



HYDROGEOLOGIC INVESTIGATION WORK PLAN

FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS

Prepared For:
Exelon Generation Company, LLC

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1.0 INTRODUCTION

This report is a Hydrogeologic Investigation Work Plan (Work Plan) for the Quad Cities Nuclear Generating Station (Station) in Cordova, Illinois (Site). Conestoga-Rovers & Associates (CRA) has prepared this Work Plan on behalf of Exelon Generation Company, LLC (Exelon). The location of the Station is presented on Figure 1.

This Work Plan has been prepared to assess groundwater quality near the Station by recommending areas for further evaluation (AFEs) regarding potential tritium impacts. CRA's development of recommended AFEs is based on information provided by Exelon Station staff and reviewed by CRA as well as CRA's Site visit. This Work Plan, including the recommended AFEs, is subject to further review and revision in the event that additional relevant information is obtained while work is being performed or from any other source.

The Work Plan also considers any historical spills and disposal/storage areas to evaluate whether:

- Appropriate documentation exists to evaluate the AFEs;
- The medias of concern were appropriately identified and evaluated;
- Specific AFEs require additional investigation;
- Any corrective actions implemented were effective; and
- Any additional corrective actions are warranted.

This Work Plan contains:

- A description of the AFEs identified at the Station;
- The specific investigation techniques to be used to investigate each AFE and the overall groundwater system at the Station; and
- All necessary supporting documentation, procedures, and appendices for field personnel to implement the scope of work.

1.1 OBJECTIVES

The purposes and objectives of this hydrogeologic investigation are to:

- Characterize the hydrogeologic conditions at the property including subsurface soil types, the presence or absence of confining layers, and the direction and rate of groundwater flow;
- Characterize the groundwater/surface water interaction at the Station including a determination of the surface water flow regime;
- Evaluate groundwater quality at the Station including the vertical and horizontal extent of any tritium in the groundwater;
- Define the probable sources and estimated quantity of any tritium released at the Station;
- Evaluate potential human, ecological, or environmental receptors of tritium released to the groundwater;
- Evaluate whether interim response activities are warranted to address the groundwater; and
- Provide a technical basis to evaluate possible remedial alternatives for tritium impacts identified at the Station.

1.2 REPORT ORGANIZATION

The remainder of this Work Plan is organized as follows:

- Section 2.0 - Site Background and Reconnaissance: this Section presents the Station background; summarizes the regional geology, hydrogeology, and groundwater flow; documents the results of CRA's inspection of the Station; summarizes previous environmental investigations; and identifies AFEs;
- Section 3.0 - Conceptual Model: this Section presents a preliminary conceptual model for the Station;
- Section 4.0 - Scope of Work: this Section describes the scope of work to be implemented including a description of the proposed activities; and
- Section 5.0 - Schedule: this Section presents the schedule for the investigation and reporting.

2.0 BACKGROUND AND RECONNAISSANCE

This section presents a summary of the Station background information, identifies AFEs, and describes the physical setting and the Station. CRA inspected the Station on March 22, 2006. CRA was accompanied by Ms. Vicki Neels and Mr. Mark Stuhlman and reviewed documents at the Station. The documents were assembled by the Station to identify potential AFEs for further evaluation in this Work Plan. A list of documents reviewed is presented in Appendix A. The following sections present a summary of the historical Station information and data provided as it relates to the tritium investigation.

2.1 STATION DESCRIPTION

This Section presents the Station-specific background information pertinent to the Hydrogeologic Investigation. Figure 2 presents a Station Property Map with the Station infrastructure and property boundary. Figure 3 presents the Station Base Map, which includes the key Station features.

The Station is located at 22710 206th Avenue North, Cordova, Illinois. The Site is in Rock Island County and is in Township 20 North, Range 6 East. It is located approximately 20 miles northeast of the Quad Cities Metropolitan Area of Davenport and Bettendorf, Iowa, and Rock Island, Moline, and East Moline, Illinois and approximately four miles north of the town of Cordova. The Site is on the east side of Pool 14 of the Mississippi River, about midway between Lock and Dams 13 and 14, and approximately 506 miles upstream from its confluence with the Ohio River. The Site is approximately 784 acres in size.

The Station is owned by Exelon Nuclear (75%) and MidAmerica Energy (25%). Station construction began in 1966. General Electric was the plant builder. Sargent and Lundy was the consulting engineer.

The Site consists of two nuclear reactors, associated structures and ancillary buildings, a 310-foot main stack, intake and discharge canals, and a former spray canal. The spray canal is approximately three miles long and was used for condenser cooling water until 1983, at which time it was changed to a facility to raise game fish for release into the Mississippi River.

The following Station contacts provided information for this Work Plan:

Vicki Neels	Chemistry, Environmental, and Radwaste Director	309-227-3200	vicki.neels@exeloncorp.com
Mark Stuhlman	Senior Environmental Analyst	309-227-2765	mark.stuhlman@exeloncorp.com

The Station is a two unit nuclear-powered steam electric plant. Each unit is a boiling water reactor that produces 2,957 megawatts thermal with a design net electrical power output of 930 megawatts electric. Units 1 and 2 went on line for testing purposes on December 14, 1972. Unit 1 began commercial operation on February 18, 1973, and Unit 2 began commercial operation on March 10, 1973. Units 1 and 2 are licensed to operate until 2032.

Once-through cooling water from the Mississippi River is used to remove heat from the main (turbine) condensers via the circulating water system and from other auxiliary equipment via the service water system. Water is drawn from an intake canal structure along the east side of the river and discharged through submerged piping into the main river channel. The total flow of river water through Units 1 and 2 for condenser circulating water and service water is approximately 970,000 gallons per minute (gpm). Water is withdrawn from the river through a canal that is perpendicular to the river flow. The canal is 235 feet long, and is 180 feet wide and 12 feet deep where it meets the river.

The Station uses a two-pipe diffuser system to return cooling water to the river. The pipes are 16 feet in diameter and lie on the bottom of the river across the main river flow. Water is discharged into the deepest part of the river through regularly spaced jet nozzles in the pipes.

Radioactive liquid wastes are collected in sumps and drain tanks at various locations and then transferred to tanks in the radwaste building for processing, storage, and release. Liquid wastes that can be reused are returned to the contaminated condensate storage tank. Liquid wastes that cannot be reused are returned to the radwaste system for reprocessing or discharging to the river (U.S. Nuclear Regulatory Commission, 2004).

2.2 SURROUNDING LAND USE

The area surrounding the Site is rural farmland and woods. There is an industrial park one mile to the north, and the Cordova Energy Center, a gas-fired power plant, is located one mile to the southeast. There is a drag strip southeast of the Site. The Upper

Mississippi River National Wildlife and Fish Refuge is across the river from the Site and on islands in the river about two miles downstream from the Site.

2.3 REGIONAL INFORMATION

The following section presents a general summary of the geology, hydrogeology, groundwater flow conditions, and surface water bodies near the Station.

2.3.1 GEOLOGY

Structurally, the region is on the extreme northwest flank of the Illinois Basin. The upper bedrock consists of Paleozoic sedimentary strata that dip gently, at approximately 15 to 20 feet per mile, to the southeast toward the center of the Illinois Basin. The region is on the south limb of the Savanna-Sabula Anticline (also known as the Plum River Fault Zone), which trends east-west through Carroll County, several miles north of the Site. The Paleozoic sedimentary rocks are of Silurian and older age and are on the order of 3,000 feet thick. They are underlain by Precambrian crystalline rocks (granite and granodiorite).

2.3.2 HYDROGEOLOGY

Groundwater can be obtained from three aquifer systems:

- unconsolidated alluvial and outwash sand and gravel deposits, 40-60 feet thick in the vicinity of the Site;
- shallow Silurian dolomitic formations, approximately 200-250 feet thick; and
- artesian sandstone aquifers of Cambrian-Ordovician age.

The potential yield from the upper unconsolidated aquifer is unknown because of lack of pumping data but in other parts of the Mississippi Valley this aquifer is generally capable of yielding large quantities of water on a long term basis. The Silurian Dolomite formations yield moderate to high quantities of water, particularly in areas where unconsolidated sand and gravel sediments are present. Dolomite aquifers immediately below the alluvium and outwash deposits are slowly recharged from water in these deposits. Wells in the Cambrian-Ordovician sandstone artesian aquifers produce large

quantities of water. Groundwater in the deep artesian aquifers is independent of the shallow near surface aquifers (Blume 1966.)

2.3.3 GROUNDWATER FLOW

The Site natural grade level is at an elevation of 594.5 feet above mean sea level (AMSL). The normal level of the river at the Site is 572 feet AMSL. Groundwater gradients in the vicinity of the Site are relatively flat and slope to the west toward the Mississippi River.

2.3.4 SURFACE WATER BODIES

The Site is located on the east side of the Mississippi River, which, in the vicinity of the Site, is composed of a series of pools formed by navigation dams located on the river both above and below the Site. The Site is located at Pool #14; the normal elevation of this pool is 572 feet AMSL.

On-Site surface water bodies include the former spray canal, discharge bay, intake bay, and dredge ponds. Silt pumped from the intake bay and from the Mississippi River in front of the intake bay is deposited in the dredge ponds. The dredge ponds contain river sediment so tritium impact from the Station is not anticipated.

2.4 STATION-SPECIFIC GEOLOGY AND HYDROGEOLOGY

2.4.1 EXISTING ON-SITE WELLS

In 2002, CRA installed three monitoring wells (MW-1, MW-2, and MW-3), which are screened 17 to 27 feet below ground surface (bgs). CRA collected groundwater samples from the wells and analyzed the samples for selected polynuclear aromatic hydrocarbons (PNAs); no PNAs were detected. The wells are located in the northwest portion of the Site, near the Main Chimney, the Unit ½ Oil Separator, and the Main Power Transformer (MRT) (see Figure 4). Wells MW-1 and MW-2 are accessible. Well MW-3 is not accessible at this time, but may become accessible in the future.

Using groundwater elevations obtained from these wells in 2002, depth to groundwater was approximately 21 feet bgs, and groundwater in this localized area was found to flow from south to north, which is inconsistent with the expected westerly flow toward the Mississippi River.

The Station receives potable water from two wells located on the east side of the Site and finished in Silurian dolomite, Well #1 (drilled 1966, 242 feet deep, cased to 52 feet) and Well #5 (drilled 1969, 264 feet deep, cased to 59 feet). Neither is of a suitable depth or construction to utilize for determining groundwater contours. The well locations are shown on Figure 4.

The Station also has the following wells: Fire Training Well (drilled 1987, 225 feet deep), Big Fish Well (drilled 1984, 175 feet deep), Little Fish Well (drilled 1986, 60 feet deep), Fish House Well No. 2 (drilled 2004, 135 feet deep), Dry Cask Storage Well (also known as East Well, drilled approximately 1960, 84 feet deep), and STP Sand Point Well (drilled 1985, 30 feet deep).

Figure 4 presents a map of the Station with the existing monitoring well network (monitoring wells MW-1, MW-2, and MW-3) and the Exelon existing well network. Table 1 presents an overview of the existing monitoring well network at the Station with well construction details.

2.4.2 STATION GEOLOGY

Beneath the Site are unconsolidated sediments comprised of clay, silt, sand, and gravel deposited as glacial till, outwash, and lake deposits. The unconsolidated sediments are underlain by bedrock of Silurian (Niagaran/Alexandrian Dolomite), Ordovician (Maquoketa Shale, Galena - Platteville Dolomite, and Glenwood - St. Peter Sandstone), and Cambrian age (dolomites, sandstones, and shales).

The Niagaran Dolomite is fossiliferous and sandy. In an abandoned Niagaran Dolomite quarry which is located approximately one mile south of Cordova, there is a high degree of fracturing in the dolomite, and the dolomite was weather-stained along fractures but was a hard competent crystalline rock. Exploration test borings indicate that the upper bedrock surface is weathered to varying depths. Deep borings indicate that the Silurian Dolomite (Niagaran and Alexandrian Formations) is approximately 250 to 300 feet thick (Blume 1966).

The bedrock surface has been eroded by the ancient Mississippi drainage system. The Site is located in the Meredosia Channel, an ancient channel of the Mississippi River that eroded the bedrock. This channel has been filled with unconsolidated sediments ranging from approximately 50 to 300 feet deep. The Site is on a rock hill that was left as an erosional remnant between channels (Blume 1966).

The pre-glacial Mississippi was immediately north and east of the Site. The present Mississippi River was formed in this area when the Meredosia Channel was blocked by ice of the last glacial age.

The depth to bedrock beneath the Site is approximately 50 feet. South of the Site the thickness of the sand and gravel increases greatly, to as much as 300 feet, due to the presence of the buried former channel (Meredosia Channel) that cuts into the dolomite bedrock. The approximate location of this channel is shown on Figure 5, based on data presented in Blume 1966.

2.4.3 STATION HYDROGEOLOGY

There are three existing monitoring wells at the Site. A groundwater contour map using January 2005 gauging data from these wells is presented on Figure 5.

Groundwater elevation ranges between 17 and 21 feet bgs. Groundwater flow direction is anticipated to be to the west toward the Mississippi River. The groundwater flow direction may be affected locally by structure basements and foundations, by sheet piles beneath the Station to a depth of 36 feet bgs at the river, and by the buried Meredosia Channel (see Figure 5 for the approximate location of the Meredosia Channel in relation to the Site). It is likely that the groundwater table will undergo seasonal fluctuations and that a temporary reversal of groundwater flow direction may occur during high water in the Mississippi River (Blume, 1966).

2.5 DETERMINATION OF AREAS FOR FURTHER EVALUATION

This section provides a review of the factors used by CRA to identify AFEs for the Station. A summary of the AFEs identified by CRA is presented in Table 3.

CRA evaluated information concerning potential historical releases at the Station and the structures, components, and areas of the Station which have the potential for the release of tritium to the environment, combined with the understanding of groundwater flow at the Station, to determine the AFEs for the Station.

2.5.1 TRITIUM RELEASES

CRA has reviewed information concerning confirmed or potential historical releases at the Station, including reports and documentation previously prepared by Exelon and compiled for CRA's review. This information was considered by CRA in developing this Work Plan, which will address all confirmed and potential releases described therein.

2.5.2 EXELON SYSTEMS EVALUATIONS

Exelon has reviewed the systems at this Station that manage tritium-containing materials. CRA has received mark-ups of Station drawings showing the locations of these systems. Figure 6 presents the locations of the systems that manage tritium-containing materials at the Station.

Exelon evaluated the significance of each of these systems with respect to potential tritium releases to soils and groundwater. Based upon CRA's review of the information provided by the Station, the following provides a listing of systems that contain or potentially contain tritium and are in direct contact with soil and/or groundwater.

<i>Identification Number</i>	<i>Description</i>
1000	RHR/RHR Service Water
1300	Reactir Core Isolation Cooling
1400	Spray Core
1900	Fuel Pool Cooling
2000	Rad Waste
2300	High Pressure Coolant Injection
2600	Sewage Treatment Plant
2600	Wastewater Treatment Plant
3000	Main Stream
3300	Condensate Transfer
4400	Cir. Water System
4800	Rx Building Equipment and Floor Drains
4900	Turbine Building Floor Drains
5400/9300	Off Gas
5650	Main Turbine (EHC)
5700	Heating System/HVAC

5773	Heating Boilers
8900	HRSS

2.5.3 SUBSURFACE UTILITIES THAT MAY BE POTENTIAL MIGRATION PATHWAYS

Based on documents provided by Station personnel, CRA has completed a review of the Station's subsurface utilities, depths, sizes, locations, and paths, including abandoned utilities and/or existing utility corridors. Figure 6 presents the locations of the utilities. CRA has completed this review to identify potential preferential groundwater migration pathways to other on-Station or off-Station receptors.

There are no dewatering systems operating at the Station.

CRA has determined that the potential for existing subsurface utility corridors to act as preferential migration pathways is highly unlikely because the hydraulic conductivity of backfill material is expected to be similar to that of the native unconsolidated deposits beneath the Station.

2.5.4 PREVIOUS INVESTIGATIONS AND REMEDIATIONS

2.5.4.1 TRITIUM DATA

The Station has collected water samples from eight on-Site wells, three oil/water separators, and the wastewater treatment plant and analyzed them on Site for tritium. Table 2 presents the analytical results. No tritium concentrations were reported above the lower limit of detection (LLD) (3,000 picocuries per liter (pCi/L) for 2005 and prior samples and 200 pCi/L for 2006 samples).

The Station collects quarterly groundwater samples from two off-Site wells (sample locations Q-35 and Q-36) and analyzes the samples for tritium. Quarterly composites of weekly samples of Mississippi River water collected upstream (Q-34) and downstream (Q-33) from the Station are analyzed for tritium. Radiological Environmental Monitoring Program (REMP) reports reviewed for 2001 through 2004 state that tritium concentrations remained below the LLD of 200 pCi/L in all samples. According to the Station, tritium concentrations in the well water and river water samples have remained below the LLD of 200 pCi/L since this testing was first initiated.

2.5.4.2 GROUNDWATER REMEDIATION

No groundwater remediation has ever been required or completed at the Station.

2.5.4.3 OTHER REMEDIATION

On August 17, 1975, a Unit 2 feedwater valve leaked, releasing tritium and other radionuclides to the soil east of the TW-2 rollup door. The impacted soil was excavated and shipped off Site. The Station replaced the faulty valve.

2.6 AREAS FOR FURTHER EVALUATION

Exelon launched an initiative to systematically assess the structures, systems, and components that potentially store, use, or convey potentially radioactive contaminated liquids. Each structure or identified component was subsequently evaluated against the following seven primary criteria:

- Location of the component (i.e., basement or second floor of building);
- Component construction material (i.e., stainless steel or steel tanks);
- Construction methodologies (i.e., welded or mechanical pipe joints);
- Concentration of material stored or conveyed;
- Amount of material stored or conveyed;
- Existing controls (i.e., containment and detection); and
- Maintenance history.

The evaluation process resulted in the identification of structures, components, and areas that require further evaluation. The structures, components, and areas, hereinafter referred to as AFEs, may include:

- Aboveground storage tanks;
- Condensate vents;
- Areas where confirmed or potential releases, spills, or accidental discharges may have occurred;
- Pipes;

- Pools;
- Sumps;
- Surface water bodies (i.e, basin, pit, pond, or lagoon);
- Trenches;
- Underground storage tanks; or
- Vaults.

The locations of the AFEs are presented on Figure 6. Figure 6 also shows the locations of the systems identified by Station personnel as containing or potentially containing tritium. CRA determined the AFEs based on information provided by the Station including a list of the systems that contain tritium and information to create maps of those systems.

The AFEs are discussed in Table 3 and are listed below:

- AFE 1 - Piping West of Radwaste Building;
- AFE 2 - Floor Drain Surge Tank;
- AFE 3 - CCSTs;
- AFE 4 - No. 1 Oil/Water Separator; and
- AFE 5 - No. 2 Oil/Water Separator.

3.0 CONCEPTUAL MODEL

As part of the preparation of this Work Plan, CRA developed a conceptual model for the Station using historical Site data. The following model serves as the basis for evaluating the fate and transport of tritium in the groundwater at the Station.

The Site is located approximately 20 miles northeast of the Quad Cities Metropolitan Area and approximately four miles north of the town of Cordova. It is on the east bank of Pool 14 of the Mississippi River, about midway between Lock and Dams 13 and 14. The Site is approximately 784 acres in size.

The Site consists of two nuclear reactors, associated structures and ancillary buildings, a 310-foot main stack, intake and discharge canals, and a former spray canal. The spray canal is approximately three miles long and was used for condenser cooling water until 1983, at which time it was changed to a facility to raise game fish for release into the Mississippi River.

The Station is a two unit nuclear-powered steam electric plant. Each unit is a boiling water reactor. Units 1 and 2 began commercial operation in 1973 and are licensed to operate until 2032.

Once-through cooling water from the Mississippi River is used to remove heat from the main (turbine) condensers via the circulating water system and from other auxiliary equipment via the service water system. Water is drawn from an intake canal structure along the east side of the river and discharged through submerged piping into the main river channel.

Radioactive liquid wastes are collected in sumps and drain tanks at various locations and then transferred to tanks in the radwaste building for processing, storage, and release. Liquid wastes that can be reused are returned to the contaminated condensate storage tank; those that cannot be reused are returned to the radwaste system for reprocessing or discharging to the river.

The depth to groundwater at the Site historically ranges between 17 and 21 feet bgs. The normal level of the Mississippi River at the Station is 572 feet AMSL.

Groundwater flow is generally to the west toward the Mississippi River, although there may be seasonal fluctuations in flow direction. Locally, groundwater flow direction beneath the Station may be influenced by the presence of building basements and

foundations, by sheet piles at the edge of the river, and by the presence of the buried Meredosia Channel to the south.

The Site is underlain by unconsolidated sediments comprised of clay, silt, sand, and gravel deposited as glacial till, outwash, and lake deposits. The unconsolidated sediments are underlain by bedrock.

Groundwater can be obtained from three aquifer systems: 1) unconsolidated alluvial and outwash sand and gravel deposits, 40-60 feet thick in the vicinity of the Site; 2) shallow Silurian dolomitic formations, approximately 200-250 feet thick; and 3) artesian sandstone aquifers of Cambrian-Ordovician age.

These five AFEs may be potential sources of tritium. If a tritium release impacts groundwater, tritium-contaminated groundwater would migrate primarily with groundwater flow. The potential off-property discharge point is the Mississippi River.

The locations of the AFEs are presented on Figure 6 and are listed below:

- AFE 1 - Piping West of Radwaste Building;
- AFE 2 - Floor Drain Surge Tank;
- AFE 3 - CCSTs;
- AFE 4 - No. 1 Oil/Water Separator; and
- AFE 5 - No. 2 Oil/Water Separator.

4.0 **SCOPE OF WORK**

This section presents the scope of work for the tritium groundwater investigation. Appendix B provides a description of the detailed field investigation methodologies to be used during the investigation. Appendix C provides a Site-specific Health and Safety Plan. Appendix D provides a property access/utility clearance data sheet for the Station. Appendix E presents CRA's standard operating procedures (SOPs) that are relevant to this project. Appendix F describes reporting and data validation.

4.1 **TASK 1 - WELL INVENTORY**

Figure 4 presents a map of the Station that includes the existing well network. Table 1 presents an overview of the existing monitoring well network at the Station with well construction details. CRA will complete an inventory of the existing well network to evaluate the integrity and status of the wells. This inventory will include the opening of each well cap, measuring the depth-to-water, and sounding the total well depth.

4.2 **TASK 2 - INSTALLATION OF NEW MONITORING WELLS**

Figure 7 presents the recommended location of new monitoring wells. These locations are based on a review of all data provided and the hydrogeology at the Station, and on the current understanding of known or potential release areas. Table 4 provides the rationale for each grouped by three major categories: upgradient, downgradient, and AFE.

Monitoring wells installed in unconsolidated sediments will be installed as a single well or in clusters consisting of one shallow and one intermediate well. The shallow well will be screened to approximately 30 feet bgs, and the intermediate well will be screened to approximately 50 feet bgs.

4.3 **TASK 3 - STAFF GAUGES**

Staff gauges in the form of elevations marked on the wall exist at the discharge and intake bays. CRA will use either the existing staff gauges or new monitoring points to monitor surface water elevations in the synoptic water level monitoring described below.

4.4 **TASK 4 - SURVEY**

After the new wells are installed, CRA will survey the existing wells, the newly installed wells, the surface water sampling locations, and the staff gauges (on discharge and intake bay walls) or bay monitoring points for locations and elevations relative to mean sea level. The top of each well casing will be surveyed to the nearest 0.01 feet relative to the National Geodetic Vertical Datum (NGVD), and the survey point will be marked on the well riser. The staff gauge elevations (marked on the discharge and intake bay walls) will be verified and corrected as needed. The survey will include the ground elevation at each well to the nearest 0.10 feet relative to the NGVD. The well location will be surveyed to the nearest 1.0 feet.

4.5 **TASK 5 - HYDROLOGIC MEASUREMENTS**

CRA will collect hydrologic data collected during groundwater sampling. Depth-to-water measurements will be collected at all monitoring wells. Manual water level measurements will be collected using an electronic depth-to-water probe accurate to +/-0.01 feet. The measurements will be made from the survey mark at the highest point on each well's inner riser.

The depth to groundwater will be converted to elevations based on the surveyed well riser elevation at each well head. The surface water elevation will be measured at the staff gauge locations during the synoptic measurement events.

4.6 **TASK 6 - GROUNDWATER SAMPLING**

CRA will collect two rounds of groundwater samples from the groundwater monitoring network shown on Figure 7. Groundwater samples will be collected from the newly installed monitoring wells and from the Exelon existing wells. Groundwater samples will be collected from the three existing monitoring wells (MW-1, MW-2, and MW-3) when they become accessible. Existing Site wells to be sampled have been identified by the Station and are as follows: Fire Training Well, Big Fish Well, Little Fish Well, Fish House Well No. 2, Dry Cask Storage Well, STP Sand Point Well, Well #1, and Well #5. Existing Site well groundwater samples will be collected as grab samples. Monitoring well groundwater samples will be collected using low flow purging techniques. The sampling rounds will be spaced at least two weeks apart. Groundwater samples

collected during the initial round will be analyzed for the following parameters (see Table 5):

- Tritium (H-3);
- Strontium-89/90 (both together);
- Strontium-90 (only if Strontium 89/90 is detected above 2 pCi/L);
- Gamma spec parameters which include:
 - Manganese - 54,
 - Ferrous Citrate - 59,
 - Cobalt - 58,
 - Cobalt - 60,
 - Zinc - 65,
 - Niobium - 95,
 - Zirconium - 95,
 - Cesium - 134,
 - Cesium - 137,
 - Barium - 140, and
 - Lanthanum - 140.

Sample analysis parameters for the second round of sampling will be determined based on the initial analysis results.

All samples will be shipped to a contract laboratory for analysis.

4.7 TASK 7 - SURFACE WATER SAMPLING

Surface water samples will be collected at the three locations shown on Figure 8. Samples will be collected during the same time groundwater samples are collected. Samples will be collected using the grab sample method. All samples will be shipped to a contract laboratory for analysis. The initial samples will be analyzed for the following parameters (see Table 5):

- Tritium (H-3);
- Strontium-89/90 (both together);
- Strontium-90 (only if Strontium 89/90 is detected above 2 pCi/L);

- Gamma spec parameters which include:
 - Manganese - 54,
 - Ferrous Citrate - 59,
 - Cobalt - 58,
 - Cobalt - 60,
 - Zinc - 65,
 - Niobium - 95,
 - Zirconium - 95,
 - Cesium - 134,
 - Cesium - 137,
 - Barium - 140, and
 - Lanthanum - 140.

Sample analysis parameters for the second round of sampling will be determined based on the initial analysis results.

4.8 TASK 8 - DATA EVALUATION

Following the completion of field activities, all data will be compiled and reviewed. This will include review and analysis of the newly acquired data collected under this Work Plan and relevant historical data. The latter will include groundwater, surface water, and other analytical tritium data collected under historical programs including REMP data and other routine monitoring programs. A revised well search of nearby potential receptors will be included in the evaluation. The well search will attempt to update previous well inventory data for nearby groundwater withdrawals including owners, locations, well construction details, aquifers, and withdrawal rates.

The data will be reviewed using one or more of these following techniques (but not limited to):

- Graphs (hydrographs and time versus concentration);
- Isoconcentration maps;
- Cross-sections;
- Hydraulic analysis;

- Statistical analysis; and
- Data trends.

4.9 **TASK 9 - HYDROGEOLOGIC INVESTIGATION REPORT**

Following completion of the above activities, CRA will submit a Hydrogeologic Investigation Report to Exelon presenting the results of the activities and the findings of the tritium study. Further details regarding reporting and data validation are presented in Appendix F.

5.0 SCHEDULE

This hydrogeologic investigation will be implemented consistent with the Fleetwide Tritium Assessment project schedule as prepared by and reviewed daily by Exelon corporate, the Station, and CRA.

TABLE 1

**SUMMARY OF EXISTING WELL NETWORK
FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS**

<i>Well Number</i>	<i>Well Installation Date</i>	<i>Ground Surface (NGVD)¹</i>	<i>Top of Riser Elevation (NGVD)</i>	<i>Boring Total Depth (ft BGS)²</i>	<i>Screen Interval (ft BGS)</i>	<i>Screen Top Elevation (NGVD)</i>	<i>Screen Bottom Elevation (NGVD)</i>	<i>Well Diameter (inches)</i>	<i>Well Material</i>
MW-1	1/8/2002	594.10	593.44	27.5	17 to 27	577.10	567.10	2	PVC
MW-2	1/8/2002	593.70	592.90	27.5	17 to 27	576.70	566.70	2	PVC
MW-3	1/8/2002	593.80	593.44	27.5	17 to 27	576.80	566.80	2	PVC

¹ NGVD - National Geodetic Vertical datum; wells surveyed 2/2002

² ft BGS - feet below ground surface

TABLE 2

**SUMMARY OF AVAILABLE TRITIUM DATA
FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS**

<i>Date</i>	<i>Well 1</i>	<i>Well 5</i>	<i>Big Fish</i>	<i>Little Fish</i>	<i>New Fish</i>	<i>Fire Training</i>	<i>Dry Cask</i>	<i>Sand Point</i>	<i>U-1 Oil Sep</i>	<i>U-2 Oil Sep</i>	<i>1/2 Oil Sep</i>	<i>WWTP</i>
6/25/03	<LLD	<LLD	<LLD	<LLD		<LLD						
8/21/03									<LLD	<LLD	<LLD	
12/29/03				<LLD								
1/2/04	<LLD	<LLD	<LLD			<LLD						
1/21/04									<LLD	<LLD	<LLD	
5/5/04			<LLD	<LLD		<LLD						
5/6/04	<LLD	<LLD										
5/18/04												<LLD
8/18/04									<LLD	<LLD	<LLD	
12/14/04	<LLD	<LLD				<LLD						
12/15/04			<LLD	<LLD								
12/22/04									<LLD	<LLD	<LLD	
1/19/05									<LLD	<LLD	<LLD	
6/2/05			<LLD	<LLD			<LLD					
6/10/05	<LLD	<LLD				<LLD						
8/4/05									<LLD	<LLD	<LLD	
3/10/06			<LLD	<LLD	<LLD		<LLD	<LLD				

Notes:

Lower Limit of Detection (LLD) is ~3000 pCi/L unless otherwise noted

LLD is 200 pCi/L for 3/10/06 sampling event

TABLE 3
SUMMARY OF AFEs
FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS

<i>AFE</i>	<i>Description</i>	<i>Location (in Relation to the Station)</i>	<i>Estimate Tritium Release Provided by Station (Yes/No)</i>	<i>Existing Wells in the Area</i>	<i>Monitoring Well IDs and Depths</i>	<i>Groundwater Samples Previously Collected (Yes/No)</i>	<i>Tritium Concentration in Groundwater (pCi/L)</i>	<i>Last Sample Date</i>	<i>Potential Receptors</i>	<i>Interim Response Activity</i>	<i>Comments</i>
1	Buried pipes west of Radwaste Building	West of Radwaste Building near buried pipes	No	No	N/A	No	N/A	N/A	Mississippi River	None	Historic release
2	Surge Tank	West of Floor Drain Surge Tank	No	No	N/A	No	N/A	N/A	Mississippi River	None	Potential source
3	Two 350,000-gallon CCTSs with no containment	South of CCTSs, southeast of LTD Building	No	No	N/A	No	N/A	N/A	Mississippi River	None	Historic release
4	No. 1 Oil/Water Separator area	Near No. 1 Oil/Water Separator	No	No	N/A	No	N/A	N/A	Mississippi River	None	Located in potential release pathway
5	No. 2 Oil/Water Separator area	Near Fish House Slab, No. 15 Cooper Heat, and No. 2 Oil/Water Separator	No	No	N/A	No	N/A	N/A	Mississippi River	None	Located in potential release pathway

Notes:

1) N/A - Not Available

TABLE 4

SUMMARY OF TRITIUM SAMPLING LOCATIONS
 FLEETWIDE TRITIUM ASSESSMENT
 QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

Category	Sampling Location ID	Approximate Location	Rationale
Upgradient Monitoring Wells	MW-QC-101 S/I	Northeast of Reactor Building and east of Protected Area fence.	To provide upgradient hydraulic control and chemistry at the northeastern corner of the Protected Area.
	MW-QC-102 S/I	Southeast of Service Building, near southeast corner of TSC Building.	To provide upgradient hydraulic control and chemistry at the southeastern corner of the Protected Area.
	MW-QC-107 S	Approximately 600 feet northeast of Wellhouse and south of access road.	To provide background data and upgradient hydraulic control.
Downgradient Monitoring Wells	MW-QC-108 S	West of Waste Water Treatment Plant and Drying Beds	To provide hydraulic control and chemistry data in the southwestern portion of the Station.
AFE Monitoring Wells	MW-QC-103 I	West of Floor Drain Surge Tank (AFE#2).	To evaluate past releases and buried piping from the surge tank since it receives radioactive waste.
	MW-QC-104 S	South of CCSTs, southeast of LTD Building (AFE#3).	Downgradient of two 350,000-gallon CCST tanks that have no containment around them and to evaluate past releases.
	MW-QC-105 I	West of No. 1 Oil/Water Separator (AFE#4).	To evaluate historical releases through the stormwater system; any releases on the south side of the Plant, including from the CCSTs, would discharge to the No. 1 Oil/Water Separator.
	MW-QC-106 S/I	Near Fish House Slab and No. 15 Cooper Heat, near No. 2 Oil/Water Separator (AFE#5).	To evaluate historical releases; any releases on the north side of the Plant would enter storm drains that discharge to the No. 2 Oil/Water Separator, including a release west of the Radwaste Building near buried pipes (AFE #1); to investigate the influence of sheet piling on groundwater flow.
Surface Water	SW-QC-1	Former spray canal north of Protected Area	To evaluate surface water quality
	SW-QC-2	Former spray canal east of Protected Area	To evaluate surface water quality
	SW-QC-3	Former spray canal south of Protected Area	To evaluate surface water quality

Notes:
 Designation "S" approximately 15 - 25 feet deep well.
 Designation "I" approximately 45 - 50 feet deep well.

TABLE 5

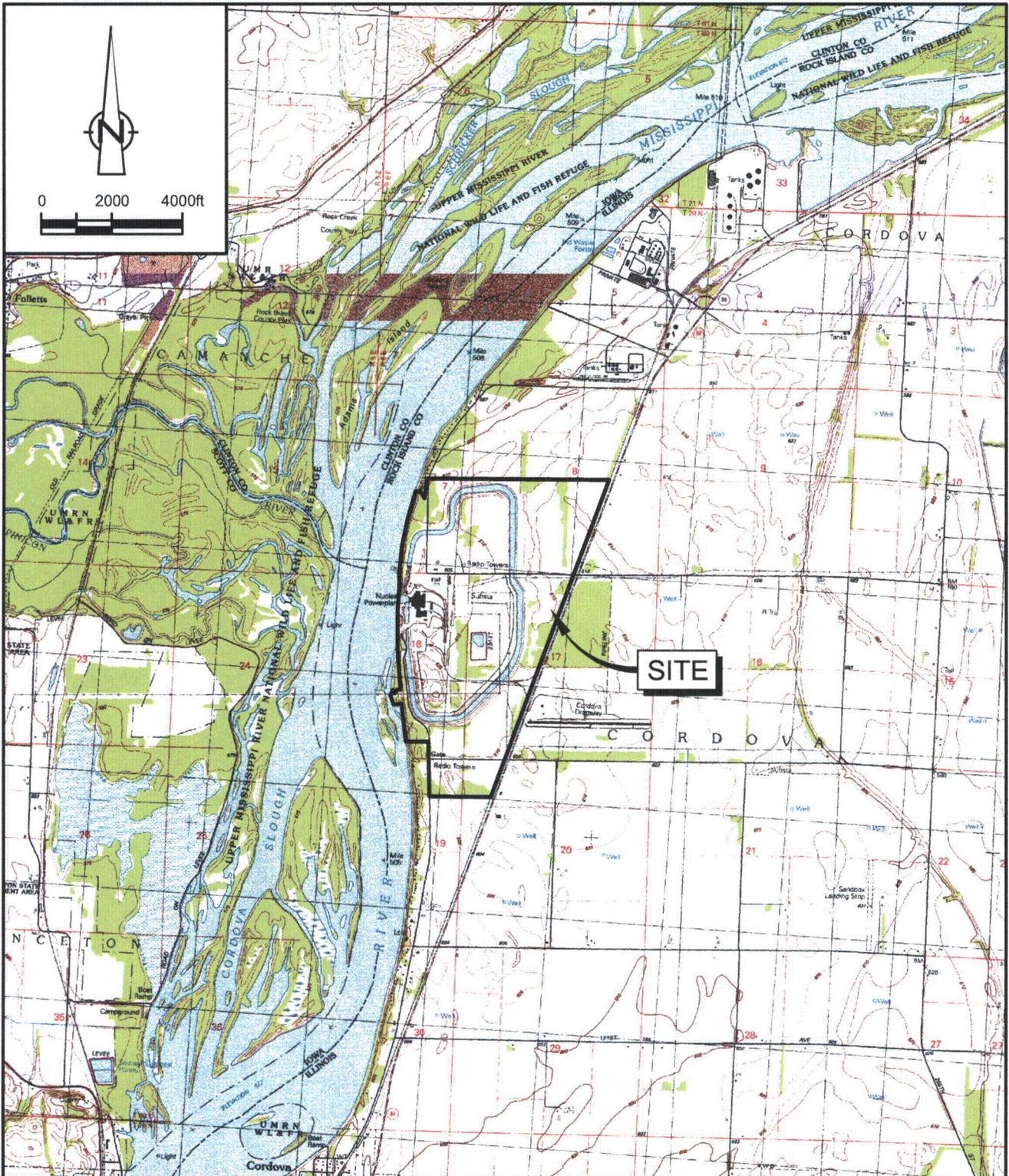
**TRITIUM SAMPLING SUMMARY
FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS**

<i>Sampling Program</i>	<i>Sampling Locations</i>	<i>Analytical Parameters</i>	
		<i>Round 1</i>	<i>Round 2</i>
Groundwater	<u>New Monitoring Wells</u>	Tritium Strontium Mn - 54 Fe - 59 Co-58 Co - 60	Tritium Additional Parameters based on results from Round 1
	<u>Existing Monitoring Wells</u>	Zn - 65 Zr - Nb - 95 I-131 Cs - 134 Cs - 137 Ba - La - 140	
	MW-1, MW-2, and MW-3 (when accessible)		
	<u>Existing Site wells</u>		
	Well No. 1, Well No. 2, Big Fish Well, Little Fish Well, Fish House Well, Dry Cask Storage Well, Fire Training Well, and STP Sand Point Well		

TABLE 5

TRITIUM SAMPLING SUMMARY
 FLEETWIDE TRITIUM ASSESSMENT
 QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Sampling Program</i>	<i>Sampling Locations</i>	<i>Analytical Parameters</i>	
		<i>Round 1</i>	<i>Round 2</i>
Surface Water	<u>Former Spray Canal</u> SW-QC-1, SW-QC-2, and SW-QC-3	Tritium Strontium Mn - 54 Fe - 59 Co-58 Co - 60 Zn - 65 Zr - Nb - 95 I-131 Cs - 134 Cs - 137 Ba - La - 140	Tritium Additional Parameters based on results from Round 1



SOURCE: USGS QUADRANGLE MAP;
 QUAD CITIES MOSAIC, ILLINOIS

figure 1

STATION LOCATION MAP
 QUAD CITIES GENERATING STATION
 EXELON GENERATION COMPANY, LLC
 Cordova, Illinois



APPENDIX A

STATION-SPECIFIC DOCUMENTS REVIEWED

APPENDIX A
SUMMARY OF DOCUMENTS REVIEWED

Quad Cities Plant Design Analysis Report, Vol. 1, May 25, 1966, revised August 18, 1966, Sections II-4.0 through II-7.0 (J. Blume - John A. Blume & Associates, Engineers).

Ground-Water Geology of the Rock Island, Monmouth, Galesburg, and Kewanee Area, Illinois, Illinois State Geological Survey, Report of Investigations 221, 1968 (J.E. Brueckmann and R.E. Bergstrom).

Handbook of Illinois Stratigraphy, Illinois State geological Survey, Bulletin 95, 1975 (H.B. Willman et al).

REMP Reports for 2004, 2003, 2002, and 2001.

Site Investigation Report for the Unit No. 2 Main Power Transformer Oil Spill, February 2002 CRA).

Contaminated Soil Volumes for Decommissioning Cost Estimates - Quad Cities Units 1 and 2, September 3, 2003.

Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 16, Regarding Quad Cities Nuclear Power Station, Units 1 and 2, Final Report, June 2004 (USNRC).

Quad Cities Generating Station Spill Prevention Control and Countermeasure Plan (SPCC Plan), Revision 13.

UFSAR - Quad Cities, Section 2.0, Revision 6, October 2001.

APPENDIX B

STATION-SPECIFIC SAMPLING PLAN

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APPENDIX B - STATION-SPECIFIC SAMPLING PLAN

The investigation methodologies in this appendix describe the various soil boring and monitoring well installation techniques that will or may be used at the Station in both unconsolidated and consolidated deposits. Methodologies on monitoring well development and sampling are also included. These methods will be conducted in accordance with current Federal and State standards, and CRA's Standard Operating Procedures (SOPs). The SOPs are company-wide documents that detail the procedures for field staff to collect data correctly and consistently. Prior to conducting any work at the Station, all field staff are required to read, review, and sign CRA's Station-specific Health and Safety Plan (HASP). A copy of CRA's HASP is in Appendix C.

B.1 HEALTH AND SAFETY

The Hydrogeologic Investigation will involve drilling and sampling within the limits of the Station. During these operations, personnel may come in contact with potentially hazardous materials, physical hazards associated with Site operations, or physical hazards associated with the drilling and sampling equipment. Therefore a Station-Specific Health and Safety Plan (HASP) has been developed to ensure the following:

- i. that Site personnel are not adversely exposed to the compounds of concern;
- ii. that public welfare or the environment are not adversely impacted by off-Site migration of contaminated materials due to work activities at the Station; and
- iii. compliance with applicable governmental (Title 29 Code of Federal Regulations (CFR) Part 1910.120) and non-governmental (American Conference of Governmental Industrial Hygienist) regulations and guidelines will be implemented for all Station work.

All sampling and investigative operations at the Station will be conducted in accordance with the provisions of the HASP (Appendix C). Subcontractors performing work at the Station will be responsible for providing a Station-Specific HASP to address hazards associated with the work they are performing. As a minimum, subcontractor HASPs are to be in accordance with the provisions of the HASP included in Appendix C of this Work Plan.

B.2 UTILITY AND SUBCONTRACTOR CLEARANCE METHODS

Prior to completing any subsurface activities, the proposed boring locations will be marked or staked and compared to overhead and subsurface utilities in the area. All borings to be installed during the investigation will be listed on CRA's Quality System Form QSF-019 (Property Access/Utility Clearance Data Sheet). The form will be completed by the CRA representative and reviewed and signed by appropriate Exelon personnel after reviewing each boring location. A copy of QSF-019 is presented in Appendix D. Soil boring activities will not proceed until the location is cleared by CRAs designated site engineer/geologist and appropriate Exelon personnel or an authorized Exelon representative. Each Station may also have its own Station-specific utility locate procedure that will be implemented.

Additionally, prior to initiating drilling activities, an air knife or similar device (e.g., vac-truck) will be utilized to verify utilities are not present at the proposed soil boring locations. All subsurface drilling locations on the property will be cleared with an air knife to a depth of approximately 10 feet below ground surface prior to soil boring installation.

In the event that soil borings will be completed off Station property, a private utility locate firm will be contacted at least three working days prior to installation to locate and mark all utilities in the area of the proposed soil borings.

All subcontractors and subcontractor vehicles and equipment will be subjected to Exelon security clearance procedures prior to gaining Station access.

B.3 DRILLING INSTALLATION METHODS

Borings completed in unconsolidated materials for soil samples or monitoring well installation will be installed using either hydraulic direct push, rotosonic, or hollow-stem auger drilling techniques. Borings completed in consolidated materials (bedrock) will be installed by rotosonic or air rotary techniques. These drilling procedures are described fully in Appendix E.

Unless specified by Exelon or the CRA project manager or coordinator, all soil borings will be continuously sampled from ground surface through the total depth of the boring. All overburden soils will be classified using the Unified Soil Classification System (USCS), as required in Section 4.2.3 of CRA's SOPs.

Any soil boring not completed as a monitoring well will be abandoned using bentonite chips, bentonite powder, or a bentonite slurry depending on the depth and type of formation encountered (and in accordance with applicable state regulations).

B.4 SOIL SAMPLE COLLECTION METHODS

Soil sampling will be completed by one or more of the following methods: discrete grab sample using a precleaned hand trowel (surficial soil sampling), continuous flight hollow-stem auger with split spoon method, or direct-push methods (dual tube systems, discrete soil sample systems) for soil sampling at depth. Each sample will consist of soil from the surface or the depth as specified within the Work Plan. All soil samples will be collected in accordance with the SOPs presented in Appendix E.

B.5 MONITORING WELL INSTALLATION METHODS

Monitoring wells installed at the Station will be completed in accordance with the SOPs presented in Appendix E. These include procedures for installing and developing permanent and temporary wells.

B.6 GROUNDWATER SAMPLE COLLECTION METHODS

Groundwater sampling will be conducted using the low-flow purging techniques outlined in Appendix E. A peristaltic pump may be used when the depth to groundwater is less than 30 feet bgs. A bladder pump, Grundfos pump, or electronic submersible pump will be used if the depth to groundwater is greater than 30 feet below ground surface. All groundwater samples will be collected in accordance with the SOPs presented in Appendix E.

B.7 SURFACE WATER SAMPLE COLLECTION METHODS

Surface water samples will be collected by direct dipping of the sample container into the stream. If the bottles are preserved, then precleaned unpreserved bottles should be used to collect the sample. The water sample may then be transferred to the appropriate preserved bottles. When collecting samples, submerge the inverted bottle to the desired sample depth and then tilt the opening of the bottle upstream to fill. Surface water samples should usually be collected in areas of the surface water body that are

representative of the surface water body conditions as directed by the Work Plan. All surface water samples will be collected in accordance with the SOPs presented in Appendix E.

B.8 SOIL/GROUNDWATER/SURFACE WATER SAMPLE ANALYSIS METHODS

Groundwater and surface water samples collected will be analyzed for tritium, beta emitters, total radioactive strontium, and strontium 90 according to approved methods. Soil samples, if collected, will be analyzed using USEPA approved methods. Specific soil analyses are specified in Section 4.0 of the Work Plan (if applicable). Samples will be transferred in dedicated sample containers to an Exelon representative for internal and external distribution as appropriate, or to the project laboratory using proper chain-of-custody protocols outlined in Appendix E.

B.9 AQUIFER CHARACTERIZATION METHODS

Aquifer characterization methodologies will be selected based on the type and saturated thickness of the formation. Standard single well hydraulic response tests will be conducted on at least four wells screened in the same hydraulic unit. If multiple saturated zones are identified, additional hydraulic response tests may be required. The tests will be evaluated using the Bouwer-Rice Method or other appropriate method and the procedures outlined in Appendix E.

Methods for other types of aquifer characterization tests will be presented for Exelon's review and approval on a station-by-station basis. Other types of aquifer characterization include:

- bail-down testing;
- step-test/pump test;
- physical/geotechnical analysis of soils; and
- surface and downhole geophysics.

In the event Exelon requests additional aquifer characterization by one of the methodologies listed above, procedures for the selected methodology will be forwarded to Exelon prior to implementation.

APPENDIX C

CRA HEALTH AND SAFETY PLAN

**SITE-SPECIFIC
HEALTH AND SAFETY PLAN**

**FLEETWIDE TRITIUM ASSESSMENT
QUAD CITIES GENERATING SYTEM
CORDOVA, ILLINOIS**

**Prepared For:
Exelon Generation Company, LLC**

MAY 2006

REF. NO. 045136 (9)

CRA 200016 QSF-013 - Rev. 4 - 06/15/2005

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Signature Page

Site Name: Exelon Generation - Quad Cities Station

Location Address: Quad Cities Generating Station, 22710 206th Ave. North, Cordova, IL 61242

Ref. No.: 45136

CRA Office: Chicago

Prepared by (signature):

Date:

Project Manager (signature):

Date:

Reviewed By (signature):

Date: _____

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Site-specific health and safety plan (HASP) is to provide specific guidelines and to establish procedures for the protection of personnel performing the activities described in Section 2 – Site Operations. The information in this HASP has been developed in accordance with applicable standards and is, to the extent possible, based on information available to date. The HASP is also a living document in that it must continually evolve as Site conditions and knowledge of the Site work activities develop further.

A vital element of Conestoga-Rovers & Associates' (CRA's) Health and Safety Policies and Procedures is the implementation of a Site-specific HASP for field activities. This HASP, as applicable to this project, includes the following measures:

- Communicate the contents of this HASP to Site personnel;
- Eliminate unsafe conditions. Efforts must be initiated to identify conditions that can contribute to an accident and to remove exposure to these conditions;
- Reduce unsafe acts. Personnel shall make a conscious effort to work safely. A high degree of safety awareness must be maintained so that safety factors involved in a task become an integral part of the task; and
- Inspect frequently. Regular safety inspections of the work site, materials, and equipment by qualified persons ensures early detection of unsafe conditions. Safety and health deficiencies shall be corrected as soon as possible, or project activities shall be suspended.

1.2 STOP WORK AUTHORITY

All CRA employees are empowered and expected to stop the work of co-workers, sub-contractors, client employees, or other contractors if any person's safety or the environment are at risk. NO repercussions will result from this action.

The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the removal of Site personnel from that area and reevaluation of the hazard and the levels of protection.

1.3 PERSONNEL REQUIREMENTS

All personnel conducting activities on Site must conduct their activities in compliance with all applicable Safety and Health legislation including, but not limited to, the Occupational Safety and Health Administration (OSHA) 29 CFR 1910, 29 CFR 1926, and

CRA policies and procedures. **Project personnel must also be familiar with the procedures and requirements of this HASP.** In the event of conflicting safety procedures/requirements, personnel must implement those safety practices, which afford the highest level of safety and protection.

1.4 PROJECT MANAGEMENT AND SAFETY RESPONSIBILITIES

Project Manager - Patricia A. Klick

The CRA project manager (PM) shall be responsible for the overall implementation of the HASP, and for ensuring that all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP and consultation with the Client/Owner regarding appropriate changes to the HASP. The PM will also ensure the appropriate resources are provided to support the project with respect to all operations.

Site Supervisor - Timothy Pranger or Designee

The Site Supervisor (SS) is the person who, under the supervision of the project manager, shall be responsible for the communication of the Site requirements to Site project personnel and subcontractors, and is responsible for carrying out the health and safety responsibilities by making sure that:

- All necessary clean-up and maintenance of safety equipment is conducted by project personnel.
- Emergency services are contacted.
- Forms attached to the HASP are completed, filed and submitted correctly.
- A pre-entry briefing is conducted which will serve to familiarize on-Site personnel with the procedures, requirements, and provisions of this HASP.

The SS is responsible for overall implementation of the HASP, and for ensuring that all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP, communication of Site requirements to Subcontractor personnel, and consultation with the Client/Site Representative regarding appropriate changes to the HASP.

The SS also has the responsibility of enforcing safe work practices for project employees. The SS watches for any ill affects on any crew member, especially those symptoms caused by heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the Site. The SS maintains communication with the Client/Site representative(s).

Other specific duties of the SS include:

- Orders the immediate shutdown of Site activities in the case of a medical emergency, unsafe condition, or unsafe practice;
- Provide the safety equipment, personal protective equipment (PPE), and other items necessary for employees;
- Enforce the use of required safety equipment, PPE, and other items necessary for employee or community safety;
- Conduct job Site inspections as a part of quality assurance for safety and health; and
- Report safety and health concerns to Site management as necessary.

Employee Safety Responsibility

CRA employees are responsible for their own safety as well as the safety of those around them. CRA employees shall use any equipment provided in a safe and responsible manner, as directed by their supervisor.

Employees are directed to take the following actions when appropriate:

- Suspend any operations which may cause an imminent health hazard to employees, subcontractors, or others;
- Correct job Site hazards when possible to do so, without endangering life or health; and
- Report safety and health concerns to the SS or Regional Safety & Health Manager (RHSM).

Subcontractors - CRA subcontractors are responsible for the implementation of their HASP and agree to comply with its contents. In the event of conflicting safety procedures/requirements, personnel must implement those safety practices, which afford the highest level of safety and protection. In addition, it is also understood that non-compliance with health and safety policies and procedures may subject the subcontractor to disciplinary action up to and including termination of their contract with CRA. Subcontractors will be required to attend an initial Site Orientation and attend subsequent safety meetings.

Equipment Operators - All equipment operators are responsible for the safe operation of heavy equipment. Operators are responsible for inspecting their equipment to ensure safe performance. Brakes, hydraulic lines, backup alarms, and fire extinguishers must be inspected routinely throughout the project. Equipment will be taken out of service if an unsafe condition occurs.

Authorized Visitors - Shall be provided with all known information with respect to the Site operations and hazards as applicable to the purpose of their visit.

1.5 TRAINING REQUIREMENTS

All personnel conducting work at this Site shall have completed the appropriate health and safety training as applicable to their job tasks/duties. The required training is referenced throughout the HASP and identified on the activity task hazard analysis.

1.5.1 SITE-SPECIFIC TRAINING

An initial Site-specific training session or briefing shall be conducted by the PM or SS prior to commencement of work activities. During this initial training session, employees shall be instructed on the following topics:

- Personnel responsibilities;
- Content and implementation of the HASP;
- Site hazards and controls;
- Site-specific hazardous procedures (e.g., drilling, excavating, etc.);
- Training requirements;
- Personnel protective equipment requirements;
- Emergency information, including local emergency response team phone numbers, route to nearest hospital, accident reporting procedures and emergency response procedures;
- Instruction on the completion of required inspections and forms; and
- Location of safety equipment (e.g., portable eyewash, first aid kit, fire extinguishers, etc.).

The various components of the project HASP will be presented followed by an opportunity to ask questions to ensure that each attendee understands the HASP. Personnel will not be permitted to enter or work in potentially contaminated areas of the Site until they have completed the Site-specific training session. Personnel successfully completing this training session shall sign the HASP Training Acknowledgement Form, which is presented in Appendix A.

In addition to the initial Site briefing conducted at the commencement of the project, supplemental brief safety meetings shall be conducted by the SS to discuss potential health and safety hazards associated with upcoming tasks, and necessary precautions to be taken.

1.5.2 SAFETY MEETING/HEALTH AND SAFETY PLAN REVIEW

"Tailgate" safety meetings will take place each day prior to beginning the day's work. All Site personnel will attend these safety meetings conducted by the SS. The safety meetings will cover specific health and safety issues, Site activities, changes in Site conditions, and a review of topics covered in the Site-specific pre-entry briefing. The safety meetings will be documented with written sign-in sheets containing a list of topics discussed. This form is found in Appendix A.

2.0 SITE OPERATIONS

2.1 SCOPE OF WORK

This HASP covers the specific Site activities that will be conducted by CRA personnel and their subcontractors. These activities are as follows:

- Mobilization of personnel, materials, and equipment to and from the site;
- Site survey;
- Installation and monitoring of staff gauges;
- Surface water sampling;
- Drilling activities;
- Surficial and subsurface soil sampling;
- Installation of permanent monitoring wells;
- Groundwater sampling; and
- Decontamination of personnel and equipment.

If Site operations are altered or if additional tasks are assigned, an addendum to this HASP shall be developed to address the specific hazards associated with these changes.

3.0 HAZARD EVALUATION

This section identifies and evaluates the potential chemical, physical, and biological hazards, which may be encountered during the completion of this project. Specific activity task hazard analysis (THA) tables (located in Appendix B) have been developed to address the hazards associated with the Site operations outlined in Section 2.

3.1 CHEMICAL HAZARDS

The chemical hazards associated with conducting Site operations include the potential on-Site contaminants encountered during field activities, and products used in decontamination of equipment and support products such as fuel. The potential routes of exposure from these products during normal use may occur through inhalation of vapors/dusts or direct contact or absorption with the materials. The chemical hazards of concern that may be encountered during the tasks identified in the project's scope of work includes tritium.

3.1.1 TRITIUM

Tritium (chemical symbol H-3) is a radioactive isotope of the element hydrogen. Tritium is produced naturally in the upper atmosphere when cosmic rays strike the air. Tritium is also produced during nuclear weapons explosions, as a byproduct in reactors producing electricity, and in special production reactors, where the isotope lithium-7 and boron-10 is bombarded to produce tritium.

Although tritium can be a gas, its most common form as a component of liquid water. Like nonradioactive hydrogen, radioactive tritium reacts with oxygen to form water. Tritium replaces one of the stable hydrogens in the water molecule and is called tritiated water. Like H₂O, tritiated water is colorless and odorless.

Under normal operating conditions at the Quad Cities Facility, the principal radionuclide in the reactor coolant is tritium. Tritium is formed when a neutron is captured by boron and/or lithium present in coolant. Excess plant water that contains tritium was released periodically to the environment via the circulating water system, which discharges to the Mississippi River.

The United States Environmental Protection Agency (USEPA) has established a Maximum Contaminant Level (MCL) of 4 millirem per year for beta particle and photon radioactivity from man-made radionuclides in drinking water. The average concentration of tritium that is assumed to yield 4 millirem per year is 20,000 picocuries per liter (pCi/l). If other radionuclides which emit beta particles and photon radioactivity are present in addition to tritium, the sum of the annual dose from all the radionuclides shall not exceed 4 millirem/year.

As with all ionizing radiation, exposure to tritium increases the risk of developing cancer. However, tritium is one of the least dangerous radionuclides because it emits very weak radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues are generally uniform and dependent on the tissues' water content.

3.1.2 SKIN CONTACT AND ABSORPTION CONTAMINANTS

Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. The proper PPE (e.g., gloves), as described in Section 4, shall be worn for all activities where contact with potentially harmful media or materials is anticipated.

3.1.3 HAZARD COMMUNICATION

Personnel required to handle or use hazardous materials as part of their job duties will be trained and educated in accordance with the Hazard Communication or Workplace Hazardous Materials Information System (WHMIS) standard as applicable. The training shall include instruction on the safe usage, and handling procedures of hazardous materials, how to read and access Material Safety Data Sheets (MSDSs), and the proper labeling requirements.

The MSDSs will be available to project personnel and are provided in Appendix C.

3.2 PHYSICAL HAZARDS

Physical hazards that may be present during project work include: potential for close proximity to heavy equipment and drilling devices, noise, overhead or underground utilities, use of hand and power tools, slip/trip/hit/fall injuries, electrical energy, material handling, vehicle traffic, heavy lifting, biological hazards, heat stress, and other potential adverse weather conditions. In addition, personnel must be aware that the protective equipment worn may limit dexterity and visibility and may increase the difficulty of performing some tasks.

3.2.1 DRILLING SAFETY

The following practices shall be adhered to by drilling personnel:

- Equipment should be inspected daily by the operator to ensure that there are no operational problems.

- Before leaving the controls, shift the transmission controlling the rotary drive into neutral and place the feed lever in neutral. Before leaving the vicinity of the drill, shut down the drill engine.
- Before raising the mast, check for overhead obstructions.
- Before the mast of a drill rig is raised, the drill rig must first be leveled and stabilized with leveling jacks and/or cribbing. Re-level the drill rig if it settles after initial set up. Lower the mast only when the leveling jacks are down, and do not raise the leveling jack pads until the mast is lowered completely.
- Employees involved in the operation shall not wear any loose-fitting clothing, which has the potential to be caught in moving machinery.
- Personnel shall wear steel-toed shoes, safety glasses, hearing protection, and hard hats during drilling operations.
- The area shall be roped off, marked or posted, to keep the area clear of pedestrian traffic or spectators.
- Personnel should be instructed in the location and use of the emergency kill switch on the drill rig.

3.2.2 UTILITY CLEARANCES

Elevated superstructures (e.g., drill rigs, back hoes, scaffolding, ladders, etc.) shall remain a distance of 10 feet away from utility lines (< 50 kV) and 20 feet away from power lines. Underground utilities, if present, shall be clearly marked and identified prior to commencement of work.

Personnel involved in intrusive work shall determine the minimum distance from marked utilities which work can be conducted with the assistance of the locator line service.

3.2.3 VEHICLE TRAFFIC

The following safety measures are to be taken by personnel that have the potential to be exposed to vehicle traffic:

- a high visibility safety vest meeting ANSI Class 2 garment requirements is to be worn at all times;
- employees will work using the "buddy system";
- cones, etc. will be used to demarcate a safe work zone around the monitoring wells; and

- appropriate signage will be posted as necessary to inform roadway/parking lot users of any additional control measures necessary to protect the public and CRA employees.

3.2.4 MATERIAL HANDLING

Material handling operations to be conducted at the project Site include manual lifting of materials and trucks.

General Storage Practices

The basic safety requirement for storage areas is that the storage of materials and supplies shall not create a hazard. Additional general storage area practices include the following:

- Bags, containers, bundles, etc. stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
- All stacked materials, cargo, etc. shall be examined for sharp edges, protrusions, signs of damage, or other factors likely to cause injury to persons handling these objects. Defects should be corrected as they are detected.
- Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage.
- Storage areas shall have provisions to minimize manual lifting and carrying. Aisles and passageways shall provide for the movement of mechanical lifting and conveyance devices.
- Stored materials shall not block or obstruct access to emergency exits, fire extinguishers, alarm boxes, first aid equipment, lights, electrical control panels, or other control boxes.
- "NO SMOKING" signs shall be conspicuously posted, as needed, in areas where combustible or flammable materials are stored and handled.
- Cylindrical materials such as pipes and poles shall be stored in racks, or stacked on the ground and blocked.

Special Precautions For Hazardous or Incompatible Materials Storage

Generally, materials are considered hazardous if they are ignitable, corrosive, reactive, or toxic. Manufacturers and suppliers of these materials must (on request) provide the recipient with MSDSs, which describe their hazardous characteristics, and give instructions for their safe handling and storage.

Many hazardous materials are incompatible, which means they form mixtures that may have hazardous characteristics not described on the individual MSDSs. The following special precautions shall be followed regarding the storage of hazardous materials:

- Based on the information available on the MSDSs, incompatible materials shall be kept in separate storage areas.
- Warning signs shall be conspicuously posted, as needed, in areas where hazardous materials are stored.

3.2.5 HEAVY LIFTING METHOD

When lifting objects, use the following proper lifting techniques:

- Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread a more stable lift can occur and the rear foot is in a better position for the upward thrust of the lift.
- Use the squat position and keep the back straight, but remember that straight does not mean vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the guts that can cause a hernia.
- Grip is one of the most important elements of correct lifting. The fingers and the hand are extended around the object you're going to lift using the full palm. Fingers have very little power; use the strength of your entire hand.
- The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered.

The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and also ensures better balance. Start the lift with a thrust of the rear foot. Do not twist.

3.2.6 HAND AND POWER TOOLS

Hand Tools

- Hand tools must meet the manufacturer's safety standards.
- Hand tools must not be altered in any way.
- At a minimum, eye protection must be used when working with hand tools.
- Wrenches (including adjustable, pipe, end, and socket wrenches) must not be used when jaws are sprung to the point that slippage occurs.

- Impact tools (such as drift pins, wedges, and chisels) must be kept free of mushroom heads.
- Wooden handles must be free of splinters or cracks and secured tightly to the tool.

Power Tools

- All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.
- Electric tools must not be used in areas subject to fire or explosion hazards, unless they are approved for that purpose.
- Portable electric tools must be connected to a GFCI when working in wet areas.
- Proper eye protection must be used when working with power tools.
- Personnel must be trained in the proper use of each specific tool.
- Any unsafe or damaged power tools must be immediately tagged and removed from service.

3.2.7 HEAT STRESS

Recognition and Symptoms

Temperature stress is one of the most common illnesses at hazardous waste Sites. Acclimatization and frequent rest periods must be established for conducting activities where temperature stress may occur. Below are listed signs and symptoms of heat stress. Personnel should follow appropriate guidelines if any personnel exhibit these symptoms:

Heat Rash – Redness of skin. Frequent rest and change of clothing.

Heat Cramps – Painful muscle spasms in hands, feet, and/or abdomen. Administer lightly-salted water by mouth, unless there are medical restrictions.

Heat Exhaustion – Clammy, moist, pale skin, along with dizziness, nausea, rapid pulse, fainting. Remove to cooler area and administer fluids if alert/awake.

Heat Stroke – Hot dry skin; red, spotted or bluish; high body temperature of 104°F, mental confusion, loss of consciousness, convulsions or coma. Immediately cool victim by immersion in cool water. Wrap with wet sheet while fanning, sponge with cool liquid while fanning; treat for shock. **DO NOT DELAY TREATMENT. COOL BODY WHILE AWAITING AMBULANCE.**

Work Practices

The following procedures will be carried out to reduce heat stress:

- Heat stress monitoring;
- Acclimatization;
- Work/rest regimes;
- Liquids that replace electrolytes/salty foods available during rest; and
- Use of buddy system.

Acclimatization

The level of heat stress at which excessive heat strain will result depends on the heat tolerance capabilities of the worker. Each worker has an upper limit for heat stress beyond which the resulting heat strain can cause the worker to become a heat casualty. In most workers, appropriate repeated exposure to elevated heat stress causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with the heat stress. Work/rest regimes will be partially determined by the degree of acclimatization provided.

Worker Information and Training

All new and current employees who work in areas where there is a reasonable likelihood of heat injury or illness should be kept informed, through continuing education programs:

- Heat stress hazards.
- Predisposing factors and relevant signs and symptoms of heat injury and illness.
- Potential health effects of excessive heat stress and first aid procedures.
- Proper precautions for work in heat stress areas.
- Worker responsibilities for following proper work practices and control procedures to help protect the health and safety of themselves and their fellow workers, including instruction to immediately report to the employer the development of signs or symptoms of heat stress overexposure.
- The effects of therapeutic drugs, over-the-counter medications, or social drugs may increase the risk of heat injury or illness by reducing heat tolerance.

3.2.8 ADVERSE WEATHER CONDITIONS

The SS shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, tornado warnings, and strong winds

(approximately 25 mph) are examples of conditions that would call for the discontinuation of work and evacuation of Site.

No work with elevated super structures (e.g., drilling) will be permitted during any type of electrical storm.

3.2.9 NOISE

Project activities, such as use of power tools and material handling equipment, that generate noise levels exceeding the decibel range (85 dBA) will require the use of hearing protection with a Noise Reduction Rating (NRR) of at least 20 when noise levels exceed 85 dBA. Hearing protection (earplugs/ear muffs) will be available to personnel and visitors that would require entry into these areas.

When it is difficult to hear a coworker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All Site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss as part of their Corporate Hearing Conservation Program.

3.2.10 SLIP/TRIP/HIT/FALL

Slip/trip/hit/fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot-check the work area to identify hazards.
- Establish and utilize a pathway which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads which you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-Site personnel.
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep a safe buffer zone between workers using equipment and tools.

3.2.11 ELECTRICAL HAZARDS

No employee shall be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or has been locked and tagged out:

- All electrical wiring and equipment shall be a type listed by Underwriters' Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. Ground fault circuit interrupters shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- Generators and like equipment will be grounded in accordance with NEC, unless exempted by NEC 250-6.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

Control of Hazardous Energy

OSHA's "Control of Hazardous Energy Sources" Standard, 29 CFR 1910.147, covers the servicing and maintenance of machines and equipment in which the unexpected energization or start-up of the machines or equipment could cause injury to employees.

The standard also establishes minimum performance requirements to control hazardous energy and requires that employers develop and implement an energy control program. The elements of an energy control program are as follows:

- Lockout/tagout;
- Employee protection;
- Energy control procedure;
- Protective materials and hardware;
- Periodic inspections;
- Training and communication;
- Energy isolation; and
- Employee notification.

Project personnel that are required to conduct operations and maintenance activities that will require the isolation of an energy hazard through the use of a Lockout/Tagout device shall follow the CRA program requirements and written procedures for that operation.

Employee Training

Employees authorized to attach and remove lockout/tagout devices shall be provided with initial training regarding the safe application, usage, and removal of such devices. Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the associated energy, and the methods necessary for energy isolation and control.

All authorized employees will be provided with refresher training annually, or at more frequent intervals whenever the following conditions apply:

- There is a job assignment change.
- There is a change in machinery or equipment, or a process change that presents new hazards.
- There is a change in the energy control procedures.
- The supervisor has reason to believe that there are deficiencies in the employee's understanding of the following:
 - The hazards associated with the energy that controls the machinery or equipment in the employee's work area.
 - Application and removal procedures for lockout/tagout devices.

Employees who work in areas where lockout/tagout procedures are used shall receive initial and annual refresher training in the purpose and use of lockout/tagout devices and principles behind their use.

3.2.12 FLAMMABLE AND COMBUSTIBLE LIQUIDS

The storage, dispensing, and handling of flammable and combustible liquids must be in accordance with OSHA 29 CFR 1910.106. The specific flammable or combustible liquids used at the Site may include gasoline, diesel, kerosene, oils, and solvents.

Flammable and combustible liquids are classified according to flash point. This is the temperature at which the liquid gives off sufficient vapors to readily ignite. Flammable liquids have flash points below 100°F. Combustible liquids have flash points above 100°F and below 200°F.

Flammable Liquid Classes

Flammable liquids are known as Class I liquids, and are divided into three classes:

- a) Class 1A, liquids having a flash point below 73°F (22.8°C), and having a boiling point below 100°F (37.8°C) (ethyl ether, isoprene, pentane, petroleum ether).
- b) Class 1B, liquids having a flash point below 73°F (22.8°C), and a boiling point at or above 100°F (37.8°C) (acetone, benzene, denatured alcohol, gasoline, methyl ethyl ketone, octane).
- c) Class 1C, liquids having a flash point at or above 73°F (22.8°C) and below 100°F (37.8°C) (amyl acetate, turpentine).

Combustible Liquid Classes

Combustible liquids are known as Class II and III liquids, and are divided into four classes:

- a) Class II, liquids include those with a flash point at or above 100°F (37.8°C), and below 140°F (60°C) (diesel, fuel oils, kerosene, mineral spirits).
- b) Class III, liquids are those with a flash point above 140°F. Class III liquids are further divided into two subclasses:
- c) Class IIIA, liquids with a flash point above 140°F and below 200°F (93.3°C).
- d) Class IIIB, liquids with a flash point at or above 200°F (93.3°C).

Note: When a combustible liquid is heated for use to within 30°F (16.7°C) of its flash point, it must be handled in accordance with the requirements for the next lower class of liquids.

Storage

Many flammables can ignite at temperatures at or below room temperature. They are far more dangerous than combustibles when they are heated. As a result, these products must be handled very carefully. At normal temperatures, these liquids can release vapors that are explosive and hazardous to employee health. Exposure to heat can cause some of these liquids to break down into acids, corrosives, or toxic gases.

For this reason, flammable/combustible liquids should be stored in cool, well ventilated areas away from any source of ignition. Always consult the MSDS of the product for specific information.

Flammable and combustible liquids must be stored in designated areas. Such areas must be isolated from equipment and work activity, which may produce flames, sparks, heat or any form of ignition, including smoking. The most practical method is the use of

one or more approved (commercially available) flammable/combustible liquid storage cabinets.

Each cabinet may store up to the following quantities:

- a) 60 gallons of Class I or II liquids.
- b) 120 gallons of Class III liquids.

Cabinets must be labeled "Flammable - Keep Fire Away." Doors must be kept closed and labeled accordingly. Containers must be kept in the cabinet when not in use. There are also restrictions on the maximum allowable container size depending on the class of the products. See table below.

Maximum Size of Containers and Portable Tanks

<i>Container Type</i>	<u>Flammable Liquids</u>			<u>Combustible Liquids</u>	
	<i>Class 1A</i>	<i>Class 1B</i>	<i>Class 1C</i>	<i>Class II</i>	<i>Class III</i>
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal
Metal drums (DOT spec)	60 gal	60 gal	60 gal	60 gal	60 gal
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal

General Requirements

- Keep containers of flammable/combustible liquids closed when not in use.
- Keep flammable/combustible liquids in designated areas and approved cabinets.
- Do not allow use of unapproved containers for transfer or storage. Use only approved safety cans (5-gallon maximum) with a spring closing lid and spout cover, designated to safely relieve internal pressure when exposed to heat or fire.
- Use only approved self-closing spigots, faucets, and manual pumps when drawing flammable/combustible liquids from larger containers/barrels.
- Use only approved metal waste cans with lids for disposal of shop towels/oily rags.
- Designate "Smoking" and "No Smoking" areas.
- Observe all signs indicating "No Smoking," "No Flames," "No Ignition."

Transferring Flammable/Combustible Liquids

- This seemingly routine task can be hazardous if certain precautions are not followed. Grounding and bonding must be observed at all times to prevent the accumulation of static electricity when transferring containers/barrels one to another.

- Drums should be grounded (#4 copper conductor) to a grounding rod.
- Bonding is necessary between conductive containers; (e.g., a barrel and a 5-gallon container).

3.2.13 WORKING OVER OR NEAR WATER

The procedures outlined in this section are to be implemented by all CRA and subcontractor personnel when there is potential to slip or fall into water that is greater than three (3) feet in depth. Additionally, these procedures are to be adhered to when water is flowing and has the potential to carry personnel away. To ensure full compliance, especially when determining specific requirements the OSHA Regulations themselves must be consulted.

- When working at ground level, a five (5) foot "no entry zone" can be established between the work area and the water hazard. The "no entry zone" is to be clearly defined and/or demarcated. Personnel will not be permitted to enter into this area unless the other provisions of this section are in place.
- Standard guardrails are required on any walking/working surface over or near water. Guardrails shall meet the requirements set forth by OSHA.
- Where guardrails are not practical due to impairment of work being performed, other types of safeguarding, such as safety harnesses, lifelines, and lanyards may be used (see CRA's Fall Protection SOP).
- If it is not feasible to provide fall protection due to the scope of work or location, personnel will be required to wear U.S. Coast Guard-approved life jackets or buoyant work vests (**29 CFR 1926.106(a)**). Prior to each use and after each use, the buoyant work vests and life preservers must be inspected for defects which would affect strength and/or buoyancy (**29 CFR 1926.106(b)**). Any damaged or defective buoyant work vest or life preserver cannot be used (**29 CFR 1926.106(b)**).
- Call in or make prearranged contacts after each activity posing a drowning hazard is completed.
- If it is necessary to work on wet/slippery surfaces above water, non-slip tape or other methods are to be used to increase traction.
- Ring buoys with a minimum of 90 feet of line must be readily available for emergency operations. The distance between buoys cannot exceed 200 feet (**29 CFR 1926.106(c)**).
- Due to the anticipated scope of work, it is not expected that a life saving skiff will be necessary (**29 CFR 1926.106(d)**). However, the SS in conjunction with the RSHM will evaluate current Site conditions to determine if a skiff is required.

3.3 BIOLOGICAL HAZARDS

3.3.1 TICK-BORNE DISEASES

Lyme disease is caused by a bacterial parasite called spirochete, and is spread by infected ticks that live in and near wooded areas, tall grass, and brush. Once the tick deposits the spirochete, it must feed on the host blood for 12 to 24 hours before it can transmit the disease. The ticks that cause the disease in the Northeast and Midwest are often no bigger than a poppy seed or a comma in a newsprint. The peak months for human infection are June through October. There are many other tick borne diseases such as Rocky Mountain Spotted Fever, which can be carried by a variety of ticks. The prevention and treatment of these diseases are similar to those of Lyme disease.

Prevention

Ticks hang on blades of grass or shrub waiting for a host to come by. When a host brushes against the vegetation, the tick grabs on. They usually first climb onto a persons legs and then crawl up looking for a place to attach. Preventative measures include wearing light-colored clothing, keeping clothing buttoned, tucking pant legs in socks, and keeping shirt tails tucked in. Periodic checks for ticks should be made during the day, and especially at night. Hair should also be checked by parting it and combing through it to make sure that no ticks have attached to the scalp. Also, check clothing when it is first removed, before ticks have a chance to crawl off.

The most common repellent recommended for ticks is N,N-dimethyl-m-toluamide, or DEET. It is important to follow the manufacturer's instructions found on the container for use with all insecticides especially those containing DEET. In general, DEET insect repellent should only be applied to clothing, not directly on the skin. Do not apply to sunburns, cuts or abrasions. Use soap and water to remove DEET once indoors.

Removal

The best way to remove a tick is removal by tweezers. If tweezers are not available, cover your fingers (tissue paper) while grasping the tick. It is important to grasp the tick as close as possible to the site of attachment and use a firm steady pull to remove it. When removing the tick, be certain to remove all the mouth parts from your skin so as not to cause irritation or infection. Wash hands immediately after with soap and water, and apply antiseptic to the area where tick was removed.

Testing and Symptoms of Lyme Disease

A variety of tests exist for determining Lyme Disease infection. However, most of these tests are not exact. The first symptoms of Lyme Disease usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick attached. The rash is often bull's eye-like

with red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy". Unfortunately, this rash appears in only 60 to 80 percent of infected persons. An infected person also has flu-like symptoms of fever, fatigue, chills, headaches, a stiff neck, and muscle aches and pains (especially knees). Rashes may be found some distance away from original rash. These symptoms often disappear after a few weeks.

3.3.2 POISONOUS PLANTS

Common *Poison Ivy* (*Rhus radicans*) grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. *Poison Sumac* (*Rhus vernix*) grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction. This reaction is called contact dermatitis.

Dermatitis, in Rhus-sensitive persons, can result from contact with the milky sap found in the roots, stems, leaves, and fruit. The sap may retain its potency for months or years in a dry atmosphere, and can occur during any time of the year. The sap may also be carried by animals, equipment or apparel.

The best form of prevention is to avoid contact. This can occur by wearing long sleeves and gloves if necessary. Disposable clothing, such as Tyvek, is recommended in high-risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

3.3.3 INSECTS

Mosquitoes

Mosquitoes are common pests within the work environment. They belong to the order Diptera and are otherwise known as the True Flies. Unlike other flies within this order, mosquitoes have scales along their wings. Mosquitoes principally feed on nectar and other similar sugar sources. However, females require a blood meal for egg production. Through these activities, mosquitoes can pass along diseases such as West Nile virus and Malaria. Several different methods can be used to control adult mosquito populations: repellants such as DEET, mosquito traps, foggers, and vegetation and water management.

Wasps

Wasps belong to the order Hymenoptera. They generally range in size from ½ to 1½ inches in length and are reddish-brown in color. They are characterized by two pairs

of membranous wings and an ovipositor for laying eggs. Most stinging wasps are predators and scavengers capable of delivering several stings to its prey. Female wasps have stingers, but males lack stinging capabilities. Wasp venom releases histamine, which dissolves red blood cells and causes temporary pain and swelling. Some individuals may experience an allergic reaction and require medical attention. Wasp nests may be located along the ground or above ground, and these nests should be professionally removed.

Honey Bees

Honey bees (*Apis mellifera*) are highly social insects and communicate with each other, relaying direction and distance of nectar and pollen sources. A honey bee colony in a house wall can cause major problems. The bees can chew through the wall and fly inside. Their storage of large amounts of honey invites other bees and wasps. Their detritus (e.g., dead bees, shedded larval skins, wax caps from combs and other material) attracts beetles and moths. When a bee colony is found in a building wall, it must be killed and the nest removed.

Paper Wasps

Paper wasps (Family Polistes) nests are often found near doorways and other human activity areas without occupants being stung. Colonies can become problems, but when they do, Paper wasps can be controlled easily. When attracted to fallen ripe fruit, these wasps sting people who venture into the same area. Colonies in trees, out buildings, hollow fence posts and other protected places are not as easy to control as those are from nests on structures.

Mud Dauber Wasps

Mud Dauber wasps (Family Sphecidae) are not social wasps like Paper wasps. They are in a different family. Many paralyze spiders to provision mud cells built to enclose eggs, larvae and pupae. The mud cells form long clay tubes or large lumps. The wasps are slender; they are shiny black or brown, orange or yellow, with black markings. Many have long slender thread waists. Like Carpenter bees there is no protective worker caste; these wasps are not aggressive; they will not sting unless pressed or handled. Mud Daubers place their mud nests in protected places like electric motors, sheds, attics, against house siding and under porch ceilings.

In parts of the United States, particularly in the eastern states, yellowjackets, wasps, hornets and bees are all called bees by the general public. Of course the general public is principally focused on one attribute these insects have in common -- their stingers. Yellowjackets, hornets and paper wasps are all in the same insect family, Vespidae.

Poisonous Spiders

Black widow spiders (genus *Latrodectus*) are not usually deadly (especially to adults) and only the female is venomous. The female spider is shiny black, usually with a reddish hourglass shape on the underside of her spherical abdomen. Her body is about 1.5 inches long while the adult male's is approximately half that. The spider's span ranges between 1-3 inches. The adult males are harmless, have longer legs and usually have yellow and red bands and spots over their back and the young black widows are colored orange and white. The bite of a black widow is often not painful and may go unnoticed. However, the poison injected by the spider's bite can cause severe reactions in certain individuals. Symptoms that may be experienced include abdominal pain, profuse sweating, swelling of the eyelids, pains to muscles or the soles of the feet, salivation and dry-mouth (alternating) and paralysis of the diaphragm. If a person is bitten, they should seek immediate medical attention. Clean the area of the bite with soap and water. Apply a cool compress to the bite location. Keep affected limb elevated to about heart level. Ask doctor if Tylenol or aspirin can be taken to relieve minor symptoms. Additional information can be obtained from the Poison Center (1-800-222-1222).

Brown recluse spiders are usually light brown in color, but in some instances, they may be darker. The brown recluse can vary in size, but some can obtain bodies of 5/8 inches in length with a leg span of 1½ inches in diameter. They can be identified by their three pairs of eyes along the head area and their fiddle shaped markings on the back. Most brown recluse bites are defensive rather than offensive. They generally only bite when they feel threatened. If bitten by a brown recluse, an individual may experience open, ulcerated sores, which when left untreated may become infected and cause tissue necrosis. If an individual believes a spider has bitten them, they need to seek medical attention as soon as possible. In order to minimize the occurrence of brown recluse bites, individuals should shake their clothing and shoes thoroughly, eliminate the presence of cluttered areas, and spray the building perimeters with pesticides.

3.3.4 SNAKES

Snakes are to be avoided on the jobsite. Many snakes are capable of inflicting severe bites, even if they are not venomous. Be aware of places where snakes may hide when removing covers of manholes, field equipment, etc. and when moving through high grass and piles of rubble.

Four native Illinois snake species are venomous: the eastern *massasauga* (*Sistrurus catenatus*), the cottonmouth (*Agkistrodon piscivorus*), the timber rattlesnake (*Crotalus horridus*), and the copperhead (*Agkistrodon contortrix*). Venom is a toxin for subduing prey. It is delivered through a pair of hollow fangs in the front, upper mouth that fold up when the mouth is closed and drop into place when the snake bites. The fangs are shed and replaced periodically. Venomous snakes strike, inject venom, then pull away.

They find and eat the prey after it dies. Illinois' venomous snakes produce venom that affects the blood of the prey. Juvenile snakes have venom equal in potency to that of the adult, but they produce lesser amounts.

In Illinois, venomous snakes are rare and tend to be restricted to specific habitats. Eastern massasaugas live in scattered locations roughly within the counties of Madison, Clinton, Piatt, Knox, Warren, Will, Cook, and Lake. Their habitats are prairie wetlands and river floodplains. Copperheads occur in the southern one-third of Illinois, south of Route 16, and in the lower Illinois River valley. They prefer upland forests or river bluffs with limestone or sandstone outcroppings. Cottonmouths live in swamps and wet bottomlands in southern Illinois, south of Route 13. Timber rattlesnakes may be found in the southern one-fourth of the state (south of Interstate 64), in the lower Illinois River valley, in the Mississippi River valley and in a few other locations. These snakes prefer heavy timber with rock outcrops and bluffs.

While venomous snakes are not aggressive and tend to bite people only when stepped on, picked up, or cornered, their bite is a serious matter. Even freshly killed snakes can bite. These snakes should be avoided and precautions taken (wear leather boots; do not reach under rocks or logs; do not step over rocks or logs; look around before you sit) if you are entering an area possibly inhabited by venomous snakes. Although usually not deadly, the bite is painful and can cause swelling, nausea, and the risk of infection. If you are bitten, go to a hospital for treatment immediately.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 GENERAL

This section shall cover the applicable PPE requirements, which shall include eye, face, head, foot, and respiratory protection. The purpose of PPE is to shield or isolate individuals from the chemical and physical hazards that may be encountered during work activities.

4.2 TYPES OF PPE

If required for a task, the following types of PPE will be available for use at the project Site: hard hat, safety glasses (with permanently affixed side shields), steel toed boots, gloves (nitrile), ear plugs, ear muffs, and reflective safety vests.

4.2.1 PROTECTIVE MATERIALS

4.2.1.1 RADIONUCLIDE PROTECTIVE CLOTHING

There is minimal external hazard with tritium. The beta particles are readily blocked by many conventional materials, including paper and clothing. If the skin is contaminated with tritium, the beta emissions will not have sufficient energy to be able to penetrate through the dead layer of skin. However, if tritium is absorbed into the body via ingestion or cuts in the skin, it can cause a radiation dose.

Tritium cannot be detected using typical radiation survey meters (e.g., Geiger-Muller or NaI). Film badges and dosimeter rings are not appropriate for monitoring tritium exposure. The maximum range of a beta particle in air is 0.6 cm. The maximum range of a beta particle in water/tissue: 0.0006 cm.

Protective gloves should always be worn when working with tritium to keep skin free from contamination, and gloves should be changed often if suspected of contamination.

4.2.1.2 CHEMICAL PROTECTIVE CLOTHING

Protective clothing is constructed of a variety of different materials for protection against exposure to specific chemicals. No universal protective material exists. All will degrade, be permeated, or otherwise fail to protect under certain circumstances.

Fortunately most manufacturers list guidelines for the use of their products. These guidelines usually concern gloves or coveralls and, generally, only measure rate of degradation (failure to maintain structure). It should be noted that a protective material

may not necessarily degrade but may allow a particular chemical to permeate its surface. For this reason, guidelines must be used with caution. When permeation tables are available, they should be used in conjunction with degradation tables.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all Site personnel using PPE:

1. when using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift.
2. inspect all clothing, gloves, and boots both prior to and during use for:
 - imperfect seams,
 - non-uniform coatings,
 - tears,
 - poorly functioning closures; and
3. inspect reusable garments, boots, and gloves both prior to and during use for:
 - visible signs of chemical permeation,
 - swelling,
 - discoloration,
 - stiffness,
 - brittleness,
 - cracks,
 - any sign of puncture, and
 - any sign of abrasion.

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of chemicals will not be reused.

4.3 LEVELS OF PROTECTION

The level of protection must correspond to the level of hazard known, or suspected, in the specific work area. PPE has been selected with specific considerations to the hazards associated with Site activities. The specific PPE to be used for each activity is outlined in each THA table located in Appendix B.

- All PPE will be disposed of and/or decontaminated at the conclusion of each workday as described below. Decontamination procedures will follow the concept of decontaminating the most contaminated PPE first.
- All disposable equipment shall be removed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work.

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited while working in area where the potential for chemical and/or explosive hazards may be present. Personnel must wash thoroughly before initiating any of the aforementioned activities.

4.3.1 REASSESSMENT OF PROTECTION LEVELS

Protection levels provided by PPE selection shall be upgraded or downgraded based upon a change in Site conditions or the review of the results of air monitoring and initial exposure assessment monitoring program.

When a significant change occurs, the hazards shall be reassessed. Some indicators of the need for reassessment are:

- commencement of a new work phase;
- change in job tasks during a work phase;
- change of season/weather;
- when temperature extremes or individual medical considerations limit the effectiveness of PPE;
- chemicals other than those expected to be encountered are identified (i.e., DNAPL encountered);
- change in ambient levels of chemicals; and
- change in work scope which effects the degree of contact with areas of potentially elevated chemical presence.

All proposed changes to protection levels and PPE requirements will be reviewed and approved prior to their implementation by the SS.

5.0 SITE CONTROL

The purpose of Site control is to minimize potential contamination of workers and protect the public from hazards found on Site. Site control is especially important in emergency situations.

5.1 COMMUNICATION

Each member of the Site entry team will be able to communicate with another entry team member at all times. Communications may be by way of an air horn, walkie-talkie, telephone or hand signals.

The primary means for external communication are telephones and radio. If telephone lines are not installed at a Site, all team members should:

- Know the location of the nearest telephone; and
- Have the necessary telephone numbers readily available

The following standard hand signals will be mandatory for all employees to understand regardless of other means of communication:

- Hand gripping throat – Cannot breathe.
- Hands on top of head – Need assistance.
- Thumbs up – OK, I'm all right, I understand.
- Thumbs down – No, negative.
- Gripping partner's wrist, or gripping both of your own hands on wrist (if partner is out of reach) – Leave area immediately.

5.2 SITE SECURITY

Site security is necessary to prevent the exposure of unauthorized, unprotected people to Site hazards and to avoid interference with safe working procedures. Security shall be maintained in the support zone.

5.3 DECONTAMINATION

It is the responsibility of the SS to ensure that all personnel and pieces of equipment coming off-Site are properly decontaminated according to the procedures outlined below. Documentation of decontamination must be made in the field log notebook that will become part of the permanent project file.

5.3.1 PERSONNEL AND EQUIPMENT DECONTAMINATION PROCEDURES

All PPE will be disposed of and/or decontaminated at the conclusion of each work day as described below. Decontamination procedures will follow the concept of deconning the most contaminated PPE first.

All disposable equipment shall be doffed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work.

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure.

Personnel - Decontamination will take place prior to exiting the contaminated work area.

Modified Level D - Remove outer protective wear, wash and rinse gloves, remove gloves. Wash hands and face.

Handle all clothing inside out when possible.

Equipment - All equipment must be decontaminated with Alconox/Liquinox solution or discarded upon exit from the contaminated area in a well-ventilated area. A temporary decon pad with a low-volume high-pressure washer will be setup on Site during drilling operations. All decon materials will be drummed for subsequent disposal.

5.4 SITE CONTROL MEASURES

Designated work areas will be set up as required. The purpose for this is to limit access to areas with potentially elevated chemical presence, and prevent the migration of potentially hazardous substances into adjacent clean areas. These work areas are described as follows:

The Exclusion Zone (EZ) is the area immediately surrounding the active work area. Sufficient area will be provided for efficient movement of personnel and equipment. Boundaries are modifiable depending on operational requirements. The SS will be responsible for maintaining the boundaries of this area. All individuals entering this area will be required to wear the designated PPE. A wind direction indicator (i.e., flagging, windsock, etc.) will be mounted in the area of the EZ.

The Contaminant Reduction Zone (CRZ) will be at the area where equipment is cleaned or decontaminated. Supplementary safety equipment such as fire extinguishers, portable eyewash units, and extra quantities of PPE may be stored.

The Support Zone (SZ) is defined as any clean area outside of the EZs or CRZs where personnel will not come into contact with potential areas of contamination or other health and safety hazards.

6.0 EMERGENCY PROCEDURES

6.1 ON-SITE EMERGENCIES

Emergencies can range from minor to serious conditions. Various procedures for responding to Site emergencies are listed in this section. The PM or SS is responsible for contacting local emergency services, if necessary, for specific emergency situations. Various individual Site characteristics will determine preliminary action to be taken to assure that these entry procedures are successfully implemented in the event of an emergency.

An Emergency Information Sheet containing the hospital location, directions, government agency phone numbers, emergency phone numbers, and a map with directions to the Hospital is located in Appendix A.

6.1.1 ACCIDENT, INJURY, AND ILLNESS REPORTING AND INVESTIGATION

Any work-related incident, accident, injury, illness, exposure, or property loss must be reported to your supervisor, the SS, and *within* 1 hour through the CRA Accident Reporting System. Motor vehicle accidents must also be reported through this system. CRA's Accident Report Form, located in Appendix A, must also be filled out and provided to the SS. The report must be filed for the following circumstances:

- Accident, injury, illness, or exposure of an employee.
- Injury of a subcontractor.
- Damage, loss or theft of property.
- Any motor vehicle accident regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the employee is acting in the course of employment.

Occupational accidents resulting in employee injury or illness will be investigated by the SS. This investigation will focus on determining the cause of the accident and modifying future work activities to eliminate the hazard.

All employees have the obligation and right to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If you wish to make such a report, it may be made orally to your supervisor or other member or management, or you may submit your concern in writing, either signed or anonymously.

6.2 EMERGENCY EQUIPMENT/FIRST AID

Safety equipment will be available for use by Site personnel, will be located within 30 feet of the work area(s) and maintained at the Site. The safety equipment will include, but is not limited to, the following: a 10 person first aid kit, emergency alarm (i.e., air horn), emergency eyewash, an ABC fire extinguisher (2A/10BC), potable water, anti-bacterial soap, and telephone.

6.3 EMERGENCY PROCEDURES FOR CONTAMINATED PERSONNEL

Whenever possible, personnel should be decontaminated in the contamination reduction zone before administering first aid, without causing further harm to the patient.

Skin Contact: Remove contaminated clothing; wash immediately with water; use soap, if available.

Inhalation: Remove victim from contaminated atmosphere. Remove any respiratory protection equipment. Initiate artificial respiration, if necessary. Transport to the hospital.

Ingestion: Remove from contaminated atmosphere. Do not induce vomiting if victim is unconscious. Also never induce vomiting when acids, alkalis, or petroleum products are suspected. Transport to the hospital, if necessary.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a listing of the contaminants of concern to which they may have been exposed.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated, as necessary.

6.4 SITE EVACUATION

In the event of an emergency situation such as fire, explosion, significant release of toxic gases, etc., an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. Personnel in the field will be notified through established communications to evacuate the area. All personnel in both the restricted and non-restricted area will evacuate and assemble near the Support Zone or other safe area as identified by the supervisor/SS prior to the beginning of field operations.

6.5 SPILL AND RELEASE CONTINGENCIES

If a spill has occurred, the first step is controlling the spread of contamination if possible. CRA personnel will immediately contact Site management to inform them of the spill and activate emergency spill procedures.

7.0 RECORDKEEPING

The SS shall establish and maintain records of all necessary and prudent monitoring activities as described below:

- name and job classification of the employees involved on specific tasks;
- air monitoring/sampling results and instrument calibration logs;
- records of training acknowledgment forms; and
- emergency reports describing any incidents or accidents.

APPENDIX A

FORMS

1. EMERGENCY CONTACT SHEET
2. HASP ACKNOWLEDGEMENT FORM
3. TAILGATE SAFETY MEETING FORM
4. CRA ACCIDENT REPORTING FORM

EMERGENCY INFORMATION		
Contact	Phone Number	Hospital Directions
Local Police	(911)	
Fire Department	(911)	
Ambulance	(911)	
Local Hospital: Illini Hospital 801 Hospital Road Silvis, Illinois 61282	(309) 792-9363	
National Poison Center	(800) 222-1222	
Project Manager: Patricia A. Klick	Office: 773-380-9933 Cell: 847-917-1561	CRA - Accident Reporting System Please call (866) 529-4886 and provide: <ul style="list-style-type: none"> • Name and location of caller • Description of incident • Name of any injured persons • Description of injuries • Phone number for return call.
Site Supervisor: Timothy Pranger or Designee	Office: 317-381-0677 Cell: 317-443-1544	
CRA Regional S&H Manager: Bill Doyle	Office: (734) 453-5123 Cell: (734) 536-1282	
Site/Client Contact: Vicki Neels	(309) 227-3200	

* Hospital Route must be field validated before Site work commences.

TAILGATE SAFETY MEETING FORM
Exelon Generation - Quad Cities Station

Date: _____ Time: _____

Site Location: _____

Site Personnel in attendance:

Name (Print)	Signature	Company

Safety Topics/Items discussed:

Supervisor

Name: _____ Date: _____

CONESTOGA-ROVERS & ASSOCIATES (CRA) ACCIDENT REPORTING FORM

Report all accidents immediately by calling 1-866-529-4886

Instructions: For Personal Injuries, Property Damage, and Near Miss Reports, Complete Sections 1 and 2.
For Vehicle Accidents, Complete Sections 1, 2, and 4. Form must be completed within 24 hours.

SECTION 1

A. Employee Identification <input type="checkbox"/> CRA Employee <input type="checkbox"/> Temporary Employee <input type="checkbox"/> Subcontractor				
Employee No.	Last Name	First Name	Middle Name/Initial	M or F
Area Code ()	Telephone Number	Address (Street, City, State, Province, Zip Code)		
Date of Hire / /	Position/Title	Supervisor	Employee's Company/Office Location	
B. General Information				
Where did the accident occur? <input type="checkbox"/> Office <input type="checkbox"/> Project Site <input type="checkbox"/> Canada <input type="checkbox"/> United States		Type of Occurrence <input type="checkbox"/> Near Miss <input type="checkbox"/> Employee Injury <input type="checkbox"/> Vehicle Accident <input type="checkbox"/> Property Damage Only		
Date and Hour of Accident		Date and Hour Reported to Employer	Date and Hour Last Worked	Time Employee Began Work
Month	Day	Year	a.m. p.m.	Month
				Day
				Year
			a.m. p.m.	a.m.
				p.m.
Normal Work Hours on Last Day Worked		Witnesses?		
From:	a.m.	<input type="checkbox"/>	Witness Name and Telephone Number	
To:	p.m.	<input type="checkbox"/>		
C. Project Information (Project Related Accidents/Near Misses Only)				
Project #	Project Name	Project Manager	Site Telephone Number ()	Employee Cell Number ()
Was the Client Advised of the Accident? <input type="checkbox"/> Yes <input type="checkbox"/> No		Project Address (Street, City, State, Province, Zip Code)		
Name:		Specific Location of Accident		

SECTION 2

A. Details of the Accident/Near Miss	
1. What job/task was being performed when the accident occurred? (Example: collecting groundwater samples).	
2. Describe the employee's specific activities at the time of the accident. Include details of equipment/materials being used, including the size and weights of objects being handled.	
3. For injuries, identify the part of body injured, and specify left or right side.	
4. Identify the object or substance that directly injured employee and how.	
5. Identify Property Damaged (include owner of property, nature and source of damage, model and serial number, if appropriate).	
B. Health Care/Medical Treatment	
Employee received health care? <input type="checkbox"/> Yes <input type="checkbox"/> No	Identify the type of health care provided and where it was performed. (Check all that apply). <input type="checkbox"/> First Aid <input type="checkbox"/> Medical treatment other than first aid (sutures, etc.) <input type="checkbox"/> Hospitalized <input type="checkbox"/> Clinic <input type="checkbox"/> Hospital emergency room <input type="checkbox"/> On location by self or CRA employee <input type="checkbox"/> On Site by EMT
Name of Health Care Provider, Physician's Name, Address (Street, City, Province/State, and Postal/Zip Code)	

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Section 2 (Continued)

C. Accident Investigation		
H&S plan prepared and on Site? () Yes () Not applicable	Did the safety plan identify and provide safety procedures for the specific tasks the employee was conducting when injured? () Yes () No If no, why not? (Explain).	
Did the employee have the proper safety training to conduct these tasks or use the equipment? () Yes () No If not, why not?		
Identify all of the potential contributing factors and how they led to the occurrence of the accident. (Lack of attention, wrong use of equipment, lack of training, etc.)		
What contributing factor above was the underlying root cause of the accident.		
Is any training or retraining recommended? If yes, describe.		
What actions have been or will be taken to correct this accident from reoccurring?		
Additional information: Attach photos, accident diagrams, as applicable.		
Report Date Month Day Year	Report Prepared by: (please print)	Report Prepared by: (signature)

*Fax Completed Form to CRA's Accident Reporting Fax: (716) 297-3389
Send Original to CRA's Accident Reporting Department, Niagara Falls, New York*

SECTION 3

D. Agency Reporting and Recording Information (To be completed by the Regional Safety and Health Manager)			
CANADA			
Form 7 Sent to WSIB? () Yes () Not required	Employee Injury Information (Injury met the following criteria) () First Aid () Medical Treatment () Critical Injury () Modified Duty () Lost Time Injury If medical treatment, what?		
Joint Safety and Health Committee Notified? () Yes () No	Total days of modified duty If exceeds 7 days, report to WSIB.	Total days of lost time (if any)	Date employee returned to work Month Day Year
UNITED STATES			
OSHA Recordable Injury? () Yes () No	Employee Injury Information (Injury met the following OSHA 300 Log criteria) () First Aid () Medical Treatment () Restricted Duty () Lost Time Injury If medical treatment, what?		
Total days of restricted duty	Total days of lost time (if any)		Date employee returned to work Month Day Year

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APPENDIX B

TASK HAZARD ANALYSIS TABLE

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

Description of Task *Potential Hazards* *Preventative Measures and Controls* *PPE*

Activity: DECONTAMINATION OF PERSONNEL AND EQUIPMENT

Personnel and Equipment Decontamination Activities	Slip, Trip, Falls	Use three points of contact to mount and dismount equipment. Continuously inspect work areas for slip, trip & fall hazards. Be aware of surroundings. Practice good housekeeping.	Level D: Hard hat; high-visibility safety vest; safety glasses; hearing protection (as necessary); work gloves; and safety-toed boots.
	Electrical Hazards	Use of GFCIs to reduce electric shock. All electrical equipment will be inspected prior to use according to CRA SOPs. Do not stand in water when using electrical equipment. All electrical equipment will be UL/FM approved.	
	Heat/Cold Stress	Dress appropriately and follow guidelines found in the HASP. Drink plenty of sports drinks/ water and use cooling devices.	
	Biological Hazards - Insects, Snakes, Poison Plants, etc.	Wear appropriate PPE and keep necessary first aid supplies readily available. Use insect repellent and snake chaps as needed and follow guidelines presented in the HASP. Practice good personal hygiene - wash hands and face regularly. Learn to identify	
	Dangerous Weather Conditions	Consult local weather reports daily, watch for signs of severe weather, use portable, battery-powered weather radio, etc. Suspend or reduce work during severe weather.	
	Pinch Points and Sharp Objects	Keep hands, feet, & clothing away from moving parts/ devices. Use appropriate PPE and select the proper tool for the job. Provide barriers and/or signage indicating swing radius of equipment, according to CRA's SOPs.	

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TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Personnel and Equipment Decontamination Activities (cont'd.)	Fueling Equipment	No smoking, allow device to cool before re-fueling, follow storage requirements (reference MSDS).	
	Heavy Lifting	Follow safe lifting practices in the HASP. Lift items within your capabilities. Ask for assistance if necessary. Limit single person lifts to 50 pounds or less unless a lifting device (dolley, lift truck, etc.) is used.	
	Moving Heavy Equipment and Vehicles	Inspect work area and be aware of surroundings at all times. Establish traffic patterns and wear safety vests. Use a spotter around moving or backing equipment.	
	Use of Hand & Power Tools	Follow manufacturer's safety precautions, inspect tools daily prior to use, replace or remove defective tools, and wear the appropriate eye and foot protection.	
	Noise	Wear appropriate hearing protection if noise levels exceed 85 dBA. Follow CRA Hearing Conservation Program.	
<p><u>Training Requirements:</u></p> <ul style="list-style-type: none"> • Inspect site daily to recognize and correct hazards (inspect equipment before using); • Hazard Communication; • 40-Hour HAZWOPER and 8-Hour Refresher (as necessary); • Personal Protective Equipment ; and • Site specific training on specific site tasks (ex., use of pressure washer, etc.). 			

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TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

Description of Task *Potential Hazards* *Preventative Measures and Controls* *PPE*

Activity: MOBILIZATION AND DEMOBILIZATION ACTIVITIES AND SITE RESTORATION ACTIVITIES

Mobilization and Demobilization of Equipment, Materials and Personnel and Site Restoration Activities	Slip, Trip, Falls	Use three points of contact to mount/dismount machinery. Continuously inspect work areas for slip, trip & fall hazards. Be aware of surroundings. Practice good housekeeping	Level D: Hard hat; high-visibility safety vest; safety glasses; hearing protection (as necessary); work gloves and safety-toed boots.
	Electrical Hazards	Use of GFCIs to reduce electric shock. All electrical equipment will be inspected prior to use according to CRA SOPs. Do not stand in water when using electrical equipment. All electrical equipment will be UL/FM approved.	
	Heat/Cold Stress	Dress appropriately and follow guidelines found in the HASP. Drink plenty of sports drinks/water and use cooling devices.	
	Biological Hazards - Insects, Snakes, Poison Plants, etc.	Wear appropriate PPE and keep necessary first aid supplies readily available. Use insect repellent and snake chaps as needed and follow guidelines presented in the HASP. Practice good personal hygiene - wash hands and face regularly. Learn to identify	
	Dangerous Weather Conditions	Consult local weather reports daily, watch for signs of severe weather, use portable, battery-powered weather radio, etc. Suspend or reduce work during severe weather.	
	Pinch Points and Sharp Objects	Keep hands, feet, & clothing away from moving parts/devices. Use appropriate PPE and select the proper tool for the job. Provide barriers and/or signage indicating swing radius of equipment, according to CRA's SOPs.	

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<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Mobilization and Demobilization of Equipment, Materials and Personnel and Site Restoration Activities (cont'd.)	Fueling Equipment	No smoking, allow device to cool before re-fueling, follow storage requirements (reference MSDS).	
	Heavy Lifting	Follow safe lifting practices in the HASP. Lift items within your capabilities. Ask for assistance if necessary. Limit single person lifts to 50 pounds or less unless a lifting device (dolley, lift truck, etc.) is used.	
	Moving Heavy Equipment and Vehicles	Inspect work area and be aware of surroundings at all times. Establish traffic patterns and wear safety vests. Use a spotter around moving or backing equipment.	
	Noise	Wear appropriate hearing protection if noise levels exceed 85 dBA. Follow CRA Hearing Conservation Program.	
	Utilities	Maintain proper utility clearances – Use a spotter if necessary. All utilities will be located prior to conducting work.	
	Use of Hand & Power Tools	Follow manufacturer's safety precautions, inspect tools daily prior to use, replace defective tools, and wear the appropriate eye and foot protection.	
<p><u>Training Requirements:</u></p> <ul style="list-style-type: none"> • Inspect site daily to recognize and correct hazards (inspect equipment and hand/power tools daily/before use); • Hazard Communication; • Personal Protective Equipment ; and • Site-specific training on specific site tasks and safety procedures. 			

APPENDIX B

TASK HAZARD ANALYSIS TABLE
EXELON GENERATION - QUAD CITIES GENERATING STATION
CORDOVA, ILLINOIS

Description of Task *Potential Hazards* *Preventative Measures and Controls* *PPE*

Activity: DRILLING (INVESTIGATIVE) ACTIVITIES

Installation of Monitoring Wells, etc.	Slip, Trip, Falls	Use three points of contact to mount/dismount machinery. Continuously inspect work areas for slip, trip & fall hazards. Be aware of surroundings. Practice good housekeeping.	Modified Level D: Hard hat; high-visibility safety vest; safety glasses; hearing protection (as necessary); work gloves; nitrile gloves and safety-toed boots.
	Electrical Hazards	Use of GFCIs to reduce electric shock. All electrical equipment will be inspected prior to use according to CRA SOPs. Do not stand in water when using electrical equipment. All electrical equipment will be UL/FM approved.	
	Heat/Cold Stress	Dress appropriately and follow guidelines found in the HASP. Drink plenty of sports drinks/water and use cooling devices.	
	Biological Hazards – Insects, Snakes, Poison Plants, etc.	Wear appropriate PPE and keep necessary first aid supplies readily available. Use insect repellent and snake chaps as needed and follow guidelines presented in the HASP. Practice good personal hygiene – wash hands and face regularly. Learn to identify	
	Dangerous Weather Conditions	Consult local weather reports daily, watch for signs of severe weather, use portable, battery-powered weather radio, etc. Suspend or reduce work during severe weather.	
	Pinch Points and Sharp Objects	Keep hands, feet, & clothing away from moving parts/devices. Use appropriate PPE and select the proper tool for the job. Provide barriers and/or signage indicating swing radius of equipment, according to CRA's SOPs.	
	Fueling Equipment	No smoking, allow device to cool before re-fueling and follow proper storage requirements.	

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Installation of Monitoring Wells, etc. (cont'd.)	Heavy Lifting	Follow safe lifting practices in the HASP. Lift items within your capabilities. Ask for assistance if necessary. Limit single person lifts to 50 pounds or less unless a lifting device (dolley, lift truck, etc.) is used.	
	Moving Heavy Equipment and Vehicles	Inspect work area and be aware of surroundings at all times. Establish traffic patterns and wear safety vests. Use a spotter around moving or backing equipment.	
	Fall Hazards	Maintain a 100% tie-off at/above 6 feet, follow a fall protection program in accordance with 29 CFR 1926 - Subpart M, and provide appropriate training to affected personnel. See guidelines contained in the HASP.	
	Use of Hand & Power Tools	Follow manufacturer's safety precautions, inspect tools daily prior to use, replace defective tools, and wear the appropriate eye and foot protection.	
	Rigging	Inspect rigging before each use.	
	Utilities	Maintain proper utility clearances. All utilities will be located prior to conducting work. Conduct an underground utility search.	

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Installation of Monitoring Wells, etc. (cont'd.)	Hazards Associated with Drilling: Proximity of Drill Rig, etc.	Beware of drill rig and struck-by hazards. Ensure that driller conducts daily inspections and follows safe work practices. Drilling contractor will provide and implement a Site-specific HASP for its scope of work.	
	Noise	Wear appropriate hearing protection if noise levels exceed 85 dBA. Follow the CRA and drilling contractor's Hearing Conservation Program.	
<p><u>Training Requirements:</u></p> <ul style="list-style-type: none"> • Hazard Communication; • 40-Hour HAZWOPER, 8-Hour Refresher (as necessary) and 8-Hour HAZWOPER Supervisory Training (as necessary); and • Personal Protective Equipment; • Inspect site daily to recognize and correct hazards (inspect equipment and hand/power tools daily/before use); • Inspect drill rig daily; and • Site-specific training on specific tasks (drilling safety procedures, etc.). 			

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

Description of Task *Potential Hazards* *Preventative Measures and Controls* *PPE*

Activity: SAMPLING AND MONITORING (INVESTIGATIVE) ACTIVITIES

Collect Monitoring Well Water Elevations; Groundwater, Surface Water, Soil, Sediment, and Oil Samples; and Other Relevant Data Collection	Slip, Trip, Falls	Use three points of contact to mount/dismount machinery. Continuously inspect work areas for slip, trip & fall hazards. Be aware of surroundings. Practice good housekeeping.	Modified Level D: Hard hat; high-visibility safety vest; safety glasses; hearing protection (as necessary); work gloves; nitrile gloves and safety-toed boots.
	Electrical Hazards	Use of GFCIs to reduce electric shock. All electrical equipment will be inspected prior to use and according to CRA SOPs. Do not stand in water when using electrical equipment. All electrical equipment will be UL/FM approved.	
	Heat/Cold Stress	Dress appropriately and follow guidelines found in the HASP. Drink plenty of sports drinks/water and use cooling devices.	
	Biological Hazards - Insects, Snakes, Poison Plants, etc.	Wear appropriate PPE and keep necessary first aid supplies readily available. Use insect repellent and snake chaps as needed and follow guidelines presented in the HASP. Practice good personal hygiene - wash hands and face regularly. Learn to identify	
	Dangerous Weather Conditions	Consult local weather reports daily, watch for signs of severe weather, use portable, battery-powered weather radio, etc. Suspend or reduce work during severe weather.	
	Pinch Points and Sharp Objects	Keep hands, feet, & clothing away from moving parts/devices. Use appropriate PPE and select the proper tool for the job. Provide barriers and/or signage indicating swing radius of equipment, according to CRA's SOPs.	

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Collect Monitoring Well Water Elevations; Groundwater, Surface Water, Soil, Sediment, and Oil Samples; and Other Relevant Data Collection (cont'd.)	Fueling Equipment	No smoking, allow device to cool before re-fueling, follow storage requirements (reference MSDS).	
	Heavy Lifting	Follow safe lifting practices in the HASP. Lift items within your capabilities. Ask for assistance if necessary. Limit single person lifts to 50 pounds or less unless a lifting device (dolley, lift truck, etc.) is used.	
	Moving Heavy Equipment and Vehicles	Inspect work area and be aware of surroundings at all times. Establish traffic patterns and wear safety vests. Use a spotter around moving or backing equipment.	
	Fall Hazards	Maintain a 100% tie-off at/above 6 feet, follow a fall protection program in accordance with 29 CFR 1926 - Subpart M, and provide appropriate	
<p><u>Training Requirements:</u></p> <ul style="list-style-type: none"> • Inspect site daily to recognize and correct hazards (inspect equipment before using); • Hazard Communication; • Personal protective equipment; • 40-Hour HAZWOPER and 8-Hour Refresher (as necessary); and • Site specific training on specific site tasks (i.e., use of sampling equipment). 			

APPENDIX B

TASK HAZARD ANALYSIS TABLE
 EXELON GENERATION - QUAD CITIES GENERATING STATION
 CORDOVA, ILLINOIS

<i>Description of Task</i>	<i>Potential Hazards</i>	<i>Preventative Measures and Controls</i>	<i>PPE</i>
Activity: SURVEYING			
Set up survey equipment and perform survey activities.	Slip, Trip, Falls	Use three points to board machinery. Continuously inspect work areas for slip, trip & fall hazards. Be aware of surroundings.	Level D: safety glasses, steel toed boots and leather work gloves.
	Heat Stress	Dress appropriately and follow guidelines in	
	Biological Hazards	Inspect work areas carefully, void contact with insects and poisonous plants. Follow procedures in HASP.	
	Dangerous Weather Conditions	Consult local weather reports daily, watch for signs of severe weather, etc.	
	Heavy Lifting	Follow safe lifting practices outlined in HASP. Lift items within your capabilities. Ask for assistance with heavy items.	
	Use of Hand & Power Tools	Follow manufacturers safety precautions, inspect tools regularly, replace defective tools, wear the appropriate eye and foot protection.	
<p><u>Training Requirements:</u></p> <ul style="list-style-type: none"> • Hazard Communication; • 40-Hour HAZWOPER, 8-Hour Refresher (as necessary) and 8-Hour HAZWOPER Supervisory Training (as necessary); and • Personal Protective Equipment; and • Inspect site daily to recognize and correct hazards (inspect equipment and hand/power tools daily/before use). 			

APPENDIX C

MATERIAL SAFETY DATA SHEETS

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid
Appearance & odor: Almost odourless.
White granular powder.
Odor threshold (ppm): Not available.
Vapour pressure (mmHg): Not applicable.
Vapour density (air=1): Not applicable.
By weight: Not available.
Evaporation rate (butyl acetate = 1): Not applicable.
Boiling point (°C): Not applicable.
Freezing point (°C): Not applicable.
pH: (1% aqueous solution).
9.5
Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10
Solubility in water (%): 100 - > 10% w/w
Coefficient of water\oil dist.: Not available.
VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability: Not flammable.
Conditions of flammability: Surrounding fire.
Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.
Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.
Auto-ignition temperature: Not available.
Flash point (°C), method: None
Lower flammability limit (% vol): Not applicable.
Upper flammability limit (% vol): Not applicable.
Not available.
Sensitivity to mechanical impact: Not applicable.
Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.
Rate of burning: Not available.
Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Medical conditions aggravated by exposure: Not available.

First Aid

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type:



Neoprene or rubber gloves.

Respiratory/Type:



If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type:



Safety glasses with side-shields.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures**FLAMMABLE PROPERTIES:**

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE: Clear, red colored liquid

pH: 4

ODOR: odorless

BOILING POINT (°C): approximately 100

SOLUBILITY IN WATER: infinite

MELTING POINT (°C): approximately 0

SPECIFIC GRAVITY: approximately 1

VAPOR PRESSURE: N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: Nitric Acid



MATERIAL SAFETY DATA SHEET

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of Carbon and Potassium.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: >3200 mg/kg (Potassium Acid Phthalate), details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, neutralize with weak sodium hydroxide solution, and then flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Not reportable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B (Protective eyewear, gloves)

Rev 1, 10-16-2000: (Section 1) added catalog number 35653-01.

Rev 2, 03-25-2003: Reviewed and approved.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

PRODUCT IDENTITY: BUFFER, Standard and High Accuracy, pH 4.01
EFFECTIVE DATE: 03-20-2006

CATALOG NUMBER (S): 00654-00, 35654-00, 05942-21, 05942-22, 05942-24, 05942-25, 05942-26, 05942-27, 35653-01
MSDS NUMBER 00506 Rev 3 Page 3 of 3



MATERIAL SAFETY DATA SHEET

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures**FLAMMABLE PROPERTIES:**

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, clay, etc.) and dispose of in accordance with local regulations. Check with local agencies for the proper disposal of phosphate containing solutions.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, green liquid	pH:	7
ODOR:	Odorless	BOILING POINT (°C):	approximately 100
SOLUBILITY IN WATER:	Infinite	MELTING POINT (°C):	approximately 0
SPECIFIC GRAVITY:	approximately 1	VAPOR PRESSURE:	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: None identified.

HAZARDOUS DECOMPOSITION PRODUCTS: Phosphorus oxides may form when heated to decomposition.



MATERIAL SAFETY DATA SHEET

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: (Sodium Phosphate Dibasic) 17 gm/kg; LD50, Dermal, Rabbit: (Potassium Phosphate Monobasic) >4640 mg/kg; details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow for the flushing of phosphate containing solutions. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented).

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Sodium Phosphate, Dibasic - 5,000 pounds.

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed.

PENNSYLVANIA: Sodium Phosphate Dibasic is listed as an environmental hazard on the state Hazardous Substance list.

Section 16. Other Information

NFPA Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B (Protective eyewear, gloves)

Rev 1, 8-25-2000: (Section 2) corrected concentration of preservative from 1 – 2 to < 0.1%.

Rev 2, 03-25-2003: Reviewed and approved, (Section 15) added CERCLA reportable quantity.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

PRODUCT IDENTITY: BUFFER, Standard, pH 7.00 (Color Coded Green)

CAT. NO (S): 00654-04, 05942-41, 35654-04, 05942-42, 05942-44, 05942-45, 35653-02

EFFECTIVE DATE: 3-20-2006

MSDS NUMBER 00507 Rev 3

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MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00654-08, 35654-08, 05942-61, 05942-62, 05942-64, 05942-65, 05942-66, 05942-67, 35653-03

Product Identity

BUFFER, Standard, pH 10.00; BUFFER, High Accuracy, pH 10.000 (Color Coded Blue)

Manufacturer's Name

RICCA CHEMICAL COMPANY

Emergency Telephone Number (24 hr)

CHEMTREC®: 800-424-9300

Address (Number, Street, City, State, and ZIP Code)

P.O. Box 13090

Telephone Number For Information

817-461-5601

Arlington, Texas 76094

Date Prepared

3-8-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits	
			ACGIH TLV	OSHA PEL
Sodium Carbonate	497-19-8	< 1	N/A	N/A
Sodium Bicarbonate	144-55-8	< 1	N/A	N/A
Preservative*	proprietary	< 0.1	N/A	N/A
*(No Mercury compounds or Formaldehyde)				
Inert Dye	proprietary	< 0.1	N/A	N/A
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆

EMERGENCY OVERVIEW

Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. Wash areas of contact with water.

☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin.

EYE CONTACT: May cause slight irritation.

INHALATION: Not likely to be hazardous by inhalation.

SKIN CONTACT: May cause slight irritation.

INGESTION: Large doses may cause nausea, vomiting, diarrhea and cramps.

CHRONIC EFFECTS / CARCINOGENICITY:

IARC – No

NTP – No

OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Sodium Bicarbonate in rats.



MATERIAL SAFETY DATA SHEET

REPRODUCTION INFORMATION:

Reproductive data cited in "Registry of Toxic Effects of Chemical Substances" for Sodium Bicarbonate and Sodium Carbonate in mice.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material and treat as normal refuse. Small amounts of the liquid may be flushed to the drain with excess water. Always dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, blue colored liquid	pH:	10
ODOR:	Odorless	BOILING POINT (°C):	approximately 100
SOLUBILITY IN WATER:	Infinite	MELTING POINT (°C):	approximately 0
SPECIFIC GRAVITY:	approximately 1	VAPOR PRESSURE:	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: Acids

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of Sodium.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: 4090 mg/kg (Sodium Carbonate), 4220 mg/kg (Sodium Bicarbonate), details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Not reportable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed.

Section 16. Other Information

NFPA® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B

(Protective eyewear, gloves)

Rev 1, 01-15-2003: added catalog number 35653-03.

Rev 2, 03-25-2003: Reviewed and approved.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and

OAKTON[®]

MATERIAL SAFETY DATA SHEET

which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.



MATERIAL SAFETY DATA SHEET

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (paper towels, etc.) and dispose of in accordance with local regulations. Small amounts may be flushed to the sewer with plenty of water.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves are recommended.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	pH:	approximately 7
ODOR:	Odorless	BOILING POINT (°C):	approximately 100
SOLUBILITY IN WATER:	Infinite	MELTING POINT (°C):	approximately 0
SPECIFIC GRAVITY:	approximately 1.0 – 1.04	VAPOR PRESSURE:	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: Bromine Trifluoride, Potassium Permanganate plus Sulfuric Acid.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of Potassium.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD₅₀, Oral, Rat: 2600 mg/kg (Potassium Chloride), details of toxic effects not reported other than lethal dose value.
Irritation: eye, rabbit (500mg/24 hr mild).

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water and flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Not reportable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA® Ratings:	Health: 0	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 0	Flammability: 0	Reactivity: 0	Protective Equipment: B

(Protective eyewear, gloves)

Rev 1, 10-16-2000: (Section 1) added catalog numbers 35653-10, 35653-11, 35653-12, and 35653-13.

Rev 2, 12-06-2001: (Section 1) added catalog number 35653-09; revised description from 23µ - 80 mS.

Rev 3, 03-25-2003: Reviewed and approved, (Section 3) added mutation statement, (Section 11) added irritation data.

Rev 4, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

MATERIAL SAFETY DATA SHEET

ESSENTIALLY SIMILAR TO U.S. DEPT OF LABOR FORM OSHA-20
Preparation & Last date Printed: 12/10/98 REV: E
Page 1 of 2

KCI

SECTION 1 NAME, PRODUCT & COMPANY NAME

MYRON L COMPANY 6115 CORTE DEL CEDRO, CARLSBAD, CA 92009

INFORMATION PHONE #: (760) 438-2021, Contact either Jerry Adams or Gary Robinson
HOURS: Mon thru Fri 8:00-4:30 PM (Pacific Time)

CHEMICAL NAME: Potassium & Chloride & Water

CATALOG NUMBERS: KCI-70, KCI-700, KCI-7000,
KCI-18, KCI-180, KCI-1800,
KCI-18,000 C-P# 01489-92,94-97

TRADE NAME & SYNONYMS: TDS/Conductivity Standard Solution
KCI Solution

CHEMICAL FAMILY: Inorganic Salts

FORMULA: KCI & H₂O

CAS #: Water #7732-18-5
Potassium Chloride #7447-40-7

SECTION 2 PHYSICAL DATA

BOILING POINT, 760mm Hg (°C)	102-107	SPECIFIC GRAVITY	>1
FREEZE POINT (°C)	-0 TO -20	SOLUBILITY IN H ₂ O, % BY WT. @20°C	100%
VAPOR PRESSURE @ 20°C	N/A	APPEARANCE AND ODOR	COLORLESS, ODORLESS LIQUID
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE	N/A
PERCENT VOLATILES BY VOLUME	N/A		

SECTION 3 FIRE & EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD)	N/A	FLAMMABLE LIMITS	N/A	LoI	N/A	UeI	N/A
EXTINGUISHING MEDIA	NON-FLAMMABLE						
SPECIAL HAZARDS & PROCEDURES	N/A						
UNUSUAL FIRE & EXPLOSION HAZARDS	N/A						

SECTION 4 REACTIVITY DATA

STABLE (XX)		CONDUCTIONS TO AVOID	None
UNSTABLE	Product Stable	MATERIALS TO AVOID	(N/A) WATER (N/A) ACIDS (N/A) BASES (N/A) OTHER SPECIFY

SECTION 5 SPILL OR LEAK PROCEDURES AND DISPOSAL

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

CLEAN SPILL USING ABSORBENT MATERIALS AND WATER, AND THEN AIR OUT AREA.

EPA WASTE NO. & DISPOSAL TREATMENT:

MATERIAL DOES NOT HAVE AN EPA WASTE NUMBER AND IS NOT A LISTED WASTE.

NOTE: ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE AND ACCORDANCE WITH FEDERAL, STATE & LOCAL REGULATIONS

SECTION 6 HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NONE KNOWN
EFFECTS OF OVER EXPOSURE: IRRITATING TO EYES & MUCOUS MEMBRANES, AND DIGESTIVE TRACT

FIRST AID PROCEDURES:

EYE CONTACT: FLUSH WITH WATER
SKIN CONTACT: RINSE WITH WATER
IF SWALLOWED: DRINK PLENTY OF WATER, DO NOT INDUCE VOMITING

CARCINOGENICITY: MATERIAL IS NOT LISTED (IARC, NTP, OSHA) AS A CANCER CAUSING AGENT

Cond/TDS

Page 2 of 2

SECTION 7 SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: NONE REQUIRED
VENTILATION: NONE REQUIRED
EYE PROTECTION: RECOMMENDED
PROTECTIVE GLOVES: NONE REQUIRED
PROTECTIVE CLOTHING: NONE REQUIRED

ROUTES OF ENTRY: INGESTION

SECTION 8 SPECIAL HANDLING AND STORING PRECAUTIONS

STORE AT ROOM TEMPERATURE,
NORMAL USE DOES NOT GENERATE A HAZARDOUS SITUATION

SECTION 9 HAZARDOUS INGREDIENTS

(REFER TO SECTIONS 3 THROUGH 8)

CHEMICAL NAME N/A CAS NUMBER NONE

SECTION 10 OTHER INFORMATION

COMMENTS: NONE
NFPA Hazard Ratings
Health: 0
Flammability: 0
Reactivity: 0
Special Hazards: 0

SECTION 11 TOXICOLOGY INFORMATION

TOXICITY DATA: N/A

TOXICOLOGICAL FINDING:

Tests on laboratory animals indicate material does not produce adverse mutagenics effects.
Cited in Registry of Toxic Effects of Substances (RTECS)

SECTION 12 TRANSPORT INFORMATION

DOT Shipping Name..... Non-Regulated

DOT Number None

SECTION 13 REGULATORY INFORMATION

TSCA INVENTORY: THE CAS NUMBER OF THIS PRODUCT IS LISTED ON THE TSCA INVENTORY.

COMPONENT..... N/A
SARA EHS(302)..... N/A
SARA EHS TOQ (LBS)..... N/A
CERCLA RQ (LBS)..... N/A
OSHA FLOOR LIST..... N/A
SARA 313..... N/A
DeMinimis for SARA 313 (%)..... N/A

MSDS APPROVED BY:.....



MSDS

For RICCA, SpectroPure, Red Bird, and Solutions Plus Brands
 Emergency Contact(24 hr) – CHEMTREC®
 Domestic: 800-424-9300
 International: 703-527-3887

ZOBELL'S SOLUTION, APHA ORP Solution, ORP Standard (+200 mV)

Material Safety Data Sheet

Section 1: Chemical Product and Company Identification.

Catalog Number: 5464.5, 9880, PX-918, S0932A, SZ117300	
Product Identity: ZOBELL'S SOLUTION, APHA ORP Solution, ORP Standard (+200 mV)	
Manufacturer's Name: RICCA CHEMICAL COMPANY LLC	Emergency Contact(24 hr) – CHEMTREC® Domestic: 800-424-9300 International: 703-527-3887
CAGE Code: 0V553	
Address: 448 West Fork Dr Arlington, TX 76012	Telephone Number For Information: 817-461-5601
Date Prepared: 11/9/98	Revision: 5 Last Revised: 04/12/2006 Date Printed: 04/27/2006 3:14:05 pm

Section 2. Composition/Information on Ingredients

Component	CAS Registry #	Concentration	ACGIH TLV	OSHA PEL
Potassium Ferricyanide	13746-66-2	<0.2	Not Available Not Available	Not Available Not Available
Potassium Ferrocyanide Trihydrate	14459-95-1	<0.5	Not Available Not Available	Not Available Not Available
Potassium Chloride	7447-40-7	<1	Not Available Not Available	Not Available Not Available
Water, Deionized	7732-18-5	Balance	Not Available Not Available	Not Available Not Available

Section 3: Hazard Identification

Emergency Overview: Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. Wash areas of contact with water.

Target Organs: eyes, skin

Eye Contact: May cause slight irritation.

Inhalation: Not likely to be hazardous by inhalation.

Skin Contact: May cause slight irritation.

Ingestion: May cause nausea, vomiting, diarrhea and cramps.



MSDS

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ZOBELL'S SOLUTION, APHA ORP Solution, ORP Standard (+200 mV)

Chronic Effects/Carcinogenicity: None

IARC - No.

NTP - No.

OSHA - No.

Reproductive Information: Reproductive effects cited in 'Registry of Toxic Effects of Chemical Substances' for Potassium Ferrocyanide Trihydrate.

Teratology (Birth Defect) Information: Mutation data cited in 'Registry of Toxic Effects of Chemical Substances' for Potassium Chloride. Mutation data cited in 'Registry of Toxic Effects of Chemical Substances' for Potassium Ferricyanide.

Section 4: First Aid Measures - In all cases, seek qualified evaluation.

Eye Contact: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

Skin Contact: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

Ingestion: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5: Fire Fighting Measures

Flash Point: Not Available.

LFL: Not Available.

Extinguishing Media: Use any means suitable for extinguishing surrounding fire.

Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.

Fire Fighting Instructions: Use normal procedures/instructions.

Fire Fighting Equipment: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Method Used: Not Available.

UFL: Not Available.

Section 6: Accidental Release Measures

Absorb with suitable material and treat as normal refuse. Small amounts of the liquid may be flushed to the drain with excess water. Always dispose of in accordance with local regulations.

Section 7: Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage.

Safety Storage Code: General

Section 8: Exposure Control/Personal Protection

Engineering Controls: No specific controls are needed. Normal room ventilation is adequate.

Respiratory Protection: Normal room ventilation is adequate.

Skin Protection: Chemical resistant gloves.

Eye Protection: Safety glasses or goggles.

Section 9: Physical and Chemical Properties

Appearance: Clear, yellow colored liquid

Odor: Odorless

Solubility in Water: Infinite

Specific Gravity: Approximately 1.0

pH: Not Available.

Boiling Point(°C): Approximately 100

Melting Point(°C): Approximately 0

Vapor Pressure: Not Applicable.

Section 10: Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.

Incompatibility: Acids, Bromine Trifluoride, Sodium Nitrate, ammonia, Chromium Trioxide, Chromic Anhydride, Cupric Nitrate.

Hazardous Decomposition Products: Oxides of Carbon, Nitrogen and Potassium, fumes of cyanide when heated to decomposition.



MSDS

For RICCA, SpectroPure, Red Bird, and Solutions Plus Brands
Emergency Contact(24 hr) – CHEMTREC®
Domestic: 800-424-9300
International: 703-527-3887

ZOBELL'S SOLUTION, APHA ORP Solution, ORP Standard (+200 mV)

Hazardous Polymerization: Will not occur.

Section 11. Toxicological Information

LD50, Oral Rat: (anhydrous Potassium Ferrocyanide) 6400 mg/kg, (Potassium Chloride) 2600 mg/kg; LD50, Oral, Mouse: (Potassium Ferricyanide) 2970 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

Ecotoxicological Information: No information found

Chemical Fate Information: No information found

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information

Part Numbers:

This product is not regulated.

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA Status:The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA Status:All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.

Sara Title III:

Section 302 Extremely Hazardous Substances:Not Applicable.

Section 311/312 Hazardous Categories:No

Section 313 Toxic Chemicals:Not Applicable.

California: None Reported.

Pennsylvania: None Reported.

RCRA Status: Not Applicable.

CERCLA Reportable Quantity: None Reported.

WHMIS: Not Applicable.



MSDS

For RICCA, SpectroPure, Red Bird, and Solutions Plus Brands
Emergency Contact(24 hr) – CHEMTREC®
Domestic: 800-424-9300
International: 703-527-3887

ZOBELL'S SOLUTION, APHA ORP Solution, ORP Standard (+200 mV)

Section 16. Other Information

NFPA Ratings:

Health: 1 Flammability: 0 Reactivity: 0 Special Notice Key:None

HMIS Ratings:

Health: 1 Flammability: 0 Reactivity: 0 Protective Equipment:B (Protective Eyewear, Gloves)

Rev 1, 9-26-2000: Reformatted from WordPerfect® to Microsoft Word®; (Section 1) Revised emergency telephone number to CHEMTREC® 800-424-9300; (Section 2) revised concentrations to ranges; (Section 3) added Potassium Chloride, Potassium Ferrocyanide and Potassium Ferricyanide references; (Section 7) added storage code; (Section 15) added TSCA statement regarding hydrates.

Rev 2, 10-09-2001: Reformatted to electronic data format.

Rev 3, 03-12-2002: (Section 1) added ORP Standard (200 mV) to title; added catalog number 5464.5.

Rev 4, 06-26-2003: (Section 1) added catalog number S0932A.

Rev 5, 04-12-2006: (Section 1) added Red Bird catalog number PX-918.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

Material Safety Data Sheet

June 1, 1999

YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387
USA

Information and Emergency Phone: (937) 767-7241

C-P# 05478-60

Page 1 of 2

SECTION 1 - MATERIAL IDENTIFICATION

PRODUCT NAME: YSI 3682 Zobell Solution

FORMULA: n/ap

Chemical Type: Inorganic chloride / cyanide

CAS No. n/app

SECTION 2 - HAZARDOUS / IMPORTANT INGREDIENTS

<u>Chemical</u>	<u>CAS No.</u>	<u>PERCENT</u>	<u>PEL/TLV</u>	<u>CARCINOGEN</u> (OSHA, NTP, IARC)
Potassium chloride	7447-40-7	72 - 78%	none	no
Potassium ferrocyanide, trihydrate	14459-95-1	10 - 15%	none	no
Potassium ferricyanide	13746-66-2	10 - 15%	none	no

SECTION 3 - CHEMICAL AND PHYSICAL PROPERTIES

Appearance: white powder

Boiling Point: n/av

Odor: none

Melting Point: n/av

pH: neutral

Specific Gravity: n/av

Water Solubility: infinite

Vapor Pressure: n/ap

Evaporation Rate: n/av

Vapor Density: n/ap

SECTION 4 - FIRE AND EXPLOSION HAZARDS

Flash Point: none Explosive Limits: none

Extinguishing Media: n/ap

Special Firefighting Procedures and Hazards: Material is not combustible. May emit toxic fumes when heated, such as NO_x, HCN, HCl. Wear protection as described in Section 6.

SECTION 5 - REACTIVITY INFORMATION

Stable: X Unstable: _____ Precautions: none known

Hazardous Polymerization: Occurs: _____ Does Not Occur: X

Incompatibility: strong acids and oxidizing agents.

Hazardous Decomposition Products: When heated, possibly NO_x, HCN, HCl.

SECTION 6 - HEALTH HAZARDS / PROTECTIVE MEASURES / FIRST AID**Inhalation:**

Possible irritation from dusts. (see CHRONIC below)
Use a NIOSH approved respirator for dusts. Get supplier recommendations. Provide adequate ventilation.
Minimize dusty conditions.
Remove to fresh air and provide artificial respiration if needed.

Skin:

Possible irritation from dusts. (see CHRONIC below)
Wear dust-proof gloves and other body protection as needed. Minimize dusty conditions.
Wash exposed areas with soap and water for 15 minutes. Remove contaminated clothing, and wash before re-using.

Eyes:

Possible irritation from dust.
Wear dust barrier goggles. Eliminate dusty conditions.
Flush with water for 15 minutes.

Ingestion

No effects expected from normal use and minor amounts ingested. Large amounts, over 1 tablespoon, can cause digestive system upset s. (see CHRONIC below)
Reduce dusting. Avoid mouth breathing. Use facemask. Provide adequate ventilation.
Avoid swallowing. Spit out. Drink large amounts of water. Induce vomiting if person is conscious. Otherwise, and if effects persist, get medical attention.

CHRONIC EFFECTS: None reported for this material. "Cyanides" in general are often reported as toxic to humans. Therefore, it is recommended that exposure via skin, inhalation, and ingestion be limited.

IN ALL CASES: GET MEDICAL ATTENTION IF EFFECTS PERSIST.

Most likely routes of entry: skin, eyes, ingestion.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Take up powder in any container and hold for disposal. Flush residual to sewer or ground. Provide personal protection as described in Section 6.

Storage and Handling: Keep containers closed. Discard any material that may be contaminated. Minimize dusting.

Waste Disposal: Is not listed as RCRA hazardous waste at this date. Cyanides are restricted in water disposed to streams and to sewers. Therefore, landfill disposal is indicated; check with local disposal companies.

Empty Containers: Rinse well. Dispose as appropriate for glass and plastic containers.

SECTION 8 - REGULATORY INFORMATION

DOT: Not regulated.
SARA Title III, S.313, Form R: Nothing reportable.

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Since information contained herein may be applied under conditions beyond our control, and with which we may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular use.