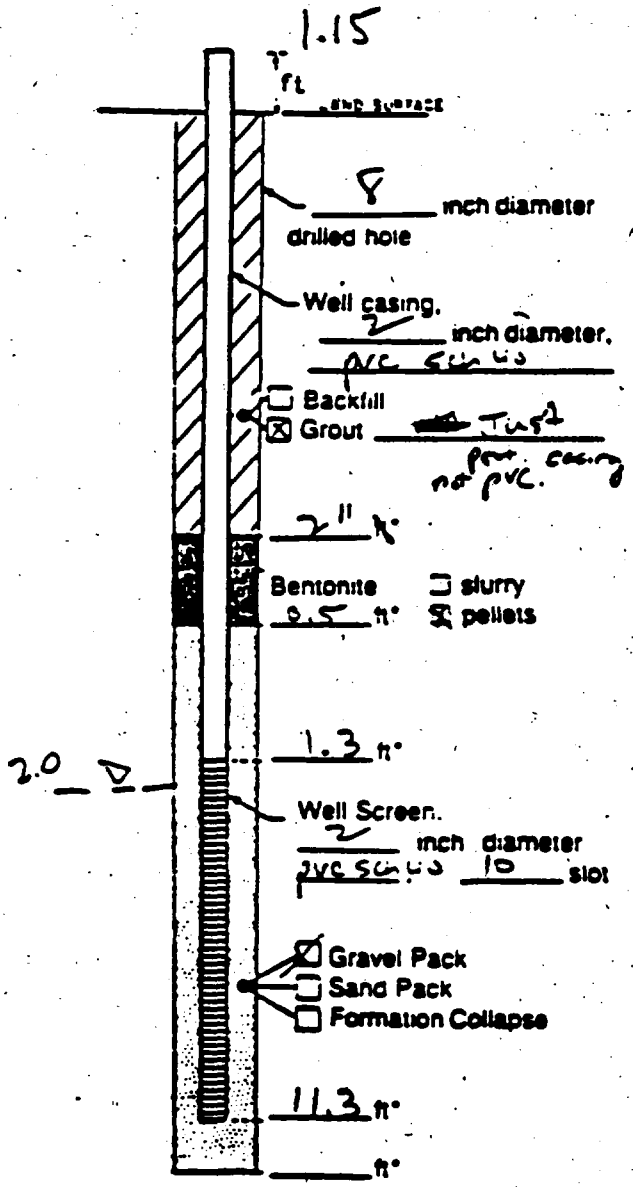
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342LI01 Well GM-14B
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-14-88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal pump

Fluid Loss During Drilling _____ gal
Water Removed During Development _____ gal
Static Depth to Water 2.6' (1:30 4-14-88) feet below
Pumping Depth to Water _____ feet below
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks Water table appears to be v. high. Screen 1'-11'. Cut pvc casing down to just the lid + a bit, so we could have some height + save $ on curb box, also so bentonite seal would not be punctured. Hard for to call. Cuttings same as GM-14A

Prepared by C. B.

Form 05 5 87

300856

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SAMPLE/CORE LOG

Boring/Well [illegible] Project/No. N1242LI01 Page 1 of 1

Site Location Glen Cove NV Drilling Started 4-13-88 10:15 Drilling Completed 2:30

Total Depth Drilled _____ feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2'x2" Sampling Interval 0 - 16 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used None Drilling Method Hollow Stem Auger

Drilling Contractor Empire Driller Bob Helper Jim

Prepared By G. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

Background OVA - 5 ppm

Headspace	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	Open Borehole
	1	3	0.5'	5-6-4-4	Silt, sand, some clay, tr. gravel, tr. pebbles, brownish-black, damp, cohesive, tr. muscovite	
50ppm	5	7	2	4-6-8-10	Sand f-vt, silt, some clay, light grey, damp, cohesive	
0	10	12	1	7-10-14-20	Sand f-m, silt, some gravel, orange, some black, loose, wet.	10 pp
0	14	16	1	5-14-7-7	Sand f-c, gravel, loose, wet. Then clay (5") both light grey.	
					END BORING	

G&M Form 80 6-86 Southern 87 1710

300857

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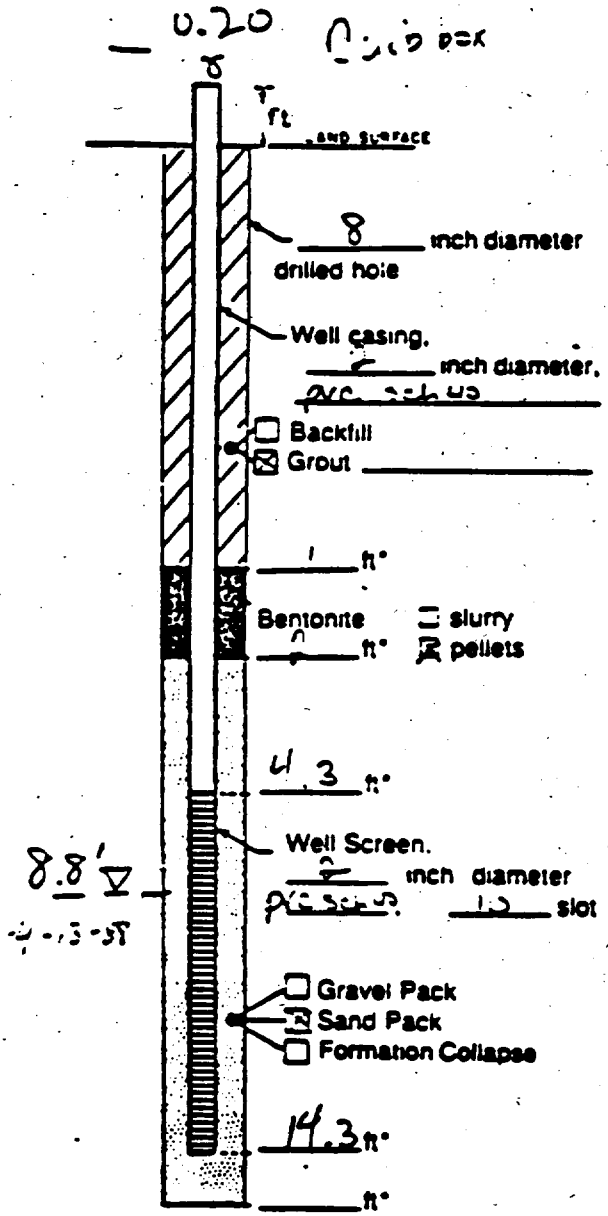
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project N13U2LI01 Well GM-15
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation
and Datum feet ☐ Surveyed
☐ Estimated
Installation Date(s) 4-13-88
Drilling Method Hollow-Stem Auger
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal pump 4-14-88

Fluid Loss During Drilling — gal
Water Removed During Development 12 gal
Static Depth to Water 8 feet below
Pumping Depth to Water feet below
Pumping Duration 0.5 hours
Yield 1.75 gpm at first Date 4-14-88
Specific Capacity gpm/ft
Well Purpose Monitor

Remarks Since GM moved up 4' in silty matrix of GM-14 I set this one 4.5 ft above water surface. This gives me 4' of play in the silty matrix

Prepared by A. Baker

300858

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SAMPLE/CORE LOG

Boring/Well GM-10 Project/No. N1342 LI01 4-15-88 Page 1 of 1

Site Location Glen Cove, NY Drilling Started 10:40 Drilling Completed 3:45

Total Depth Drilled 9 feet Hole Diameter 4 inches Type of Sample/Coring Device split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0-7 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used Water Drilling Method Wash Boring Tripod

Drilling Contractor Empire Driller Bob Helper Jim

Prepared By A. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

Background OVA 1-2 ppm

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	OVA header
0.3'	0	2'	3"	1-2-6-4	Sand, f-m, some gravel tr. silt, organic debris. Tan loose, saturated.	0
-▽-	5'	7'	0.5'	10-12-18-10	Sand f-vf, silt, tr. clay, tr. gravel + pebbles. light gray cohesive, wet	0
					— End Boring —	

GSM Form 02 6-88 Southern SP 1716

300859

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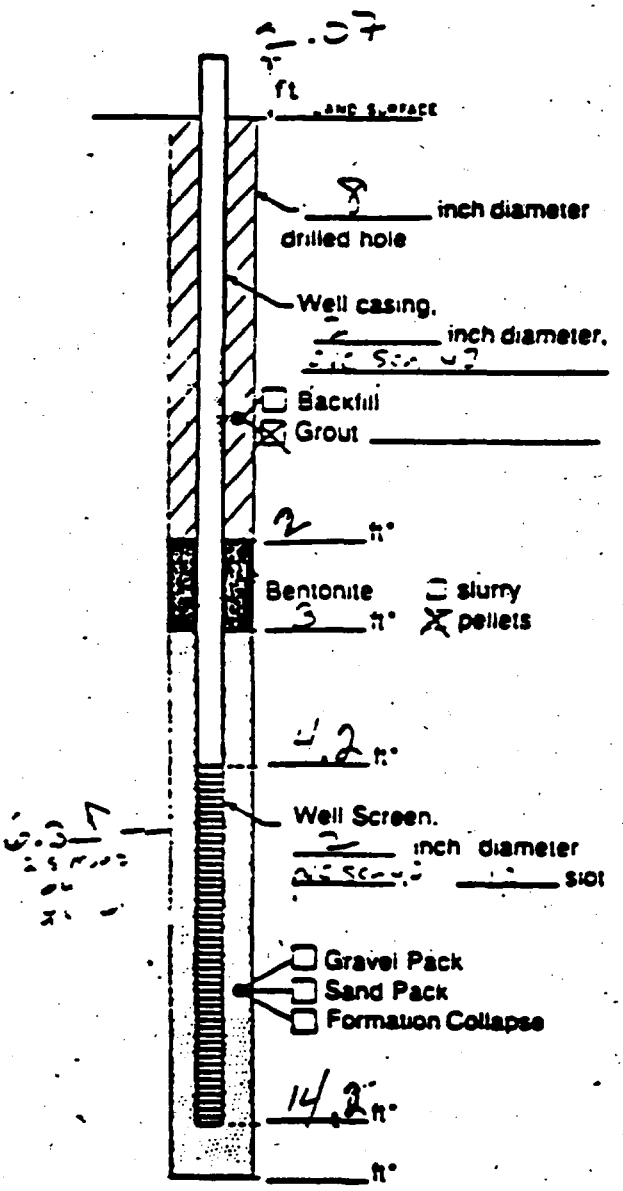
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342 LT01 Well GM-11
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-7-88 + 4-8-88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid

Development Technique(s) and Date(s)
Centrifugal pump 4-14-88

Fluid Loss During Drilling _____ gal
Water Removed During Development 25.5 gal
Static Depth to Water 6.6' (4-7-88) feet below l
Pumping Depth to Water _____ feet below l
Pumping Duration 12 mins hours
Yield 1.5 gpm Date
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks + static level 5.8' 4-14-88 before grad
Sounded depth = 14'

Prepared by

300860

1

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4-7-88

SAMPLE/CORE LOG

Boring/Well GM-11 Project No. N1342LI01 Page 1 of 1

Site Location Glen Cove NV Drilling Started 4:00 pm Drilling Completed 4:30 pm

Total Depth Drilled 14 feet Hole Diameter 8 inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2'x2" Sampling Interval 0-12 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method Hollow-Stem Auger

Drilling Contractor Empire Driller Boo Helper Jim

Prepared By A. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

* VOC samples from each spoon
OVA background 0

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	OVA
0	2	1	2-4-6-8	Sand, m-c, some gravel, tr. pebbles, orange, loose, damp	0
5	7	1	6-8-10-10	Sand m-c, tr. silt, orange, damp, loose. Then sand gravel some pebbles tan wet loose	2ppm
10	12	0.5	1-2-3-4	Water at 6.3: Sand f-m, tr. silt, tr. pebbles, tan cohesive, saturated.	
				END BORING	

300861

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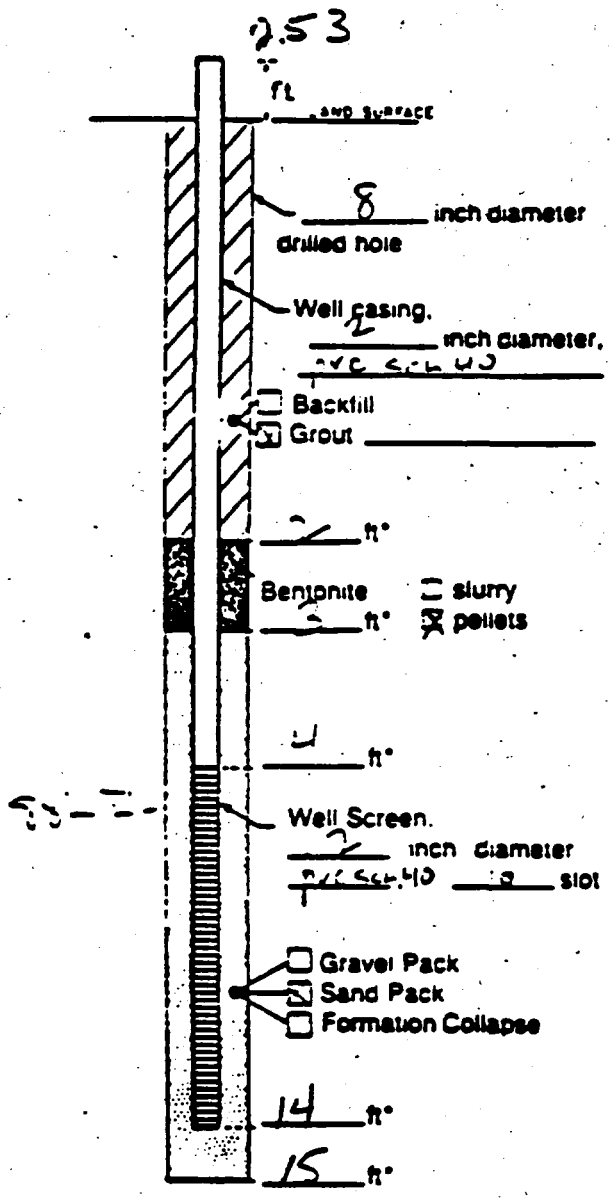
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342LI-1 Well GM-12
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-11-88
Drilling Method Hollow-stem Auger
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal pump 4-14-88

Fluid Loss During Drilling _____ gal
Water Removed During Development 5 gal
Static Depth to Water 8' (4-12-88) feet below M
Pumping Depth to Water _____ feet below M
Pumping Duration 6.50 hours MP = Top PVC
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks clay from @ 9'-17' Solid clay from 15'-17', silty clay from 10'-15' Bedded w/ Vince to set well 4-14'. 4-14-88 - well pumped dry twice depth to water 6.5'

Prepared by G. B...

300862

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SAMPLE/CORE LOG

Boring/Well GM-12 Project No. N1342 VI01 Page 1 of 1

Site Location Glen Cove Drilling Started 9 42 4-11-88 Drilling Completed 11 15

Total Depth Drilled 15 feet Hole Diameter 8 inches Type of Sample/Coring Device split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0-17 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used none Drilling Method Hollow-Stem Auger

Drilling Contractor Empire Driller Bob Helper Jim

Prepared By A. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

OVA background 1-2 ppm

OVA Headspace	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	OVA c of o boren
10ppm	0	2	1.5	2-13-23-23	Sand m-c, some gravel, some pebbles, dark brown, loose, damp. Some black pieces - old asphalt?	
20ppm	5	7	1.5	12-12-12-12	Silt, clay, sand - light grey, tr. pebbles. Cohesive damp wood chip.	100p
2ppm	10	12	1.5	18-10-15-14	12" of clay - grey, tr. silt. Top 6" of sandy silt, grey, saturated	.02
	15	17	1	11-5-7-13	clay, some wood	.03
E 8.8'						
					END BORING	

300863

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SAMPLE/CORE LOG

Boring/Well GM-13 Project/No. N1342LI01 Page 1 of 1

Site Location Cabin Cove NY Drilling Started 3:00 PM 4-11-88 Drilling Completed 4:15

Total Depth Drilled 17 feet Hole Diameter 8 inches Type of Sample/Coring Device Split Spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0 - 17 feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used none Drilling Method Hollow Stem Auger

Drilling Contractor Empire Driller BOD Helper Jim

Prepared By A Baker Hammer Weight 140 Hammer Drop 30 inches

Background OVA 3-5 ppm

Headspace OVA	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	OVA over hole
0	0	2'	1	2-3-6-8	Sand, silt, clay. Tr. pebbles. yellow/orange, m-f, Cohesive damp	0
10ppm	5	7	1	10-10-12-10	Silt, clay, light grey, tr. pebbles, sne red spot toward top of spoon. Wash orange clay too	0
10ppm	10	12'	0.5'	[illegible]	Sand, coarse, gravel, black, grey, some pebbles loose saturated	2ppm over hole
	15'	17'	1.5'	4-6-8-8	Clay, TRASH, dk grey to - pinkish brown.	3ppm

G&M Form 80 6-85 Southern 87 1718

300864

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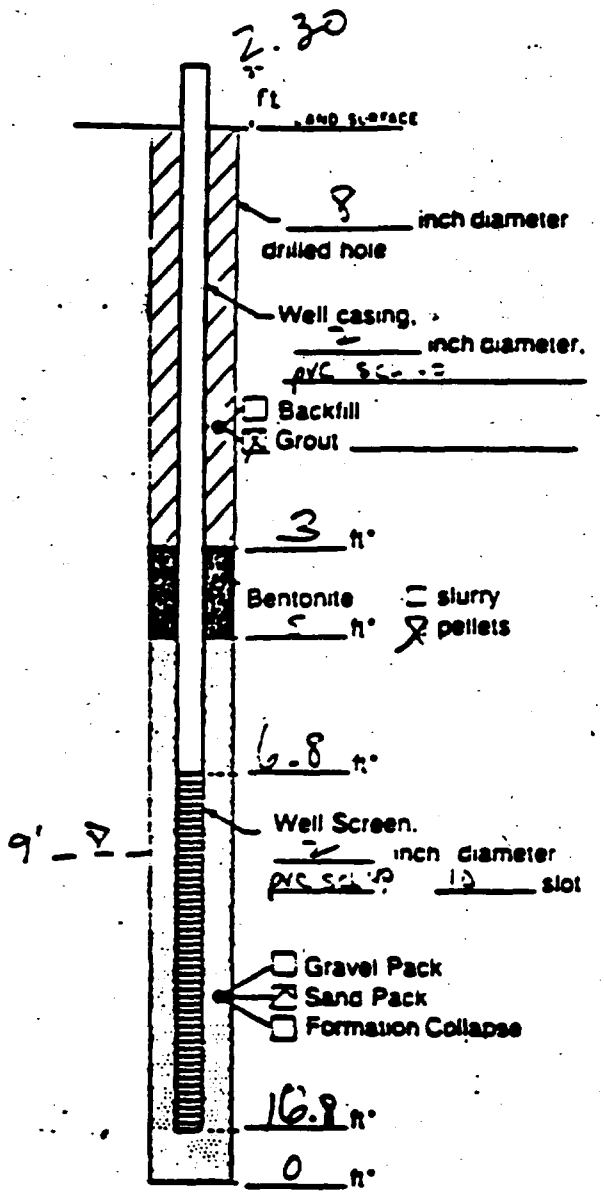
WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342L-01 Well GM-13
Town/City Glen Cove
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-11-88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid none

Development Technique(s) and Date(s)
Centrifugal pump
4-13-88

Fluid Loss During Drilling _____ gall
Water Removed During Development 22.5 gall
Static Depth to Water 11' ~~feet below~~
Pumping Depth to Water _____ feet below
Pumping Duration 45 mins ~~hours~~
Yield 0.5 gpm Date
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks during development water was grey, silty w/ settling after 10 mins

Prepared by QB

G&M Form 05 5 87

300865

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Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well [illegible] Project/No. N13[illegible] 4-12-88 Page 1 of 1

Site Location Glen Cove NY Drilling Started 12 [illegible] pm Drilling Completed 1[illegible]

Total Depth Drilled 18 feet Hole Diameter ____ inches Type of Sample/Coring Device Split spoon

Length and Diameter of Coring Device 2' x 2" Sampling Interval 0 - 17 feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used None Drilling Method Hollow - Stem Auger

Drilling Contractor Empire Driller Joe Helper Jim

Prepared By A. Baker Hammer Weight 140 lbs Hammer Drop 30 inches

OVA background 2-3 ppm

OVA Readings	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description	
1-10 ppm	0'	2'	1	[illegible]	Silty sand, pitch black w/a sheen to it and odor of petroleum trace gravel - pebbles, cohesive, damp.	.03% of hole black [illegible] 3" [illegible]
100 ppm	5'	7'	1	1-1-2-2	Silt [illegible], some clay tr. pebbles, black, oily, cohesive, odorous, wet	
100 ppm	10'	12'	2	[illegible]	Silt, clay, fine sand light gray, damp, cohesive, trace pebbles. Still oily silt at top of spoon	0 = hole
10 ppm	15'	17'	2	3-5-8-10	oily silt, black, then gray silty clay, light gray then sand - fine, silt, tr. gravel, tr. pebbles odorous, loose wet.	.05 out ho

* note - cutting from 0-10' were blue - black, w/ an oily sheen - + smelled of petroleum May have floating product in this well

* at 9' matrix formed up

G&M Form 60 6-85 Southern [illegible]

300866

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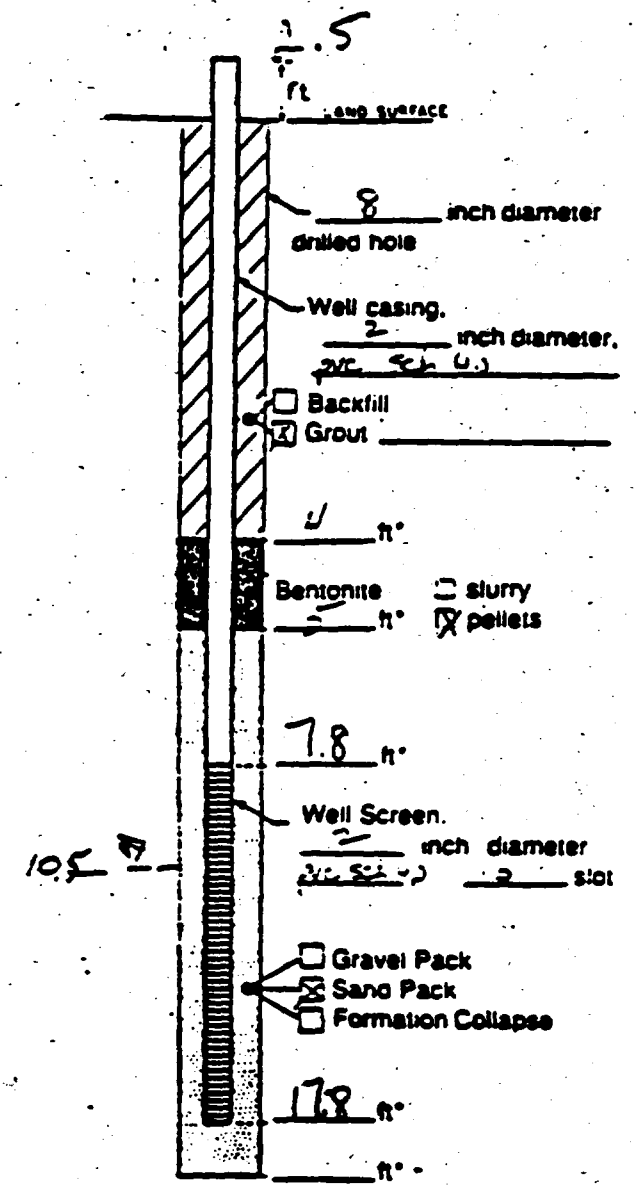
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project N1342LI01 Well GM-14A
Town/City Glen Cove NY
County Nassau State NY
Permit No.
Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated
Installation Date(s) 4-12-88
Drilling Method Hollow Stem Auger
Drilling Contractor Empire
Drilling Fluid None

Development Technique(s) and Date(s)
Centrifugal pump 4-14-88

Fluid Loss During Drilling _____ ga
Water Removed During Development 3 ga
Static Depth to Water 6.3 (4-13-88) [illegible] feet below
Pumping Depth to Water _____ feet below
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor

Remarks Green foam tushed during development Pumped dry Slow recovery water at 5.1' 4-14-88

Prepared by _____

GSM Form CS 5-87

300867