Site Management Plan

Cornell University
Chemical Disposal Site
Radiation Disposal Site

Prepared by:
Cornell University Environmental Health and Safety

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Acronym List

CDS	Chemical Disposal Site
ECOS	Cornell Office of Environmental Compliance and Sustainability
EH&S	Cornell Department of Environmental Health and Safety
FER	Final Engineering Report
FS	Feasibility Study
GWIRM	RDS Groundwater Interim Remedial Measure
GWTP	Groundwater Treatment Plant
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRM	Interim Remedial Measure
NYSDOH	New York State Department of Health
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Act
PCS	Plume Control System
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
RDS	Radiological Disposal Site
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SCS	Source Control System
SMP	Site Management Plan
SOP	Standard Operating Procedure
SPDES	State Pollutant Discharge Elimination System
USDOT	United States Department of Transportation
UV-OX	Ultraviolet Oxidation
VOC	Volatile Organic Compound

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1 Introduction

This Site Management Plan (SMP) has been prepared to summarize requirements pertaining to Cornell University's Chemical Disposal Site (CDS) and Radiation Disposal Site (RDS). The requirements are derived from the listing of these sites as Inactive Hazardous Waste Sites under New York State's Environmental Conservation Law, and the Orders on Consent that followed (Appendix A).

Currently both sites are undergoing remediation in accordance with Records of Decision (RODs) issued by NYSDEC (Appendix B). This Plan summarizes the required maintenance, monitoring, record keeping, and reporting for the sites. In addition, site background, regulatory status, management structure, citizen participation, and health & safety are described herein, and reference documents are listed which contain additional details where appropriate. The goal of this document is to serve as a single point of reference for all site requirements. This Management Plan will be a "living document," with information and procedures updated regularly. The entire plan will be reviewed annually by Cornell's CDS-RDS Operations Manager, and a summary of any changes made will be reported in the Annual Report for the sites.

The two disposal sites are distinct, yet share some common features and requirements. In the following sections, the two sites may be discussed together or separately depending on how much overlap there is between the sites for that particular subject area.

2 Site Description

2.1 Physical Site Description

Both disposal sites are located on the outskirts of Ithaca, NY on Cornell-owned property approximately 5 miles from the main campus (Figure 1). The sites are approximately ⅓ mile apart on Snyder Road, east of the Ithaca Tompkins Regional Airport (Figure 2). The facilities are surrounded by Cornell-owned land or county land associated with the airport for at least ½ mile in all directions. The land adjacent to the sites consists of open meadows, brush, wetlands, or wooded parcels. Each disposal site is surrounded by a chain-link fence that restricts access and typically provides a minimum of a 50-foot buffer to the edge of each former disposal area (although along the east side of the CDS the fence is slightly less than 50 feet from the former disposal area).

The disposal sites are located on a ridge east of Cayuga Lake, at an elevation of around 1100 feet. Surface water flows from northeast to southwest across the CDS and RDS, often following drainage pathways such as culverts and ditches. Two intermittent streams flow southwest from the vicinity of the sites and eventually combine to form the south branch of Twin Glens Creek. Twin Glens Creek flows into Cayuga Lake approximately three miles west of the sites.

The CDS and RDS are underlain by about 10 to15 feet of glacial till and 20 to 25 feet of shallow highly fractured predominantly shale bedrock that transitions to more competent bedrock at a depth of about 40 feet below ground surface (Figure 3). Groundwater is present in all three zones, with the fractured shale being the predominant flow zone. The general direction of groundwater flow is southwesterly in the till, southwesterly in the fractured shale bedrock, and westerly in the competent bedrock. The groundwater gradient across the site is approximately 2%.

The climate in the Ithaca area is typical of the temperate mid-latitudes. Average precipitation for the year is 36.7 inches, and the annual mean temperature is 46.1^{o}F.

2.2 Disposal History and Regulatory Status

2.2.1 Chemical Disposal Site

The former Chemical Disposal Site (CDS) is a one-acre site that was used for the disposal of Cornell's laboratory waste chemicals from 1962 to 1978. The CDS is located north of the Ithaca Tompkins Regional Airport on Snyder Road, in the Town of Lansing, Tompkins County, New York (Figures 1 and 2). A wide range of materials, including solvents, acids, bases, inorganic solutions, solid chemicals, and gas cylinders were disposed of at the site. Waste chemicals were managed at the site in nine disposal cells by various techniques, including burial in trenches; open burning with burial of the residue; mounding; and evaporation (Figure 4).

The CDS was listed on New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (site #755002). Class 2 indicates "significant threat to public health or environment - action required." Subsequent to this listing a Remedial Investigation - Feasibility Study (RI/FS) process was begun, leading to the eventual issuance by the NYSDEC of a Record of Decision (ROD) specifying the required remedial measures to be completed (Appendix B). The main milestones in this process are as follows:

1985: Preliminary Environmental Assessment (PEA) performed
1987-1991: Remedial Investigation (RI) performed
1989-1991: Source Area IRM installed

1990-1992: Groundwater Plume Collection and Treatment IRM installed
1992: Feasibility Study (FS) completed
1992: ROD issued
1997-1998: IRM Performance Evaluation completed
1998: Consent Order signed
1998-1999: Groundwater Plume Collection Upgrade installed
2003-2004: Source Area Final Remedy installed
2010: Site re-classified to Class 4 ("Site properly closed - requires continued management.")

The current regulatory status for the CDS is that the ROD has been fully implemented and operation, maintenance, and monitoring is being performed for the final remedial measures (see letter from NYSDEC dated January 27, 2005 - Appendix D). Groundwater treatment at the CDS is being done in accordance with requirements of a substantive SPDES permit for discharges to surface water. In addition, the groundwater treatment process for the CDS requires bulk storage of hydrogen peroxide at the Treatment Plant, for which a Chemical Bulk Storage tank registration is maintained (Appendix C).

2.2.2 Radiation Disposal Site

The former Radiation Disposal Site (RDS) is a two-acre site that was used for the disposal of low-level radioactive waste (LLRW) generated by Cornell from 1956-1978. The RDS is also located north of the Ithaca Tompkins Regional Airport on Snyder Road, in the Town of Lansing, Tompkins County, New York (Figures 1 and 2). This facility was utilized as a disposal area for animal carcasses, wastes from animal care, scintillation cocktails, and short-lived isotopes. Waste materials were disposed in trenches 6 to 12 feet deep.

The RDS was listed on New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 3 site (site #755001). Class 3 indicates "does not present a significant threat to public health or the environment - action may be deferred." Subsequent to this listing a Remedial Investigation - Feasibility Study (RI/FS) process was begun, leading to the eventual issuance by the NYSDEC of a Record of Decision (ROD) specifying required remedial measures to be completed (Appendix B). The main milestones in this process are as follows:

1994: Preliminary Site Assessment (PSA) performed
1995-1997: Remedial Investigation (RI) performed
1996: Consent Order signed
1996-1997: Source Area IRM installed
1997-1999: Supplemental RI completed
1998-1999: Baseline Human Health Risk Assessment completed
1998-1999: Feasibility Study (FS) completed
2001-2002: Groundwater Recovery IRM installed
2002: ROD issued
2003-2004: Source Area Final Remedy installed
2005: 5-year Post-Closure Monitoring began
2010: Site re-classified to Class 4 ("Site properly closed - requires continued management.")

The current regulatory status for the RDS is that the ROD has been fully implemented and operation, maintenance, and monitoring is being performed for the final remedial measures (see letter from NYSDEC dated July 28, 2005 - Appendix D). The RDS source area Post-Closure Monitoring and Maintenance period under Part 380 formally extended through the end of 2009. Since 2009, Cornell University has continued the Post-Closure Monitoring and Maintenance pending receipt of an Institutional Control permit or similar from NYSDEC.

2.3 Remedial Investigation/Feasibility Study & Interim Remedial Measures

2.3.1 Chemical Disposal Site

During remedial investigations and interim remedial measures at the CDS, fifty-seven groundwater wells, twelve piezometers, and sixteen extraction wells were used to characterize, define, monitor, and control the chemical plume and the disposal site groundwater (Figure 2). Groundwater contamination, primarily from trichloroethylene (TCE) and other volatile organic compounds (VOCs), has been detected in the two shallow zones (glacial till and fractured shale). The groundwater contamination is predominantly in the fractured shale zone, and extends approximately 2,500 feet southwest of the disposal site, extending under a portion of the Tompkins County airport property.

Between 1990 and 1992, interim remedial measures (IRMs) for the CDS were designed and constructed in accordance with New York State Department of Environmental Conservation (NYSDEC) Consent Order #T042887, as amended on March 25, 1992 (Appendix A). The IRMs included a Source Control System (SCS) for the disposal area and a Plume Collection System (PCS) for contaminated groundwater downgradient of the site. Both the SCS and the PCS required collection and treatment of contaminated groundwater; therefore, a groundwater treatment plant (GWTP) was constructed which began operating in 1990. These IRMs are further described below.

A Feasibility Study (FS) was completed in 1992 which assessed the risks associated with the CDS and evaluated potential remedial actions. Health risks above U.S. EPA guidelines were found to be associated with the groundwater only. A survey of groundwater use in the vicinity of the site found that there were no drinking water wells impacted by site contaminants. The FS recommended that remediation consist of a reinforced cap over the CDS disposal area, in combination with the Source Control IRM (soil/bentonite barrier wall around the landfill) and the Groundwater Plume Collection System IRM (groundwater collection trench and wells downgradient of the CDS).

In December 1998, the Plume Collection System was upgraded to prevent the migration of contamination beneath and past the initial groundwater collection trench. This project was referred to as the CDS Trench Upgrade. This work was performed in accordance with a new NYSDEC Consent Order (Index # A7-0289-92-10), dated August 19, 1998, that incorporates the requirements of the earlier Consent Order by reference and formalizes the previously issued Record of Decision for the site (Appendix A).

The remedial action objectives set forth in the ROD for the selected final remedy were to:

- Prevent ingestion or inhalation of contaminated soil.
- Reduce leaching of contaminants from soil into groundwater.
- Contain the migration of contaminated groundwater.

The elements of the remedy, as specified by NYSDEC in the ROD, to meet these remedial action objectives were:

1. Site access restrictions.
2. Institutional controls over future land use.
3. Environmental monitoring of the groundwater plume.
4. A long-term, multi-media cap for the landfill.
5. A containment structure for the compressed gas cylinders in the landfill.
6. Continuation and modification (as needed) of the Interim Remedial Measures, including:
    - The SCS for landfill leachate collection and treatment, and
    - The PCS for plume collection and treatment.

During 2004, Cornell completed installation of the remedial measures required at the CDS under the Order on Consent (Index #A7-0289-92-10) and the subsequent Record of Decision by installing a concrete capping system for the cylinder burial area and an engineered cap covering the landfill (see letter from NYSDEC dated January 27, 2005 - Appendix D).

Cornell University is currently operating and maintaining these remedial measures, which are designed to control and remove volatile organic compound (VOC) contamination from groundwater in and around the site, as well as to prevent further releases from the former disposal area. The groundwater treatment plant, which treats contaminated groundwater pumped by the IRMs, operates in accordance with NYSDEC *Effluent Limitations and Monitoring Requirements* #755002 (Appendix C).

2.3.2 Radiation Disposal Site

During remedial investigations for the RDS, 34 groundwater monitoring wells and 42 surface water sampling locations were established to evaluate the nature and extent of contamination (Figure 2). Remedial investigations concluded that groundwater and surface water are the affected media in the RDS investigation area. Radionuclides (strontium-90 and tritium), paradioxane, dichloroethylene (DCE), and benzene are the contaminants of concern in the groundwater, and paradioxane is the contaminant of concern in the surface water. Identification of these contaminants of concern was based on contaminant mobility, potential health effects, frequency and distribution of detections, and comparison to background levels of radionuclides. Paradioxane is the most extensive contaminant in groundwater. The groundwater contamination is predominantly in the highly fractured shale zone, with paradioxane detected in groundwater in this zone approximately 2,500 feet downgradient from the disposal area. Paradioxane has been detected in surface water primarily north of Snyder Road and on airport property, although it also has been detected occasionally further downstream.

In 1996-97, capping interim remedial measures (IRMs) were performed at the RDS that included: covering the disposal area with a high-density polyethylene cap system with gas vents; grading the area to provide surface water diversion and erosion protection systems; and installing a below-ground conveyance line to transport RDS site related water to the Groundwater Treatment Plant located near the CDS, approximately one-third mile to the southeast of the RDS. The Capping IRM eliminated volatilization, surface runoff, surface water infiltration, and direct contact as potential contaminant migration pathways.

A Feasibility Study (FS) was completed in 1999 which assessed the risks associated with the RDS and evaluated potential remedial actions. A survey of groundwater use in the vicinity of the site found that there were no drinking water wells impacted by site contaminants. Potential exposure to site contaminants was found to be associated with impacted surface water only. Risks for potentially exposed populations were less than the threshold established by the U.S. EPA, meaning that no further action was required based on human health risks. The objectives established for the RDS site remediation were:

- Minimize contaminant releases and migration
- Meet regulatory Standards, Criteria, and Guidance Values (SCGs)
- Minimize generation of radioactive or hazardous waste

The FS recommended that remediation consist of isolating the disposal area with a cap, soil/bentonite wall, and grout curtain, in combination with groundwater recovery and natural attenuation of the groundwater plume.

A Groundwater IRM to capture paradioxane was constructed in 2001, and started operating in 2002. The final Source Area Remediation specified in the ROD was completed during 2004. These remedial measures are described in more detail below.

The remedial action objectives set forth in the ROD for the selected final remedy were to:

- Eliminate, to the extent practicable, off-site migration of groundwater and surface water that do not attain NYSDEC Standards, Criteria and Guidance (SCGs) values.
- Eliminate, to the extent practicable, human and environmental exposures to radionuclides.
- Eliminate, to the extent practicable, the exceedance of applicable environmental quality standards related to releases of contaminants to the waters of the state.
- Minimize the generation of new radioactive and mixed wastes (radioactive and hazardous) during the remediation process.
- Isolate and contain, to the maximum extent practicable, the radioactive and hazardous wastes.

The elements of the remedy, as specified by NYSDEC in the ROD, to meet these remedial action objectives were:

1. A remedial design program to verify the components of the proposed design and provide the details necessary for the construction, operations and maintenance, and monitoring of the remedial program.
2. Operation and Maintenance of the existing interim cap. This included any necessary upgrades to meet current or future performance criteria.
3. Soil-bentonite slurry wall around the waste mass, keyed into the fractured shale bedrock.
4. Vertical grout curtain under the slurry wall that seals the fractured shale zone and any transitional zones down to the relatively impermeable competent bedrock.
5. Piezometers inside and outside the slurry wall to monitor its performance.
6. Operation and maintenance of the groundwater interim remedial measure (IRM) collection and treatment systems.
7. Natural attenuation and monitoring of the plume.

RDS Source Area Remedy

The RDS Source Area Remedy completed in 2004 was designed to reduce releases of contaminated groundwater from the RDS waste cell. Pursuant to the basis of design, the remedy consisted of:

- a soil-bentonite slurry wall surrounding the waste material and keyed into fractured shale bedrock;
- a vertical grout curtain to seal the fractured shale zone and transitional zone to the top of relatively impermeable bedrock (i.e. at depth below the slurry wall); and,
- a new cap consisting of a geosynthetic clay liner (GCL), a high density polyethylene (HDPE) liner, two geotextile membranes, a sand layer, a biotic barrier, a fill layer, topsoil and vegetative cover.

Groundwater Recovery System

The groundwater recovery and treatment system, initially referred to as the RDS Groundwater Interim Remedial Measure (IRM), was implemented in 2002 to prevent the continued migration of paradioxane-contaminated water south of Snyder Road via hydraulic control. The system consisted of 13 groundwater recovery wells and a UV-Oxidation treatment system, and operates to remediate the plume of groundwater containing concentrations of paradioxane (1,4-dioxane) greater than 50 ug/L. Since 2002, some of the wells have been turned off to focus the groundwater recovery on the areas with significant contaminant mass. The next phase will shift from pumping to monitored natural attenuation of the paradioxane plume.

Monitored Natural Attenuation

Monitored natural attenuation consists of:

- the process by which the concentration of paradioxane in groundwater decreases under natural conditions, and
- the process by which the decrease in the concentration and distribution of paradioxane in groundwater will be monitored over time.

More details of the monitored natural attenuation program are contained in the RDS Final Remedy Design Report [19].

3 Site Remedial Action

3.1 Management

3.1.1 External Parties

The remediation of both the CDS and RDS is being performed under the NYS Superfund program, administered by the NYSDEC. Project management is through NYSDEC's Region 7 Division of Environmental Remediation in Syracuse. Others with jurisdiction over various aspects of site remediation include the NYSDEC Bureau of Radiation (RDS Part 380 closure process), the NYSDOH (exposures to the public), the Tompkins County Health Department (primarily water supply protection), and the Tompkins County Legislature Facilities and Infrastructure Committee (via resolution to access the Ithaca Tompkins Regional Airport property)(Figure 5).

3.1.2 Cornell Organization

Cornell University, as the owner and responsible party for the CDS and RDS disposal areas, has assigned management of the sites to the Environmental Health and Safety Department (EH&S) within Cornell University Human Resources and Safety Services (Figure 6).

Cornell's endowed (private) colleges share joint responsibility for the remediation of the CDS and RDS with the contract colleges. Funding is allocated through a Hazardous Waste Reserve established by the endowed colleges and through the Contract Colleges Facilities Office for contract colleges.

3.1.3 Personnel

The operation of the CDS and RDS remediation projects involves the following Cornell University staff:

Primary Personnel

EH&S Associate Vice President (Christine Stallmann) - overall responsibility for sites
EH&S Associate Director, EHS Compliance (Patrick McNally) -
CDS/RDS Operations Management (Andrew Murphy and Brian Seward) - day-to-day management of on-site personnel and activities, budget, contractors and suppliers, data, permits, and reporting
Site Operators (Dave Emery and Nancy Snowberger) - Cornell mechanics who perform equipment maintenance and environmental monitoring/sampling
Radiation Safety Officer (David Rynders) - oversees Cornell's Radiation Safety Program
Site Safety Officer (usually either the Operations Manager or the senior Site Operator on site) - responsible for ensuring the HASP is implemented for site work

Support Personnel

Cornell University Facility Services - provide engineering and technical support as needed; provide specialists in electrical work, plumbing, carpentry, excavation, etc. as needed

Environmental Health & Safety (EH&S) - provide support regarding spills, emergency response, instrumentation, rad safety, chemical hygiene, and relevant OSHA requirements

3.1.4 Training

The GWTP Operators attended site-specific training on system safety, operations, and maintenance conducted by the equipment manufacturer (Calgon), hydrogen peroxide supplier (US Peroxide), and the system design engineer (Sovereign). This site-specific training was conducted between May 2001 (Sovereign and US Peroxide) and November 2001 (Sovereign and Calgon), prior to system turnover to Cornell University. Subsequent site-specific training will be the responsibility of the Operations Manager and may be performed by others.

Site operations require periodic shipments of hazardous waste (e.g. used bag filters and spent activated carbon). Per USDOT Hazardous Materials Regulations (49 CFR Part 172.704) and Cornell University policy, all shippers of hazardous waste must receive training. Site Operators and the Operations Manager will receive appropriate training provided by Cornell EH&S.

OSHA-mandated Health and Safety training requirements are discussed below in Section 8.4

3.2 Permits & Waste Handling

Based on the nature of site contaminants and operations, there are regulatory requirements in the following areas:

1. Discharge Requirements;
2. Waste Handling and Disposal Requirements;
3. Hazardous Material Storage Requirements; and
4. Health & Safety Requirements.

This section will be reviewed by the Operations Manager or Designee annually, or as regulations/requirements and/or operations change, to ensure that it is correct and up-to-date.

3.2.1 Discharge Requirements

3.2.1.1 Water

In order to operate, the GWTP has a substantive surface water discharge (SPDES) permit issued by NYSDEC (Appendix C). Operation of the CDS groundwater recovery system requires this permit for the discharge of treated waters from the GWTP. Discharge occurs to surface water that eventually drains to Cayuga Lake (water Index No. Ont 66-12 P296-88, Class C).

This permit allows Cornell to operate the GWTP for the treatment of CDS waters, provided the effluent limitations set forth in the substantive discharge permit are met. In order to meet the requirements of the substantive discharge permit, sampling, monitoring and reporting is performed in accordance with the permit provisions. The CDS discharge and sampling requirements are specified in SPDES permit #7-55-00l. The monitoring procedures for the GWTP are detailed in Section 4.

In summary, the key requirements of the discharge permit are as follows:

SPDES Permit

- Monitor the discharge for flow, 6 general chemistry parameters, 17 metals, and 18 organic compounds (see Table 4-2)
- Operate within the limits set for these parameters and within the design flow capacity of the treatment system
- Only site-generated wastewater may be discharged
- Any substantive changes to the treatment process must be approved by the DEC
- Report the results of discharge monitoring monthly to the NYSDEC and provide an annual summary of operational data, system effectiveness, repairs, and maintenance performed

Site discharges are also subject to a substantive Part 380 discharge permit associated with the site (Appendix C). This substantive permit authorizes discharge of radionuclides including Carbon-14, Strontium-90 and Tritium, provides annual discharge limitations and requires Cornell to sample and analyze the influent for these parameters with reporting requirements.

3.2.1.2 Air

Areas that were reviewed for potential air permitting requirements were the vents from the RDS and CDS water storage tanks (i.e., T-1 RDS Equalization Tank, T-2 UV/OX Equalization Tank and T-3 CDS-PCS Equalization Tank), and the propane heating system.

The RDS and CDS water storage tanks are exempt from registration and permitting requirements under 6 NYCRR Part 201, pursuant to 6 NYCRR Part 201-3. 1(a) and 6 NYCRR Part 201-3.3(94). Specifically, this allows for the exemption of registration and permitting of the tank vents as a "trivial activity" since the RDS and CDS waters contain "trace constituents included in raw materials or byproducts, where the constituents are less than 1 percent by weight for a regulated air pollutant, or 0.1 percent by weight for a carcinogen listed by the United States Department of Health and Human Services Seventh Annual Report on Carcinogens (1994)" (6 NYCRR Part 201-3-3(94)). Based on this, the concentrations in the RDS and CDS waters are orders of magnitude below New York State's action limit.

The GWTP propane heating system is exempt under regulation 6 NYCRR Part 201 regulations which exempt furnaces that fire propane with a maximum rated heat input less than 10 million BTU/hr. The maximum output of GWTP propane heating system is approximately 320,000 BTU/hr.

3.2.2 Waste Handling, Storage, and Disposal Requirements

As part of the Operation and Maintenance (O&M) of the GWTP, it is necessary to handle, store, and dispose of hazardous wastes. Since the CDS water is considered a listed waste (F039) under 40 CFR Part 261, material that comes in contact with the CDS waters must be handled, stored and disposed of in accordance with Resource Conservation and Recovery Act (RCRA), 40 CFR Parts 260-266 and 270-272 and 6 NYCRR Parts 370-374 and 376, unless actions are taken to remove potential contaminants from the material. Therefore, it is acceptable to decontaminate such materials as piping meters, valves, transfer pumps, personnel protective equipment, etc., that then may be disposed of as non-hazardous. Materials not decontaminated require disposal as a hazardous waste. Although RCRA regulations define these materials as hazardous waste, the concentrations of hazardous constituents are very low and the corresponding risk to human health is also very low if they are handled properly.

The following items are considered hazardous waste:

- CDS-SCS bag filters and Liquid Phase Carbon;
- CDS-PCS bag filters and Liquid Phase Carbon;
- Post UV/OX Bag Filters; and,
- Sediments in Tanks T-2 and T-3 (UV/OX Equalization Tank and CDS-PCS Equalization Tank).

RDS waters are also considered a listed waste (F039) as long as they contain detectable levels of hazardous constituents. Therefore, material that comes in contact with the RDS waters also must be handled, stored and disposed of in accordance with RCRA requirements unless it has been demonstrated that no hazardous constituents were present in the water.

Once the CDS waters are treated, they must be discharged to surface water in accordance the provisions set forth in the substantive SPDES permit #7-55-002.

Hazardous waste reporting and recordkeeping requirements are conducted in accordance with 6 NYCRR Part 372. The procedures for the handling, storage, and disposal of these materials are discussed in Section 5.

The treatment plant is operated under administrative controls that ensure no more than 1,000 kg (2,200 lbs.) of hazardous waste are generated each month, Therefore, in accordance with 6 NYCRR Parts 372 and 373 regulations, the GWTP is considered a small quantity generator (SQG).

Although not required for SQGs, an operational Contingency Plan has been prepared, to inform response personnel and protect the local community which may be affected by hazardous waste as a result of an accident or emergency caused by remedial activities, in accordance with the Orders on Consent and 6 NYCRR Parts 372 and 373. The GWTP Contingency Plan is described in Section 10.

As part of the CDS-SCS treatment process, a UV/OX system is used to treat the contaminated waters. This system utilizes two UV lamps in each reactor. These lamps contain a small amount of mercury, thereby requiring that they be handled and disposed of as universal waste once they are removed from service. These used lamps are managed with other similar material generated elsewhere on the Cornell University campus in accordance with Cornell procedures. Handling procedures are presented in Chapter 4.0 of the RAYOX Operation and Maintenance Manual (RDS-Final Engineering Report Appendix S).

Other ancillary material that requires special handling include fluorescent lamps and spent oil and filters from the air compressors. These materials are collected on central campus and disposed of with similar wastes in accordance with Cornell procedures. These procedures can be obtained by contacting either the GWTP Operations Manager or Designee.

3.2.3 Hazardous Materials Storage Requirements

As part of the GWTP operations, storage of hazardous materials is required. Hazardous materials at the GWTP include the following:

- Propane for heating;
- An 1,100-gallon double-walled tank containing 50-percent hydrogen peroxide;
- Gasoline (less than 10-gallons);
- Methanol (less than 500 ml);
- Small quantities of “over-the-counter” solvents, lubricants, adhesives, insecticides and herbicides (e.g., WD-40, PVC cement, wasp spray, weed killer, etc.).

The storage of hydrogen peroxide requires registration of the storage vessel in accordance with the NYSDEC Bulk Storage regulations for Handling and Storage of Hazardous Substances, 6NYCRR Parts 596-599. Pursuant to 6 NYCRR Parts 596 1(b)(i) this tank has been registered with New York State Department of Environmental Conservation (Hazardous Substance Bulk Storage Tank ID No. 7-000324), because it is used to store a hazardous substance (i.e., hydrogen peroxide) and is greater than 185-gallons in capacity (Appendix C).

In addition, a Spill Prevention Report has been prepared in accordance with the guidelines of the NYSDEC regulations on Handling and Storage of Hazardous Substances, 6 NYCRR 598.1(k), the Orders on Consent and 6 NYCRR Parts 372 and 373 (RDS GWIRM Final Engineering Report, Appendix V). The purpose of the Spill Prevention Report is to prevent and respond to spills, releases and accidents involving the use and handling of hydrogen peroxide at the GWTP. In addition, as described in Section 10, the plant has an operational Emergency Contingency Plan. The purpose of the Contingency Plan is to inform emergency responders and to protect the

local community which may be affected by hazardous waters, materials and waste as a result of an accident or emergency caused by remedial activities.
Pesticides used onsite are segregated from other chemicals and labeled and kept in a secured metal storage cabinet in accordance with applicable regulations.

3.3 Description of Final Measures

3.3.1 Chemical Disposal Site

3.3.1.1 Cap and Source Control System

The Source Control System (SCS) was designed to minimize the release of contaminants from the former chemical burial site. It consists of a groundwater barrier wall, a groundwater extraction system, and a capping system. The soil-bentonite groundwater barrier wall surrounding the one-acre site extends into the upper fractured shale bedrock. Pumping from four groundwater extraction wells, located inside the four corners of the enclosure, controls migration of contaminants by maintaining an inward hydraulic gradient across the groundwater barrier wall. A concrete containment structure covers an area containing for buried gas cylinders. The entire source area is covered with a multi-layer impervious capping system with soil and vegetation at the surface.

3.3.1.2 Plume Collection System

The Plume Collection System (PCS) was designed to prevent further migration of, and reduce contaminant concentrations in, the CDS groundwater plume. It consists of a groundwater collection trench and extraction wells which control the plume by pumping contaminated groundwater for treatment at the groundwater treatment plant, located adjacent to the former one-acre disposal area. Two scavenger wells (SW-1 and SW-2) are located at what once were the more highly contaminated locations within the plume. The collection trench, which is approximately 900 feet long and 8 to 14 feet deep, is located near the downgradient boundary of the plume. Three extraction points (EP- to EP-3) are located inside the trench. This portion of the Plume Collection System is known as the PCS-Shallow recovery system (PCS-Shallow).

To recover the deeper portion of the plume in groundwater from the upper portion of the bedrock (10 to 40 feet below land surface), seven extraction wells (EW-1 to EW-7) were installed in December 1998 immediately downgradient of the collection trench. Known previously as the PCS Trench Upgrade, this system is now referred to as the PCS-deep recovery system (PCS-Deep). Contaminated groundwater from the three extraction sumps in the trench and the two scavenger wells is combined and pumped to the treatment plant. Water from the seven extraction wells is combined in a second pipeline and conveyed to the treatment plant where it joins with the PCS-Shallow system water upon reaching settling tank T-3. Figure 2-1 shows the location of the PCS scavenger wells, extraction points and extraction wells.

3.3.2 Radiation Disposal Site

3.3.2.1 Source Area

The Record of Decision for the site specified a Final Remedy which included source area containment measures consisting of a grout curtain in the bedrock, a soil-bentonite wall in the soil layer, and a multi-layered capping system. Installation of these measures was completed during 2004. The grout curtain and soil-bentonite wall are intended to minimize transport of contaminants from the site via groundwater, while the cap is intended to prevent contact with the waste materials and to prevent infiltration of water into the waste.

3.3.2.2 Groundwater Recovery System

A Groundwater Recovery System to control the migration of the paradioxane plume emanating from the site was constructed as an IRM in 2001, and began operating on August 19, 2002. With the issuance of the ROD, it became part of the Final Remedy for the site.

3.3.2.3 Monitored Natural Attenuation

The final stage of remediation of the RDS groundwater plume consists of monitored natural attenuation (MNA; see Section 2.3.2). MNA consists of monitoring the natural attenuation processes within the groundwater plume, and will be performed as described in Section 4.2.2.2 below. When the objectives of the MNA stage have been achieved, remediation will be complete and the site will be managed according to the procedures for long-term monitoring (Section 4.2.2.3).

3.3.3 Groundwater Treatment Plant

The 1992 groundwater treatment system was designed to meet effluent requirements by removing a variety of VOCs and suspended metals and sediment. It was modified in December 1998 to treat flows from the new extraction wells (PCS-Deep) added to the PCS and again in 2001 to treat flows from the RDS Groundwater IRM recovery system (Figure 7). SCS groundwater is filtered, pumped through carbons to remove VOCs, and then passed through UV/Oxidation system and bag filters to remove paradioxane and suspended solids. The PCS groundwater is pumped to settling tank T-3, filtered, and finally processed by adsorption by granular activated carbon. The CDS groundwater treatment system as currently designed can process up to approximately 178 gallons per minute. Effluent from the treatment system meets New York State Class GA groundwater guidelines and is discharged to an intermittent stream in accordance with NYSDEC effluent discharge requirements (Appendix C). The stream discharges to a one-acre pond (CDS Outfall Pond), which discharges to Cayuga Lake over a three-mile course of culverts and open channel flow.

3.3.3.1 Processes

The GWTP has two primary treatment processes for site contaminants (carbon adsorption and ultraviolet oxidation), as well as two secondary processes (sediment filtration and iron filtration) (Figure 7).

CDS-PCS Treatment Process

The CDS-PCS treatment process is designed to treat waters extracted from the following areas:

- CDS-PCS Shallow System, which includes two extraction wells (SW-1 and SW-2) located in highly contaminated zones of the CDS plume and three extraction wells (EP-1 through EP-3) located within a 900 foot long collection trench, located within the airport property; and,
- CDS-PCS Deep System, which includes seven extraction wells (EW-1 through EW-7) located immediately downgradient of the collection trench, located within the airport property.

The CDS-PCS Shallow System yields water flows of approximately 0 to 89 gallons per minute (gpm) and the CDS-PCS Deep System yields water flows of approximately 0 to 28 gpm.

Once the CDS-PCS waters enter the GWTP building they are directed to the CDS-PCS equalization tank T-3. The water is then transferred via pump P-3 through a three-stage set of automated particulate bag filters and through granular activated carbon vessels before being combined with the treated CDS-SCS waters prior to discharge through GWTP Outfall 001. Routing modifications can be implemented to re-direct the CDS-PCS stream to the UV/OX system via manual valves, in the event that paradioxane treatment should become necessary. However, under normal operating conditions, the CDS-PCS flow stream will not be treated through the UV/OX system.

CDS-SCS Treatment Process

The CDS-SCS water is pumped into the GWTP building from four leachate collection wells (referred to as Northwest, Northeast, Southeast and Southwest) installed within the CDS barrier wall perimeter. Since the CDS-SCS stream contains both VOCs and paradioxane, it is treated by both activated carbon and UV-Oxidation. After passing through an iron removal unit and a two-stage set of particulate bag filters, it is treated by a series of two granular activated carbon vessels. Then it flows into the UV-Oxidation Storage Tank T-2 where it is combined with the RDS waters prior to treatment by UV-Oxidation.

The CDS-SCS recovery system yields water flows from 0 to 5 gpm.

In the event that the UV/OX system is off-line, the CDS-SCS water may be redirected, through valve adjustments, to the CDS-PCS equalization tank T-3, and combined with the CDS-PCS water. The redirected flow would be treated through the normal CDS-PCS treatment process prior to discharge.
Approval from the GWTP Operations Manager is required to operate in this mode.

RDS Groundwater Treatment Process

The RDS recovery system includes 13 recovery wells (RW-101 through RW-113) downgradient of the RDS along Snyder Road which were designed to capture the bulk of the plume of paradioxane greater than 50 ppb. Water from the recovery system enters the GWTP building and is directed to the RDS Equalization Tank T-l. The water is then pumped by transfer pump P-1 through a three-stage set of automated particulate bag filters and into the UV-Oxidation Storage Tank T-2 where it is combined with the CDS-SCS waters. The water from the UV Oxidation Storage Tank T-2 is pumped by transfer pump P-2 through the UV/OX system and through a dual stage set of manual particulate bag filters, then combined with the treated CDS-PCS waters prior to discharge through GWTP Outfall 001.

The skid mounted UV/OX system was designed to treat a maximum concentration of paradioxane of 8,000 ppb at an influent flow rate of 90 gpm to below 10 ppb. Actual influent concentrations have typically been less than 200 ppb and actual influent flow rates have typically been less than 10 gpm. In addition, the system has the capability to hydraulically process the combined RDS and CDS process of up to 200 gallons per minute.

3.4 Future Status - Closure Process

3.4.1 Chemical Disposal Site

Since the ROD has been fully implemented at the CDS, there is no specific closure process identified at this point. The final remedy requires containment of the CDS groundwater plume until groundwater standards are met in that portion of the site. The CDS source area containment system as currently constructed requires pumping from the interior of the barrier wall system to control potential leakage, and this is expected to continue indefinitely. Cornell is evaluating options for enhanced bioremediation of the CDS plume and additional containment measures for the CDS source area that could allow a transition to passive management measures in the future. These options will be discussed with the NYSDEC in future correspondence.

3.4.2 Radiation Disposal Site Part 380 Closure

In accordance with Cornell's Order on Consent (Index No. A7-0289-92-l0), a Closure Plan for the Radiation Disposal Site (RDS) was prepared to meet applicable closure requirements under 6 NYCRR Part 380 et seq (RDS Final Remedy Remedial Design Report). As an inactive disposal

site that precedes the NYSDEC siting, operations, closure, and post-closure regulations, many portions of these Part 380 et seq. regulations do not apply. In order to develop a closure plan acceptable to NYSDEC, Cornell communicated with Barbara Youngberg and Tim Rice of the NYSDEC Bureau of Radiation to define the applicable requirements.

Disposal of low level radioactive materials at the RDS was originally permitted in 1956 under a non- specific exemption license from the Atomic Energy Commission. Subsequently (in 1963), the New York State Department of Health became the regulatory authority for such facilities. Pursuant to the enactment of Part 380, the site became regulated by the New York State Department of Environmental Conservation under Title 6 of the New York Code of Rules and Regulations (6 NYCRR), Part 380 series (for the management of radioactive materials). After site oversight and regulation passed to the NYSDEC in 1975, the NYSDEC issued a permit for site operations under Part 380 regulations (Letter from NYSDEC, February 18, 1975. Waste disposal at the site ceased in 1978.

As confirmed by letter with the NYSDOH in December 2001, disposed radioactive materials at the RDS are not covered under Cornell's current radioactive materials license with the NYSDOH. Additionally, NYSDOH and NYSDEC concur that RDS remediations fall under the jurisdiction of NYSDEC under the Consent Order.

The confirmed closure process for the RDS is as follows:

CLOSURE →POST CLOSURE MONITORING & MAINTENANCE→ INSTITUTIONAL CONTROL→PERMIT TERMINATION

These four elements of the closure process are defined as follows:

1. Closure: Closure of the RDS was granted by the NYSDEC based on the implementation of the Source Area Remedy component of the Final Remedy (letter dated July 28, 2005 - Appendix D).

2. Post-Closure Monitoring: As part of the FER for the RDS Source Area Remedy, Cornell submitted a 5-Year Post-Closure Monitoring and Maintenance Plan in accordance with Part 383-9.7. Cornell began implementation of the Post-Closure Monitoring and Maintenance Plan following the submission of the FER in December 2004. The post-closure monitoring period formally concluded in 2009. Cornell has continued with post-closure monitoring pending development of an Institutional Control permit.

3. Institutional Control: No later than 180 days before the end of the Post-Closure maintenance and monitoring period, Cornell will prepare and submit an Institutional Control Plan and application to modify the permit from "Closure" to "Institutional Control" in accordance with the requirements set forth in Part 3 83-5. If the RDS meets the requirements set forth in Part 383-5.3, where applicable, the permit will be modified to authorize institutional control.

4. Permit Termination: At the conclusion of the institutional control period, the duration of which cannot be defined at this time, Cornell will submit an application to terminate the permit, in accordance with Part 383-6.

4 Sampling and Analysis

4.1 Site Elements

This monitoring plan for the CDS/RDS covers all environmental monitoring activities for both sites. These activities consist of groundwater sampling, surface water sampling, groundwater level measurements and treatment plant water sampling. Standard Operating Procedures (SOPs) for each of the monitoring activities are included in Appendix E. Monitoring activities are organized according to the following site elements:

CDS: the source control system, the plume control system, the groundwater plume, and long-term monitoring.

RDS: the source area remedy, the plume control system, the groundwater plume, and long-term monitoring.

Groundwater Treatment Plant: treatment processes.

Monitoring for each element serves a specific purpose and will cease when that aspect of site remediation has achieved its objectives. The final phase of site monitoring is long-term monitoring, which will continue indefinitely. The monitoring for each of the site elements is described in detail below.

4.2 Monitoring Plan

4.2.1 Chemical Disposal Site

4.2.1.1 Source Area Containment

The objectives of the source area containment monitoring at the CDS are to ensure that the SCS continues to function properly and to track the attenuation of the remnant portion of the groundwater plume that is located near the disposal area (i.e. north of Snyder Road). The monitoring network in place to accomplish this consists of “shallow” groundwater monitoring wells sampling the top soil layer (well numbers ending in "S") and “deep” wells sampling the upper, fractured portion of the bedrock (well numbers ending in "D"). Wells sampling the deeper bedrock will not be monitored, since historical data have determined that the deeper bedrock has not been significantly impacted by site contaminants.

The source area containment monitoring to be performed is specified in table 4-1. This monitoring will continue until target VOC concentrations in monitoring wells MW-15D and MW-19D remain below groundwater standards for 2 years. Subsequently, source area monitoring will be performed as described in Section 4.2.1.4 (Long-term Monitoring).

Measurement of the water level differentials will alert the site operators to problems with the operation of the SCS pumps so that repair or adjustment of the pumps can be performed to maintain an inward gradient across the barrier wall. Should lack of an inward gradient be detected along any side of the site, immediate steps will be taken to identify and correct the source of the problem.

Groundwater samples from wells MW-8S, MW-8D, MW-9S, MW-9D, MW-12S, and MW-12D will allow for detection of leaks through the vertical barrier system. The results will be compared to previous events to determine if there is a significant increase in the concentration of one or more target analytes. A significant increase is defined as a concentration above groundwater standards that is at least twice the maximum for the previous 5 sampling events. Such a detection will

trigger follow-up sampling at that location to confirm the result. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

The groundwater samples from wells MW-15D and MW-19D will be used to evaluate degradation of the remnant portion of the plume adjacent to the disposal area. Should an increasing trend in target VOC concentrations be observed, potential responses will be evaluated by Cornell and discussed with the NYSDEC.

4.2.1.2 Groundwater Plume Control System

The objectives of the plume control system monitoring at the CDS are to ensure that the PCS continues to function properly and to track the attenuation of the groundwater plume south of Snyder Road. The monitoring network in place to accomplish this consists of the extraction points themselves, groundwater monitoring wells and piezometers sampling the upper, fractured portion of the bedrock (well numbers ending in "D" or starting with "P"), and a surface water sampling location in a ditch downgradient of the PCS. Wells sampling the soil layer are not present in this portion of the site, and the deeper bedrock will not be monitored, since historical data have determined that these layers have not been significantly impacted by site contaminants south of Snyder Road.

The plume control system monitoring to be performed is specified in table 4-1. This monitoring will continue until target VOC concentrations along the PCS trench/extraction well alignment remain below groundwater standards for 2 years. Subsequently, plume monitoring will be performed as described in Section 4.2.1.3 (Groundwater Plume).

Measurement of the water levels will alert the site operators to problems with the operation of the PCS pumps so that repair or adjustment of the pumps can be performed to maintain groundwater capture along the leading edge of the groundwater plume. Should insufficient drawdown be detected in any of the pumping wells, immediate steps will be taken to identify and correct the source of the problem.

Collection of groundwater samples from wells MW-22D, MW-27D, MW-30D, MW-33D, MW-35D, and P-4 and a surface water sample from SW-41 will allow for tracking of contaminant concentrations upgradient and downgradient of the collection system to verify that capture/control of the plume is occurring. Collection of a groundwater sample from well MW-32D will be used to verify that the leading edge of the plume has not advanced downgradient of the airport runway. The results will be compared to previous events to determine if there is a significant increase in the concentration of one or more target analytes downgradient of the recovery system. A significant increase is defined as a concentration above groundwater standards that is at least twice the maximum for the previous 5 sampling events. Such a detection will trigger follow-up sampling at that location to confirm the result. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

4.2.1.3 Groundwater Plume

The monitoring described in this section will commence upon termination of operation of the plume control system. The groundwater plume refers to the area of off-site groundwater contamination that is above groundwater standards. The objective of the groundwater plume monitoring program at the CDS is to track the location and concentration of the plume. The monitoring network for the groundwater plume area consists of groundwater monitoring wells sampling the upper, fractured portion of the bedrock (well numbers ending in "D"). Wells sampling the soil layer are not present in this portion of the site, and the deeper bedrock will not be monitored, since historical data have determined that these layers have not been significantly impacted by site contaminants south of Snyder Road.

The groundwater plume monitoring to be performed is specified in table 4-1. This monitoring will continue until contaminant concentrations at all monitoring points within the plume have been reduced below applicable standards and remain below them for two years.

Measurement of the groundwater elevations will allow for continued verification of the direction of groundwater flow and the groundwater gradient across the plume area. Significant changes in the groundwater flow direction or gradient will trigger a review of sampling locations and frequency to ensure that sufficient data are collected to track the location of the plume.

Groundwater samples will be used to track the center of the plume (MW-30D), the leading edge of the plume (MW-33D), and the area immediately downgradient of the plume (MW-32D). Should concentrations of target VOCs show a significant increase at the leading edge of the plume, or be detected above groundwater standards downgradient of the plume, follow-up sampling will be performed to confirm the result. If the result is confirmed, potential responses will be evaluated by Cornell and discussed with the NYSDEC.

4.2.1.4 Long-term Monitoring

Long-term monitoring is defined as the environmental monitoring that is expected to continue indefinitely after the current remediation efforts have run their course and the site has reached a stable "steady state" condition. For the CDS plume, that will occur when the groundwater has been remediated to below groundwater cleanup standards. The CDS Source Control System, including the treatment plant, will remain in operation to ensure continued containment of the source area waste materials. This is discussed in Section 4.2.3.

The objectives of the long-term monitoring program at the CDS are to ensure that 1) the SCS continues to function properly, and that 2) groundwater contamination in excess of regulatory standards is not migrating off-site. The monitoring network for long-term monitoring consists of groundwater monitoring wells sampling the soil layer (well numbers ending in "S") and wells sampling the upper, fractured portion of the bedrock (well numbers ending in "D"). Wells sampling the deeper bedrock will not be monitored, since historical data have determined that the deeper bedrock has not been significantly impacted by site contaminants. The long-term monitoring to be performed is specified in table 4-1.

Measurement of the water level differentials will alert the site operators to problems with the operation of the SCS pumps so that repair or adjustment of the pumps can be performed to maintain an inward gradient across the barrier wall. Should lack of an inward gradient be detected along any side of the site, immediate steps will be taken to identify and correct the source of the problem.

The composite groundwater sample from wells MW-8D, MW-9D, and MW-12D will allow for detection of leaks through the vertical barrier system. The results will be compared to previous events to determine if there is a significant increase in the concentration of one or more target analytes. A significant increase is defined as a concentration above groundwater standards that is at least twice the maximum for the previous 5 sampling events. Such a detection will trigger follow-up sampling of each of the three individual wells to confirm the result and identify the area where the potential leak is occurring. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

The groundwater sample from well MW-19D will be used to demonstrate compliance with groundwater standards at the downgradient site boundary. Should concentrations of target VOCs be detected above groundwater standards, follow-up sampling will be performed to confirm the result. If the result is confirmed, potential responses will be evaluated by Cornell and discussed with the NYSDEC.

4.2.2 Radiation Disposal Site

4.2.2.1 Source Area Containment

The objective of the source area containment system monitoring at the RDS is to ensure that the containment system continues to function properly. The monitoring specified in this section will continue until paradioxane concentrations in monitoring wells RDS-1WS, RDS-2WS, and RDS-3WS remain below groundwater standards for 1 year. Subsequently, source area monitoring will be performed as described in Section 4.2.2.3 (Long-term Monitoring). The source area containment system monitoring to be performed is specified in table 4-1.

Measurement of the water levels inside and outside the barrier system will allow an assessment of the degree to which the barrier system is maintaining hydraulic isolation of the source area from the surrounding groundwater. Should it be determined that there is insufficient hydraulic isolation of the RDS source area, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC (see RDS Final Remedy Remedial Design Report).

Analysis of paradioxane, carbon-14, tritium, and strontium concentrations in groundwater samples from wells RDS-1WS, RDS-2WS, RDS-3WS, RDS-4WS, and RDS-6WS will be used to track degradation of the remnant portion of the plume adjacent to the disposal area as well as to detect leaks through the vertical barrier system. Should an increasing trend in target analyte concentrations be observed, potential responses will be evaluated by Cornell and discussed with the NYSDEC (see RDS Final Remedy Remedial Design Report).

The groundwater sample from well RDS-2BRK will be used to verify that the barrier system is not allowing releases of contaminants from the source area into the deeper bedrock. The results will be compared to previous events to determine if there is a significant increase in the concentration of paradioxane. A significant increase is defined as a concentration above 50 ug/L that is at least twice the maximum for the previous 5 sampling events. Such a detection will trigger follow-up sampling to confirm the result. If the result is confirmed, potential responses will be evaluated by Cornell and discussed with the NYSDEC.

4.2.2.2 Groundwater Recovery System

The objectives of the plume control system monitoring at the RDS are to ensure that the Groundwater Recovery System (GRS) continues to function properly and to track the attenuation of the groundwater plume south of Snyder Road. The monitoring network in place to accomplish this consists of the extraction points themselves, groundwater monitoring wells and piezometers sampling the upper, fractured portion of the bedrock (well numbers ending in "WS") or the lower till and upper bedrock (well numbers ending in “X”), and surface water sampling locations. Wells sampling the upper soil layer are not present in this portion of the site, and the deeper bedrock will not be monitored, since historical data have determined that these layers have not been significantly impacted by site contaminants south of Snyder Road.

The plume control system monitoring to be performed is specified in table 4-1. This monitoring will continue until paradioxane concentrations on the airport property south of Snyder Road remain below the 50 ppb cleanup objective for 2 years. Subsequently, plume monitoring will be performed as described in Section 4.2.2.3 (Groundwater Plume).

Measurement of the water levels will alert the site operators to problems with the operation of the GRS pumps so that repair or adjustment of the pumps can be performed to maintain groundwater capture along Snyder Road. Should insufficient drawdown be detected in any of the pumping wells, immediate steps will be taken to identify and correct the source of the problem.

Collection of groundwater samples from wells RDS-19X, RDS-25X, RDS-10WS, RDS-11WS, and RDS-13WS and a surface water sample from SW-37 and SW-7 will allow for tracking of

contaminant concentrations upgradient and downgradient of the collection system to verify that capture/control of the plume is occurring. Locations and rates of groundwater extraction may be altered to optimize system efficiency while meeting the remedial objectives. If the existing recovery system should fail to provide consistent compliance with these objectives, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

4.2.2.3 Groundwater Plume (Monitored Natural Attenuation)

The groundwater plume refers to the area of groundwater contamination, not immediately adjacent to the RDS disposal area, which contains or recently contained contaminant concentrations above groundwater standards. The objective of the groundwater plume monitoring program at the RDS is to track the attenuation of the 1,4-dioxane groundwater plume. The monitoring specified in this section will continue until 1,4-dioxane concentrations in the specified monitoring wells remain below 50 ug/L for 2 years. Subsequently, plume monitoring will be performed as described in Section 4.2.2.3 (Long-term Monitoring). The groundwater plume monitoring to be performed is specified in table 4-1.

Collection of groundwater samples from wells RDS-11WS and RDS-13WS will allow for tracking of 1,4-dioxane concentrations on the Tompkins County Airport property, and samples from wells RDS-9WS, RDS-10WS, and RDS-12WS will allow for tracking of 1,4-dioxane concentrations on Cornell property upgradient of the property boundary.

Should concentrations of 1,4-dioxane show a significant increase in these wells in excess of groundwater standards, follow-up sampling will be performed to confirm the result. If the result is confirmed, potential responses will be evaluated by Cornell and discussed with the NYSDEC.

4.2.2.4 Long-term Monitoring

Long-term monitoring is defined as the environmental monitoring that is expected to continue indefinitely after the current remediation efforts have run their course and the site has reached a stable "steady state" condition. For the RDS, that will occur when the groundwater plume has been remediated to below groundwater cleanup objectives.

The objectives of the long-term monitoring program at the RDS are to ensure that 1) the Source Area Containment System continues to function properly, and that 2) groundwater contamination in excess of cleanup objectives is not migrating off-site. The long-term monitoring to be performed is specified in table 4-1.

Measurement of the water levels inside and outside the barrier system will allow an assessment of the degree to which the barrier system is maintaining hydraulic isolation of the source area from the surrounding groundwater. Should it be determined that there is insufficient hydraulic isolation of the RDS source area, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC (see RDS Final Remedy Remedial Design Report).

The composite groundwater sample from wells RDS-1WS, RDS-2WS, and RDS-3WS will allow for detection of leaks through the vertical barrier system. The results will be compared to previous events to determine if there is a significant increase in the paradioxane concentration. A significant increase is defined as a concentration above 50 ug/L that is at least twice the maximum for the previous 5 sampling events. Such a detection will trigger follow-up sampling of each of the three individual wells to confirm the result and identify the area where the potential leak is occurring. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

The groundwater samples from wells RDS-9WS, RDS-10WS, and RDS-12WS will be used to demonstrate compliance with groundwater standards at the downgradient site boundary. Should

concentrations of paradioxane be detected above cleanup objectives, follow-up sampling will be performed to confirm the result. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

4.2.3 Treatment Plant Monitoring

The objectives of the treatment plant monitoring are to monitor compliance with the conditions of both the substantive SPDES permit for water discharges and the substantive Part 380 discharge permit and to gather the data necessary for effective management of the treatment processes. Monitoring to accomplish this consists of water samples collected from various locations in the treatment plant.

The treatment plant monitoring to be performed is specified in table 4-2. Monitoring not explicitly required for permit compliance may be modified at the discretion of Cornell's CDS-RDS Operations Manager, in accordance with operational objectives. This monitoring will continue for the duration of treatment plant operations.

Sampling of the treatment plant effluent will allow for assessment of compliance with the conditions of the substantive discharge permits. Should an exceedance of the substantive permit limits occur, follow-up sampling and analysis will be conducted to confirm the result. If the result is confirmed, potential corrective actions will be evaluated by Cornell and discussed with the NYSDEC.

Sampling of the influent streams will allow verification that the appropriate type and capacity of processes are in place to treat the contaminants that are entering the plant. Should significant increases in contaminant concentrations or new types of contaminants be detected, follow-up sampling and analysis will be conducted to confirm the results. If the results are confirmed, Cornell will assess the ability of the existing treatment processes to treat these contaminants. Should changes to the treatment processes be required, Cornell will evaluate options and discuss them with the NYSDEC.

A bag filter management plan for bag filters used in the RDS groundwater treatment process was developed as part of the substantive Part 380 discharge permit. Sampling and analysis of RDS bag filters for waste characterization purposes is conducted if RDS influent trigger concentrations are exceeded. See section 5.2.2 for further discussion of bag filter disposal.

4.3 Analytical Program

All required laboratory analyses will be performed using laboratories approved by the NYS Environmental Laboratory Approval Program (ELAP). As appropriate, either EPA or DOH approved analytical methods will be employed. Cornell will employ an independent data validator to review approximately 25% of the laboratory results.

For samples not required under the monitoring plan, other service providers may be used (e.g. internal Cornell labs), and independent validation will not be performed.

4.4 Records

During sampling activities, field data will be recorded on Field Data Sheets (Appendix F). Chain-of-Custody (COC) forms will be utilized for transporting samples to the laboratory. Electronic copies of the laboratory data reports (including COCs) and sample collection Field Data Sheets will be kept on file for a minimum of 3 years. Cornell uses a database as the primary means of storing and managing site monitoring data. The database will be reviewed annually by the

Operations Manager for accuracy and completeness, particularly regarding data from the most recent year.

4.5 Reporting

Monitoring results are reported as follows:

- Substantive SPDES Permit monitoring - monthly DMR reports are sent to the NYSDEC Region 7 office, and an annual review and summary is presented in the Annual Report submitted to the NYSDEC Division of Environmental Remediation.
- Substantive Part 380 discharge permit monitoring – quarterly status reports are submitted to the NYSDEC Albany Radiological Sites Section and the NYSDEC Region 7 office, and an annual review and summary is presented in the Annual Report submitted to the NYSDEC Division of Environmental Remediation.
- Groundwater, surface water and treatment plant monitoring - results are presented, summarized, and discussed in the Annual Report submitted to the NYSDEC Division of Environmental Remediation.

Significant anomalies detected during site monitoring will be reported to the appropriate NYSDEC office as soon as data are available and confirmed.

5 Operation and Maintenance

5.1 Maintenance Activities

5.1.1 Categories of Maintenance Requirements

Operation and Maintenance (O&M) activities at the CDS and RDS sites fall into three categories:

- Procedures specified as part of DEC-approved reports or plans;
- Cornell University standard procedures; and
- Best practices employed in the interest of effective and efficient operations.

This Management Plan primarily focuses on those procedures contained within approved reports and plans submitted to the regulatory community (identified in Section 5.1.2). Written procedures outlining these required maintenance activities are provided in Appendix E. Cornell standard procedures and site-specific best practices are presented as a general overview.

5.1.2 Approved Reports and Plans

Maintenance procedures are derived from various reports and plans submitted during different phases of construction of the remedial measures. The main reference documents are:

- Treatment Plant O&M Manual (undated)
- CDS Plume Collection System O&M Instructions (February 1992)
- CDS Performance Monitoring Manual (updated April 1993)
- CDS Plume Collection System Trench Upgrade Final Engineering Report (May 1999)
- RDS Groundwater IRM Final Engineering Report (February 2002)
- Treatment Plant Spill Prevention Report
- RDS Final Remedy Project Final Report
- CDS Cap & Cover O&M Manual (October 2004)

Instructions on the normal operation of the treatment system (controls, settings, operating modes, and alarms) are contained in the RDS Groundwater IRM Final Engineering Report O&M Manual. Maintenance activities outlined in that document have been incorporated into the written procedures included as Appendix E. Detailed operating instructions included in that report have not been duplicated. Refer to the source document for detailed operating guidelines and product data.

5.1.3 Management

Operation and maintenance activities at the CDS-RDS are managed by the Operations Manager in Cornell University's EH&S Department. The Operations Manager is responsible for understanding the O&M requirements and scheduling required work utilizing either Cornell University personnel or contractors. O&M requirements may change as a result of changes to the containment or treatment processes, changing site conditions, modifications to equipment, or other factors. The Operations Manager will track all such changes and ensure that the appropriate O&M procedures are in place. The Operations Manager will have the discretion to change O&M procedures to optimize site operations as long as such changes do not jeopardize effective containment and treatment as required by the ROD. Any major changes to O&M procedures will be reflected in this Site Management Plan.

5.1.4 Cornell University Maintenance Personnel

Maintenance activities at the site are performed primarily by Cornell mechanics. A primary site Operator and a backup have been designated. Both the Operator and the backup will receive all required training, as described in Section 8. Cornell has shift mechanics and emergency response personnel who are available at all times to respond to treatment plant alarms.

Certain maintenance activities may be performed by the qualified Cornell personnel (eg, EH&S specialists, equipment operators, electricians, etc.). Qualified contract personnel may be utilized as well at the discretion of the Operations Manager.

5.1.5 Schedule of Primary Maintenance Activities

The below list outlines the primary systems and components that require regularly scheduled maintenance at the RDS, CDS and GWTP. Written procedures have been developed for those activities which require specific instruction according to manufacturer guidelines, regulatory agreements, or owner experience. Those activities without specific written guidance include daily inspection activities, best management practices, activities performed by external parties with specialized training, and those maintenance activities which commonly occur within any similar facility.

Task	**Frequency**	**Procedure ID**
Influent flow readings	Daily*	N/A
Alarm and status	Daily*	N/A
Peroxide tank	Daily*	N/A
Bag filter pressure	Daily*	N/A
UV-Ox status	Daily*	N/A
Plant security	Daily*	N/A
Compressor/air dryer	Daily*	N/A
SCS differentials	Weekly	N/A
Hazardous waste storage area	Weekly	N/A
Water storage tank level	Weekly	N/A
Monitor Propane level	Weekly	N/A
Monitoring instrument field calibration	Monthly	N/A
Change sediment filters	As Needed	N/A
Change carbon vessels	As Needed	N/A
Pumps	Monthly	SP-001
Air Delivery System	Monthly	SP-002
Coalescers/Dryers/Filters/air tank blowoff filtration unit (Zeks)	Monthly	SP-003
UV-OX Chamber	Monthly	SP-004
Tank level sensors	Monthly	N/A
UTV maintenance	As needed	N/A
Radiological survey	Monthly	N/A
Pneumatic Submersible Pumps, Manholes	Monthly	SP-019
Inspect RDS source area	Quarterly	N/A
Inspect CDS source area	Quarterly	N/A
Sanitary wastewater holding tank pumping	Quarterly	N/A

Sump Pump	Quarterly	SP-005
CDS-PCS GAC Filters	Quarterly	SP-006
CDS-SCS GAC Filters	Quarterly	SP-007
Effluent pH meter calibration	Quarterly	
Heating system maintenance	Annually	N/A
Flow Switches	Annually	SP-008
Level Switches	Annually	SP-009
Pressure Switches	Annually	SP-010
Metering Pump	Annually	SP-011
Temperature Transmitter	Annually	SP-012
Tanks & Containment	Annually	SP-013
Static Mixer	Annually	SP-014
Motor Operated Valves	Annually	SP-015
Pressure Relief Valves	Annually	SP-016
Notification Alarms	Annually	SP-017
Process Ball Valves	Annually	SP-018
Cap and Security	Annually	SP-020

*Daily activities are performed each workday.

5.1.6 Records

Hard-copy maintenance records are retained on-site. Examples of the maintenance and inspection forms are included on the associated written procedure (Appendix E).

5.1.7 Review of Operation and Maintenance

The Operations Manager will perform an annual review of site Operations and Maintenance to ensure that the O&M procedures are up-to-date, effective, and being followed. The review will include:

- Changes in the requirements governing site activities;
- Changes in containment or treatment processes;
- Changes in site conditions;
- Modifications to the equipment utilized;
- Corrective actions required during the year; and
- O&M records.

The review may be conducted in conjunction with preparation of the Annual Report. Any significant changes to O&M procedures will be incorporated into the SMP and summarized in the Annual Report. Revised procedure forms and newly created procedure forms will be submitted along with the Annual Report.

5.2 Waste Sources and Handling

Handling, testing, storage and disposal of sediment, bag filters, spent GAC, equipment, and materials are specified in this section in compliance with applicable regulatory requirements and Cornell University procedures. Types of waste generated during normal site operations that may require special handling are as follows:

- Spent liquid phase GAC;
- Spent bag filters;
- Air compressor spent oil and filters;

- Spent UV lamps;
- Hydrogen peroxide-laden water;
- Sediments generated from contaminated water; and
- Ancillary Equipment and Personnel Protective Equipment (i.e., spent piping, valves, etc.)

Prior to handling these wastes the operator must review the relevant health and safety procedures to determine:

- Hazards associated with the activity;
- Special requirements (i.e., confined space entry, lock-out/tag-out, etc.);
- Monitoring requirements;
- Personal protective equipment.

If there is uncertainty regarding the classification or handling of any waste materials, the Operations Manager should be consulted. Cornell EH&S personnel responsible for managing hazardous wastes on campus are also available for consultation.

5.2.1 Granular Activated Carbon

The granular activated carbon (GAC) vessels are used in the treatment of the contaminated CDS-SCS and CDS-PCS waters. Since the CDS water is considered a listed hazardous waste (F039) under 40 CFR Part 261, the GAC must be handled, disposed, and/or regenerated as a hazardous waste. The GAC vessels are installed with two vessels operating in series (the "lead" and "lag" vessels). The lead vessel is removed from service when there is significant breakthrough of VOC compounds, as determined by the GWTP Operations Manager. Vessels taken off line are placed in the 180-day hazardous waste storage area pending shipment of the carbon off-site for disposal or regeneration of the carbon.

5.2.2 Bag Filters

Bag filters located throughout the GWTP remove and collect particulates from the water stream. The bag filters are changed out based on the differential pressure between the inlet and outlet of the filter system or on an established change-out schedule. Bag filters are located at the process points:

- CDS-SCS influent (CDS-SCS bag filters);
- Tank T-3 effluent (CDS-PCS bag filters);
- Tank T-1 effluent (RDS bag filters); and
- UV/OX system effluent (Post UV/OX bag filters).

The spent bag filters are considered hazardous waste and therefore will be placed in 55-gallon drums and stored in a designated satellite accumulation area within the plant. Each drum will be moved to the 180-day storage area once it is full. Storage and disposal of the spent bag filters will be coordinated with the GWTP Operations Manager.

Additional radiological analyses for C-14 and Sr-90 are conducted on RDS bag filters if RDS influent exceeds trigger concentrations established in the 2007 bag filter management plan.

5.2.3 Spent Oil and Oil Filters

Spent oil and filters are generated during routine maintenance and repair of the air compressors. Drained oils should be recycled and oil filters and oily rags, etc. should be disposed of in

accordance with Cornell University's procedures. Contact the GWTP Operations Manager for disposal authorization.

5.2.4 Spent UV Lamps

As part of the CDS-SCS treatment process, a UV/OX system is used to treat the contaminated waters. This system utilizes two UV lamps. These lamps contain a small amount of mercury, thereby requiring careful handling and proper disposal as hazardous once they are removed from service. The handling procedures are presented in Section 4.0 of the RAYOX Operation and Maintenance Manual. Once removed from the housing, the spent UV Lamps are to be stored in a protective cardboard sleeve and in a safe place within the GWTP to prevent breakage. These lamps must be sent to an approved company that can accept these types of lamps and disposed of in accordance with Cornell procedures. Contact the Operations Manager for disposal authorization.

5.2.5 Hydrogen Peroxide-laden Water

50 % hydrogen peroxide is used as part of the treatment process for CDS-SCS groundwater. A 1,100-gallon double walled tank located in the GWTP is used to store the hydrogen peroxide. As part of the operations of the hydrogen peroxide system, hydrogen peroxide may be spilled as a result of filling operations, leaks from the storage tank, piping, valving and/or metering pumps, purging, etc.

Procedures for handling hydrogen peroxide spills are contained in the Spill Prevention Report. Refer to these documents for procedures in handling spills of hydrogen peroxide.

The response to spills may involve the generation of hydrogen peroxide-laden waters (i.e., water-diluted hydrogen peroxide, with a dilution of at least 10 parts water to 1 part hydrogen peroxide). When handling the hydrogen peroxide-laden waters, goggles and gloves are necessary, as a safety precaution. If you are uncertain as to whether the peroxide is diluted properly to a 10% solution, follow the same procedures and PPE required in the HASP for 50 % hydrogen peroxide.

The hydrogen peroxide-laden waters cannot be sent through the carbon filters in the treatment process, as the peroxide will cause damage to the carbon. The hydrogen peroxide-laden waters must be pumped into either tank T-1 or T-2.

Additional information concerning the handling of hydrogen peroxide-laden waters can be obtained by contacting the Operations Manager or Cornell's Environmental Health and Safety Office.

5.2.6 Sediment

Sediments may accumulate over time as a result of settled solids in the equalization tanks (T-1, T-2, and T-3 and the GWTP building sump), UVOX chamber, and conveyance piping. Minor accumulation of solids is allowed as long as the buildup does not inhibit system efficiency. When sediment is removed from the process equipment, the solids are consolidated with process bag filters and disposed of as F039 waste. Transportation and disposal will be coordinated with a licensed waste hauler.

5.2.7 Ancillary Equipment and PPE

Ancillary equipment includes, but is not limited to, piping, meters, valves, and transfer pumps. Since CDS and RDS water is considered a listed waste (F039) under 40 CFR Part 261, ancillary equipment and personal protective equipment (PPE) that comes into contact with contaminated

site waters must be handled, stored and disposed of as hazardous waste, unless actions are taken to remove potential contaminants from the material. Therefore, if authorized by the Operation Manager, operators may decontaminate ancillary equipment and PPE which then may be disposed of as non-hazardous. Any material that comes into contact with contaminated site waters and is not decontaminated must be drummed and disposed of as a hazardous waste. Contact the Operations Manager for guidance and further information concerning regulatory requirements.

6 Reports

Reporting requirements for various types of data as well as operational and project status information were established under the Consent Orders, permits, and plans for the CDS and RDS. These can be classified as follows:

- Reporting of discharge monitoring associated with the substantive SPDES discharge permit
- Reporting of discharge monitoring associated with the substantive Part 380 discharge permit
- Reporting of environmental monitoring results required by the Consent Order
- Reporting of remedy operation and maintenance activities required by the relevant permits and O&M plans
- Reporting of remedy performance monitoring required by the relevant Performance Monitoring plans.

A summary of the reporting requirements is presented below:

Reporting Requirement	Frequency	Document
Treatment plant effluent chemical data	Monthly	DMR
Treatment plant effluent radiological data	Quarterly	Letter report
RDS bag filter radiological data	Quarterly	Letter report
RDS activity summary	Annually*	Annual report
RDS discharge minimization report	Annually*	Memo to file
Treatment plant operational summary	Annually	Annual Report
Hazardous waste manifests	If required (SQG & LQG only)	Submit Copy to NYSDEC
RCRA hazardous waste report	If required (LQG only)	Standard forms
Groundwater and surface water sampling data	Annually	Annual Report
Groundwater treatment plant performance evaluation	Annually	Annual Report
CDS source area containment performance evaluation	Annually	Annual Report
CDS plume collection system performance evaluation	Annually	Annual Report
RDS source area containment performance evaluation	Annually	Annual Report
RDS groundwater plume attenuation status evaluation	Annually	Annual Report

7 Citizen Participation

Cornell University prepared a Citizen Participation Plan for the RDS in 1997. This plan defines the basic elements of citizen participation and communication to the community that Cornell employs for RDS remediation. The main public involvement initiatives are:

- Key relevant project and background documents are maintained in locations available to any interested parties (repositories). Key project documents are made available for public review in two repositories: one at the Lansing Village Offices, and one at the Cornell EH&S offices.
- An annual update on site activities is given to the Tompkins County Public Works Committee.
- Public meetings have been held at key points in the process of selecting and implementing the remedial strategy for the sites.
- Press releases are sent to print and broadcast journalists in the area when there is significant information to disseminate.

8 Health & Safety

8.1 Categories of Health and Safety Activities

Health and safety activities and requirements at the CDS and RDS sites fall into four categories:

- OSHA regulatory requirements contained in 29 CFR 1910 and specifically those contained in 1910.120 – Hazardous Waste Operations and Emergency Response.
- NYS regulatory requirements including those contained in 6 NYCRR 370-376, 380-383, and the RDS and CDS consent orders.
- Cornell University standard procedures; and
- Best practices employed in the interest of effective and efficient operations.

This Plan primarily focuses on the structure of health and safety management at the CDS and RDS facility. The analysis of specific hazards and the measures taken to minimize or mitigate hazards are contained within the site specific Health and Safety Plans identified in Section 8.2.

8.2 Approved Reports and Plans

The following documents contain information about health and safety requirements related to the CDS and RDS:

- Groundwater Treatment Plant Health and Safety Plan (May 2002)
- Groundwater Treatment Plant and UV/OX System Operations and Maintenance Manuals (RDS Groundwater IRM Final Engineering Report, Appendices R and S)
- CDS/RDS Spill Prevention Report and Contingency Plan (February 2002)
- RDS Groundwater Recovery System Performance Monitoring Plan
- The following Cornell University programs, policies, and procedures:
    - Release Response and Reporting Plan
    - Policy 2.4 - Health and Safety
    - Radiation Safety Manual
    - Policy 2.2 - Lockout/Tagout
    - Confined Space Program
    - Hearing Conservation Program
    - Respiratory Protection Program
    - Hazard Communication Program
    - Laboratory Safety Manual and Chemical Hygiene Plan

8.3 General Responsibilities

In addition to the site operators, the EH&S Department is responsible for University-wide OSHA programs, including the CDS and RDS facilities. The general responsibilities of Cornell University employees, as well as contractors and visitors, are described below.

<u>CDS/RDS Operators</u>
All site workers must read and understand the requirements of the Groundwater Treatment Plant Health and Safety Plan (HASP). The site safety officer (who is typically an operator) is responsible for the on-site day-to-day implementation of the health and safety procedures in the HASP.

Department of Environmental Health and Safety
EH&S manages the CDS and RDS site remediation, operation, and monitoring activities. The Operations Manager directs and oversees these activities through frequent and direct communications with site operators. The Operations Manager is also responsible for personnel and visitor training and recordkeeping.

EH&S plays several roles at the site, including providing technical support for the development of health and safety programs. The University Radiation Safety Officer reviews radiological aspects of the H&S program and assesses worker exposure under Cornell's Radiation Safety Program. EH&S has an emergency response team which responds to emergencies on campus. EH&S also develops and oversees University programs such as respiratory protection, confined space entry, PPE selection, lockout-tagout, hearing conservation, and fire safety, and provides services such as the review of the H&S plan, OSHA reviews of plant activities, training, equipment calibration, and other assistance as needed.

Contractors
Contractors who conduct work at the CDS and RDS are responsible for the health and safety of their employees. They should review the information provided in the HASP and ensure that appropriate procedures are in place for their employees. Contractors must supplement Cornell's HASP with any specific procedures deemed appropriate to the needs of their employees, and must designate a Site Safety Officer for their work on site.

Visitors
The Operations Manager and/or operators are responsible for briefing visitors on the hazards present at the site and must inform visitors of any relevant requirements of the HASP prior to allowing entry to the facility.

8.4 Training

Anyone serving at the Groundwater Treatment Plant (GWTP) in the role of Operator, Operations Manager or Site Safety Officer must attend site-specific training on system and radiation safety, operations, monitoring, and maintenance, with updates if site conditions change. Safety briefings will be held annually (at a minimum), and for each new or special activity being performed. Safety briefings will be led by the Site Safety Officer, Operations Manager, or Designee.

The 29 CFR 1910.120 Occupational Safety and Health regulations include the following provisions for employees exposed to hazardous substances, health hazards, or safety hazards: training as described in 120(e); medical surveillance as described in 120(f); and personal protective equipment described in 120(g). In addition, the Operations Manager and Site Safety Officer must complete an 8-hour supervisor-training course within the first year of assuming the position.

All operations personnel at the GWTP are trained in accordance with paragraph (e) of the HAZWOPER regulations. GWTP Operators and the Operations Manager receive, at a minimum, the initial and annual refresher training as specified in 29 CFR 1910.120 paragraph (e) and hazard communication. Additional training may be required depending on specific operations or maintenance activities (i.e., respirator training, confined space entry, etc.). Training will be provided by a qualified individual as designated by the Operations Manager and can include outside specialists, Cornell's EH&S Department, and on-the-job training from supervisors. The department supervisor and the department conducting the training maintain training records, a program outline, and attendance sheets, with copies provided to the Operations Manager.

The requirements of other workers are determined by the Operations Manager and depend on the activities being performed and the potential for contact with site-related contaminants and other hazards. Requirements for visitors are limited to a briefing on site hazards.

Table 9.1 Training Requirements

	Training Responsibilities	Frequency
Site Safety Officer	Conduct Safety Brief	As Necessary
	HAZWOPER Training	Initial
	HAZWOPER Supervisor Training	Initial
	HAZWOPER refresher	Annual
	RCRA Hazardous Waste	Annual
	Heat Stress	As Needed
	First Aid/CPR	Initial
	Advanced Record Keeper Training	Initial
	Radiation Safety Training	Initial
Operations Manager	HAZWOPER Training	Initial
	HAZWOPER Supervisor Training	Initial
	HAZWOPER refresher	Annual
	RCRA Hazardous Waste	Annual
	Advanced Record Keeper Training	Initial
	Radiation Safety Training	Initial
Operator	HAZWOPER Training	Initial
	HAZWOPER refresher	Annual
	RCRA Hazardous Waste	Annual
	Advanced Record Keeper Training	Initial
	Radiation Safety Training	Initial
	DOT Hazardous Materials Shipping	3 Years

The department supervisor and department conducting the training will maintain training records, program outline, and attendance sheets, with copies provided to the operations manager. The central repository for health and safety training records is a database maintained by Cornell's EH&S Department.

8.5 Hazard Evaluation

Detailed hazard assessments have been prepared for the CDS and RDS facilities (see below). Examples of the potential hazards that may exist at the facility include radiological and chemical hazards, physical and mechanical hazards, electrical hazards, atmospheric hazards (such as confined spaces), and biological hazards (such as stinging insects). In general, the potential employee exposure to hazards is minimized through the use of engineering controls, written procedures and contingency plans, worker training, regular health and safety briefings, work practice controls, audible/visual alarms, PPE, and periodic reviews.

Existing Facility Hazard Assessments:

- Groundwater Treatment Plant Health and Safety Plan (May 2002) - Primary Reference
- CDS Health and Safety Plan (1992)
- RDS Health and Safety Plan (May 1998)
- RDS Capping IRM Operation and Maintenance Manual and Health and Safety Plan (June 1997)

8.6 Personal Protection and Monitoring

A personal protection equipment assessment has been prepared for the site and is contained within the site HASP used in conjunction with the University PPE program. Refer to these documents to determine which PPE is available for a given activity. PPE is not a substitute for a knowledgeable worker utilizing good work practices or administrative and engineering controls.

Varying levels of protection are warranted at the site dependent upon the tasks being performed. The level of protection will be based on:

- Measured concentrations and toxicity of chemicals in ambient air
- Potential for chemical and radiological exposure
- Knowledge of chemicals and radiological material on site, their toxicity, and exposure pathways.

Monitoring is designed to assess exposure to personnel during O&M activities and to determine if PPE is required and/or adequate to assure worker protection. The relevant HASP describes chemical and radiological monitoring requirements, including when monitoring is appropriate, action levels, and monitoring instrument requirements such as types, calibrations, and survey methods. The primary hazards requiring monitoring include chemical contaminants such as VOCs, radiological contaminants, as well as hazards related to oxygen deficient and explosive atmospheres.

8.7 Emergency Response

Although every reasonable effort has been undertaken to reduce known hazards at the facility, the potential always exists that an emergency will occur. In the event of an emergency, staff should refer to the emergency response procedures in the Health and Safety Plan (medical emergencies) or the Contingency Plan (spill or fire emergencies). Both these documents are available in the office at the GWTP.

In the event of a fire, spill, or medical emergency, employees should contact Tompkins County Emergency Services via the 911 system. They will dispatch appropriate police, fire, hazardous materials, or medical personnel. Spill response will be handled by the Cornell EH&S "418" team, which maintains hazardous materials first-responder capability. The Site Operations Manager should be contacted as soon as practical for additional support and direction on the appropriate response to an incident.

8.8 Health & Safety Records

Cornell maintains records of training and certain health & safety activities in accordance with the requirements of relevant regulations and approved plans. Records of OSHA and Cornell-required safety training are maintained in Cornell EH&S's database. Monitoring instrument calibration records are maintained by Cornell's EH&S Department. Records of safety briefings, air monitoring, and confined space entry are maintained on site. See Section 9 for a more complete listing of the records maintained for site activities.

9 Records & Forms

Cornell maintains records of training, health & safety, operation, maintenance, inspections, and monitoring in accordance with the requirements of relevant permits and plans. Copies of the forms used to create many of these records are included in Appendices E and F. The main types of records are as follows:

Summary of Records Maintained		
Activity	**Frequency**	**Location of Records**
Training		
OSHA-required	As needed	EH&S database
DOT-required	As needed	EH&S database
RCRA	Initial and as needed	EH&S database and onsite
Cornell-required	As needed	EH&S database
Equipment and procedures training of operators	As needed	EH&S office or on-site
Health & Safety		
HASP/safety briefings	As needed	On site
Incident reporting	As needed	On site
Confined space entry	As needed	On site
Air monitoring	As needed	On site
Instrument calibration	As needed	EH&S office
Operation and Maintenance		
Log book of daily site activity	Daily	On site
UV-oxidation unit readings	As needed	On site
Corrective and preventive action	As needed	On site
Inspections		
Hydrogen peroxide tank	Monthly	On site (in SPR)
Hydrogen peroxide tank	Annual	On site (in SPR)
Hazardous waste storage area	Weekly	On site
RDS cap (quarterly)	Quarterly	On site
Corrective and preventive action	As needed	On site
Monitoring		
Field data sheets for well sampling	Quarterly	On site
Chain-of-custody forms for samples submitted to the laboratory	Monthly	On site and EH&S office
Database of monitoring/sampling results	As needed	EH&S office
Corrective and preventive action	As needed	EH&S office and on-site

10 Emergency Contingency Plan

A Contingency Plan for emergencies (spills or fires) at the Groundwater Treatment Plant (GWTP) is included in Appendix G. The plan was originally developed to satisfy requirements under RCRA for Large Quantity Generators of hazardous waste. Although Cornell's GWTP operations have been modified to ensure that we remain within Small Quantity Generator thresholds, the Contingency Plan remains a useful reference document for site operations. The plan includes:

- Key facility maps, drawings, and other site information
- A description of the wastes/contaminants on site
- An evacuation plan
- Emergency contacts
- A hazardous material response equipment and materials inventory
- Emergency shutdown procedures

A copy of the Contingency Plan is kept on display in the office area of the GWTP. The plan will be reviewed and updated annually by the Operations Manager to ensure that facility information, hazard descriptions, emergency response procedures, contact information, and emergency response equipment and supplies are accurate and up-to-date.

In addition to the Contingency Plan, a Hydrogen Peroxide Spill Prevention Report (SPR) was prepared specifically to address spill prevention and response pertaining to the bulk storage of hydrogen peroxide at the GWTP. Key portions of the SPR are also included in Appendix G. The full report was included in the RDS GWIRM FER as Appendix V [18].

11 References

1. Cornell University, 2006, *Chemical Disposal Site and Radiation Disposal Site 2005 Annual Report*.
2. Cornell University, 2003, *Chemical Disposal Site Cover and Cap Remedial Design Report*.
3. Cornell University, 2004, *Radiation Disposal Site Final Remedy Final Engineering Report*.
4. D. A. Collins, 2004, *Cornell University CDS Cap and Cover O&M Manual*.
5. McLaren/Hart, Inc. 1997. *Remedial Investigation Report, Cornell University Radiation Disposal Site.*
6. McLaren/Hart, Inc. 1997. *RDS Monitoring Plan, Cornell University Radiation Disposal Site.*
7. McLaren/Hart, Inc. 1999. *Baseline Human Health Risk Assessment, Cornell University Radiation Disposal Site.*
8. McLaren/Hart, Inc. 1999. *Supplemental Remedial Investigation Report, Cornell University Radiation Disposal Site.*
9. McLaren/Hart, Inc. 1998. *Interim Remedial Measure Final Engineering Report, Appendix N, Operations and Maintenance Manual for the Cornell University Radiation Disposal Site.*
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11. New York State Department of Environmental Conservation. 1996. *Order on Consent, Index # A7-0333-95-08.*
12. New York State Department of Environmental Conservation. 1998. *Ambient Water Quality* Standards and Guidance Values and Groundwater Effluent Limitations.
13. New York State Department of Environmental Conservation, 2002, *Record of Decision, Cornell University, Radiation Disposal Site, Lansing, Tompkins County, Site 7-55-002*.
14. New York State Department of Environmental Conservation, 2003, Substantive Part 380 Permit #*7-5032-00102100001*.
15. New York State Department of Environmental Conservation, 2002, *Substantive SPDES Permit #7-55-002*.
16. New York State Department of Environmental Conservation. 1993. *Part 382 Regulation of Low-level Radioactive Waste Disposal Facilities: Certification of Proposed Sites and Disposal Methods.*
17. Sovereign Consulting Inc., 2001**,** *Performance Monitoring Plan, Cornell University RDS/CDS Groundwater Treatment Plant, Lansing, New York.*
18. Sovereign Consulting Inc., 2002, *Final Engineering Report-Groundwater Interim Remedial Measure & Groundwater Treatment Plant Modifications & Upgrades*.
19. Sovereign Consulting Inc., 2002, *Final Remedy Design Report and 6 NYCRR Part 380 Performance Assessment.*
20. Sovereign Consulting Inc., 2002, *RDS Source Area Pre-Design Subsurface Investigation Data Report.*

TABLES

Table 4-1 Summary of CDS/RDS Monitoring

Table 4-2 Summary of Groundwater Treatment Plant Monitoring

Appendix A

Consent Orders

Appendix B

Records of Decision (RODs)

Appendix C

Permits

Appendix D

Regulatory Correspondence

Appendix E

Standard Operating Procedures (SOPs)

Appendix F

Forms

Appendix G

Spill Prevention Report and Contingency Plan

Note: See stand-alone binder for “Hydrogen Peroxide Spill Prevention Report”