PACTIV
Advanced Packaging Solutions

PACTIV CORPORATION

MACEDON FILMS SITE
MACEDON, NEW YORK

REMEDIAL INVESTIGATION WORKPLAN

SEPTEMBER 2004

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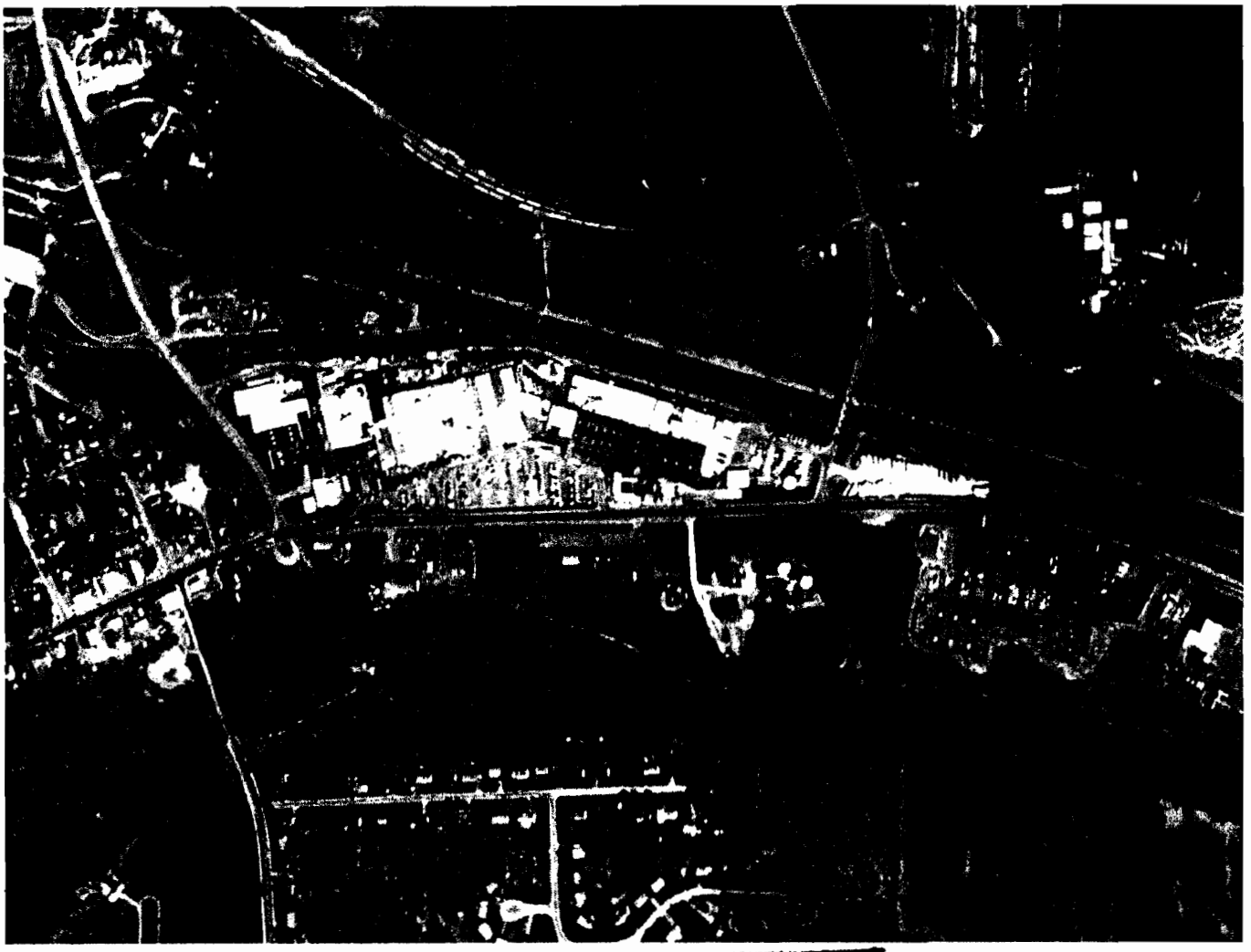

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1.0 INTRODUCTION

On behalf of Pactiv Corporation (Pactiv), URS Corporation-New York (URS) is pleased to present the New York State Department of Environmental Conservation (NYSDEC) with this *Remedial Investigation Work Plan* (*RI Work Plan*) for the Macedon Films Site at 112 Main Street in Macedon, New York. The location of the Macedon Films Site is shown in Figure 1. The NYSDEC's identification number for this site is C859025. This site is being investigated under the Brownfield Cleanup Program (BCP) in accordance with Brownfield Site Cleanup Agreement (BCA) number B8-0669-04-06 between Pactiv and the NYSDEC.

This *RI Work Plan* incorporates, by reference, the following three documents:

- *Field Sampling Plan (FSP),* dated September 2, 2004;
- *Quality Assurance Project Plan (QAPP)*, dated September 2, 2004; and
- *Health and Safety Plan (HSP)*, dated September 2, 2004.

These three documents are being submitted concurrently with the *RI Work Plan.* The scope of work presented in this *RI Work Plan* was agreed upon between Pactiv, NYSDEC, and URS during the investigation scoping meeting that was held at the Macedon Films site on June 29, 2004.

This *RI Work Plan* contains six sections. Section 2.0 provides background information for the site. The objectives of the remedial investigation are presented in Section 3.0. The proposed scope of work is presented in Section 4.0. Section 5.0 outlines the tentative schedule for the proposed scope of work. Section 6.0 provides the references that URS used to prepare this Work Plan. Appendix A of this *RI Work Plan* is the Community Air Monitoring Plan. Appendix B presents the analyte lists for laboratory analytical methods for samples that may be collected during the investigation.

2.0 BACKGROUND

This section presents a summary of background information including a site description, the site history, a description of the geology and hydrogeology at the site, and a summary of previous investigations.

2.1 SITE DESCRIPTION

Pactiv's former Macedon facility is on Main Street in the Village of Macedon, Wayne County, New York. Pactiv's former Macedon facility (Macedon Films) is the westernmost part of a 23.6-acre complex. The 23.6 acre complex consists of approximately 92,000 square feet of building space and includes manufacturing facilities for Mobil's Commercial Films Division (Exxon-Mobil) and Huntsman Design Products (Pliant Corporation).

The Macedon Films site occupies 6.95 acres on the western portion of the 23.6 acre complex. The Macedon Films site is shown on Figure 2.

The Macedon Films site is bordered by a spillway of the New York State Barge Canal and a Pennsylvania Central railroad spur to the north, New York State Route 31 to the south, New York State Route 350 to the west, and Exxon-Mobil to the east. Pliant Corporation is east of Exxon-Mobil. Quaker Road and a truck trailer parking area are east of Pliant Corporation.

2.2 SITE HISTORY

In the 1920's the site was originally developed for vegetable canning operations. Sanborn maps from 1906, 1912, and 1931 show that there were lumberyards and a creamery previously located on the site.

Polyethylene flexible packaging products have been manufactured at the site since the 1950s. Polyethylene resin pellets are processed and extruded to form a film that is subsequently converted into packaging products such as produce bags. Manufacturing operations ceased at the site in July 2004.

2.3 GEOLOGY AND HYDROGEOLOGY

This section describes the geologic and hydrogeologic characteristics of the site. The geology of Macedon Films site was characterized by the interpretation of 13 boring logs recorded by URS (formerly Dames & Moore) in 1999. Several sources of geologic literature were also used to supplement our understanding of the geology of the area. The following subsections present the geology and hydrogeology beneath the facility.

Regional Geology

The Village of Macedon lies within a glacial valley. The glacial valley is characterized by outwash plains and terraces and by drumlins and drumlin fields. Drumlins are elongated hills oriented in a north-south direction along the path of the advancing glaciers during the last ice age. There are fairly large swamp areas near the site that are the remnants of former shallow

glacial lakes.

The Macedon Films site is within the Erie-Ontario Lowlands physiographic province. This physiographic province is characterized by relatively low, flat-lying areas to the south of Lake Ontario and Lake Erie. The ground surface at the site is relatively flat, at an elevation of approximately 410 feet above mean sea level (msl). The site is underlain by the dolostone, shale, gypsum, and salt of the Camillus and Syracuse formations of the Salina Group (Isachsen and Fisher, 1970). These geologic formations were deposited in the shallow, salty seas of Late Silurian times (NYS Museum, 1991). The area was glaciated in the Wisconsin stage of the Pleistocene. The area is currently part of a large drumlin field, and bedrock is covered by an average of 40 feet of glacial till.

According to the *Soil Survey of Wayne County, New York* (Soil Conservation Service, 1978), the site is identified as cut and fill land. Areas immediately south and east of the site are also mapped as cut and fill land. Areas immediately west of the site are mapped as gravelly loams of the Phelps and Palmyra series, soil of the Palmyra and Alton series, and cut and fill land. Silty loams of the Canandaigua and Wayland series, and gravelly loams of the Ontario and Palmyra series are present north of the canal that is the northern boundary of the site. The Phelps series consists of consists of deep, moderately well drained soil formed in glacial outwash and beach deposits containing sand and gravel. The Palmyra series consists of deep, well drained to excessively drained soils formed in glacial outwash deposits. The Alton series consists of deep, well drained to somewhat excessively well-drained soil formed in glacial outwash and beach deposits. The Canandaigua series consists of deep, poorly drained and very poorly drained soil formed in silty glacial lake sediments. The Wayland series consists of deep, poorly drained and very poorly drained soil formed in silty alluvial sediments. The Ontario series consists of deep, well-drained soil formed in glacial till.

Site Geology and Hydrogeology

The overburden encountered at the site during the 1999 investigation (Section 2.4) consists of brown and gray fine- to medium-grained sand with traces of silt and angular gravel above a one- to two-foot thick layer of brown and gray clay. Bedrock was encountered at the site between eight and 16 feet below ground surface (bgs).

Groundwater is encountered at the site at approximately six to ten feet bgs. Based on water level measurements collected on separate events in November 1999 and March 2000, groundwater flow in the sand deposits is generally from the southwest to the northeast. Groundwater flow near the Barge Canal Spillway is south (towards the site) upstream of the weir and north (towards the canal spillway) downstream of the weir.

The New York State Canal Corporation, which is a subsidiary to the New York State Thruway Authority, maintains the water levels in the canal. The peak navigation season for the canal is generally between late May and early October. Because of the site's proximity to the spillway, artificial seasonal water level fluctuations in the canal and the spillway can affect on-site groundwater flow patterns.

2.4 PREVIOUS INVESTIGATIONS

Previous investigations completed at the site have been documented in the following nine reports:

- *Environmental Priority Initiative Preliminary Assessment, Mobil Chemical Company, Macedon Packaging*, USEPA, June 30, 1992.
- *Soil-Gas Survey Building 10 Courtyard Storm Drain No. 93 Area, Mobil Chemical Company, Macedon, New York*, H&A of New York, January 1995.
- *Environmental Audit Tenneco Packaging Specialty Products, Macedon, New York,* CH2M Hill, April 19, 1997.
- *Summary of Environmental Issues and Investigation Plan, Tenneco Packaging Macedon Plant,* IT Corporation, July 1998.
- *Site Assessment and Closure of Two Chemical Bulk Storage Tanks, CBS Registration No. 8-000025, Tenneco Packaging Macedon Facility,* International Technology Corporation, January 1999.
- *SPDES Investigation Report,* URS Corporation, August 31, 1999.
- *Soil and Groundwater Investigation for Pactiv Macedon, New York*, URS Corporation, August 21, 2000.
- *Revised Water Table Maps Soil Gas Survey Former Pactiv Facility Macedon, New York*, URS Corporation, September 11, 2002.
- *SWMU Questionnaire for Macedon, NY*, URS Corporation, October 17, 2002.

Sampling locations from these previous investigations are shown on Figure 3.

There have been two site-wide investigations completed at the site. In 1996, Pactiv, then known as Tenneco Packaging retained a consultant, CH2M Hill, to conduct an environmental audit. Areas of potential soil and groundwater contamination at the site were identified during the audit and a Phase II site investigation was conducted. The results of the audit and site investigation were summarized in CH2M Hill's report *Environmental Audit Tenneco Packaging Specialty Products, Macedon, New York,* dated April 19, 1997.

Based on the results of the Phase II investigation completed in 1996, additional investigation tasks were completed at the site in 1999 and 2000 by URS (formerly Dames & Moore). The results from the 1999 and 2000 investigation were summarized in URS's *Soil and Groundwater Investigation for Pactiv Macedon, New York*, dated August 21, 2000.

Based on our review of the previous investigation results, there appears to be three areas at the site between the buildings and the canal that have been impacted by petroleum hydrocarbons, petroleum related volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). These three areas are shown on Figure 3 and include:

- the former gasoline underground storage tanks (USTs) and former diesel fuel aboveground storage tanks (ASTs) area north of Building 11,
- the waste ink tank area north of Building 10, and
- the area near the former multi-phase extraction system that was installed at the former solvent tank area.

These three areas are further described below.

A fourth potential area of concern is the courtyard surrounded by Buildings 3A, 7S, 10B, and 13 where soil impacted with VOCs and SVOCs were investigated by conducting a soil gas survey in 1994.

2.4.1 Former Gasoline USTs and Diesel Fuel ASTs Area

Prior to 1978, there was a 2,000-gallon gasoline UST, a 900-gallon gasoline UST, a 100-gallon diesel fuel AST, and a 260-gallon diesel fuel AST northeast of Building 11. This area was identified as SWMU T-6 in the October 2002 SWMU Questionnaire completed by URS for the Macedon facility. According to the CH2M Hill report, there were reportedly releases from the diesel fuel ASTs and gasoline USTs during the 1970s. In 1978, the ASTs were removed, the USTs were excavated, and contaminated soil around the USTs was reportedly removed to a depth of 10 feet.

In 1996, soil boring MA-6A and MA-6B were advanced to 10 feet below ground surface (bgs) at the former gasoline UST and former diesel fuel AST area. VOCs and SVOCs were not detected in soil samples MA-6A-2 from 6 to 7 feet bgs and MA-6B-2 from 7 to 8 feet bgs and TPH was not detected in sample MA-6A-2 from 6 to 7 feet bgs. TPH was detected at 3,780 mg/kg in sample MA-6B-2 from 7 to 8 feet bgs.

During URS' 1999-2000 investigation, two soil borings MSB-1 and MSB-2 were advanced to 12 feet bgs and monitoring well MMW-3 was installed in the former gasoline USTs and former diesel fuel ASTs area. Monitoring well MMW-3 was installed to a total depth of 12 feet with a ten-foot screen installed between 2 and 12 feet bgs. VOCs (BTEX compounds) at concentrations that exceed NYSDEC Recommended Soil Cleanup Objectives (RSCOs) and petroleum hydrocarbon compounds were detected in the soil samples collected from the borings MSB-1 and MSB-2. Phenol was the only SVOC detected in MSB-1 (8 to 10 feet) at a concentration that exceeded NYSDEC RSCOs. VOCs (naphthalene and xylenes) were detected in the groundwater from well MMW-3 at concentrations that exceed NYSDEC guidance values or groundwater standards. Other VOCs including benzene compounds, acetone, 2-butanone, carbon disulfide, and p-isopropyltoluene have also been detected in well MMW-3. Petroleum hydrocarbons were also detected in the groundwater sample collected from well MMW-3.

2.4.2 Waste Ink Tank Area

Solvent-based wastewater from the ink tray wash room and steam cleaning rooms were stored in a 6,000-gallon UST that was installed near Building 10B in 1969. In 1987, this UST, identified as SWMU T-2 in the October 2002 SWMU Questionnaire, was removed and replaced with a double-walled UST. The closure activities for this UST are documented in the January 1988 closure report prepared by O'Brien & Gere that was provided as a reference document in the June 1992 USEPA document. During the removal of this UST, evidence of leakage from a fitting was found and contaminated soil was removed. The replacement 6,000-gallon double-walled UST is identified as SWMU T-3 in the October 2002 SWMU Questionnaire. A leak in the cleanout line from the sump in the ink tray washroom occurred in 1987. The sump and

contaminated soil were subsequently removed. Beginning in 1991, non-hazardous water-based inks were used at the site.

In 1996, two soil borings MA-8A and MA-8B were advanced to 10 feet bgs near the waste ink tank. Diesel fuel odors in the overburden materials were noted during drilling at depths below 7 and 8 feet bgs. Benzene was reportedly detected at 0.82 mg/kg in soil sample MA-8A-3 from 8 to 9 feet bgs.

In 1999, two soil borings MSB-4 and MSB-5 were advanced near the west and east sides of waste ink tank. Boring MSB-4 was advanced to 8 feet bgs (refusal) and a strong petroleum odor and free product was encountered between 2 and 5 feet bgs. Boring MSB-5 was advanced to 16 feet bgs (refusal) and a slight petroleum odor was detected at approximately 6 feet bgs. Petroleum hydrocarbons and elevated levels of organic compounds were detected in soil sample MSB-4 (4 to 6 feet). Tetrachloroethene (PCE) was also detected at 730 mg/kg in soil sample MSB-4 (4 to 6 feet). This detection of PCE is the only indication of PCE at the site. No VOCs, SVOCs, nor petroleum hydrocarbons were detected in soil sample MSB-5 (12 to 14 feet).

In 2002, a soil gas survey was conducted in the area of the waste ink tank to evaluate the extent of the PCE detected at boring MSB-4. The results of the soil gas survey were presented in URS' *Revised Water Table Maps Soil Gas Survey Former Pactiv Facility Macedon, New York*, dated September 11, 2002. Five soil gas samples (SG-1 through SG-5), including one duplicate sample from location SG-4, were collected from four locations at depths of 5 feet bgs surrounding boring MSB-4. There were no detections of PCE in any of the soil gas samples, which suggests that the PCE detected at boring MSB-4 is limited in lateral extent.

Localized groundwater impacts, if any, downgradient of the waste ink tank area cannot be fully evaluated at this time with the existing monitoring well network. However, groundwater impacts due to the waste ink tank do not appear to be widespread based on previous groundwater sampling results from well MMW-05, which is approximately 450 feet east of the waste ink tank.

2.4.3 Former Solvent Tank Area

Between 1969 and 1987, there were five 4,000-gallon co-solvent USTs west of Building 12. These five USTs were used for solvent storage (lacolene, isopropyl alcohol, and VMP naphtha). In the 1980s, there were two spills at the former solvent tank area. The first spill was a 5,000-gallon lacolene (a petroleum distallate-based solvent for rubber and latex) from underground storage tanks that were adjacent to the canal. The second spill of 500 gallons of fuel oil occurred in the same general area of the lacolene spill. In 1982, two recovery wells and four monitoring wells were installed in the spill area. In 1987, oil-contaminated soil and USTs were removed. Between 1993 and 1996, there was a multi-phase extraction system in use at the site to remediate the soil and groundwater in the spill area. In April 1996, the system was shut down with the concurrence of the NYSDEC.

A groundwater sample from extraction well MW-7 was collected during CH2M Hill's 1996 investigation. No VOCs were detected in the groundwater but four SVOCs and metals were detected. Benzo(a) anthracene, benzo(b) fluoranthene, benzo(a) pyrene, bis(2-ethylhexyl)

phthalate, chrysene, chromium and lead were detected in the MW-7 groundwater sample at concentrations that exceeded NYSDEC groundwater standards or guidance values.

In 1999, soil boring MSB-3 was advanced in this area and well MMW-4 was installed on the south side of the former solvent tank area. Soil boring MSB-3 was advanced to 16 feet bgs. Strong petroleum odors were detected at both borings at depths of approximately 6 to 10 feet bgs. Toluene and xylenes were detected in soil sample MSB-3 (8 to 10 feet) at concentrations that exceed NYSDEC's RSCOs. Gasoline range organics and fuel oil No. 2 were detected in soil sample MSB-3 (8 to 10 feet). No SVOCs were detected in soil sample MSB-3 (8 to 10 feet).

Toluene was detected slightly above the NYSDEC's groundwater standard of 5 µg/L in the groundwater sample collected from MMW-4 in November 1999. Phenol was also detected in the November 1999 groundwater sample from MMW-4 at 21 µg/L, which exceeds the NYSDEC's groundwater standard (1µg/L). No SVOCs were detected above method detection limits in the March 2000 groundwater sample from MMW-4. Gasoline and diesel range organics were detected in the groundwater samples from MMW-4.

2.4.4 Courtyard Area

There is a courtyard at the eastern side of the Macedon Films site building that is surrounded by Buildings 3A, 7S, 10B, and 13. The courtyard area was used to cool extruder screws with a water spray. The water spray was reportedly drained into a storm drain in the courtyard, which discharged to an outfall (Outfall 005). During the repair of the storm water drain in the north end of the courtyard in April 1992, stained soil with a mild hydrocarbon odor was found. The stained soil was excavated and stockpiled. Soil and water samples were found to contain elevated concentrations of toluene and xylenes, other VOCs and some SVOCs. In 1994, a soil gas survey was completed within the north end of the courtyard to further investigate the area. The results of the soil gas survey are documented in H&A of New York's 1994 report. Eleven soil gas samples were collected and analyzed for VOCs. No VOCs were detected in any of the soil gas samples and it was concluded that the contaminated soil had been removed.

According to CH2M's April 1997 *Environmental Audit Report*, ink products were reportedly observed in this area by an employee during the repair of an underground utility line. However, this anecdotal information cannot be substantiated and there are no known past activities involving inks in the courtyard.

Groundwater impacts, if any, beneath the courtyard area cannot be evaluated with the existing monitoring well network. The installation of a monitoring well in the courtyard would also provide another groundwater elevation monitoring point that would help further evaluate the relationship between the canal water levels to the groundwater levels beneath the site buildings.

2.4.5 Summary

In summary, most of the subsurface soil impacts detected during previous investigations along the north side of the site have been sufficiently defined at most areas of the site for the purposes of remedy selection. The proposed scope of work presented in this work plan includes the collection of some additional soil and groundwater samples at and downgradient of the waste ink tank area and the installation of a monitoring well within the courtyard. Additional soil sampling to document the current contaminant levels at locations along the north side of the site where previous soil impacts have been detected is not warranted. The intended remedy for the site is to have land use restrictions, limit the disturbance of the soil at the site, and restrict the use of site groundwater. There is a deed restriction already in place at the site that limits site use to industrial and commercial activities, and restricts the use of site groundwater.

3.0 WORK PLAN OBJECTIVES

The overall objectives of the remedial investigation is to define the nature and extent of contamination related to past site activities so that a response scenario can be developed, that is protective of human health and the environment. The specific objectives of the scope of work presented in Section 4.0 of this *RI Work Plan* are to:

- Further evaluate the lateral extent of groundwater impacts downgradient of the former waste ink tank area;
- Evaluate whether there are impacts to soil and groundwater in the courtyard area;
- Further evaluate the presence of PCE in the soil near boring MSB-4;
- Further evaluate groundwater flow in the overburden at the site;
- Conduct further research on the presence of local water supply wells near the site; and
- Evaluate whether there is a potential for impacts to indoor air quality at the site.

4.0 SCOPE OF WORK

The proposed scope of work to meet the objectives in Section 3.0 consists of six tasks.

Task 1 – Advance one soil boring
Task 2 – Install two monitoring wells
Task 3 – Conduct two water level gauging and groundwater sampling events
Task 4 – Conduct indoor air investigation
Task 5 – Conduct survey for local water supply wells
Task 6 – Prepare a *Remedial Investigation Report*

These tasks are further described below. Table 1 summarizes the analytical program for this investigation.

4.1 TASK 1 – ADVANCE ONE SOIL BORING

URS will advance one soil boring MSB-8 at the same location as previous soil boring MSB-4 to further evaluate the presence of PCE previously detected at soil boring MSB-4. The proposed soil boring location is shown on Figure 4. Soil boring and sampling procedures are described in detail in the *FSP*.

The soil boring will be advanced to bedrock, which is anticipated to be encountered at approximately 8 feet bgs, using continuous-flight, 4.25-inch diameter inner diameter (ID) hollow-stem augers (HSAs). The soil boring will be continuously sampled using two-inch diameter by two-foot long split-spoons. The soil will be visually inspected by a geologist and screened for VOCs using a photo ionization detector (PID). One soil sample will be collected from 4 to 6 feet bgs from the boring and analyzed for VOCs using USEPA SW-846 Method 8260B. A second soil sample will also be collected from 6 to 8 feet bgs immediately above the top of bedrock and analyzed for VOCs using USEPA SW-846 Method 8260B. The analytical laboratory will provide an ASP Category B deliverable package so that URS can prepare a *Data Usability Summary Report (DUSR)*.

The rationale for the collection and analysis for the deeper soil sample is to evaluate the potential for downward migration of chlorinated VOCs contamination deeper in the overburden and near the top of bedrock. VOCs were not detected in previous soil gas samples collected between 4 to 6 feet bgs near boring MSB-4. If visual observations or field screening indicate impacts in soil above the 4 to 6 foot interval in boring MSB-8 then URS may elect to submit additional soil samples from the soil boring for analysis or drill additional borings in this area.

If the results of the two soil samples collected during this task and the results of the groundwater monitoring collected in Task 3 indicate there is a potential for bedrock impacts by chlorinated VOCs, then investigation of the bedrock conditions beneath the site may be warranted. A separate workplan will be prepared if Pactiv and NYSDEC agree that investigation of the bedrock is warranted.

4.2 TASK 2 – INSTALL TWO MONITORING WELLS

URS will install two overburden monitoring wells at the site. One overburden monitoring well (MMW-6) will be installed east of well MMW-4 and west of well MMW-5. Based on the June 29, 2004 scoping meeting with the NYSDEC, the proposed location for well MMW-6 will be as close to the east side of the cooling tower as possible based on access and utilities. A second monitoring well MMW-7 will be installed in the courtyard surrounded by Buildings 3A, 7S, 10B, and 13. The proposed monitoring well locations are shown in Figure 4.

Based on the depth to bedrock at wells MMW-4 and MMW-5, bedrock at well MMW-6 will likely be encountered at approximately 16 feet bgs. It is anticipated that bedrock at well MMW-7 will likely be encountered at a depth of approximately 14 feet based on the depth of bedrock at previous well and soil boring locations north and south of the courtyard. If visual observations or field screening indicate impacts in soil then URS may submit one or more soil samples from each boring that will be completed as a monitoring well from the interval exhibiting the greatest impacts for laboratory analysis for volatile organic compounds (VOCs) using USEPA SW-846 Method 8260B and semi-volatile organic compounds (SVOCs) using USEPA SW-846 Method 8270C. The analytical laboratory will provide an ASP Category B deliverable package so that URS can prepare a *Data Usability Summary Report (DUSR).*

Detailed monitoring well construction procedures are described in the *FSP*. In summary, after the boring is drilled to the required depth using 4.25-inch ID HSAs, a string of two-inch, flush-threaded, new schedule 40 PVC well riser and screen will be installed through the HSAs. A threaded bottom plug will be placed in the bottom of the screen and the top of the well will be protected with a vented cap. The well will be completed with a 0.010-inch slot size 10-foot long screen. Appropriate sandpack material, a 24-inch thick (minimum) bentonite plug, and grout will be used to fill the annular space between the risers and borehole walls. At this time, we anticipate that the new monitoring wells will be completed as flush-mount wells. URS will mark a survey reference point on the top of the well riser. Water level recordings will be made with respect to this reference mark.

Well Development

Well development will begin no sooner than 48 hours after grout placement and will be accomplished through a combination of surging and high volume pumping using a centrifugal or Waterra pump equipment with a surge block and foot valve as described in the *FSP*. The position of the foot valve will be raised and lowered across the screened interval to remove sediment and drilling fluids from the sand pack. Development will continue until the well is pumped dry or until the discharged water contains no visible particles or turbidity. Well development procedures will be documented in the field notebook or on a well development record.

Investigation Derived Waste Handling

Drilling tools will be steam cleaned between each drilling location to prevent cross-contamination. Decontamination will be conducted on the temporary decontamination pad

constructed at the rear of the manufacturing buildings. The decontamination fluids will be containerized for proper off-site disposal.

The drill cuttings and development water from each well will be containerized and stored on-site in DOT-approved 55-gallon drums or a holding tank for later off-site disposal in accordance with all relevant regulations.

Well Surveying

The locations and elevations of all new wells will be surveyed by a New York licensed surveyor, for inclusion to the existing base map. The survey data will be essential for construction of potentiometric maps from which groundwater gradients can be determined. The geographic location or horizontal survey measurement will be surveyed to an accuracy of one foot.

A reference point will be marked on the top of the well riser at the time of construction. The elevation of the well riser will be surveyed to the reference point, and all future water level recordings will be made with respect to the reference point. The elevation of the reference mark at the top of the well riser on all monitoring wells will be surveyed to the nearest 0.01 foot. The ground elevation at the base of each well will be surveyed to an accuracy of 0.01 foot.

The surveyor will provide tabular summaries of the vertical elevations and horizontal coordinates of the boring locations, benchmarks, and other reference points as specified in the work plan. The survey data will be used to update the existing computer-aided design (CAD) base map that depicts boring locations, samples, and other reference points.

4.3 Task 3 – Conduct Two Water Level Gauging and Groundwater Sampling Events

URS proposes to conduct two rounds of water level monitoring in order to continue to evaluate the influence of the canal to the onsite groundwater levels during the navigation season and when the canal is closed. For each monitoring round, water levels will be obtained from the existing monitoring wells and piezometer, the new monitoring wells MMW-6 and MMW-7 and the three canal spillway gauging stations (Gauging Stations 1 through 3) that were established in 1999.

URS proposes to conduct the first gauging event in 2004 after the water level in the canal is lowered. The second round of gauging will be conducted in the spring of 2005 after the water level is raised again for the navigation season.

The depth to groundwater in the wells and the depth to water at the gauging stations will be measured to the nearest 0.01 foot using an electronic water level indicator (i.e., Model P-1 Solinst or equivalent) following the procedures in the *FSP*. The order of gauging will be based on the anticipated or known level of contamination in the well. The clean wells will be checked first.

In conjunction with water level gauging, URS will also collect two rounds of groundwater samples from the five existing monitoring wells MMW-1 through MMW-5, existing piezometer MP-1, and the two new monitoring wells MMW-6 and MMW-7. As requested by NYSDEC, the

groundwater samples for the first round will be analyzed for VOCs using USEPA SW-846 Method 8260B, SVOCs USEPA SW-846 Method 8270C, and RCRA metals using USEPA SW-846 6010B/7470 Methods. The RCRA metals include arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), selenium (Se), and silver (Ag). The analytical laboratory will provide an ASP Category B deliverable package so that URS can prepare a DUSR.

As agreed during the June 29, 2004 scoping meeting between NYSDEC, NYSDOH, Pactiv, and URS if metals are not detected in the samples from the first round of groundwater sampling at concentrations that exceed NYSDEC groundwater standards, then analysis of the second round of groundwater samples for RCRA metals will not be required.

The monitoring wells and piezometer will be purged and sampled following the USEPA's low flow purging and sampling protocol (EPA 540/S-95/504). The groundwater monitoring well sampling procedures are described in detail in the *FSP* procedures.

Purging procedures have a great influence on the reliability of groundwater samples, and inconsistent purging can be a source of variability among groundwater analyses. Therefore, purging procedures will be standardized as much as possible as described below. Once a specific purging procedure has been used and found suitable for a well, the same procedure will be used in subsequent purging events, when possible. The purge water from each well will be containerized and stored on-site in DOT-approved 55-gallon drums or a holding tank for later off-site disposal in accordance with relevant regulations by Pactiv.

Upgradient wells, background wells, and other wells that are considered to be relatively uncontaminated, based on available data, will be purged and sampled first, whenever feasible. This practice is intended to minimize the potential for cross-contamination from more contaminated wells.

4.4 Task 4 – Conduct Indoor Air Investigation

This task was requested by NYSDOH during the June 29, 2004 scoping meeting between NYSDEC, NYSDOH, Pactiv, and URS. This task will only be completed if the soil samples collected in Task 1 and Task 2 and the groundwater samples in Task 3 indicate that there is a potential for VOCs in the subsurface to impact indoor air. It was agreed at the meeting that NYSDOH would be provided with the analytical data for their review. Implementation of indoor air sampling at the site would be based on NYSDOH's evaluation of the soil and groundwater data. A separate workplan will be prepared if it is determined that indoor air monitoring is warranted. However, indoor air sampling procedures are described in *FSP*.

4.5 Task 5 – Conduct Survey For Local Water Supply Wells

This task was requested by NYSDOH during the June 29, 2004 scoping meeting between NYSDEC, NYSDOH, Pactiv, and URS. URS will attempt to obtain additional information on water supply wells near the site by contacting the local municipal offices. As part of this task, URS will also contact the Village of Macedon Public Works Department to determine the limits of their service area.

4.6 TASK 6 – PREPARE REMEDIAL INVESTIGATION REPORT

URS will prepare a *Remedial Investigation Report* that describes the findings of the investigation and submit the report to the NYSDEC. The report will present the geologic and hydrogeologic site conditions of the site, including a description of the nature and extent of soil and groundwater quality for the site.

An interim report will also be submitted to NYSDEC and NYSDOH that provide the analytical data from the soil samples and the first groundwater sampling round.

5.0 SCHEDULE

The proposed project schedule is shown on Figure 5. As shown, URS anticipates that the *Remedial Investigation Report* will be submitted within approximately 34 weeks of the NYSDEC's approval of this *RI Work Plan.*

6.0 REFERENCES

This section lists the references used to prepare this report. Previous investigation documents that pertain to the site are also listed.

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TABLES

TABLE 1
ANALYTICAL PROGRAM
REMEDIAL INVESTIGATION

PACTIV CORPORATION
MACEDON FILMS SITE
MACEDON, NEW YORK

Task	Matrix	Analyses	Method	Number of Field Samples	QA/QC Samples				Total Number of Samples
					Field Duplicates	MS/MSD[1]	Trip Blanks	Equipment Blanks	
1 - Soil Sampling	Soil	VOCs	USEPA SW-846 8260B	2	0	0	0	0	2
2 - Install Two Monitoring Wells	Soil	VOCs	USEPA SW-846 8260B	2	1	0	0	1	4
		SVOCs	USEPA SW-846 8270C	2	1	0	0	1	4
3 - Two Groundwater Sampling Events[2]	GW	VOCs	USEPA SW-846 8260B	8	1	1	1	1	13
		SVOCs	USEPA SW-846 8270C	8	1	1	0	1	12
		Metals[3]	USEPA SW846 6010B/7470	8	1	1	0	1	12

Notes:

1 - Matrix spike/matrix spike duplicate (organic analysis) or matrix spike/matrix duplicate (metals).

2 - Number of samples per event. A total of two events will be conducted.

3 - RCRA Metals include As, Ba, Cd, Cr, Pb, Hg, Se, and Ag
Metals analysis may be omitted from the second event.

The laboratory will provide ASP Category B type deliverables so that URS can prepare a Data Usability Summary Report.

Soil samples collected during Task 1 and 2 will be submitted to the laboratory as one sample batch.

VOCs - Volatile organic compounds

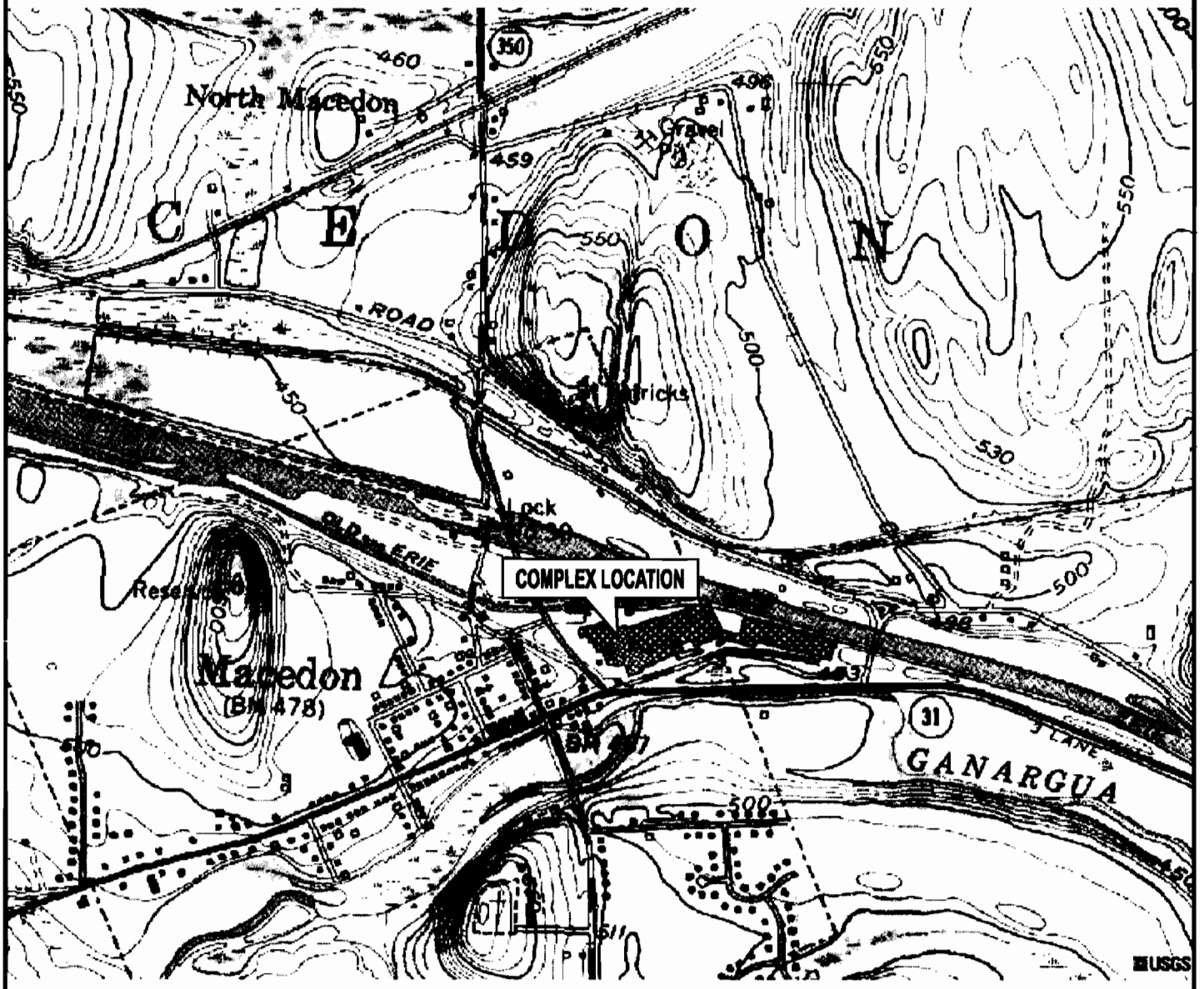
SVOCs - Semivolatile organic compounds

GW - Groundwater

Air - Soil vapor or ambient air

Soil - Subsurface soil

FIGURES



Title:	COMPLEX LOCATION MAP
Location:	MACEDON, NEW YORK
Client:	PACTIV Advanced Packaging Solutions

SOURCE:
USGS 7 1/2 Minute Series Topographic Map
Macedon, New York 1984

0 1/4 1/2
GRAPHIC SCALE IN MILES

URS
URS Corporation
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

Drafter: DAD	Date: July 2004
Drg. Size: 8.5 x 11	Job No.: 38393677

FIGURE 1

P:\Client Docume...\dtv\38393677\R\ Workplan\Figures\Site Location map.ai

N

True North Per Barge Canal Mapping Prepared By State of New York

LEGEND

- Gauging Station
- Monitoring Well
- Soil Boring
- Piezometer
- Site Boundary
- BLDG. 7S 1955 — Building Number and Date Built

NOTES:
All locations are approximate.

DRAWING SOURCE:
Mobil Chemical Drawing DX1631 (SPCC Drawing) 3/94

0 50 100
GRAPHIC SCALE IN FEET

Title: MACEDON FILMS SITE BOUNDARY

Location: MACEDON, NEW YORK

Client: PACTIV Advanced Packaging Solutions

URS Corporation
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

Drafter: DAD	Date: July 2004
Drg. Size: 11 x 17	Job No.: 38393677

FIGURE 2

P:\Client Docu...s\Pactiv\38393677\RI Workplan\Figures\Figure 2 Site Boundary.dwg

MSB 1 & 2 ABOVE SOIL CRIT.

LEGEND

- Gauging Station
- Monitoring Well
- Soil Boring
- Piezometer
- Previous Temporary Well Location
- Previous Soil Sampling Location
- Site Boundary
- BLDG. 7S 1955 — Building Number and Date Built

NOTES:
All locations are approximate.

DRAWING SOURCE:
Mobil Chemical Drawing DX1631 (SPCC Drawing) 3/94

0 50 100
GRAPHIC SCALE IN FEET

Title: PREVIOUS INVESTIGATIONS

Location: MACEDON, NEW YORK

Client: PACTIV Advanced Packaging Solutions

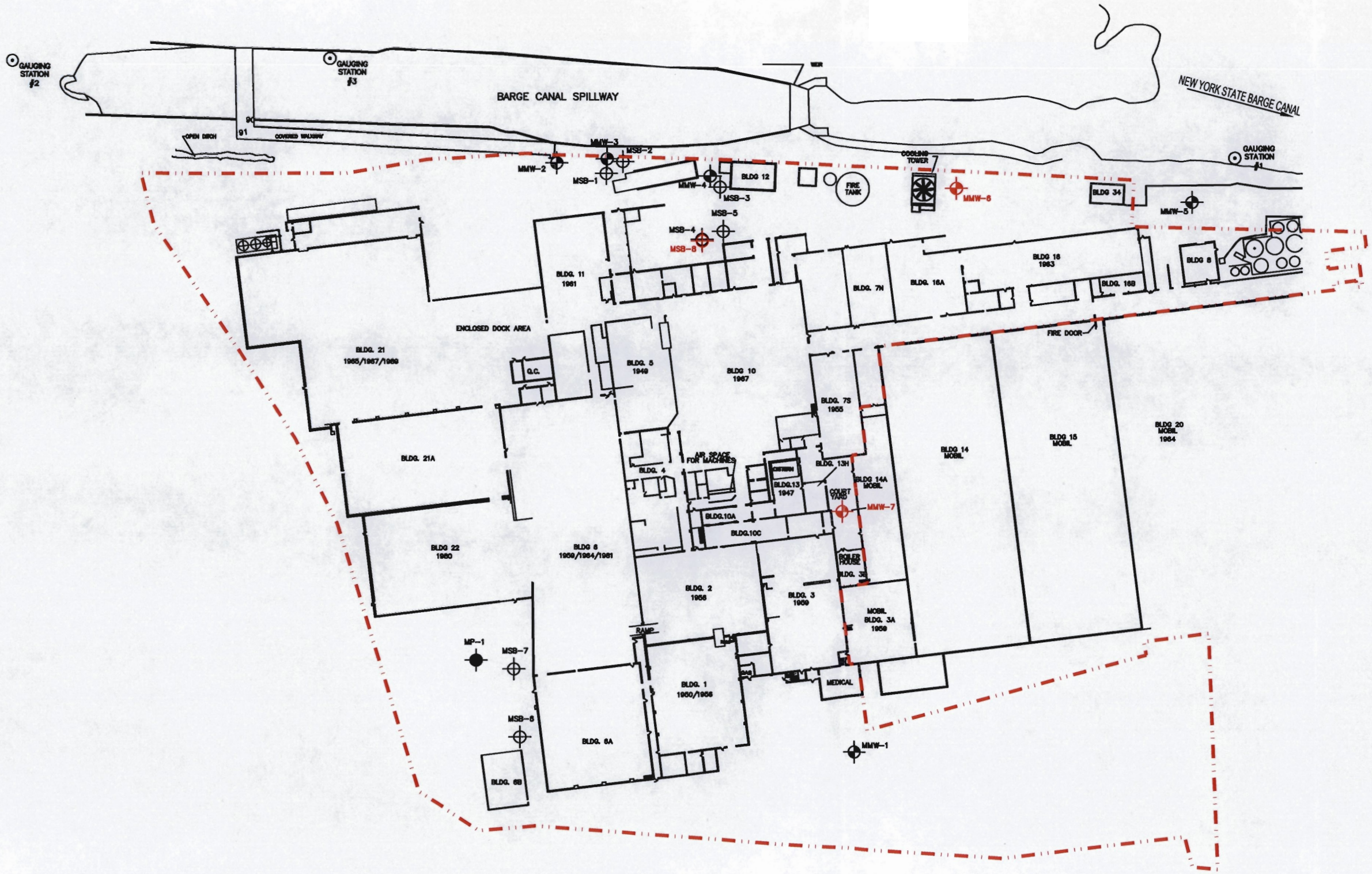
URS Corporation
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

Drafter: DAD	Date: July 2004
Drg. Size: 11 x 17	Job No.: 38393677

FIGURE 3

True North Per Barge Canal Mapping Prepared By State of New York

P:\Client Doc...s\Pactiv\38393677\RI Workplan\Figures\Figure 3 Previous Investigations.dwg



True North Per Barge Canal Mapping Prepared By State of New York

LEGEND

- Canal Spillway Gauging Station
- Monitoring Well
- Soil Boring
- Piezometer
- Proposed Soil Boring
- Proposed Monitoring Well
- Site Boundary
- BLDG. 7S 1955 — Building Number and Date Built

NOTES:
All locations are approximate.

DRAWING SOURCE:
Mobil Chemical Drawing DX1631 (SPCC Drawing) 3/94

0 50 100
GRAPHIC SCALE IN FEET

Title: PROPOSED SAMPLING LOCATIONS

Location: MACEDON, NEW YORK

Client: PACTIV Advanced Packaging Solutions

URS Corporation
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

Drafter: DAD	Date: July 2004
Drg. Size: 11 x 17	Job No.: 38393677

FIGURE 4

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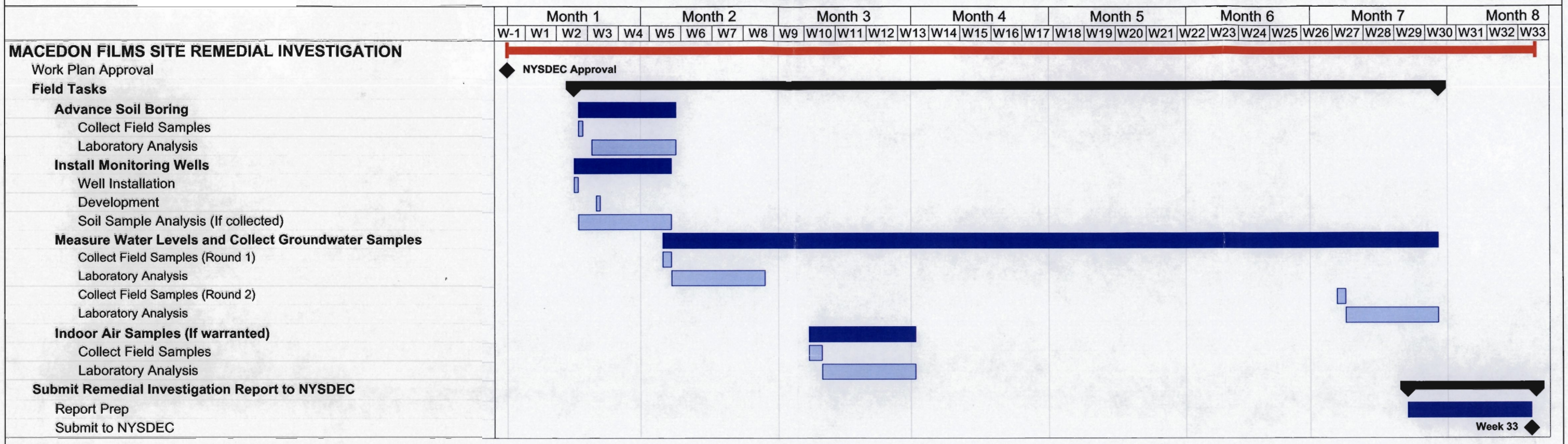
FIGURE 5
PROPOSED SCHEDULE
REMEDIAL INVESTIGATION



Pactiv - Macedon Films Site
RI Sched.mpp
Fri 8/20/04

URS Corporation - New York
Clifton Park, New York

APPENDIX A
COMMUNITY AIR MONITORING PLAN

Appendix A
Community Air Monitoring Plan

Pactiv Corporation
Macedon Films Site
Macedon, New York

This *Community Air Monitoring Plan (CAMP)* presents a scope of work to monitor the potential influence of site activities on the air quality in the surrounding community. This CAMP will be performed during implementation of the remedial investigation at the Macedon Films Site, according to the New York State Department of Environmental Conservation (NYSDEC)'s approved *RI Work Plan.*

The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. Action levels for worker respiratory protection can be found in the *Health and Safety Plan.*

Objective: The objective of this *CAMP* is to monitor the impacts of volatile organic compounds (VOCs) and dust from this project may have on ambient air quality so that measures (if required) can be implemented in order to protect human health.

Equipment: Photoionization Detector (PID) (OVM 580B or equivalent) that can record readings every 1 minute and calculate 15-minute running average concentrations. The PID will be equipped with a 10.2 electron volt (EV) lamp and calibrated daily according to the manufacturers instructions.

Implementation: Air monitoring will be performed in the Operator's Breathing Zone (OBZ), according to the Health and Safety Plan and as described below in Section 1.0. If the lower range of the 1st Action Level for VOCs [5 parts per million (ppm) above background], air monitoring in the OBZ will continue and also be conducted at the perimeters of the exclusion zone (which is 25 feet distance around the immediate work area) using monitoring equipment. Dust migration will also be assessed visually. The monitoring at the perimeter of the exclusion zone is described in Section 2.0.

1.0 Monitoring in Operator's Breathing Zone

According to Health and Safety Plan, continuous air monitoring for VOCs will be performed in the OBZ for all ground intrusive activities, which for the RI will include the installation of soil borings or monitoring wells. In the future, other potential ground intrusive activities may include soil/waste excavation and handling, test pitting or trenching.

For continuous air monitoring, the PID will be programmed to record readings every 1 minute and calculate 15-minute running average concentrations. All data collected by the

portable meter will be downloaded to a PC daily and saved. All data will be available to NYSDEC and NYSDOH personnel for review.

Periodic air monitoring for VOCs only will be performed in the OBZ during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from the monitoring wells. "Periodic" monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring every 15 minutes during well baling/purging, and taking a reading prior to leaving a sample location.

Action Levels

The action levels for the VOCs in the OBZ are summarized below. The lower range of the 1st Action Level for VOCs in OBZ is 5 ppm above the background reading.

Downwind VOC Concentration	Action
Less than 5 ppm above background	Continue regular work procedures.
15-minute average greater than 5 ppm above background	Work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work can resume with continued monitoring.
Between 5 ppm and 25 ppm above background	Work activities must be halted, the source of vapors identified, corrective actions taken, and monitoring continued. Work can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
> 25 ppm above background	Stop work and reevaluate work procedures.

If during ground intrusive activities, sustained visible dust is generated, a water mist will be applied or other effective dust control method will be to reduce dust generation.

2.0 Monitoring at the Perimeter of Exclusion Zone

This section describes the monitoring at the upwind and downwind perimeter of the exclusion zone (if required) and related actions. The exclusion zone will be established according to procedures described in the *Health and Safety Plan.*

2.1 VOC Monitoring

If the action level described in Section 1.0 are exceeded (5 ppm above background in OBZ), then VOCs will be monitored at the downwind perimeter of the exclusion zone on a continuous basis. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions.

If the ambient air concentration of total organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring will be continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

If the organic vapor level is above 25 ppm at the perimeter of the exclusion zone, activities will be shutdown.

APPENDIX B
ANALYTE LISTS

Appendix B
Analyte Lists

Pactiv Corporation
Macedon Films Site
Macedon, New York

Volatile Organic Compounds in Soil or Groundwater by USEPA SW846 Method 8260B

Chloromethane
Chloroethane
Acetone
Vinyl acetate
1,1,1-Trichloroethane
Benzene
1,2-Dichloropropane
cis-1,3-Dichloropropene
1,1,2-Trichloroethane
Dibromochloromethane
Styrene
Xylenes (total)
1,3-Dichlorobenzene
Vinyl chloride
1,1-Dichloroethene
Methylene chloride
2-Butanone (MEK)
Carbon tetrachloride
1,2-Dichloroethane
Bromodichloromethane
4-Methyl-2-pentanone (MIBK)
Tetrachloroethene
Chlorobenzene
Bromoform
1,4-Dichlorobenzene
Bromomethane
Carbon disulfide
1,1-Dichloroethane
Chloroform
1,2-Dichloroethene (total)
Trichloroethene
2-Chloroethylvinylether
Toluene
2-Hexanone
Ethylbenzene
1,1,2,2-Tetrachloroethane
1,2-Dichlorobenzene

Base/Neutral/Acid Extractable Semivolatile Organic Compounds in Soil or Groundwater by USEPA SW846 Method 8270C

n-Nitrosodimethylamine
1,3-Dichlorobenzene
Benzyl alcohol
n-Nitroso-di-n-propylamine
2-Chlorophenol
1,2,4-Trichlorobenzene
Hexachlorobutadiene
2,4,6-Trichlorophenol
2-Methylnaphthalene
4-Chloro-3-methylphenol
3-Nitroaniline
Acenaphthylene
Dibenzofuran
4-Nitroaniline
Diethyl phthalate
n-Nitrosodiphenylamine
Anthracene
Pyrene
3,3-Dichlorobenzidine
Benzo(b)fluoranthrene
Indeno(1,2,3-cd)pyrene
Phenol
1,4-Dichlorobenzene
2-Methylphenol (o-cresol)
Hexachloroethane
Nitrobenzene
Isophorone
Naphthalene
2,4,5-Trichlorophenol
2-Nitroaniline
2,6-Dinitrotoluene
Dimethyl phthalate
2,4-Dinitrotoluene
4-Nitrophenol
4-Bromophenyl phenyl
4-Chlorophenyl phenyl
4,6-Dinitro-2-methylphenol
Di-n-butyl phthalate
Butyl benzyl phthalate
Bis(2-ethylhexyl)phthalate
Benzo(k)fluoranthrene
Dibenzo(a,h)anthracene
Bis(2-chloroethyl)ether
1,2-Dichlorobenzene
2,2-oxybis (1-chloropropane)
4-Methylphenol (m/p-cresol)
Bis(2-chloroethoxy)methane
2,4-Dimethylphenol
4-Chloroaniline
Hexachlorocyclopentadiene
2-Chloronaphthalene
2-Nitrophenol
2,4-Dinitrophenol
Acenaphthene
Fluorene
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Fluoranthene
Benzo(a)anthracene
Di-n-octyl phthalate
Benzo(a)pyrene
Benzo(ghi)perylene

RCRA Metals in Soil or Groundwater by USEPA 6010B/7470 Methods

Arsenic (As)	Barium (Ba)	Cadmium (Cd)
Chromium (Cr)	Lead (Pb)	Mercury (Hg)
Selenium (Se)	Silver (Ag)	

Volatile Organics in Air by USEPA Method TO-14A

1,1-Dichloroethane	1,2-Dichloroethane	1,2-Dichlorobenzene
1,2-Dibromoethane	1,2,4-Trimethylbenzene	1,2-Dichloropropane
1,2-Dichlorotetrafluoroethane (freon 114)		1,1,2-Trichlorotrifluoroethane (freon
113)1,1-Dichloroethane	1,1,2-Trichloroethane	1,1,2,2-Tetrachloroethane
1,1,1-Trichloroethane	1,2,4-Trichlorobenzene	Bromomethane
Ethylbenzene	Dichlorodifluoromethane	Chloromethane
Chloroform	Chloroethane	cis-1,2-Dichloroethene
Carbon Tetrachloride	Benzene	1,4-Dichlorobenzene
trans-1,3-Dichloropropene	cis-1,3-Dichloropropene	1,3-Dichlorobenzene
1,3,5-Trimethylbenzene	Chlorobenzene	o-Xylene
m&p-Xylene	Vinyl Chloride	Trichlorofluoromethane
Trichloroethene	Toluene	Tetrachloroethene
Styrene	Methylene Chloride	Hexachlorobutadiene

PACTIV
Advanced Packaging Solutions

PACTIV CORPORATION

MACEDON FILMS SITE
MACEDON, NEW YORK

FIELD SAMPLING PLAN
MACEDON FILMS SITE
MACEDON, NEW YORK

Site # C859025
Index # B8-0669-04-06

SEPTEMBER 2004

Prepared For:
Pactiv Corporation
Canandaigua, New York

URS
URS Corporation - New York
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

FIELD SAMPLING PLAN
TABLE OF CONTENTS

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1.0 INTRODUCTION

URS Corporation – New York (URS) has prepared this *Field Sampling Plan* (*FSP*) on behalf of Pactiv Corporation (Pactiv). The site is being investigated under the Brownfield Cleanup Program (BCP) in accordance with Brownfield Cleanup Agreement Number B8-0669-04-06 (BCA) between Pactiv and the New York State Department of Conservation (NYSDEC). This *FSP* provides detailed descriptions of the routine field methods to be used during the investigation of the site. Specialized sampling methods, as needed, will be described in specific work plans and approved by NYSDEC.

This *FSP* has five sections. Section 2.0 includes a description of field procedures that will be used to implement the tasks outlined in the *Remedial Investigation Work Plan* dated September 2, 2004 and subsequent work plans submitted by Pactiv and approved by the NYSDEC in accordance with the BCA. Section 3.0 describes field quality assurance and decontamination procedures. Section 4.0 describes sample handling procedures. Section 5.0 is a list of references used to prepare this *FSP*. Copies of field forms that are referenced in this *FSP* can be found in Appendix A.

2.0 SAMPLING PROCEDURES

The scope of work for the field investigation of the site may consist of the following tasks:

- Collect subsurface soil samples;
- Install and develop groundwater monitoring wells;
- Collect groundwater samples from monitoring wells;
- Measure groundwater elevations;
- Collect indoor air samples.

The remainder of this section describes the procedures that will be followed to complete these tasks, as specified in NYSDEC approved workplans.

2.1 SUBSURFACE SOIL SAMPLING PROCEDURES

Soil borings will be advanced and continuous overburden soil samples will be obtained to verify the geologic profile and assure proper placement of the well screens. The collection of subsurface soil sampling may be conducted using discrete samplers and MacroCore™ open samplers with a Geoprobe™ unit mounted to a truck or van or using split-spoon samplers during drilling with a conventional drill rig equipped with hollow stem augers (HSAs).

Field Equipment

Some or all of the following equipment will be used during soil sampling:

- Field boring log sheet and field notebook;
- Photo-ionization detector (PID);
- Stainless-steel knife, trowels, spoons, scoops, and bowls;
- Personal protective equipment (PPE);
- Disposable gloves;
- Distilled/deionized water;
- Cleaning detergents and decontamination chemicals;
- Five-gallon pails for decontamination;
- Brushes;
- Sample bottles;
- Coolers;
- Sufficient ice or freezer packs to maintain the samples at four degrees Celsius; and
- Chain of Custody (COC) forms.

2.1.1 Soil Sampling Using Geoprobe™ Samplers

Discrete samplers will be used to collect samples obtained with a Geoprobe™. These samplers have an open tube design and measure approximately two-inches in diameter (outer) by 44-inches long. The samplers will be fitted with a removable cutting shoe. The sampler will be advanced to the

desired depth. Each of the samplers will be fitted with a new acetate liner prior to collection of a sample. The acetate liner will be split open to log the soil and collect the soil samples.

The length of sample recovery, percent recovery, and soil description, including odors, will be recorded on the boring log. A copy of a field boring log sheet is provided in Appendix A.

If samples are to be sent to the laboratory for analysis, an aliquot of soil will be transferred to the volatile organic compound (VOC) sample containers immediately upon retrieval of the sampler. The VOC sample containers will be completely filled in order to minimize headspace in the containers.

A second aliquot of soil from the sampler will be retained for headspace analysis using a PID. Headspace analysis procedures are described in Section 2.1.3. The rationale behind this sequence of procedures (i.e., collecting a sample first, and then screening) is to minimize the loss of VOCs from samples that will be sent to a laboratory for analysis.

The remaining soil will be placed in a clean stainless-steel bowl. After removal of any stones, large twigs, or other vegetation, the sample will be thoroughly homogenized by mixing the sample in the bowl with a stainless-steel spoon. The sample will then be quartered in the bowl and each quarter will be mixed separately, before finally mixing the entire sample again and placing it in containers for non-volatile constituent analysis.

Field personnel will wear disposable gloves for the collection and handling of all samples and will be changed between each sample. A stainless-steel scoop or trowel may be used to fill the sample containers.

Samples that are to be sent for laboratory analysis will be packed into sample coolers containing sufficient bags of ice or freezer packs to maintain the samples at 4° Celsius (°C). All acetate liners will be discarded after use. Upon completion of sampling at each location, all sampling equipment will be decontaminated in accordance with the procedures described in Section 3.3. Quality assurance samples, including duplicate samples, equipment rinseate blanks, and trip blanks will be collected as necessary in accordance with the procedures described in Section 3.1 and the site-specific *Quality Assurance Project Plan (QAPP)*. The sample custody procedures are described in Section 4.0.

2.1.2 Soil Sampling Using Stainless Steel Split-Spoons

The soil samples will be collected using two-inch diameter by two-foot long split-spoons in accordance with ASTM D-1586-84: *Standard for Penetration Test and Split-Barrel Sampling of Soils*. The split-spoons will be driven into the overburden materials using a 140-pound hammer-drop system until the desired depth of the boring is reached. The blow counts for each six-inch increment of penetration will be recorded on the boring log. The hollow stem augers (HSAs) will be advanced two feet after each split spoon is collected to avoid borehole cave-in. Furthermore, a plug inside of the HSAs will be advanced during drilling. The soil samples obtained from the split-spoon samplers will be collected and handled in a similar manner as the soil samples obtained from discrete samplers, described in Section 2.1.1.

Upon completion of sampling at each location, all sampling equipment will be decontaminated in accordance with the procedures described in Section 3.3. Quality assurance samples, including duplicate samples, equipment rinseate blanks, and trip blanks will be collected as necessary in accordance with the procedures described in Section 3.1 and the *QAPP*. The sample custody procedures for the soil samples are described in Section 4.0.

2.1.3 Headspace Analysis Procedures

Field screening of collected soil samples will be completed using headspace analysis using a photo ionization detector (PID) equipped with a 10.2 electron volt (eV) lamp to detect the presence of VOCs. Immediately upon retrieval of a soil sample, two aliquots of soil will be collected. One aliquot will be used to completely fill the VOC sample containers and the second aliquot will be used for headspace analysis using a PID. The rationale behind this sequence of procedures (i.e., collecting a sample first, and then screening) is to minimize the loss of VOCs from samples that will be sent to a laboratory for analysis.

The soil to be used for headspace analysis will be placed in new sealable polyethylene bags. Each bag will be labeled with the location, depth interval, and date of the soil sample. The soil will be allowed to warm to ambient temperature to allow the vapors in the soil to equilibrate with the air in the bag. If ambient temperature is less than 68° Fahrenheit (i.e. room temperature) the samples may be placed indoors to allow the soil to warm to room temperature. A measurement will be collected by inserting the probe of the PID through an opened corner of the bag. Care will be taken to avoid uptake of water droplets and soil particles. The highest meter response will be recorded as the headspace concentration. Each PID measurement will be recorded on the appropriate soil boring log or in a field notebook.

2.2 MONITORING WELL INSTALLATION PROCEDURES

This section describes the procedures that will be used to install monitoring wells using a drill rig. The procedures described in this section will provide monitoring wells that will:

- Provide reliable stratigraphic information about penetrated soils;
- Provide representative samples of groundwater for analysis;
- Permit collection of representative water level data; and
- Effectively isolate the separate hydrogeologic strata penetrated during drilling.

Some or all of the following equipment will be used during monitoring well installations:

- Drilling rig, drilling tools, and support truck with water tanks;
- Sheet of plywood, or mud box;
- Steam cleaner;
- Tremie pipe;
- Two-inch threaded polyvinyl chloride (PVC) well risers and screens with a minimum wall thickness of Schedule 40 and screen slot sizes of 0.010-inch and 0.020-inch;
- PVC or steel well caps and bottom plugs;
- Washed Morie No. 0 or equivalent quartz sand for filter pack with 0.010-inch slot screen;

- Washed Morie No. 1 or equivalent quartz sand for filter pack with 0.020-inch slot screen;
- Portland cement, Type I or II;
- Bentonite pellets;
- Powdered bentonite;
- Protective casings and/or roadboxes and padlocks;
- Concrete mix for surface completions;
- Polyethylene sheeting; and
- Field notebook, soil boring logs, and well construction logs.

2.2.1 Drilling, Borehole Logging, Well Installation, and Construction

All necessary access permits and utility clearances for underground utilities will be obtained prior to the start of drilling operations. All drill rigs will use necessary tools, supplies, and equipment, which will be supplied by the drilling subcontractor. The drill crew will consist of a NYS-licensed driller and one or more driller's assistants. Appropriate URS personnel will be onsite to supervise the drill crew and for logging the soils and sampling. Drilling subcontractor personnel will transport water to the rigs, clean tools, assist in the installation of security and marker pipes, construct the concrete aprons, and may develop the wells.

All soil boring and well construction details will be properly logged by the supervising field geologist. All notes will be entered on a standard boring log sheet (Appendix A) and field book. The following information will be recorded on the boring log sheet: project name and number, boring or well number and location, drilling contractor, drilling method and equipment, sampling method and equipment, start and finish time and date, and name of the supervising field geologist.

Supplies and equipment will be transported to the lay-down area designated onsite. Before moving onto the first well location, all reusable drilling equipment and tools will be steam-cleaned at a designated onsite decontamination station using a portable steam cleaner. Decontamination procedures are in Section 3.3.

During the advancement of the soil boring standard penetration tests will be performed in accordance with ASTM D-1586-84: *Standard for Penetration Test and Split-Barrel Sampling of Soils*. Soil sampling procedures, including field screening of the soil samples using head-space analysis are described in Section 2.1.3.

At each boring location, drilling will be conducted through a mud box or at a minimum a sheet of plywood with a hole cut through the center to contain the drill cuttings. Hollow stem augers (HSA) will be used to drill through the overburden materials. A plug will be lowered to the bottom of the HSA drill string (inside of the HSAs) and advanced with the HSAs during drilling, this plug will be removed during soil sample collection.

Groundwater Monitoring Well Construction

Overburden monitoring wells will be installed in the unconsolidated material using continuous-flight, 4.25-inch (or larger as necessary) inner diameter (ID) hollow-stem augers (HSAs) for two-inch wells.

URS' field personnel will prepare a soil boring log and maintain a time log of significant events during each working day. The soil boring logs will be used to record field classification of soils, sampling types and number of samples, sampling depths, first encountered and static groundwater levels, progress of drilling, final completion depth, and the nature and resolution of problems encountered. The Unified Soil Classification (USC) System will be used for soil descriptions.

After the boring is drilled to the required depth, a string of two-inch, flush-threaded, PVC well riser and screen will be installed through the HSAs. A threaded bottom plug will be placed at the bottom of the screen and the top of the well will be protected with a vented cap. The wells will be set at the desired horizon of the overburden materials with appropriate changes in screen length, if necessary. In general, the lengths of the monitoring well screens will be ten feet. The well riser will be of sufficient length to extend from the top of the screen to approximately six inches below grade for wells to be completed as flush-mount wells. If the well is to be completed above grade, the well riser will be of sufficient length to extend from the top of the screen to approximately two to three feet above the ground surface.

New two-inch diameter schedule 40 PVC screens and risers will be used for all overburden monitoring wells. The screen slot size will be selected by the URS personnel supervising the well installation based on the visual inspection of particle size of the material to be screened. The screen slot size (0.010- or 0.020-inch) and appropriate sand pack materials will be chosen to adjust for grain size variations in the formation and will be suited to the smallest grain-size within the screened-interval.

If fine-grained sand and silt are present in the screened interval, a 0.010-inch slot size screen will be used, otherwise a 0.020-inch slot size screen will be used for the coarser formation material. Washed Morie No. 0 or equivalent sand will be used for 0.010-inch slot screens. Washed Morie No. 1 or equivalent sand will be used for 0.020-inch slot screens.

If groundwater conditions permit, the top portion of the shallow well screens will be set approximately two feet above the water table to detect light nonaqueous phase liquids (LNAPLs), if present, and to allow for observations of seasonal water level fluctuations.

The sand pack will be installed around well screen to a depth extending two to three feet above the top of the screen. During installation of the sand pack, the augers will be withdrawn in small increments so as to avoid disturbing the sand pack. URS field personnel will record the amount of sand used. A weighted fiberglass tape will be used to measure the top of the sand pack and detect bridging of the sand pack material. If bridging is detected it will be corrected prior to the addition of more filter pack material.

A 24-inch thick (minimum) seal of bentonite pellets will be placed over the sand pack and hydrated. For shallow monitoring wells, where the top of the screen is above the water table, hydration of the bentonite clay pellets will be accomplished by adding potable water to the borehole and underspace. A bentonite-cement grout consisting of approximately seven pounds of powdered bentonite per 94-pound sack of Portland cement, and not more than six gallons of clean water per 94-pound sack of cement, will be introduced into the borehole annular space by injection under pressure using a tremie pipe. The grout will be allowed to set and cure for at least 48 hours before commencing well development or other activities, which might disturb the seal.

Wellhead Construction

All wells will be completed with protective stickup risers unless site conditions or use require flush-mount road boxes. A four-inch by four-inch five-foot long steel outer protective stickup riser with a hinged, lockable cover will be installed in the grout to a depth of 2.5 feet and equipped with a padlock. The integrity of the well will be protected with a new, lockable, sealing, vented well cap with an expandable O-ring, which forms an air-tight seal. All locks will be keyed alike.

The drilling subcontractor will construct a (2 foot x 2 foot x 0.5 foot) concrete apron around each well. Concrete aprons will be sloped to promote runoff away from the well. Concrete pads will be constructed within three days after wells have been installed.

Cuttings will be containerized in the New York State Department of Transportation's (NYSDOT) approved 55-gallon drums and disposed in accordance with relevant regulations by Pactiv. Drilling fluids will also be containerized for off-site disposal. The drums will be labeled and staged on-site.

2.2.2 Well Development

This section describes the groundwater monitoring well development procedures and quality control requirements. The following equipment will be used to develop the newly installed overburden monitoring wells.

- Centrifugal or Waterra inertial pump;
- New high density polyethylene (HDPE) tubing;
- New HDPE foot valves and surge blocks;
- Generator and extension cords with GFI protection;
- ASTM Type II or analyte-free distilled water;
- Water level indicator;
- Five-gallon bucket;
- Polyethylene sheeting;
- Well development record and field notebook; and
- Turbidity meter.

Well development will begin no sooner than 48 hours after grout placement and will be accomplished through a combination of surging and pumping using a centrifugal or Waterra pump. First, the high density polyethylene tubing with a surge block and foot valve will be lowered to the bottom of the well. The tubing will then be attached to the pump and the pump is started. The

position of the foot valve will be raised and lowered across the screened interval to remove sediment and drilling fluids from the sand pack.

Development will continue for a maximum of five hours, until the well is pumped dry or until the discharged water contains no visible particles and turbidity is less than 50 NTU. Well development procedures will be documented in the field notebook or on a well development record. A copy of a well development record is provided in Appendix A.

The drilling contractor may develop the bedrock monitoring wells using a drill rig. The monitoring wells will be developed by alternately pumping and air-surging ten-foot intervals. Each interval will be surged until a turbidity of 50 NTU is reached or a maximum time of 30 minutes. Alternately pumping and surging will continue until a minimum of water is recovered equaling the approximate amount of drilling fluid lost during coring and reaming plus five screen volumes.

The development water from each well will be containerized and stored on-site in DOT-approved 55-gallon drums or a holding tank for later off-site disposal in accordance with relevant regulations by Pactiv.

2.2.3 Well Surveying

The locations and elevations of all new wells will be surveyed by a New York licensed surveyor, using a United States Geodetic Survey benchmark or other previously established relative site datum as a datum. The geographic location or horizontal survey measurement will also be surveyed to an accuracy of one foot.

A reference point will be marked on the top of the well riser at the time of construction. The elevation of the well riser will be surveyed to the reference point, and all future water level recordings will be made with respect to the reference point. The elevation of the reference mark at the top of the well riser on all monitoring wells will be surveyed to the nearest 0.01 foot. The ground elevation at the base of each well will also be surveyed to an accuracy of 0.1 foot.

The surveyor will provide tabular summaries of the vertical elevations and horizontal coordinates of the boring locations, benchmarks, and other reference points as specified in the work plan. The survey data will be used to update the existing base map that depicts boring locations, samples, and other reference points.

2.3 GROUNDWATER ELEVATION MEASUREMENT

Prior to groundwater sampling, groundwater elevations will be collected for all existing and newly installed monitoring wells. Some or all of the following equipment will be used to collect water level measurements.

- Electronic water level indicator with 0.01 feet graduations;
- Personal protective equipment (PPE);
- Disposable gloves;
- Distilled/deionized water; and

- Cleaning detergents and decontamination chemicals.

After the new wells have been developed, the new wells and the existing and accessible wells at the site will be gauged using an electronic water level meter to obtain water level elevations. The water level data will be used to further refine the groundwater flow regime beneath and near the site. Groundwater levels will be measured in all monitoring wells using the following procedures:

- Verify the identification of the monitoring well.
- Observe the wellhead for signs of deterioration. Record observations.
- Identify the surveyed elevation point on the well. If one does not exist, create a mark using a steel file. This mark will be the measuring point for subsequent rounds of water level measurements.
- Slowly lower the electronic water level indicator probe into the well.
- When the water level indicator contacts groundwater, note the point on the water level indicator as referenced by the measuring point on the well.
- Record the water level to within 0.01 foot in the field notebook or gauging form.
- Retrieve the water level indicator and re-lock the well.
- Decontaminate the water level indicator after each use with an Alconox/distilled water wash followed by a distilled water rinse.

The order of gauging will be based on the anticipated or known level of contamination in the well. The clean wells will be checked first. The gauging data will be recorded on a gauging form. A copy of a gauging form is provided in Appendix A.

2.4 GROUNDWATER SAMPLING PROCEDURES

Groundwater samples will be collected following the USEPA's low-flow sampling protocol (EPA/540/S-95/504) to obtain representative groundwater samples from the monitoring wells. Some or all of the following equipment will be used to collect groundwater samples:

- Sampling and purging logs;
- Peristaltic or Waterra Hydrolift-II pump;
- New or dedicated HDPE tubing;
- New or dedicated foot-valve;
- VOC sampling kit for Waterra pump;
- Personal protective equipment (PPE);
- Disposable gloves;
- Distilled/deionized water;
- Cleaning detergents for decontamination;
- Five-gallon pails for decontamination;
- Brushes;
- Laboratory-supplied sample bottles;
- Coolers;
- Sufficient ice or freezer packs to maintain the samples at four degrees Celsius; and
- Chain of Custody (COC) forms.

2.4.1 Well Purging and Stabilization

Purging procedures have a great influence on the reliability of groundwater samples, and inconsistent purging can be a source of variability among groundwater analyses. Therefore, purging procedures will be standardized as much as possible as described below. Once a specific purging procedure has been used and found suitable for a well, the same procedure will be used in subsequent purging events, when possible. The purge water from each well will be containerized and stored on-site in DOT-approved 55-gallon drums or a holding tank for later off-site disposal in accordance with relevant regulations by Pactiv.

Upgradient wells, background wells, and other wells that are considered to be relatively uncontaminated, based on available data, will be purged and sampled first, whenever feasible. This practice is intended to minimize the potential for cross-contamination from more contaminated wells.

Groundwater samples will be collected following the USEPA's low-flow sampling protocol for purging and sampling (EPA/540/S-95/504). Wells will be purged using a peristaltic pump with new or dedicated polyethylene tubing with a stainless steel foot valve. During purging, URS will monitor temperature, pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity using a multi-parameter meter connected to an in-line flow-though cell. Purging will be maintained a pumping rate that minimizes drawdown to less than 0.3 feet (typically 0.1 liters per minute [L/min] to 0.5 L/min). In all cases, the purge rate will not exceed one L/min. If drawdown cannot be maintained at less than 0.3 feet, then the condition will be noted. Samples will be collected following a minimum of 30 minutes of purging and once parameters have stabilized (within 10 percent for temperature, specific conductivity, DO and turbidity, within 0.1 pH units, within 10 mV for ORP over three consecutive readings collected at three- to five-minute intervals). The flow-through cell equipment will be calibrated daily in accordance with the manufacturer's instructions.

A maximum of five wetted screen volumes will be purged from those wells that are not purged dry. A wetted screen volume is defined as the volume of water within the screen. The volume wetted screen can be calculated using the following equation:

$$V \text{ (in cubic feet)} = \pi r^2 h$$

where:

V = volume of water in well;
$\pi = 3.14$;
h = length of screen below the water table in feet; and
r = well radius in feet.

This equation simplifies the following equation, which uses the diameter of the well in inches and a constant to convert the volume to gallons.

$$V \text{ (in gallons)} = h \times d^2 \times 0.0408$$

where d is the well diameter in inches.

The depth to water will be measured to the nearest 0.01 foot. The total depth of the well will be determined from well installation logs or by sounding the depth of the well by lowering the water level indicator to the bottom of the well.

2.4.2 Groundwater Sampling Procedures

This procedure describes steps involved in collecting groundwater samples after the well has been purged according to the methods in Section 2.4.1. The objectives of the activities covered by this procedure are to:

- Obtain groundwater samples for laboratory and field analysis;
- Ensure that the groundwater samples will be representative of actual groundwater quality;
- Ensure quality control and consistency during sampling; and
- Serve as a means to allow traceability of error(s) in sampling and data recording.

At wells that are not purged dry, groundwater sampling will commence immediately after purging without turning the pump off. The discharge hose will be disconnected or cut off from the flow-through cell prior to sampling to minimize cross-contamination. The groundwater samples will be collected using VOC sampling kits compatible with the Waterra Hydrolift II pump, if used.

Containers used for VOC analysis will be filled first using bottom-filling, small diameter tubing designed for VOC sampling with the pump, which reduces air bubbles and minimizes agitation so as to prevent aeration. The pumping rate will be lowered while VOC vials are being filled. After the VOC vials are filled, then the remaining sampling containers will be filled. At well locations where turbidity is greater than 50 NTUs then the groundwater samples for metals analysis, if required, will be field-filtered using a 0.45 micron (μm) in-line disposable filter. The aliquot for metals analysis will be preserved by adding a sufficient amount of concentrated nitric acid to maintain the sample at a pH of less than 2 standard units (SU).

If a peristaltic pump is used, a foot-valve will be placed on the bottom of the tubing prior to purging. When purging is complete, sampling containers (except VOCs) will be filled directly from the pump discharge line. At well locations where turbidity is greater than 50 NTUs then the groundwater samples for metals analysis will be field-filtered using a 0.45 μm in-line disposable filter. The aliquot for metals analysis will be preserved by adding a sufficient amount of concentrated nitric acid to maintain the sample at a pH of less than 2. The pump will then be turned off and the HDPE tubing will be disconnected from the pump. The VOC sampling vial will be filled by raising the tubing (with a foot-valve) from the well head and allowing the water to gently flow into the vial. The vial will be immediately capped such that no headspace or bubbles are present in the vial. This procedure ensures that the sample is representative of the purged interval and minimizes the potential for volatilization of VOCs, which may occur as a result of the pumping mechanism in the peristaltic pump.

The sample containers will be wiped dry and each sample container will be labeled. The sample number, date, time, location, depth, type of analysis, preservative, and sample collector's name will be recorded on the sample label. This information will also be recorded on the groundwater

sampling data sheet along with a description of the physical appearance of the sample including color, clarity, suspended solids, and odor.

The samples will be placed in coolers with sufficient bagged ice or ice packs to maintain a temperature of 4EC during shipment. Sample vials for VOC analyses will be placed in resealable plastic bags prior to placement in the coolers. Quality assurance samples, including duplicates, equipment rinseate blanks, and trip blanks will be collected as necessary in accordance with the procedures described in Section 3.1 and the *QAPP*. The sample custody procedures for the groundwater samples are described in Section 4.0.

All data relating to weather conditions, time of collection, sampling method, field observation, sample location, and analysis will be recorded on a field sampling record or field notebook. A copy of a field sampling record is provided in Appendix A.

2.5 STAFF GAUGE MEASUREMENTS

In addition to groundwater elevation measurements, staff gauge measurements will be collected at the three staff gauging stations (Gauging Stations 1 through 3) in the canal spillway to help further evaluate the groundwater and surface water relationship. Some or all of the following equipment will be used to collect water level measurements.

- Electronic water level indicator with 0.01 feet graduations;
- Personal protective equipment (PPE);
- Disposable gloves;
- Distilled/deionized water; and
- Cleaning detergents and decontamination chemicals.

The staff gauge measurements will be measured from the marked surveyed elevation point and recorded to 0.01 foot in the field notebook or gauging form. Remark the surveyed elevation point as necessary with spray paint. The water level indicator will be decontaminated after each use with an Alconox/distilled water wash followed by a distilled water rinse. The gauging data will be recorded on a gauging form. A copy of a gauging form is provided in Appendix A.

2.6 INDOOR AIR INVESTIGATION

Indoor air samples may be collected within the building. Prior to sampling, the New York State Department of Health Indoor Air Quality Questionnaire and Building Inventory Form will be completed for each area to be sampled. A copy of the Indoor Air Quality and Questionnaire and Building Inventory Form is provided in Appendix A.

Indoor and ambient air samples will be collected using a summa canister that is calibrated with a fixed-flow rate controller set by the laboratory, set to take in four to five liters of air over a designated period (e.g., 24 hours). Ambient blanks will be collected outside and upwind from the indoor air sampling locations. For indoor and ambient air samples, the summa canister will be placed at the breathing height and collected using the following procedures.

- Assign sample identification on the canister tag and record on the COC and summa canister sampling sheet.
- Remove the brass plug from the canister fitting and attach the precalibrated flow controller.
- Record canister serial number, sample identification, purge time, flow rate, PID readings, canister pressure, and sample start time on summa canister sampling sheet. If canister does not show a vacuum do not use.
- Assign sample identification on canister identification tag and record on COC.
- Take a digital photograph of canister set up and surrounding area.

At the end of the collection period, record gauge pressure and record end time on COC and close valve. A slight vacuum should remain in the canister, if the canister returns to ambient pressure the sample shouldn't be collected and the project manager will be contacted to discuss further action.

Quality assurance samples, including duplicates and ambient blanks will be collected as necessary in accordance with the procedures described in Section 3.1 and the *QAPP*.

3.0 QUALITY ASSURANCE FIELD PROCEDURES

This section describes the quality assurance procedures that will be followed while conducting the field investigation.

3.1 QUALITY ASSURANCE SAMPLES

As part of the quality assurance (QA) program, QA samples will be prepared and collected to provide control over the collection of environmental measurements and interpretation of the analytical data. Four types of QA samples will be prepared or collected: 1) field duplicate samples; 2) field (equipment rinseate) blanks; 3) ambient air blanks; and 4) trip blanks. Duplicate samples and field blanks will be prepared for all sampling parameters. Trip blanks will only be analyzed for VOCs when aqueous sampling for VOCs is conducted. The three types of QA samples are discussed in the following sections. In addition, matrix spike/matrix duplicates (MS/MSD) (organic analyses) or matrix spike/matrix duplicate (MS/MD) (inorganic analyses) samples will be collected in accordance with the *QAPP*.

3.1.1 Field Duplicate Samples

The analysis of blind duplicate samples provides a means of evaluating the relative precision of the sample collection and analytical procedures. An important factor in evaluating the analytical data from sample pairs is the homogeneity of the analyte within the sample matrix. Therefore, whenever possible, the field personnel will homogenize an aliquot from a discrete location or interval before the sample and duplicate are collected. However, in order to prevent the loss of VOCs, VOC samples must never be homogenized. In general, the handling of VOC samples will be minimized to preserve the physical integrity of the VOC fraction. Duplicate samples will be prepared for each sample matrix at a rate of one duplicate per twenty samples. Duplicates will be designated with fictitious sample identification following the format for field samples.

Duplicates of solid samples for VOC analysis will be obtained by alternately filling the sample containers for the sample and duplicate for VOC analysis with aliquots collected from the same discrete location or interval. Once samples for VOC analysis have been collected, the sample will be thoroughly homogenized. Following homogenization, the sample containers for the remaining parameters will be filled.

Duplicates of liquid samples will be obtained by alternately filling the sample and duplicate containers with aliquots of liquid collected with the same sampling device. VOC samples and duplicates will be collected first in order to minimize the potential for loss of VOCs. After the VOC samples are collected, any liquid remaining in the sampling device will be equally apportioned among all the sample containers. Upon retrieval of the next aliquot of liquid, the order in which the sample bottles are filled will change by one increment.

Duplicates of indoor air samples two summa canisters will be placed side by side and both summa canisters are to be opened and closed simultaneously.

3.1.2 Field and Equipment Rinseate Blanks

A field blank is used to test for potential contamination from ambient air. An equipment rinseate blank is used to test for potential contamination from sampling instruments used to collect and transfer samples from point of collection into sample containers. Field blanks will be collected at the discretion of the project manager. If re-usable equipment is used, equipment rinseate blanks will be collected at a rate of one per 20 samples per matrix.

A field blank is prepared by filling a sample container with analyte-free water from the laboratory. This container is then opened and exposed to the ambient atmosphere in the most contaminated area of the site. After this exposure, the field blank container is sealed and the field blank is then handled, transported, and analyzed in the same manner as the other analytical samples. Field blanks will be denoted as "FB" followed by the six digit date (i.e., FBYYYYMMDD).

Equipment rinseate blanks are prepared by passing laboratory-supplied analyte-free water (or the distilled/deionized water that is used for decontamination) through decontaminated sampling equipment and collecting it in an empty sample container for analysis. Note that it may be necessary for the lab to provide extra, full VOC vials to ensure sufficient volume of blank water to eliminate headspace. Rinseate blanks will be denoted with a "RB" followed by the six digit date (i.e.,: RBYYYYMMDD).

3.1.3 Trip Blanks

The primary purpose of a trip blank is to detect sources of VOC cross-contamination during shipment that might potentially influence VOC concentration values reported in actual samples. Thus, trip blanks serve as a mechanism of control on sample bottle preparation and blank water quality, as well as, sample handling. The trip blank is prepared by the laboratory and travels to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions.

Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. The following have been identified as potential sources of contamination:

- Laboratory reagent water;
- Sample containers;
- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank consists of a set of sample bottles filled at the laboratory with analyte-free water. The trip blank and laboratory method blank water must originate from one common source and physical location within the laboratory. Trip blanks will be handled, transported, and analyzed in the same manner as the other analytical samples, except that the sample containers for the trip blanks will not be opened in the field. Trip blanks must return to the lab with the same set of bottles they accompanied to the field.

The trip blanks will be shipped and analyzed at a frequency of one trip blank per cooler per shipment of aqueous samples for VOC analysis. Trip blank sample identification consists of a "TB" followed by the six digit date (i.e.,: TBYYYYMMDD).

3.1.4 Ambient Air Blanks

Ambient air blanks can be collected by simply opening the summa canister valve for the designated 24 hour time frame upwind from the sampling locations.

3.2 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

Field equipment used during the investigation will be maintained and calibrated in accordance with the manufacturer's supplied equipment operation manuals. Equipment requiring calibration will be calibrated on a daily basis or according to the manufacturer's recommendations, whichever is more frequent.

Equipment that report erratic readings during use will be recalibrated. If erratic readings persist after recalibration, the equipment will be replaced with an equivalent model.

3.3 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Sampling equipment will be decontaminated in the laboratory or the field prior to site use and between sampling locations. The sampling device and equipment decontamination method will involve a non-phosphate detergent wash, tap water rinse, distilled/deionized water rinse, air drying, and a second distilled/deionized water rinse.

Drilling tools will be steam cleaned between each drilling location to prevent cross-contamination. A tap water rinse will be followed by another round of steam-cleaning. Decontamination will be conducted on the temporary decontamination pad constructed at the rear of the manufacturing buildings. The decontamination fluids will be containerized for proper off-site disposal by Pactiv.

Following well development and prior to sampling, the depth to groundwater in the new and existing wells will be measured using an electronic water level meter or interface probe. To avoid cross-contamination between wells, the water level meter or interface probe will be decontaminated after each use with an Alconox/distilled water wash followed by a distilled water rinse.

3.4 PROJECT FILES

Throughout the field investigation, URS field personnel will maintain field notebooks to document project activities. Each individual making an entry into a field notebook will date and sign their entry. The field notebook entries will contain accurate and inclusive information of the project activities. Only facts and observations will be written in the field notebooks.

In addition, URS field personnel will note all measurements, calculations, and data relating to location, date, time, weather conditions, and sample types directly on the appropriate field records.

Copies of field records, which include a soil boring log, a well development record, and a groundwater sampling data sheet, that will be completed in the field are provided in Appendix A.

Photographs may be taken during the field investigative activities. Each photograph will include a scale to show dimensions. All photographs will be labeled to include a description of the feature photographed, the location and depth (if applicable), and date the photograph was taken.

The field notebooks, field records, and photos will be maintained in the project files. The original (final) copies of the field sheets will be maintained by the field personnel and project manager in URS' office in Clifton Park, New York. The project manager will keep copies of all files while the project is active.

Other data files that will be maintained in the project files will include equipment calibration sheets, air monitoring records, analytical requests to subcontract laboratories, survey data, and chains of custody documentation.

Originals of the contract laboratory reports will be stored in the project files and maintained at the contracted laboratory. The laboratory analytical data will be entered into the laboratory's computer database. The data will be manipulated in order to achieve the quality assurance/quality control (QA/QC) and reporting requirements described in the *Quality Assurance Project Plan*. The laboratory will provide URS with a hard copy and electronic copy of the analytical data.

4.0 SAMPLE HANDLING AND CUSTODY

All samples will be collected and handled in a manner such that sample agitation, cross-contamination, and contact with the atmosphere is reduced or kept to minimum. Field personnel will wear new disposable gloves when collecting and handling samples, and will change gloves between sampling locations.

Sample chain of custody will be initiated by the laboratory with the selection and preparation of the sample containers. To reduce the chance for error, the number of personnel assuming custody of the sample and sample containers will be held to a minimum. Personnel involved in the chain of custody and transfer of samples will be briefed on the procedures and their purposes prior to the initiation of sampling.

4.1 FIELD SAMPLE CUSTODY

A Chain of Custody (COC) form will accompany the sample from initial sample container selection and preparation commencing at the laboratory, to the field for sample containment and preservation, through its return to the laboratory.

The Project Manager will notify the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival. Sample shipping containers (coolers or "shuttles") will be provided by the laboratory. The shipping containers will be insulated. All sample bottles within each shipping container will be individually labeled for identification.

The labels will include the following information:

- Site name;
- Sample number;
- Name of collector;
- Date and time of collection;
- Place of collection;
- Type of sample;
- Sample volume;
- Analyses required; and
- Preservative (if used).

If a sample shipping container has been assigned a unique identification number by the laboratory, then this number will be recorded on the COC.

Personnel receiving the sample containers will check each cooler for the integrity of the seals. Coolers or shuttles with broken seals will be returned to the laboratory, and the sample containers will not be used. The receiving personnel will break the seal, inspect the contents for breakage, and record and sign on the COC form that the sample containers have been received. A temporary seal will be affixed to each cooler until the sample containers are filled.

Sample Location Designation

This section describes the procedure for identifying each soil boring location, monitoring well location, sediment sampling location, and indoor air sampling location.

Each soil boring advanced using a conventional drill rig will be designated by a "MSB." Each soil boring advanced using a Geoprobe will be designated by a "MGP." The two digit year and number will follow the "MSB" or "MGP" name to associate the boring with a specific location. For example, soil boring number 3 advanced in 2004 will be identified as MSB-04-03.

The proposed well names for the overburden monitoring wells have been designated by a "MMW" followed by a number.

Indoor air sample locations will be denoted with a "MIA," followed by a number. The ambient air sample location will be denoted with "MAA" followed by a number.

Sample Designation

Each subsurface soil sample collected from a soil boring location will be identified using the following code: MSB-YY-ZZ (TT-BB) where:

MSB = soil boring;
TT= the starting depth (feet) of the interval from which the sample was collected;
BB = the end depth (feet) of the interval from which the sample was collected;
YY = the two digit year; and
ZZ = the boring location number.

For example, a subsurface soil sample collected from 8-10 feet from soil boring MSB-04-24 would be coded MSB-04-24 (08-10).

Groundwater samples will be identified by using the following code: MMW-ZZ (MM/DD/YYYY) where,

MMW-ZZ = location number.
MM/DD/YYYY = sample date.

For example, a groundwater sample to be collected from the well MMW-03 on January 1, 2004 will be coded MMW-03 (01/01/2004).

Each indoor air sample will be identified using the following code: MIA-YY-ZZ (MM/DD/YYYY) where:

MIA = indoor air sample;
MM/DD/YYYY = date sample collected; and
ZZ = the sample location number.

For example, an indoor air sample collected from surface water sampling location MIA-04-01 on January 1, 2004 would be coded MIA-04-01 (01/01/2004).

Ambient air samples will be identified using the following code: MAA-YY-ZZ (MM/DD/YYYY) where:

MAA = ambient air sample;
MM/DD/YYYY = date sample collected; and
ZZ = the sample location number.

For example, an indoor air sample collected from sampling location MAA-04-01 on January 1, 2004 would be coded MAA-04-01 (01/01/2004).

QC samples can be coded using this same system and simply adding a MS, MSD, or MD (for matrix spike, matrix spike duplicate, or matrix duplicate) to the end of the code. Blind duplicates can be coded using this system with a fictitious location number. The locations of each blind duplicate will be recorded in its respective the field sampling sheet.

Once the sample containers are filled, the samples will be immediately preserved, as required and stored at 4°C until delivered to the laboratory. Preservation requirements are provided in Table 1. The samples will be kept cool at 4°C using insulated containers containing sufficient ice or ice packs. If ice is used, the ice will be double-bagged at a minimum. VOC sample jars will be placed in resealable plastic bags prior to placement in coolers. The field sampler will indicate sample designation/location number in the spaces provided on the appropriate COC for each sample of water or soil. The COC will be signed and placed in the cooler. The cooler will be sealed. The samples will be delivered to the laboratory no later than 24 hours after sample collection.

If samples are split and sent to different laboratories, a copy of the COC will accompany the replicate sample. The original COC will accompany the sample for the primary laboratory. The "remarks" column of the COC will be used to record specific considerations associated with sample acquisition such as: sample type, container type, sample preservation methods, and analyses to be performed. The laboratory will maintain on file the completed original forms. Copies will be submitted as a part of the final analytical report.

The specific analyses for each sample are outlined in the workplan. Samples will be collected according to the procedures in this *FSP*. Samples will be hand-delivered or shipped in coolers with sufficient packing material and ice to insure that samples arrive at the laboratory intact, below 4EC, and within 18 hours of shipping.

4.2 LABORATORY SAMPLE CUSTODY

Receipt, storage, and tracking of samples submitted to the laboratory must be conducted according to NYSDEC ASP protocol to prevent sample contamination or loss, as well as, the production of invalid laboratory data as a result of sample deterioration or tampering.

5.0 REFERENCES

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TABLES

TABLE 1
ANALYTICAL METHODS, SAMPLE CONTAINERS AND PERSERVATION REQUIREMENTS, AND ANALYTICAL HOLDING TIMES

PACTIV CORPORATION
MACEDON FILMS SITE
MACEDON, NEW YORK

Analysis	Container	Preservation	Holding time
FIELD MEASUREMENTS			
Field pH	Flow-cell	N/A	Immediate
Dissolved Oxygen	Flow-cell	N/A	Immediate
Oxidation-reduction potential	Flow-cell	N/A	Immediate
Temperature	Flow-cell	N/A	Immediate
Specific conductivity	Flow-cell	N/A	Immediate
Turbidity	Flow-cell	N/A	Immediate
LAB MEASUREMENTS			
Aqueous Samples			
VOCs (EPA Method 8260B)	Three 40 ml septa vials, Glass	HCl to pH < 2, Cool 4 °C	Analyze within 10 days (7 days if not preserved with HCl)
SVOCs (EPA Method 8270C)	Two 1-Liter Glass	Cool 4 °C	Extract within five days; analyze within 40 days
Metals (EPA Method 6010B/7470A)	32 oz., Plastic	HNO_3 to pH < 2, Cool 4 °C	Analyze within 6 months (Mercury - 26 days)
Solid Samples			
VOCs (EPA Method 8260B)	4 oz. Glass jar, Teflon cap	Cool 4 °C	Analyze within 10 days.
SVOCs (EPA Method 8270C)	1-6oz. Glass jar, Teflon cap	Cool 4 °C	Extract within 5 days; analyze within 40 days.
Metals (EPA Method 6010B/7471A)	1-6oz. Glass jar, Teflon cap	Cool 4 °C	Analyze within 6 months (Mercury - 26 days)
Air Samples			
VOCs (EPA Method TO-14A)	6 Liter Summa Canister	--	Analyze within 30 days.

Notes:

VOCs indicates Volatile Organic Compounds

SVOCs indicates Semivolatile organic compounds

Holding times from validated time of sample receipt (VTSR) at the laboratory, except for method TO-14A, which is from time of sample collection.

APPENDIX A

FIELD FORMS

Well Development Record

URS

Project:_____
Contractor:_____
Field Personnel:_____
Project No._____
Method of Development:_____

Site Location:_____
Well No._____

Date	Weather / Temp.	Time	Static Water Level	pH (units)	Temp (°C)	Conductivity (umhos)	NTU	Appearance / Odor, etc.	Notes: Gallons removed, etc.

WATER LEVEL FIELD DATA SHEET

Project: _____ Field Personnel

Date: _____ _____

WELL #	TIME	DEPTH TO WATER	INSTRUMENT	NOTES

URS Corporation - New York
28 Corporate Drive, Suite 200
Clifton Park, New York 12065
Tel. 518.688.0015
Fax 518.688.0022

DAILY FIELD RECORD

Project:_____ Date:_____
Client:_____ Contractor:_____

From	To	Productive Hours	Activity/Comments
Total Productive Hours			LEVEL B / LEVEL C / LEVEL D (circle selection)

LABOR		MATERIALS/SUPPLIES	
UNITS	ACTIVITY	UNITS	ITEM

WEATHER:

_____ URS ON-SITE COORDINATOR

_____ CONTRACTOR REPRESENTATIVE

FIELD PARAMETER METER CALIBRATION SHEET

strument Model________________ Equipment #________________

Project#________________ Project Name____________________

Date	Initials	Battery	pH	Conductivity	Dissolved Oxygen	ORP	Turbidity	Comments
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	
			1 2 3 Point List Standards	1 2 3 Point List Standards	Barometer Zero Check (Y/N)	Checked (Y/N) Reading______ Calibrated (Y/N)	Standard Used:	

FIELD PARAMETER METER CALIBRATION SHEET

Project#__________________ Project Name________________________

Meter 1: ________________ Equipment #_________________
Meter 2: ________________ Equipment #_________________
Meter 3: ________________ Equipment #_________________
Meter 4:________________ Equipment #_________________

Date	Initials	Meter 1	Meter 2	Meter 3	Meter 4	Comments
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	
		pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	pH SC Temp DO ORP Turb Other	

DISSOLVED OXYGEN SATURATION LIMIT VERSUS TEMPERATURE

T (°F)	T(°C)	O_2 Solubility (mg/L)
32	0	14.6
41	5	12.8
50	10	11.3
59	15	10.1
68	20	9.1
77	25	8.3
86	30	7.6
95	35	6.9
104	40	6.4

Dissolved oxygen saturation limit represents the maximum concentration expected (100% saturation). Only under extremely rare field conditions can DO be greater than the solubility.

LOW-FLOW GROUNDWATER SAMPLING DATA SHEET

WELL NO: _____

Field Personnel:

_____

_____

Date: _____

Job No.: _____

Location: _____

Total Well Depth (from top of casing): _____ feet

Depth to Water Surface Before Purging (from top of casing): - _____ feet

Height of Water Column: a = _____ feet

Screen Length b _____ feet

Lesser of a and b _____

Well Diameter (d): _____ inches Gals per ft: $(d^2 \times 0.0408) =$ x _____

One Wetted Screen Volume of Water Before Purging: = _____ gallons or _____ liters

Volume of Water Equal to three wetted screen volumes volumes: _____ gallons or _____ liters
(Wetted Screen Volume multiplied by 5.0) (1 gallon = 3.785 liters)

Purging Method: Bladder Pump/Waterra Pump/Peristaltic Pump Meter #_____

Time	Volume Purged (Gallons / Liters)	Depth to Water (feet)	SC (mmhos/cm or µmhos)	Temp. (°F or °C)	pH (SU)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Turbidity (NTU)
Stabilization Criteria*		Drawdown < 0.3 feet	+/- 10%	+/-0.1 °C	+/- 0.1 SU	+/- 10%	+/- 10 mV	+/- 10%

Total Volume of Water Purged: _____ gallons/liters

Sampling Data:

- Sampling Method: Bailer or Pump
- Depth of Pump intake or bailer: _____ feet
- Color: Odor: Sheen/Appearance:

Notes:

_____

_____

_____

_____

_____

_____

_____

* - Based on three consecutive readings collected at five minute intervals. Minimum of 30 minutes of purging, maximum of five wetted screen volumes.

LOW FLOW GROUNDWATER SAMPLING DATA SHEET

WELL NO: __________

Page ____ of _____

Field Personnel: ____________________

Date: ____________________

Time	Well Volumes (Gallons / Liters)	Depth to Water (feet)	SC (mmhos/cm or µmhos)	Temp. (°F or °C)	pH (SU)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Turbidity (NTU)

Total Volume of Water Purged: ______________ gallons/liters

Notes:

URS

SURFACE WATER/SEDIMENT
SAMPLE RECORD

JOB No.: _____ Job Name: _____ Date: _____

Location: _____ Samplers _____ Time: _____

SAMPLE LOCATION: _____ _____

SAMPLE ID: _____ _____

SAMPLE MATRIX (Circle One): Sediment / Surface Water

SAMPLE METHOD (Circle One): SW - Direct Fill / Dipper / Other _____
Sediment – Core / Dredge / Other _____

SAMPLE TYPE (Circle One): Point / Grab / Composite

SAMPLE DESCRIPTION:

FIELD TEST:	VALUE:
Temperature (°C/°F)	_____
PH	_____
Conductivity (umhos/cm)	_____
Turbidity (NTU)	_____
Dissolved Oxygen (mg/L)	_____
ORP (mV)	_____
Other	_____

WEATHER: _____

COMMENTS _____

URS

Client_____
Site_____
Project_____
Job Number_____

SLUG TEST FIELD DATA

Test Number _____ Well Number _____

Field Crew _____ Date _____

_____

Weather _____

Type of Slug _____ Volume _____

Water Level Monitoring Transducer / Solinst (circle one) Instrument #_____

Time started _____ Initial Displacement _____

Static Depth to Water _____

Data File Name _____

Method of Transfer to Office _____ Date of Transfer to Office _____

TIME	STATIC	FALLING	RISING	COMMENTS

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO.

SHEET

SAMPLING METHOD:

OF

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH						

DATUM

ELEVATION

DRILLING CONTR.

DATE

CHK'D BY

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						10	
						11	
						12	
						13	
						14	
						15	
						16	
						17	
						18	
						19	
						20	

SURFACE CONDITIONS:

REV. 11-89

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH ASSESSMENT
BUREAU OF TOXIC SUBSTANCE ASSESSMENT

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY

This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____ Date Prepared _____

Preparer's Affiliation _____ Phone No._____

1. **OCCUPANT**

Name: _____

Address: _____

_____

County: _____

Home Phone No. _____Office Phone No _____

2. **OWNER OR LANDLORD:**
(If different than occupant)

Name: _____

Address: _____

_____

Phone No. _____

A. Building Construction Characteristics

Type (circle appropriate responses): Single Family Multiple Dwelling Commercial

Ranch	2-Family
Raised Ranch	Duplex
Split Level	Apartment House _____ Units
Colonial	Number of floors _____
Mobile Home	Other specify _____

Residence Age _____ General Description of Building Construction Materials _____

_____

Is the building insulated? Yes / No How air tight is the building _____

OSR-3 (continued)

B. <u>Basement construction characteristics (circle all that apply)</u>:

1. Full basement, crawlspace, slab on grade, other _____
2. Basement floor: concrete, dirt, other _____
3. Concrete floor: unsealed, painted, covered; with _____
4. Foundation walls: poured concrete, block, laid up stone, other _____
5. The basement is: wet, damp, dry _____Sump present? y / n _____Water in sump? y / n ____
6. The basement is: finished, unfinished _____
7. Identify potential soil vapor entry points (e.g., cracks, utility ports etc.)

   _____

8. Describe how air tight the basement is _____

   _____

C. <u>HVAC (circle all that apply)</u>:

1. The type of heating system(s) used in this residence is/are:

Hot Air Circulation	Heat Pump
Hot Water Radiation	Unvented Kerosene Heater
Steam Radiation	Wood stove
Electric Baseboard	Other (specify) _____

2. The type(s) of fuel(s) used is/are: Natural Gas, Fuel Oil, Electric, Wood Coal Solar

   Other (specify) _____.

3. Is the heating system's power plant located in the basement or another area: _____.
4. Is there air-conditioning? Yes / No Central Air or Window Units?

   Specify the location _____

5. Are there air distribution ducts present? Yes / No
6. Describe the supply and cold air return duct work in the basement including whether there is a cold air return, the tightness of duct joints

   _____

   _____

OSR-3 (continued)

D. Potential Indoor Sources of Pollution

1. Has the house ever had a fire? Yes / No
2. Is there an attached garage? Yes / No
3. Is a vehicle normally parked in the garage? Yes / No
4. Is there a kerosene heater present? Yes / No
5. Is there a workshop, hobby or craft area in the residence? Yes / No
6. An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.
7. Is there a kitchen exhaust fan? Yes / No Where is it vented? _____
8. Has the house ever been fumigated? If yes describe date, type and location of treatment. _____

E. Water and Sewage (Circle the appropriate response)

Source of Water

Public Water Drilled Well Driven Well Dug Well Other (Specify) _____

Water Well Specifications:

Well Diameter _____ Grouted or Ungrouted _____

Well Depth _____ Type of Storage Tank _____

Depth to Bedrock _____ Size of Storage Tank _____

Feet of Casing _____ Describe type(s) of Treatment _____

_____

Water Quality:

Taste and/or odor problems? y / n If so, describe _____

How long has the taste and/or odor been present? _____

Sewage Disposal: Public Sewer Septic Tank Leach Field Other (Specify) _____

Distance from well to septic system _____ Type of septic tank additive _____

OSR-3 (continued)

F. Plan View

Draw a plan view sketch for each floor of the residence and if applicable, indicate air sampling locations, possible indoor air pollution sources and PID meter readings.

OSR-3 (continued)

G. Potential Outdoor Sources of Pollution

Draw a sketch of the area surrounding the residence being sampled. If applicable, provide information on the spill location (if known), potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system if applicable, and a qualifying statement to help locate the site on a topographical map.

Household Products Inventory

Occupant / residence _____

Investigator: _____ Date: _____

Product description (dispenser, size, manufacturer …)	VOC Ingredients	PID Reading

Household Products Inventory

Occupant / residence _____

Investigator: _____ Date: _____

Product description (dispenser, size, manufacturer …)	VOC Ingredients	PID Reading

PACTIV
Advanced Packaging Solutions

PACTIV CORPORATION

MACEDON FILMS SITE
MACEDON, NEW YORK

QUALITY ASSURANCE PROJECT PLAN
MACEDON FILMS SITE
MACEDON, NEW YORK

Site # C859025
Index # B8-0669-04-06

SEPTEMBER 2004

Prepared For:
Pactiv Corporation
Canandaigua, New York

URS
URS Corporation - New York
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

QUALITY ASSURANCE PROJECT PLAN
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1.0 INTRODUCTION

This *Quality Assurance Project Plan* (*QAPP*) is designed to provide an overview of quality assurance/quality control (QA/QC) procedures and programs which will be adhered to during the investigation and remedial program as described in the Brownfield Cleanup Agreement Number B8-0669-04-06 (BCA) between Pactiv Corporation (Pactiv) and the New York State Department of Environmental Conservation (NYSDEC). The *QAPP* will identify specific methods and QA/QC procedures for chemically testing environmental samples collected from the Macedon Films Site in Macedon, Wayne County, New York (the site). The NYSDEC number for the site is C859025.

2.0 PROJECT/SITE DESCRIPTION

A complete project description of the Macedon Films Site is provided in the *Remedial Investigation Work Plan*, dated September 2, 2004.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization chart is shown on Figure 1. The URS Project Manager will be responsible for overseeing both the analytical and field QA/QC activities, coordinating the overall project, and maintaining quality throughout the project.

The URS Field Manager is responsible for verifying that QA procedures are followed in the field so that valid, representative samples are collected. This person also will be responsible for coordinating the activities of the URS Field Team, and will be in daily communication with the Project Manager. The Field Manager will verify that all field work is carried out in accordance with the approved project plans.

The URS QA Officer is responsible for verifying that corporate QA procedures are followed. The URS QA Officer (or designee) will be in direct contact with the analytical laboratory to monitor laboratory activities so that holding times and other QA/QC requirements will be met. The analytical laboratory to be used for the analysis of air, soil, and water samples will be certified by the New York certified by State Department of Health Environmental Laboratory Approval Program (ELAP) for the specified analyses. The QA Manager of the laboratory will be responsible for performing project-specific audits and for overseeing the quality control data generated. Also, the Laboratory Project Manager will be in daily communication with the URS QA Officer (or designee).

4.0 DATA QUALITY OBJECTIVES

4.1 BACKGROUND

Data quality objectives (DQOs) are qualitative and quantitative statements, which specify the quality of data required to support the investigation of the site. The project DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved using screening and definitive data categories, as outlined in *Data Quality Objectives Process* for Superfund, Interim Final Guidance, QA/G-4, United States Environmental Protection Agency (USEPA, September 1993). The definitive data are generated using rigorous analytical methods, such as approved USEPA reference methods. The laboratory analytical methods to be used are presented in Table 1.

The project DQOs for data collected during this ongoing investigation are to:

- Evaluate the lateral extent of contamination of volatile organic compounds, semivolatile organic compounds, and metals through the analysis of soil and groundwater samples in the areas surrounding the site.
- Evaluate whether indoor air at the site is impacted by volatile organic compounds.
- Obtain data of sufficient quality and quantity to perform a Feasibility Study to evaluate remedial options for the site.

4.2 QA OBJECTIVES FOR CHEMICAL DATA MEASUREMENT

For the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, and completeness will be measured during offsite chemical analysis. Samples shipped offsite will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory.

4.2.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in the field and/or laboratory handling procedures. Precision is evaluated using analyses of field duplicates as well as laboratory matrix spike/matrix spike duplicates (MS/MSD) and matrix duplicates (MD), which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision. RPD criteria are specified in the methods identified in Table 1.

4.2.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Sources of error are the sampling

process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. Sampling accuracy may be assessed by evaluating the results of rinse and trip blanks. These data help to assess the potential contamination contribution from various outside sources. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery (%R) criterion is used to estimate accuracy based on recovery in the MS/MSD, laboratory control sample (LCS), and matrix spike blank (MSB) samples. The MS/MSD, which will give an indication of matrix effects that may be affecting target compounds, are also a good gauge of method efficiency. Recovery criteria are specified in the methods identified in Table 1.

4.2.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter, which is most concerned with the proper design of the sampling program or subsampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives. The sampling procedures, as described in Section 2.0 of the *Field Sampling Plan* (*FSP*) have been selected with the goal of obtaining representative samples for the media of concern.

4.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. An objective for this program is to produce data with the greatest possible degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples, and reporting analytical results in appropriate units.

Complete field documentation using standardized data collection forms will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, completeness) because only when precision and accuracy are known can data sets be compared with confidence. For data sets to be comparable, it is imperative that the analytical methods and procedures be explicitly followed.

4.2.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. To meet project needs, it is important that appropriate QC procedures be maintained to verify that valid data are obtained. For the data generated, a goal of 90% is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC, Pactiv, and URS project personnel will determine whether the deviations may cause the data to be rejected and what, if any, further actions need to be taken.

5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Section 4.0 of the *Remedial Investigation Work Plan* and in the *FSP* and subsequent work plans submitted and approved by the NYSDEC in accordance with the BCA.

6.0 SAMPLE CUSTODY AND HOLDING TIMES

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presenting sample analytical results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in these investigations will follow the chain-of-custody guidelines of National Enforcement Investigations Center (NEIC) *Policies and Procedures*, prepared by the NEIC of the USEPA Office of Enforcement.

6.1 CUSTODY DEFINITIONS

- Chain-of-Custody Officer - The employee responsible for oversight of all chain-of-custody activities is the Field Manager (or his/her designee).

- Under Custody - A sample is "Under Custody" if:

  - It is in one's possession, or
  - It is in one's view, after being in one's possession, or
  - It was in one's possession and one locked it up, or
  - It is in a designated secure area.

6.2 RESPONSIBILITIES

The Field Manager will be responsible for monitoring all chain-of-custody activities and for collecting legally admissible chain-of-custody documentation for the permanent project file. An example chain-of-custody form is included in Appendix A. The URS Field Manager will be responsible for:

- Initially reviewing sample labels or tags, closure tapes, and chain-of-custody record forms. The Field Manager or his/her designee shall document this review for the project file.
- Training all field sampling personnel in the methodologies for carrying out chain-of-custody and the proper use of all chain-of-custody forms and record documents.
- Monitoring the implementation of chain-of-custody procedures.
- Submitting copies of the completed chain-of-custody forms to the Project Manager on a daily basis.

6.3 CHAIN-OF-CUSTODY

Chain-of-custody is initiated in the laboratory when the sample containers are cleaned, packed, and shipped to the site for use in the field. When the containers are received at the site, they will be checked for any breach of chain-of-custody seals or any evidence of tampering.

6.4 SAMPLE CONTAINERS AND HOLDING TIMES

Table 2 identifies the analytical methods, sample container and preservation requirements, and analytical holding times to be used for the samples collected as part of this investigation.

7.0 ANALYTICAL PROCEDURES

Table 1 identifies the specific methods to be performed on each of the sample matrices. All holding times begin with the validated time of sample receipt (VTSR) at the laboratory (except where noted otherwise on Table 2). All analyses will be performed in accordance with the following documents:

- USEPA Office of Solid Waste *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846 (Final Update III, June 1997).

- New York State Department of Environmental Conservation *Analytical Services Protocol,* June 2000 Edition.

- USEPA *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition, January 1999.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

In order to obtain a high level of precision and accuracy during sample processing and analysis procedures, laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following sections describe the analytical support areas and laboratory instrument calibration procedures.

8.1 ANALYTICAL SUPPORT AREAS

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from sources traceable to National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished per the methods referenced in Table 1. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with manufacture specifications. Calibration is conducted with two ASTM Class 1 weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and properly document results in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (4°C ± 2°C for refrigerators) shall be clearly posted on each unit in service.

Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses and ion-exchange treatment is recommended for inorganic tests. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

8.2 LABORATORY INSTRUMENTS

Calibration of instruments is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet method established quantitation limits. Each instrument for organic analysis shall be calibrated with standards appropriate to the type of instrument and linear range

established within the analytical method(s). Calibration of laboratory instruments will be performed according to methods specified in Table 1.

Calibration of an instrument must be performed prior to the analysis of any samples (initial calibration) and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still properly calibrated. If the contract laboratory cannot meet the method-required calibration requirements, corrective action shall be taken as discussed in Section 11.0. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

9.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as to determine the effect sample matrix may have on data being generated. Two types of internal checks are performed - batch QC and matrix-specific QC procedures. The type and frequency of specific QC samples performed by the laboratory will be determined by the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples are presented within the analytical methods referenced in Table 1.

QC results that vary from acceptable ranges shall result in the implementation of appropriate corrective measures, potential application of qualifiers to the analytical data, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples including any project-specific QC will be analyzed are discussed below.

9.1 BATCH QC

Method Blanks - A method blank is defined as laboratory demonstrated analyte-free water, analyte-free solid or humid zero air that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Laboratory Control Samples/Matrix Spike Blanks – An LCS or MSB is an analyte-free matrix spiked with all or a representative group of the analytes being analyzed for. The LCS/MSB is a measure of precision and accuracy that is used to verify that the analysis being performed in control. An LCS/MSB will be performed for each matrix.

9.2 MATRIX-SPECIFIC QC

Matrix Spike/Matrix Spike Duplicate Samples - An aliquot of a sample is spiked with known concentrations of specific compounds as stipulated by the methodology. The MS and MSD are subjected to the entire analytical procedure in order to assess both accuracy and precision of the method for the matrix by measuring the percent recovery and relative percent difference of the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. For sample batches greater than five, MS/MSDs are analyzed at a frequency of one each per twenty samples per matrix, as listed in Table 1.

Matrix Duplicates - The MD is a second aliquot of a sample, which is prepared and analyzed in a manner identical to that used for the parent sample. Collection of MD samples provides for the evaluation of precision both in the field and at the laboratory by comparing the analytical results of two samples taken from the same location. An MD (for inorganic parameters only) will be performed instead of the MSD. Every effort will be made to obtain replicate samples; however, due to interferences, lack of homogeneity, and the nature of the soil samples, the analytical results are not always reproducible. For sample batches greater than five, MD samples are to be included at a frequency of one per twenty samples per matrix, as listed in Table 1.

Field Duplicates – A field duplicate (FD) sample pair are independent samples, which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling process. Field duplicate samples are to be included at a frequency of one per twenty samples per matrix, as listed in Table 1.

9.3 ADDITIONAL QC

Rinsate (Equipment) Blanks – For soil and groundwater samples, an equipment blank is a sample of laboratory demonstrated analyte-free water passed over and/or through the cleaned sampling equipment. The water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. For air samples, the equipment blank consists of zero humid air drawn through any equipment used for sample collection (e.g., flow controllers, filters, etc.) after it has been cleaned. An equipment blank is used to indicate potential contamination from sample instruments used to collect and transfer samples. The equipment blanks should be collected, transported, and analyzed in the same manner as the samples acquired that day.

Trip Blanks - Trip blanks are not required for non-aqueous matrices. Trip blanks are required for aqueous sampling events. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte-free water. These samples then accompany the bottles that are prepared at the laboratory into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks must return to the laboratory with the same set of bottles they accompanied to the field. Trip blanks will be analyzed for volatile organics only. Trip blanks will be analyzed at the frequency stated in Table 1.

10.0 CALCULATION OF DATA QUALITY INDICATORS

10.1 PRECISION

Precision is evaluated using analyses of a field duplicate and/or a laboratory MS/MSD, which not only exhibit sampling precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision by the following formula:

$$RPD = \left(\frac{|X_1 - X_2|}{(X_1 + X_2)/2} \right) \times 100\%$$

where:

X_1 = *Measured value of sample or matrix spike*
X_2 = *Measured value of matrix duplicate or matrix spike duplicate*

Precision will be determined through the use of MS/MSD/MD analyses. RPD criteria for this project must meet the requirements of the methods referenced in Table 1.

10.2 ACCURACY

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. The closer the numerical value of the measurement comes to the true value or actual concentration, the more accurate the measurement is. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample or laboratory demonstrated analyte free-water/solid matrix at known concentrations before analysis. Analytical accuracy may be assessed through the use of known and unknown QC samples and spiked samples. Accuracy will be determined from MS, MSD, MSB, and LCS analyses as well as from surrogate compounds added to organic fractions (i.e., volatile and semivolatile organics), and is calculated as follows:

$$\%R = \left(\frac{X_s - X_n}{K} \right) \times 100\%$$

where:

X_s - Measured value of the spike sample
X_u - Measured value of the unspiked sample
K - Known amount of spike in the sample

10.3 COMPLETENESS

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\%\,Completeness = \frac{N - X_n}{N} \times 100\%$$

where:

X_n - Number of invalid measurements
N - Number of valid measurements expected to be obtained

11.0 CORRECTIVE ACTIONS

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem shall be filed in the project records, and the information summarized in the case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

11.1 INCOMING SAMPLES

Problems noted during sample receipt shall be documented by the laboratory. The URS Project QA Officer (or designee) shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.2 SAMPLE HOLDING TIMES

If any sample extractions and/or analyses exceed method holding time requirements, the URS QA Officer (or designee) shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.3 INSTRUMENT CALIBRATION

Sample analysis shall not be allowed until all initial calibrations meet the appropriate requirements. All laboratory instrumentation must be calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, recalibration must be performed, and if necessary, all samples affected back to the previous acceptable calibration check must be reanalyzed.

11.4 REPORTING LIMITS

The laboratory must meet all method-required quantitation limits, which are referenced in the methods listed in Table 1. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory must notify the URS QA Officer (or designee) for problem resolution. To achieve those quantitation limits, the laboratory must utilize all appropriate cleanup procedures. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must report all initial and secondary dilution sample results. Dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a dilution with no target analytes detected, the URS QA Officer (or designee) will be immediately notified so that appropriate corrective actions can be initiated.

11.5 METHOD QC

All QC, including blanks, matrix spikes, matrix spike duplicates, matrix duplicates, surrogate recoveries, laboratory control samples, and other method-specified QC samples, shall meet the requirements of the methods referenced in Table 1. Failure of method-required QC will result in the review and possible qualification of all affected data. When the criteria are not met, the affected

sample(s) shall be reanalyzed (when required by the analytical method) within holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria as defined by the data validation guidelines identified in Section 12.2. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed at no cost to URS or Pactiv. The URS QA Officer (or designee) shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

11.6 CALCULATION ERRORS

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review, calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the laboratory report case narrative.

12.0 DATA REDUCTION, VALIDATION, AND USABILITY

The laboratory will provide NYSDEC ASP Category B deliverable data packages for all sample analyses. The standard NYSDEC Data Package Summary Forms (see Appendix B) will be completed by the analytical laboratory and included in the deliverable data packages.

12.1 DATA REDUCTION

Laboratory analytical data are first generated in raw form at the instrument. These data may be either graphic or printed tabular form. Specific data generation procedures and calculations are found in each of the referenced methods. Analytical results must be reported consistently. Data for aqueous samples will be reported in concentrations of micrograms per liter (µg/L) or milligrams per liter (mg/L). Data for soils will be reported in concentrations of micrograms per kilograms (µg/kg) or milligrams per kilogram (mg/kg) and reported on a dry weight basis. Data for air or soil gas samples will be reported in concentrations of parts-per-billion by volume (ppbv).

Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or other reliable commercial sources. Data reduction will be performed by individuals experienced with a particular analysis and knowledgeable of requirements.

12.2 DATA VALIDATION

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use.

Data validation will be performed by environmental chemists under the supervision of the URS QA Officer (or designee). All analytical samples collected will receive a limited data review. This review will include a review of holding times; completeness of all required deliverables; review of QC results (surrogates, spikes, blanks) to determine if the data is within the protocol-required limits and specifications; a determination that all samples were analyzed using established and agreed upon analytical protocols; an evaluation of the raw data to confirm the results provided in the data summary sheets; and a review of laboratory data qualifiers. The methods referenced in Table 1 as well as the general guidelines presented in the following USEPA Region II documents will be used to aide the chemist during the data review:

- CLP *Organic Data Review and Preliminary Review*, SOP HW-6, Revision 12, March 2001;
- *Evaluation of Metals Data for the Contract Laboratory Program*, HW-2, Revision XI, January 1992; and
- *Validating Canisters of Volatile Organics in Ambient Air*, SOP HW-18, Revision 0, August 1994
- *Validating Volatile Organic Compounds by SW-846 Method 8260B*, HW-24, Revision 1, June 1999; and

- *Validating Semivolatile Organic Compounds by SW-846 Method 8270*, HW-22, Revision 2, June 2001.

12.3 DATA USABILITY

A *Data Usability Summary Report* (*DUSR*) (NYSDEC, 1999) will be submitted to NYSDEC, and will describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations, and quality control problems are identified and their effect on the data will be discussed. The DUSR will also include recommendations on resampling/reanalysis.

13.0 PREVENTIVE MAINTENANCE

The laboratory is responsible for maintaining its analytical equipment. Preventive maintenance is provided on a regular basis to minimize down-time and the potential interruption of analytical work. Instruments are maintained in accordance with the manufacturer's recommendations. If instruments require maintenance, only trained laboratory personnel or manufacturer-authorized service specialists are permitted to do the work. Maintenance activities will be documented and kept in permanent logs. These logs will be available for inspection by auditing personnel.

14.0 PERFORMANCE AND SYSTEM AUDITS

Audits are evaluations of both field and laboratory quality control procedures, and are performed before or shortly after systems are operational. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, or field samples spiked with known amounts of analytes.

System audits are onsite qualitative inspections and reviews of the quality assurance system used by some part of or the entire measurement system. They provide a qualitative measure of the quality of the data produced by one section or the entire measurement process. The audits are performed against a set of requirements, which may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to verify that the QA/QC procedures are being followed.

14.1 PERFORMANCE AND EXTERNAL AUDITS

In addition to conducting internal reviews and audits, as part of its established quality assurance program, the laboratory is required to take part in regularly-scheduled performance evaluations and laboratory audits from state and federal agencies. They are conducted as part of the certification process and to monitor the laboratory performance. The audits also provide an external quality assurance check of the laboratory, and provide reviews and information on the management systems, personnel, standard operating procedures, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the Laboratory QA Manager and Laboratory Management, and corrective action shall be instituted as necessary.

14.2 SYSTEMS/INTERNAL AUDITS

As part of its Quality Assurance Program, the Laboratory QA Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to verify that the analytical systems are working properly, and that personnel are adhering to established procedures and documenting the required information. These checks and audits also assist in determining or detecting where problems are occurring.

The Laboratory QA Manager periodically will submit laboratory control samples. These samples will serve to check the entire analytical method, the efficiency of the preparation method, and the analytical instrument performance. The results of the control samples are reviewed by the Laboratory QA Manager, who then reports the results to the analyst and the Laboratory Director. When a problem is indicated, the Laboratory QA Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. The Laboratory QA Manager will also recheck the systems as required.

15.0 REFERENCES

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy, Revision I, October 1989.

National Enforcement Investigations Center of USEPA Office of Enforcement. *NEIC Policies and Procedures.* Washington: USEPA.

New York State Department of Environmental Conservation (NYSDEC). Analytical Services Protocol, June 2000 Edition.

NYSDEC. 1999. Division of Environmental Remediation, *Guidance for the Development of Data Usability Summary Reports*. June.

USEPA. 2001a. *Contract Laboratory Program Organic Data Review, SOP No. HW-6, Revision 12.* USEPA Region II. March.

USEPA, 2001b. *Validating Semivolatile Organic Compounds by SW-846 Method 8270*, HW-22, Revision 2, June 2001.

USEPA, 1999a. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition.

USEPA, 1999b. *Validating Volatile Organic Compounds by SW-846 Method 8260B*, HW-24, Revision 1, June 1999; and

USEPA. 1993. *Data Quality Objectives Process for Superfund, Interim Final Guidance.* September. EPA540-R-93-071.

USEPA, 1994. *Validating Canisters of Volatile Organics in Ambient Air*, SOP HW-18, Revision 0, August 1994

USEPA. 1992. *Evaluation of Metals Data for the Contract Laboratory Program*, PSO No. HW-2, Revision XI. January.

USEPA. 1987. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87-001, (OSWER Directive 9355.0-14). December. Cincinnati, OH: USEPA.

USEPA SW-846. *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods.* Final Update III, June 1997

TABLES

TABLE 1
SUMMARY OF ANALYTICAL PARAMETERS AND QA/QC SAMPLES

PACTIV CORPORATION
MACEDON FILMS SITE
MACEDON, NEW YORK

Analysis	Method[1]	Reporting Limit (ppb)	QA/QC Sample Frequency			
			Field Equipment Blanks	Trip Blanks	Field Duplicates	MS/MSD or MS/MD[2]
Aqueous Samples						
Organic Analyses						
Volatile Organic Compounds	SW-846 Method 8260B	1	1 per 20[3]	1 per day[4]	1 per 20	1 per 20
Semivolatile Organic Compounds	SW-846 Method 8270C	10	1 per 20	--	1 per 20	1 per 20
Inorganic Analyses						
Metals	SW-846 Method 6010B/7470A	per method	1 per 20	--	1 per 20	1 per 20
Solids Samples						
Organic Analyses						
Volatile Organic Compounds	SW-846 Method 8260B	per method	1 per 20	--	1 per 20	1 per 20
Semivolatile Organic Compounds	SW-846 Method 8270C	per method	1 per 20	--	1 per 20	1 per 20
Inorganic/Wet Chemistry Analyses						
Metals	SW-846 Method 6010B/7471A	per method	1 per 20	--	1 per 20	1 per 20
Air Samples						
Volatile Organic Compounds	TO-14A[5]	per method	1 per event	--	1 per 20	--

Notes:

1 - United States Environmental Protection Agency SW-846 Methods from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*

2 - MS/MSD and MS/MD will be collected when sample batch exceeds five field samples. Lab batch QC will be used to evaluate data usuability for sample batches of five or fewer field samples.

3 - One QA/QC sample (or sample pair) analyzed per twenty field samples or one every two weeks, whichever is more frequent.

4 - One trip blank per sample cooler (aqueous VOC samples only).

5 - USEPA, 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second Edition

TABLE 2
ANALYTICAL METHODS, SAMPLE CONTAINERS AND PERSERVATION REQUIREMENTS, AND ANALYTICAL HOLDING TIMES

PACTIV CORPORATION
MACEDON FILMS SITE
MACEDON, NEW YORK

Analysis	Container	Preservation	Holding time
LAB MEASUREMENTS			
Aqueous Samples			
VOCs (EPA Method 8260B)	Three 40 ml septa vials, Glass	HCl to pH < 2, Cool 4 °C	Analyze within 10 days (7 days if not preserved with HCl)
SVOCs (EPA Method 8270C)	Two 1-Liter Glass	Cool 4 °C	Extract within five days; analyze within 40 days
Metals (EPA Method 6010B/7470A)	32 oz., Plastic	HNO_3 to pH < 2, Cool 4 °C	Analyze within 6 months (Mercury - 26 days)
Solid Samples			
VOCs (EPA Method 8260B)	4 oz. Glass jar, Teflon cap	Cool 4 °C	Analyze within 10 days.
SVOCs (EPA Method 8270C)	1-6oz. Glass jar, Teflon cap	Cool 4 °C	Extract within 5 days; analyze within 40 days.
Metals (EPA Method 6010B/7471A)	1-6oz. Glass jar, Teflon cap	Cool 4 °C	Analyze within 6 months (Mercury - 26 days)
Air Samples			
VOCs (EPA Method TO-14A)	6 Liter Summa Canister	--	Analyze within 30 days.

Notes:

VOCs indicates Volatile Organic Compounds

SVOCs indicates Semivolatile organic compounds

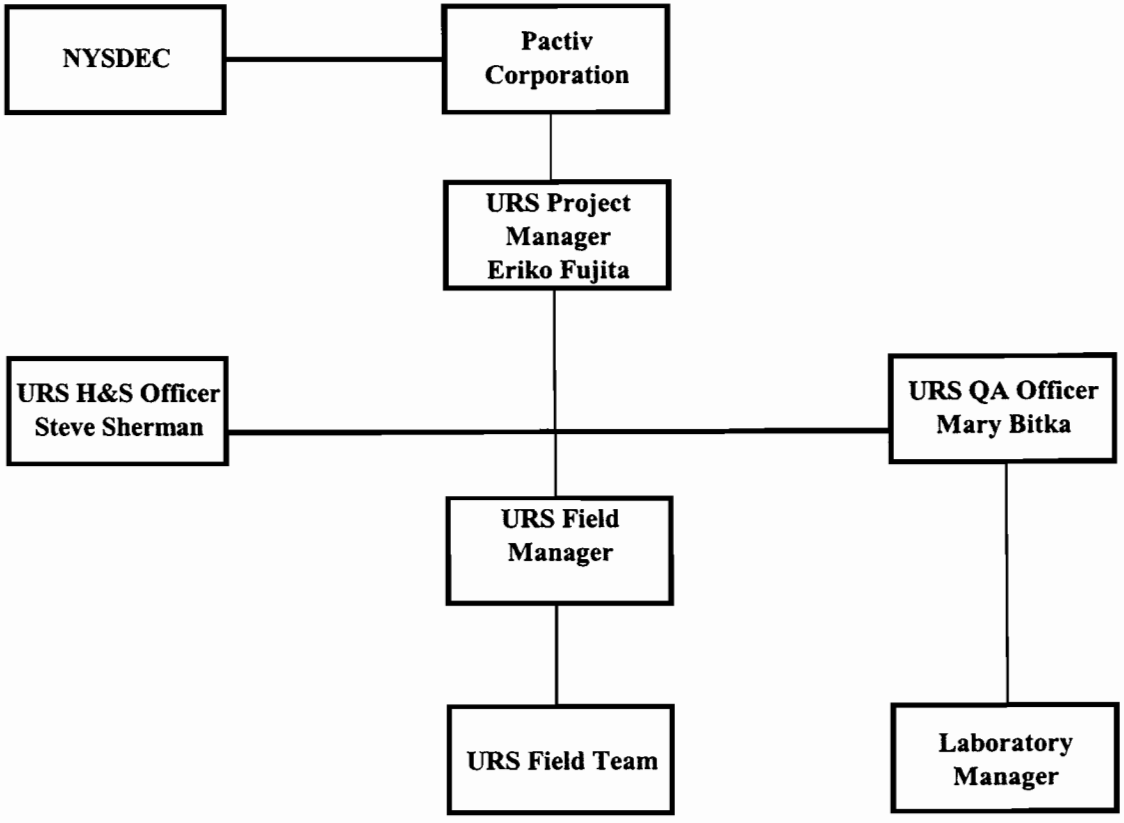
Holding times from validated time of sample receipt (VTSR) at the laboratory, except for method TO-14A, which is from time of sample collection.

FIGURES

FIGURE 1

PROJECT ORGANIZATION

PACTIV CORPORATION
MACEDON FILMS SITE
MACEDON, NEW YORK



APPENDIX B

NYSDEC DATA PACKAGE SUMMARY FORMS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

Customer Sample Code	Laboratory Sample Code	Analytical Requirements					
		*VOA GC/MS Method #	*BNA GC/MS Method #	*VOA GC Method #	*Pest PCBs Method #	*Metals	*Other

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Analyzed

PACTIV
Advanced Packaging Solutions

PACTIV CORPORATION

MACEDON FILMS SITE
MACEDON, NEW YORK

HEALTH AND SAFETY PLAN
MACEDON FILMS SITE
MACEDON, NEW YORK

Site # C859025
Index # B8-0669-04-06

SEPTEMBER 2004

Prepared For:
Pactiv Corporation
Canandaigua, New York

URS
URS Corporation - New York
28 Corporate Drive, Suite 200
Clifton Park, New York 12065

HEALTH AND SAFETY PLAN
FIELD INVESTIGATION
PACTIV
MACEDON FILMS SITE
MACEDON, NEW YORK

		PHONE
Project Number:	38393677.00000	
Project Manager:	Eriko Fujita	518-688-0015
Plan Preparer:	Eriko Fujita	518-688-0015
Preparation Date:	7/20/04	
Expiration Date:	12/31/05	

APPROVALS

Health and Safety Representative 8/24/04
(DATE)

Regional Health and Safety Manager:]

CIH 07/23/04
Steven Jay Sherman, CIH (DATE)

Project Manager:
7/26/04
(DATE)

THIS HSP IS TO BE USED FOR THE SPECIFIC PROJECT DESCRIBED HEREIN. IT IS NOT TO BE USED FOR ANY OTHER PROJECT, NOR IS IT TO BE USED FOR PROJECTS IN WHICH SIGNIFICANT CONTAMINANT REMOVAL IS REQUIRED.

SITE HEALTH AND SAFETY PLAN
FIELD ACTIVITIES

Activities covered under this HSP include the oversight of hollow-stem auger drilling, monitoring well installation, and soil and groundwater sampling activities. This plan has been developed for URS personnel; it is not intended for subcontractor or client use.

URS personnel on this project must meet the training requirements of 29 CFR 1910.120(e) and be participating in a medical surveillance program as per 29 CFR 1910.120(f). Eating, drinking and smoking will only be allowed in designated areas of the support zone.

This plan is valid only for the specific project identified in the following project description. The Project Manager and Site Safety officer are responsible for implementation of this plan that includes the site safety briefing. Field activities are limited to providing general oversight in accordance with the workplan, and obtaining soil and/or groundwater samples for laboratory analysis.

PROJECT DESCRIPTION

Project Name Macedon Films Remedial Investigation
Field Dates October 2004 through December 2004
Site Address 200 East Main Street, Macedon, New York 14502

SITE HISTORY

Pactiv's former Macedon facility is on Main Street in the Village of Macedon, Wayne County, New York. Pactiv's former Macedon facility (Macedon Films) is the westernmost part of a 23.6-acre complex. The 23.6 acre complex consists of approximately 92,000 square feet of building space and includes manufacturing facilities for Mobil's Commercial Films Division (Exxon-Mobil) and Huntsman Design Products (Pliant Corporation).

The Macedon Films site occupies 6.95 acres on the western portion of the 23.6 acre complex. The site is bordered by a spillway of the New York State Barge Canal and a Pennsylvania Central railroad spur north, New York State Route 31 to the south, Quaker Road and a truck trailer parking area to the east of the site, and New York State Route 350 to the west.

In the 1920's the site was originally development for vegetable canning operations. Sanborn maps from 1906, 1912, 1931 and 1953 show that there were lumberyards and a creamery previously located on the site.

Polyethylene flexible packaging products have been manufactured at the site since the 1950s. Polyethylene resin pellets are processed and extruded to form a film that is subsequently converted into packaging products such as produce bags.

Previous investigation results indicate that the area of the site between the buildings and the canal have been impacted by petroleum hydrocarbons, petroleum related volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). VOCs (BTEX compounds) at concentrations that exceed NYSDEC Recommended Soil Cleanup Objectives (RSCOs) and petroleum hydrocarbon compounds have been detected in soil samples collected from the site. Phenol has also been detected in soil from the site at a concentration that exceeded NYSDEC RSCOs.

Tetrachloroethene (PCE) was also detected at 730 mg/kg in one soil sample (MSB-4) and is the only detection of PCE is the only indication of PCE at the site. In 2002, a soil gas survey was conducted in the

area of the waste ink tank to evaluate the extent of the PCE detected and there were no detections of PCE in any of the soil gas samples, which suggests that the PCE detected is limited in lateral extent.

The following compounds have been detected in groundwater samples from the site at concentrations that exceed NYSDEC guidance values or groundwater standards: naphthalene, xylenes, benzo(a) anthracene, benzo(b) fluoranthene, benzo(a) pyrene, bis(2-ethylhexyl) phthalate, chrysene, chromium and lead. Petroleum hydrocarbons have also been detected in the site groundwater.

SCOPE OF WORK

Field activities to be conducted at the site may include:

- Collecting soil samples using hand tools and drill rigs;
- Collecting groundwater samples;
- Advancing soil borings;
- Installing monitoring wells;
- Collecting surface water/sediment samples; and
- Hydraulic conductivity testing.

The scope of work and field methods to be completed are described in the NYSDEC approved work plans and Field Sampling Procedures (FSP).

RESPONSIBLE PERSONNEL	Name	Phone
Project Manager	Eriko Fujita	518-688-0015
Site Manager	Christopher McMahon	518-688-0015
Site Safety Officer	Christopher McMahon	518-688-0015
Health and Safety Representative	Tom Shine	518-688-0015
REGIONAL HEALTH AND SAFETY MANAGER (RHSM)		Steven Jay Sherman, CIH
RHSM PHONE NUMBERS		716-856-5636

EMERGENCY/CONTINGENCY INFORMATION

Hospital/Clinic Newark Wayne Community Hospital Foundation Phone No. 315-332-2022
Hospital Address Driving Park Ave, Newark, NY 14513
Paramedic 911 Fire Dept. 911 Police Dept. 911

Hospital Directions:

To reach the hospital from the site, turn left onto Route 31 and follow Route 31 through Palmyra into Newark. Turn left onto Route 88 (north); turn left onto Stuart Road (west). Turn right onto Driving Park Avenue.

EMERGENCY/CONTINGENCY PLAN

Coordinate evacuation procedures with the drilling contractor and remain a safe distance from the emergency. Perform First Aid/CPR as warranted by the situation. Do not move personnel with suspected neck or back injuries. Report all injuries to the supervisor (see Attachments). Note: the hospital route map is located in the Attachments.

CHEMICAL HAZARDS

Chemical Name	OSHA PEL [ACGIH TLV®]	Concentration Present Soil	Water	Health Hazards/ Target Organs	Symptoms Of Overexposure
Tetrachloroethylene ("perc", PCE)	100 ppm [25 ppm]	7,300 mg/kg	<5.0 µg/L	Eye, Nose, throat irritant Eyes, skin, respiratory system SUSPECT HUMAN CARC	Nausea, dizziness, headache
Gasoline	300 ppm	61 mg/kg	880 µg/L	Eye & Throat Irritant	Headache, Nausea, Dizziness & Blurred Vision
Diesel	[100 mg/m^3]	3,400 mg/kg	2,200 µg/L	Skin Irritant & Central Nervous System Depressant	Headache, Nausea, Dizziness, Incoordination & Vomiting

PHYSICAL HAZARDS

Physical hazards are inherently present during drilling and sampling activities performed with a conventional drill rig (hollow-stem augers) or Geoprobe unit. Common physical hazards include mechanical hazards; noise exposure associated with the operation of sampling equipment; slip-trip-fall hazards associated with the field environment; hazards associated with weather conditions; musculoskeletal injury resulting from lifting tasks; engine exhaust exposure; and explosion hazards from underground pipes or lines that may be encountered during the drilling process. The typical physical hazards anticipated to be present on the site and the methods for preventing injury due to these hazards are described below.

Sampling Equipment - Operation of drill rig or Geoprobe sampling equipment during site activities presents potential physical hazards to personnel. During all site activities, personal protective equipment (PPE) such as steel-toed shoes, safety glasses or goggles, and hard hats should be worn whenever such equipment is present, and personnel should at all times be aware of the location and operation of sampling equipment, and take precautions to avoid getting in the way of its operation.

Noise - The primary noise hazard at this site is from the drilling equipment. Whenever feasible, noise levels, identified as exceeding 85 decibels, will be reduced by means of personal protective equipment. Ear plugs and/or muffs will be worn at all times when URS personnel are within 25 feet of operating equipment. Hearing protection will also be worn in the vicinity of generators, concrete cutters, and any other high noise emitting equipment. See URS SMS 26 for additional information.

Slip-Trip-Fall Hazards - Slip-trip fall hazards are common at field sites due to open holes; muddy, slippery or unstable surfaces; and equipment on the ground. While it is difficult to eliminate all slip-trip-fall hazards, implementing safe work practices, utilizing proper footwear, and keeping the work area free of obstructions will minimize risk of injury.

Lifting Hazards - Field operations often require the performance of laborious tasks. All employees must implement proper lifting procedures, such as keeping the load close to the body, and using leg

muscles instead of back muscles to perform lifting tasks. Additionally, employees will not attempt to lift large, heavy, or awkwardly shaped objects without assistance. See URS SMS 45 for additional information.

Weather - Weather conditions are an important consideration in planning and conducting site operations. Extremely hot or cold weather can cause physical discomfort, loss of efficiency and personal injury. Of particular importance at drilling sites is heat stress, often resulting from the use of impermeable protective clothing, which decreases the body's natural cooling processes.

Lightning may accompany storms, creating an electrocution hazard during outdoor operations. To eliminate this hazard, weather conditions will be monitored and work suspended during electrical storms.

The following potential weather hazard exists at the site:

_X_ Heat Stress
_X_ Cold Stress
___ Neither is anticipated

Underground Utilities - All proximal underground utility locations must be located by either URS or the drilling contractor or utility locator prior to the commencement of drilling activities. The proper utility company personnel should certify the deactivation of utilities. See URS SMS 34 for additional information.

Overhead Hazards - Overhead power lines pose a danger of shock or electrocution if the power line is contacted or severed during site operations. Prior to conducting work in areas where overhead lines could be impacted, the appropriate utility company will be notified and information will be obtained regarding the line voltage and the minimum separation distance required for work in this area. See URS SMS 34 for additional information.

Work Area Protection - As the project operation may be undertaken in a roadway or parking lot, motor vehicles may be a hazard. Guidance on properly conning and flagging the work area is located in the Attachments. See URS SMS 32 for additional information.

MONITORING EQUIPMENT

The following monitoring equipment will be used during drilling activities:

___ Organic Vapor Analyzer
___ HNu w/lamp __ eV
___ Explosimeter
___ Microtip w/lamp __ eV
_T_ Organic Vapor Monitor w/lamp 10.2 eV
___ MiniRAE PID w/lamp ___ eV.

(T) The monitoring equipment must be calibrated in accordance with the manufacturer's instructions. In addition, the results of daily instrument calibrations shall be logged in the field logbook, or on the Daily Instrument Calibration Check Sheet found in the Attachments.

ACTION LEVELS

Action levels and response criteria are presented below. Initial monitoring is conducted on a regular basis (every 10 minutes) in the work area. All readings are to be recorded in the field logbook.

Analyzer Reading*	Location	Duration	Action	Personal Protective Equipment
< 15 ppm	Point of Operations/ Release Source point	_____	Continue periodic monitoring.	Minimum Site Ensemble (Hardhat, Steel-toed boots, eye protection, hearing protection)
> 15 ppm	Point of Operations/ Release Source point	>1 minute	Monitor OBZ; don protective clothing; establish work zones	Minimum Site Ensemble, PLUS: Tyvek coveralls, Nitrile Outer Gloves, and Nitrile Inner (surgical) Gloves
< 15 ppm	OBZ	-----	No respirators required.	Same as above
> 15 ppm	OBZ	>1 minute	Provide respiratory protection; establish decon area	Add Half-face Respirators with organic vapor cartridges
> 75 ppm	OBZ	>1 minute	Increase respiratory protection.	Replace half-face respirators with Full-face respirators with organic vapor cartridges.
> 150 ppm OR > 300 ppm	OBZ OBZ	>1 minute instanta-neous	Stop work; move upwind while vapors dissipate. If elevated levels remain, cover boring and cuttings, evacuate upwind and notify RHSM or PM.	As specified by RHSM

(OBZ - Operator's Breathing Zone)

SITE CONTROL

Work area barricades will be used to prevent access by unauthorized persons. Yellow caution tape and/or sawhorse-type barricades can be used for this purpose. Formal work zones will be implemented if the analyzer reading exceeds 15 ppm in the work area.

DECONTAMINATION PROCEDURES

Wash hands thoroughly before eating; clean-up and wash hands and face when work activities are completed. Formal decontamination procedures are required if the analyzer reading exceeds 15 ppm in the OBZ (see Attachments).

HEALTH AND SAFETY EQUIPMENT R = Required A = As Needed

R Hard Hat	R Eye Protection (Type) Safety Glasses
R Hearing Protection	R Gloves (Type) Nitrile gloves when handling contam. mtls.
R Steel-toed Boots	A Chemical-resistant steel-toed Boots
A Orange Safety Vest	A Respirator (Type) Half-face APR
A Tyvek Coveralls	A Cartridges (Type) Combo P100/Organic Vapor
A Poly-coated Tyvek	R Fire Extinguisher
R First Aid Kit	___ Other _____

The HSP Preparer has conducted a Hazard Assessment for this project based upon information provided by the Project Manager, in accordance with 29 CFR 1910.132 (d).

HAZARD COMMUNICATION (MSDSs)

T TSP/Alconox	T Hydrochloric Acid (sample preservation)
T Isobutylene	T Nitric Acid (sample preservation)

(T) See the information sheet found in the Attachments.

INJURY AND ILLNESS PREVENTION PROGRAM

The purpose of this program is to provide and maintain a safe and healthful work environment and to reduce the incidence of work place injuries and illnesses (see Attachments). The SSO is responsible for implementing the Program during site activities. See URS SMS 005 for additional information.

SAFETY MANAGEMENT STANDARDS

The Project Manager is to append the following URS Safety Management Standards to this HSP:

SMS 46 – Subcontractor Health and Safety Requirements
SMS 49 – Injury/Illness/Incident Reporting
SMS 26 – Noise and Hearing Conservation
SMS 45 – Back Injury Prevention
SMS 14 – Fire Prevention
SMS 34 – Utility Clearances and Isolation
SMS 2 – Worker Right to Know (Hazardous Communication)
SMS 59 – Cold Stress
SMS 56 – Drilling Safety Guidelines
SMS 12 – Electrical Safety
SMS 16 – Hand Tools and Portable Equipment
SMS 17 – Hazardous Waste Operations
SMS 18 – Heat Stress
SMS 19 – Heavy Equipment Operations
SMS 24 – Medical Screening Surveillance
SMS 47 – Biological Hazards
SMS 29 – Personal Protective Equipment

These Safety Management Standards (SMS) are available on the URS' Safety intranet. Go to Safety Management Standards, and click on the "Print this SMS" link for each SMS.

ATTACHMENTS

- HOSPITAL ROUTE MAP
- FORMS
- MATERIAL SAFETY DATA SHEETS
- SAFETY MANAGEMENT STANDARDS

.

SAFETY COMPLIANCE AGREEMENT, BRIEFING FORM,
AIR MONITORING LOG, AND CALIBRATION CHECK SHEET
FOR MACEDON FILMS SITE

I have read the Health and Safety Plan for the project and I understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the health and safety requirements specified in the Plan.

	Name	Signature
URS Site Manager		
URS Site Safety Officer		
URS Site Personnel		
URS Site Personnel		

SAFETY ISSUES

	DISCUSSED Yes	No
Protective Clothing/Equipment		
Chemical and Physical Hazards		
Control Methods		
Air Monitoring Action Levels and Requirements		
Nearest Phone		
Hospital Name/Address/Directions		

Meeting conducted by: _____ Date: _____

Attendees' Names (print) **Signatures**

_____

_____

_____

_____

_____

DAILY INSTRUMENT CALIBRATION CHECK SHEET

DATE	INSTRUMENT	BATTERY CHECK OK?	ZERO ADJUST OK?	CALIBRATION GAS(PPM)	READING (PPM)	CALIBRATED BY

FIELD MONITORING ACTIVITY LOG

DATE	ACTIVITY MONITORED	TIME	LOCATION	READING	ACTION	READING BY

Starting from: A 112 Main St, Macedon, NY 14502-8996

Arriving at: B Newark-Wayne Community Hosp Driving Park Ave, Newark, NY 14513-1005 (315) 332-2022

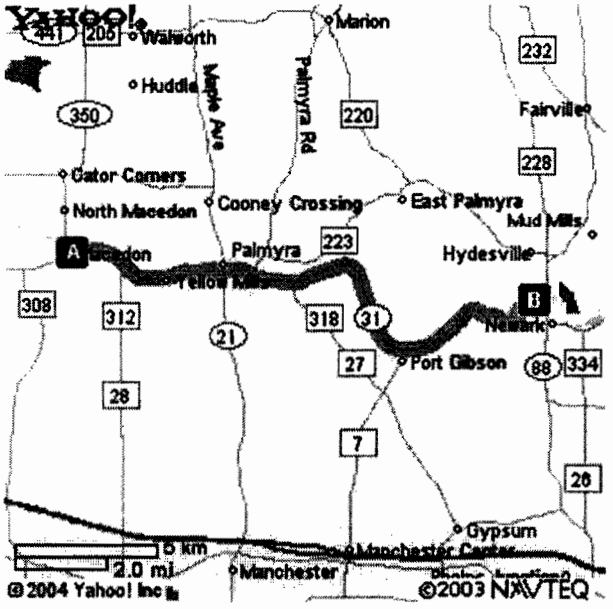
Distance: 12.5 miles **Approximate Travel Time:** 26 mins

Your Directions

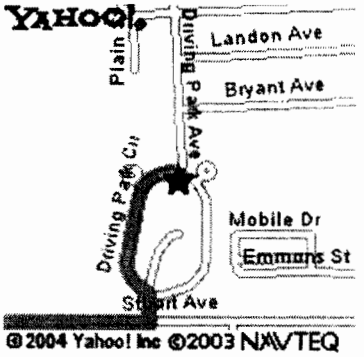
1.	Start at **112 MAIN ST, MACEDON** going towards **RT-31F\RT-350\ONTARIO CENTER RD** - go **0.4** mi
2.	**MAIN ST** becomes **RT-31** - go **3.1** mi
3.	Continue on **RT-21/RT-31** - go **0.6** mi
4.	Continue on **RT-31** - go **7.3** mi
5.	Turn **L** on **EDGETT ST** - go **0.2** mi
6.	Turn **L** on **BARKER PKY** - go **0.2** mi
7.	Turn **R** on **STUART AVE** - go **0.3** mi
8.	Turn **L** on **DRIVING PARK CIR** - go **0.2** mi
9.	Arrive at **DRIVING PARK AVE, NEWARK**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Your Full Route



Your Destination

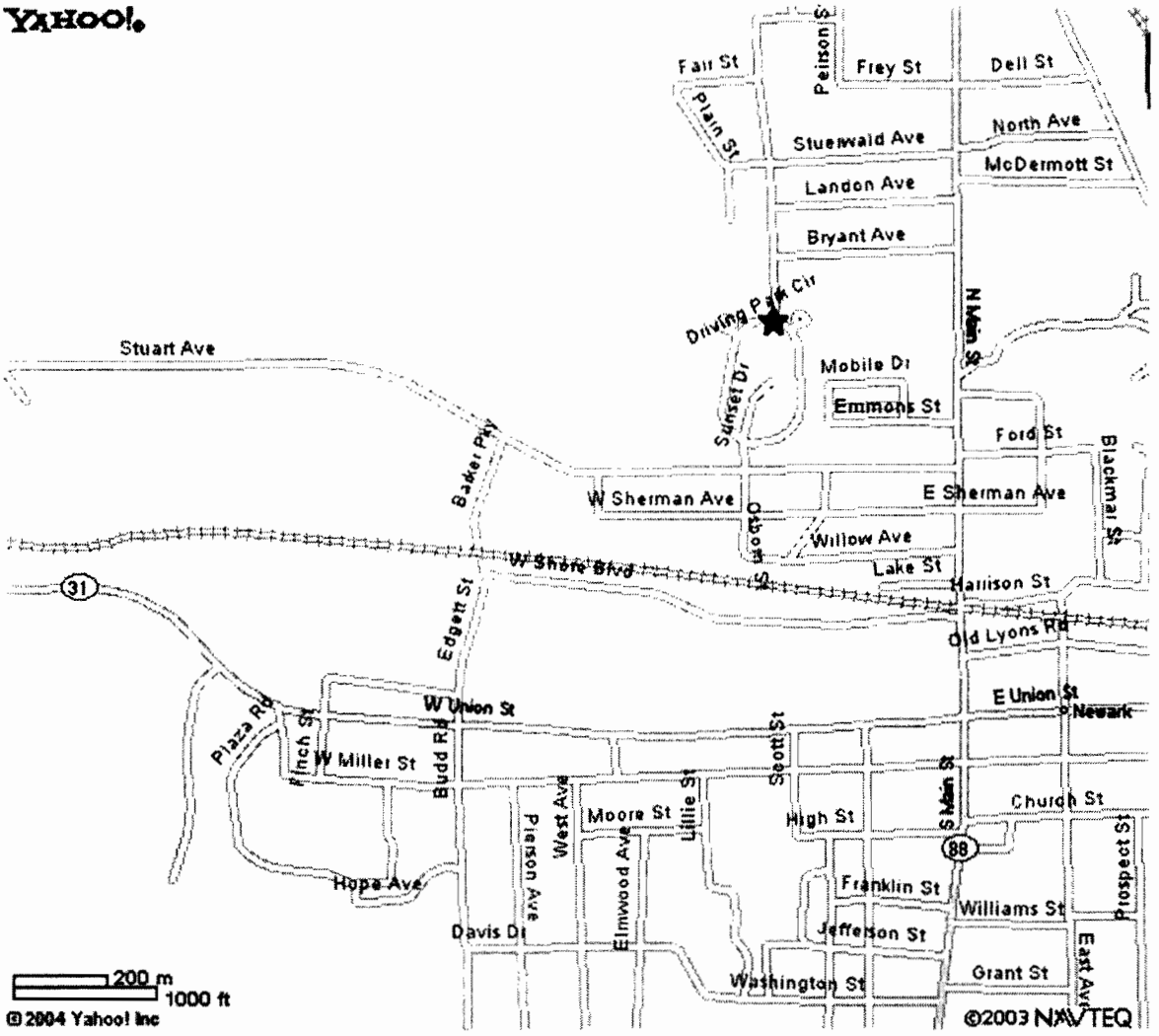


Address:
Newark-Wayne Community Hosp Driving Park Ave
Newark, NY 14513-1005

Yahoo! Maps

« Back to Map

★ Newark-Wayne Community Hosp, Driving Park Ave Newark, NY 14513-1005



When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

URS

SAFETY MANAGEMENT STANDARDS

URS SAFETY MANAGEMENT STANDARD
Subcontractor Health and Safety Requirements

1. Applicability

This procedure is applicable to subcontractors retained by URS to perform construction (including drilling and excavation), alteration, demolition, and/or repair activities utilizing their own workforce or equipment. This procedure is applicable to the operations of subcontractors and sub-subcontractors of any tier.

This procedure does not apply to third party contractor operations where there is no subcontract relationship between the contractor and URS Corporation. Health and safety issues regarding third party contractor operations are governed by project specific contracts and are not covered by this standard.

2. Purpose and Scope

This procedure provides guidelines on the pre-evaluation of subcontractor safety programs. It also provides guidance on contractual risk management, subcontractor safety performance on the job site, and the responsibilities of the Project Manager with respect to subcontractor jobsite safety performance.

It is recommended that each URS Corporation subcontractor be evaluated at least annually using Attachment 46-1, "Subcontractor Safety Evaluation Form," in order to perform work on any new URS Corporation projects.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Guidelines

A. Pre qualification of Subcontractor - The Project Manager shall complete the following procedures for all subcontractors retained on projects covered by this standard (the PM should also require subcontractors to follow these procedures with respect to pre-qualification of sub-subcontractors of any tier):

1. Request all subcontractor candidates to complete the attached "Subcontractor Health and Safety Evaluation Form" (Attachment 46-1).

2. Conduct an assessment of each subcontractor's qualifications with respect to the subcontractor health and safety evaluation criteria contained in Attachment 46-2.

3. Verify that subcontractors meet the insurance requirements as stated in Attachment 46-2 or as approved by Counsel.

4. If the subcontractor has been successfully evaluated within the last 12 months, that evaluation may be substituted.

5. For long term projects, this evaluation should be updated within 12 months of the previous evaluation.

B. Contractual and Risk Management Requirements of Subcontractors

1. Ensure that subcontractor is contractually bound to comply with applicable client and URS Corporation Health and Safety Program requirements.

2. Ensure that subcontractor is contractually bound to develop additional safety procedures for work that is exclusive to their activities on the site and for which they may have superior knowledge.

3. Assess compliance of subcontractor's insurance with the URS Corporation subcontract requirements (including, but not limited to, necessary types and amounts of coverage, URS Corporation additional insured endorsement, etc.).

4. Ensure that URS Corporation has the right in its subcontract, without liability to the subcontractor, to stop the subcontractor's work in the event of any violations of the applicable Health & Safety Plan.

C. Subcontractor Safety Representative

1. Require each subcontractor to appoint a Subcontractor Safety Representative (SSR) who:

   a. Is knowledgeable of the subcontractor's activities.

   b. Understands the safety requirements of the subcontractor's activities.

   c. Has the ability to recognize and the authority to correct safety deficiencies and execute a stop work order should an imminent danger arise.

d. Has the responsibility for the administration of the subcontractor Health and Safety Program.

e. Will serve as the direct contact with URS Corporation regarding resolution of Health and Safety issues.

D. Communication

1. Provide the SSR with information regarding Site Safety Program including but not limited to:

   a. Client Requirements.

   b. URS Corporation Site Safety Program.

   c. Site Hazard Communication Program.

   d. Site Emergency Action Plan.

   e. Any additional safety information from other contractors or subcontractors working on the site.

2. Provide SSR with name of URS Corporation project contact and alternate for addressing site Health and Safety issues.

3. Require the participation of subcontractors in all Site Safety Briefings.

4. Require subcontractor compliance with all safety directives and/or stop work orders issued by the URS Corporation site representatives.

E. Subcontractor Safety Performance

1. To the extent reasonable in light of URS Corporation's scope of work under the client contract, visit the site and periodically observe subcontractors operations (i.e., conduct spot checks) to assess whether subcontractor appears to be conducting its operations in accordance with applicable health and safety requirements. Periodically review any required subcontractor health and safety written documentation for compliance with applicable requirements.

2. In the event that deficiencies are observed immediately bring them to the attention of the SSR for resolution.

3. In the event of observation of an "Imminent Danger" situation (i.e. involving a situation that could result serious injury or death), immediately contact the SSR and stop the work.

4. Investigate all injuries/illnesses related to subcontractor operations to identify causes and effect corrective actions.

5. In the event of serious and/or continuing subcontractor breaches of applicable health and safety requirements contact legal counsel to assess whether formal contractual action is appropriate under the subcontract.

5. Documentation Summary

A. File in the Project Safety File

1. Subcontractor Health and Safety Evaluation Form.

2. Applicable and current Insurance Certificates.

3. Names and telephone numbers of SSR for each subcontractor.

4. Verification of Health and Safety documents transmitted to subcontractors and received from subcontractors.

5. Identified safety deficiencies as applicable for subcontractors and verification of correction of conditions.

6. All other safety related documentation between URS Corporation and subcontractor such as training certifications, etc.

7. Subcontractor safety plan, incident reports and resolution reports.

6. Resources

A. Federal OSHA Workplace Injury and Illness statistics (http://www.osha.gov/oshstats/work.html)

B. Managing Subcontractor Safety, Prepared by The Construction Industry Institute, Safety Task Force, Publication 13-1, The University of Texas at Austin, Austin, Texas, 1991 (http://www.construction-institute.org/)

C. American National Standard Construction and Demolition Operations -- Safety and Health Program Requirements for Multi-Employer Projects,

ANSI A10.33-1992, National Safety Council, Itasca, Illinois 60143-3201 (http://www.nsc.org)

D. "Liability, OSHA and the Safety of Outside Contractors," Professional Safety, American Society of Safety Engineers, January 1993 (http://www.asse.org)

E. "Proactive Construction Management; Dealing With the Problem of Subcontractor Safety," Professional Safety, American Society of Safety Engineers, January 1990 (http://www.asse.org)

F. "Design Professional Liability Under OSHA," Presented by Thomas F. Holt, Jr., HWAC Lawyer's Roundtable, June 14, 1995 (to be Published) (http://www.hwac.org)

G. "Occupational Injury and Illness Rates by SIC", Bureau of Labor Statistics, U. S. Department of Labor (http://stats.bls.gov/sahome.html)

H. Attachment 46-1 - Subcontractor Safety Evaluation Form

I. Attachment 46-2 - Subcontractor Evaluation Criteria

URS SAFETY MANAGEMENT STANDARD
Injury / Illness / Incident Reporting

1. Applicability

This procedure applies to URS Corporation offices and field operations.

2. Purpose and Scope

The purpose of this procedure is to provide guidance for the timely reporting of work related injuries, illness, and incidents.

3. Implementation

Office Locations - Implementation of this program is the responsibility of the employee's Supervisor.

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Reporting: All employees shall immediately notify their appropriate level of management (line, project, and/or office) of a reportable incident. A reportable incident includes the following:

1. An injury to any URS employee, subcontractor, client representative, or private citizen, even if the injury does not require medical attention;
2. An injury to a member of the public occurring on a URS work site or possibly resulting from a URS or subcontractor activity or involving URS or subcontractor property, equipment, or resource;
3. Illness resulting from suspected chemical exposure;
4. Chronic or re-occurring conditions such as back pain or cumulative trauma disorders (example: carpal tunnel syndrome);
5. Fire, explosion, or flash;
6. Any vehicle accidents occurring on site, while traveling to or from client locations, or with any company-owned or leased vehicle;
7. Property damage resulting from any URS or subcontractor activity;
8. Structural collapse or potential structural hazards;

9. Unexpected release or imminent release of a hazardous material;

10. Unexpected chemical exposures to workers or the public;

11. A safety related complaint from the public regarding URS activities.

12. Any other significant occurrence that could impact safety.

B. Actions: The following actions will be taken following a reportable incident:

1. Employees:

a. If necessary, suspend operations and secure and/or evacuate the area;

b. Immediately notify your supervisor and/or project manager

c. Record information pertaining to the incident (e.g., time, date, location, name and company of person(s) involved, description of event, and actions taken);

d. Assist with incident investigation as directed by management;

e. Implement corrective actions as directed by management;

f. *Do not* discuss the incident with members of the news media or legal representatives (except URS legal counsel or your personal legal advisor) unless directed to do so by URS management;

g. *Do not* make statements pertaining to guilt, fault, or liability.

2. Line/Project Management:

a. Review circumstances of the incident with applicable employee(s);

b. Notify local Health and Safety representative. If incident involves and an injury/illness of a URS employee, also notify the local Human Resources Representative;

c. Complete and distribute injury/incident report within 24 hours. (Note: If the employee is unable to complete the

report, another company employee, line manager, project manager, or local health and safety representative may complete the report.);

d. Review and verify that necessary corrective actions are identified and implemented;

e. Discuss with department or project staff the circumstances surrounding the incident and corrective actions taken.

3. Local Health And Safety Representative

a. Assist with incident evaluation;

b. With management, identify cause(s) of incident and identify corrective actions needed to avoid recurrence;

c. Review injury/incident report for completeness and accuracy;

4. Local Human Resources Representative

a. Report work-related injuries and illness to worker compensation carrier

(St. Paul Fire and Marine @ 1-800-787-2851);

5. Documentation Summary

A. File these records in the Office Safety File:

1. Attachment 49-1 - Incident Report Form

2. Maintain OSHA 200 Log.

B. File these records in the Project Health and Safety File

1. Attachment 49-1 - Incident Report Form

2. Maintain OSHA 200 Log if applicable for Project.

6. Resources

A. U. S. OSHA

B. Attachment 49-1 - Incident Report Form

URS	Health and Safety Program INCIDENT REPORT FORM	Attachment 49-1

ADMINISTRATIVE INFORMATION:

URS Division/Company _____

Project Office: _____

Project Number: _____

Date/Time of Incident: Date _____ Time _____

Location: _____

FOR INJURIES / ILLNESSES:

Name of Injured Employee: _____

Age: _____

Sex: ○ Male ○ Female

See a Doctor? ○ Yes ○ No
If yes, attach a doctor's report.

Describe Injury:

TYPE OF INCIDENT (Check all applicable items)			
☐ Illness	☐ Injury	☐ Fire, Explosion, Flash	☐ Unexpected Exposure
☐ Property Damage	☐ Vehicular Accident	☐ Other (describe):	

DESCRIPTION OF INCIDENT: (Describe the facts contributing to the incident. Identify individuals involved, witnesses, and their affiliations. Attach additional sheets, drawings, or photographs as needed.)

URS	Health and Safety Program INCIDENT REPORT FORM	Attachment 49-1

PREPARED BY:

Name: _____

Date: _____

Signature: _____

Reporter must deliver this report to the operating unit health and safety representative within 24 hours of the reported incident for medical treatment cases and within 5 days for other incidents.

REVIEWED BY:

_____

Supervisor Date

_____

Health and Safety Representative Date

DISTRIBUTION:

- Division Health and Safety Manager
- Project File
- Occupational Health Specialist (Fax 512-419-6013)
- Local Human Resources (Injury / Illness cases only)

CORRECTIVE ACTONS (*For Internal Use Only*):

URS SAFETY MANAGEMENT STANDARD
Noise and Hearing Conservation

1. Applicability

This procedure applies to URS Corporation facilities and field operations where URS Corporation personnel may encounter noise exposures that may exceed 85 dBA as an 8 hour Time Weighted Average.

2. Purpose and Scope

The purpose of this procedure is to protect employees from hazardous noise exposures and to prevent hearing loss.

3. Implementation

Office/Lab locations:	High noise is unlikely to be encountered at URS offices, however, if applicable, the implementation of this program is the responsibility of the Office Manager.
Field Activities:	Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. General

The use of hearing protectors in any location where powered or motorized equipment or any other noise source could reasonably be expected to exceed 85 dBA. Use of hearing protectors may only be discontinued when noise levels are verified to be less than 85 dBA through a properly conducted noise survey. Whenever information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the project manager or location manager will be responsible to enforce the proper use of hearing protectors.

B. Hearing Protectors

1. Require that at least two (2) types of hearing protectors are available to employees free of charge, preferably a plug and a muff type.

2. Minimum Noise Reduction Ratings (NRR)

Hearing protectors issued must have the following minimum NRR:

Ear Plug	Muffs
29 dBA	27 dBA

3. Require that hearing protectors are used and thus effectively protect hearing.

C. Noise Surveys

1. Noise surveys must be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys must be conducted under the supervision of a URS Safety Program Representative.

2. Sound level meters and audio dosimeters used to determine employee exposure to noise sources must be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).

D. Noise Controls

Eliminate noise sources to the extent possible. Examples of controls that must be considered follow:

1. Addition or replacement of mufflers on motorized equipment.

2. Addition of mufflers to air exhausts on pneumatic equipment.

3. Following equipment maintenance procedures to lubricate dry bearings.

4. Isolation of loud equipment with newer and quieter models.

E. Audiometric Exams

1. Tests

Details on the medical surveillance program (including audiometric testing) are included in SMS 24.

Audiometric tests shall be performed by a person meeting OSHA's 1910.95 (g)(3)'s definition. Within 6 months of an employee's first exposure at or above the action level, a valid baseline audiogram shall be established against which subsequent audiograms can be compared. Testing to establish a baseline audiogram shall be preceded by 14 hours without exposure to noise. Hearing protectors may be used as a substitute for the requirement that

baseline audiogram shall be preceded by 14 hours without exposure to workplace noise. The medical surveillance provider shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination. For multi-year projects, an annual audiogram shall be obtained for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if there is a standard threshold shift (STS). If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer will obtain a retest within 30 days and consider the results in assessing an STS as the annual audiogram. The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. If an STS has occurred, the medical surveillance provider will notify the employee within 21 days of the determination.

2. Standard Threshold Shifts

   If an employee's test results show a confirmed STS, their hearing protection will be evaluated and refitted, and a medical evaluation may be required.

F. Training

Verify that each employee who must work in a noisy environment is current on the required Hearing Conservation Training. Training must include the following topics:

1. The effects of noise on hearing.
2. The purpose of hearing protectors.
3. The advantages and disadvantages of various types of hearing protectors.
4. The attenuation of various types of hearing protection.
5. The selection, fitting, care, and use of hearing protectors.
6. The purpose of audiometric testing.

7. An explanation of the audiometric testing procedure.

5. Documentation Summary

A. File these records in the Office Safety Filing System:

1. Noise surveys, when applicable.

2. Training Records.

B. File noise surveys, when applicable, in the Project Safety File:

6. Resources

A. U.S. OSHA Standard – Occupational noise exposure – 29 CFR 1910.95

B. U.S. OSHA Construction Standard – Occupational noise exposure – 29 CFR 1926.52

C. U.S. OSHA Technical Links - Noise and Hearing Conservation

D. American Industrial Hygiene Association: The Occupational Environment – Its Evaluation and Control, Chapter 20. Fairfax, VA: 1997

E. National Hearing Conservation Association web site

F. URS SMS 24 Medical Screening and Surveillance

URS SAFETY MANAGEMENT STANDARD
Back Injury Prevention

1. Applicability

This procedure applies to URS operations where personnel perform manual lifting.

2. Purpose and Scope

The purpose of this procedure is to prevent back injuries to URS personnel.

3. Implementation

Office Locations - Implementation of this procedure is the responsibility of the Office Manager.

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Safe Lifting Practices in the Office

1. Require that personnel receive the training described in (C) below.

2. Evaluate all assignments that involve lifting, such as moving boxes of files and paper, computer equipment, and the like to see that the task can be completed without risk of back injury to assigned personnel.

3. Provide material handling devices, such as carts and dollies, to assist in the safe moving of materials.

4. Obtain outside assistance, such as contract movers, if the job cannot be safely accomplished by URS personnel.

5. Require that heavier items are stored on lower shelving units.

B. Safe Lifting Practices in the Field

1. Recognize that field assignments tend to be lifting-intensive, and that URS has a duty to provide the means by which personnel can perform lifting duties without risk of injury.

2. Require that personnel receive the training described in (C) below.

3. Evaluate all field assignments that involve lifting to see that the tasks can be completed without risk of back injury to assigned personnel.

4. Provide material handling devices, such as carts, dollies, trucks with lift gates, to assist in the safe moving of materials. If required, assign additional personnel to the task.

5. Direct field personnel not to assist in lifting tasks that are normally undertaken by subcontractor personnel.

6. Contact a URS Health and Safety Program Representative when assistance is necessary to evaluate a lifting task that may pose a back injury risk to assigned personnel.

C. Training

1. Require that personnel who may have lifting as part of their duties receive training that includes the following topics:

   a. Showing personnel how to avoid unnecessary physical stress and strain.

   b. Teaching personnel to become aware of what they can comfortably handle without undue strain.

   c. Instructing personnel on the proper use of equipment.

   d. Teaching personnel to recognize potential hazards and how to prevent or correct them.

2. This training must be completed prior to an employee being assigned to a task that involves lifting.

D. Office Moves and Relocations

1. Utilize professional movers (who are appropriately insured) to move office furniture such as desks, file cabinets, and bookcases, even if such a move is only between offices or cubicles at a particular location (on-site move).

2. Utilize professional movers for intensive moving of file boxes and other heavy materials.

E. Material Packaging

1. Use only smaller size (<18") file ("Banker") boxes for file storage, as the larger (>18") boxes are awkward and readily overloaded.

2. Use only smaller coolers for field samples, as the larger coolers are awkward and readily overloaded.

5. Documentation Summary

File the following documents in the Office Health and Safety File

- Training rosters

File the following documents in the Project Health and Safety File

- Training rosters

6. Resources

A. Work Practices Guide for Manual Lifting, NIOSH

URS SAFETY MANAGEMENT STANDARD
Fire Prevention

1. Applicability

This procedure applies URS office and project locations.

2. Purpose and Scope

The purpose of this procedure is to reduce/eliminate potential fire hazards in the workplace and to provide for a rapid, effective response should a fire occur.

3. Implementation

Office Locations – Implementation of this procedure is the responsibility of the Office Manager.

Field Activities – Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

General

A. Develop an Emergency Action Plan as outlined in SMS 3, "Emergency Action Plans."

B. Maintain good housekeeping to reduce fire hazards and to provide safe routes of egress should a fire occur.

C. Provide the appropriate number and types of fire extinguishers for the operations being performed. Refer to Attachment 14-1 for guidance.

D. Inspect fire extinguishers monthly and maintain an inspection log.

E. Conduct frequent periodic inspections to identify fire hazards such as:

   1. Unnecessary accumulation of combustibles.

   2. Unnecessary storage of flammables.

   3. Sources of ignition (e.g., faulty wiring, sparks, open flame, etc.).

F. Remove all fire hazards promptly.

G. Prohibit smoking and other ignition sources in flammable storage and other fire hazard areas.

H. Post emergency numbers near telephones and evacuation maps in appropriate locations.

I. Conduct evacuation drills.

J. Train employees in:

1. Fire hazard recognition.
2. Fire hazard prevention.
3. Fire extinguisher use.
4. Emergency and evacuation procedures.

6. Documentation Summary

File the following in the Office/Project Health and Safety File:

A. Emergency Action Plans.

B. Fire extinguisher inspection logs.

C. Employee training documentation.

D. Site audits.

E. Evacuation drills.

7. Resources

A. U.S. OSHA Standard - Means of Egress - 29 CFR 1910, Subpart E

B. U.S. OSHA Standard - Employee Emergency Plans and Fire Prevention Plans - 29 CFR 1910.38

C. U.S. OSHA Standard - Fire Protection - 29 CFR 1910, Subpart L

D. U.S. OSHA Technical Links - Fire Safety

E. U.S. OSHA Construction Standard - Fire Protection and Prevention 29 CFR 1926, Subpart F

F. U.K. - "Fire Precaution" Regulations

G. Australian Standards AS 1851.1-1995 - Maintenance of Fire Protection Equipment - Portable Fire Extinguishers and Blankets

H. Australian Standards Collection 15 - Fire Extinguishing Equipment

I. USACE EM 385-1-1 Section 9 - Fire Prevention and Protection

J. Attachment 14-1 - Fire Extinguisher Placement Guidelines

URS Corporation

URS Corporation Health & Safety Program
FIRE EXTINGUISHER PLACEMENT GUIDELINES

1. Fire Extinguishers – General

The following are **minimum** requirements for fire extinguisher placement in office buildings, construction facilities, support buildings, and/or buildings under construction. In some cases, client requirements may be more stringent, in which case the client's requirements supercede the guidelines below.

a. A fire extinguisher, rated at a minimum of 2A, must be provided for each 3,000 square feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet.

b. At least one fire extinguisher, rated at a minimum of 2A, must be provided on each floor. In multi-story buildings, at least one fire extinguisher must be located adjacent to the stairway.

c. Where more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used, a fire extinguisher, rated at least 10B, must be provided within 50 feet.

d. Portable fire extinguishing equipment, suitable for the fire hazard involved, must be provided at convenient, conspicuously accessible locations in Yard Storage areas. Portable fire extinguishers, rated at least 2A, shall be placed so that maximum travel distance to the nearest unit does not exceed 100 feet.

2. Flammable/Combustible Liquid Storage

The following are **minimum** requirements for fire extinguisher placement in flammable/combustible liquid and gas storage areas. In some cases, client requirements may be more stringent, in which case the client requirements supercede the guidelines below. Refer to SMS 15, "Flammable and Combustible Liquids and Gases, Attachment 2".

a. At least one portable fire extinguisher, rated at least 20B, must be located outside of, but not more than 10 feet from, the door opening into any room used for storage of more than 60 gallons of flammable or combustible liquids.
b. At least one portable fire extinguisher, rated at least 20B, must be located not less than 25 feet, nor more than 75 feet, from any flammable

liquid storage area located outside.

c. At least one portable fire extinguisher, rated at least 20BC, must be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable/combustible liquids.

d. At least one fire extinguisher, rated at least 20BC, must be provided within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication/service areas.

e. At least one fire extinguisher, rated at least 20BC, must be provided at each LPG container storage area.

3. Hot Work

A minimum of one fire extinguisher, rated at least 20BC, must be provided for each hot work location. The extinguisher should be conspicuously positioned no more than 10 feet from the hot work. Refer to SMS 20, "Hot Work".

URS SAFETY MANAGEMENT STANDARD
Utility Clearances And Isolation

1. Applicability

This procedure applies to URS projects where personnel may encounter subsurface or overhead utilities.

2. Purpose and Scope

Many field activities are conducted near aboveground and underground utilities. The primary purpose of this Standard is to establish operating requirements that will permit employees to work safely in the vicinity of electrical, natural gas, fuel, water, and other utility systems and installations. The secondary purpose is to prevent economic damage to utility systems from operations associated with project-related activities.

The term "utility clearance" includes

A. The positive locating of utility systems in or near the work area.

B. A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

Note that in some cases, utility representatives may deem it appropriate or necessary to use insulating blankets to isolate a power line; this is an acceptable alternative to positive de-energizing (only utility representatives can make the determination).

"Contact" with overhead power lines is considered to occur when equipment is closer to power lines than permitted by the criteria in the table in Section 4.0.C.2.b below. (See note for U.K. operations).

3. Implementation

Field Operations - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Time for Completion

Complete utility clearances prior to the start of any work in the area of the utility that could feasibly result in contact with or damage to that utility.

B. Local Regulations

Research local codes and regulations regarding utility locating and isolation requirements. Utility companies and locating services are among the appropriate resources.

C. Overhead Power Lines

1. Proximity to Power Lines

   No work is to be conducted within 50 feet (15 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15 meters) of overhead power lines without first making this determination.

2. Operations adjacent to overhead power lines are **PROHIBITED** unless one of the following conditions is satisfied:

   a. Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.

   b. The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked so that no part, including cables, can come within the minimum clearances shown in the table.

MINIMUM DISTANCES FROM POWERLINES	
Powerlines Nominal System kV	Minimum Required Distance
0-50	10 feet (3 meters)
51-100	12 feet (3.6 meters)
101-200	15 feet (4.6 meters)
201-300	20 feet (6.1 meters)
301-500	25 feet (7.6 meters)
501-750	35 feet (10.7 meters)
751-1000	45 feet (13.7 meters)

Note: for U.K. operations, the specific safe distance is determined by the utility company.

   c. The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine

the minimum safe operating distance; get this determination in writing with the utility representative's signature.

3. All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the Project Manager prior to the start of work.

D. Underground Utilities

1. Do not begin subsurface work (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings must be confirmed with additional geophysical or other survey.

2. Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.

3. Obtain utility clearances for subsurface work on both public and private property. Clearances are to be in writing, signed by the party conducting the clearance.

4. Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.

5. Do not conduct mechanical-assisted subsurface work (e.g., powered drill rig, mechanical excavator, etc.) within five (5) feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure. Confirm minimum distances for mechanical-assisted subsurface work with the utility owner, as distances beyond this five foot minimum may be required.

6. Subsurface work within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure must be done by hand (e.g., hand auger, shovel) to the point where the obstruction is visually located and exposed. Once the obstruction location is confirmed in this manner, mechanical-assisted work may commence.

7. Reference SMS 13, "Excavation Safety" for additional information regarding subsurface operations.

E. Training

Conduct a site briefing for site employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.

5. Documentation Summary

File these records in the Safety Filing System:

1. Documents requesting utility clearance.
2. Documents confirming utility clearance.
3. Training/briefing documentation of each isolation.

6. Resources

1. Utility Locating Services (typically under "Utility" in the Yellow Pages)
2. NIOSH Alert - Preventing Electrocutions from Contact Between Cranes and Power Lines (http://www.cdc.gov/niosh/crane.html)
3. One Call Utility Locating List (http://www.underspace.com/refs/ocdir.htm)
4. National Utility Locating Contractor's Association (http://www.underspace.com/nu/index.htm)
5. U.K. - Health and Safety Executive GS6

URS SAFETY MANAGEMENT STANDARD
Worker Right-to-Know (Hazard Communication)

1. Applicability

This procedure applies to URS office and field operations.

2. Purpose and Scope

The worker right-to-know program provides URS personnel with information and training about safety and health hazards associated with the chemicals they might encounter in the workplace. This procedure describes how chemical safety hazards are communicated to URS personnel working in offices and at field site locations, and how information is to be provided to employees of other employers working at the location. The requirements include steps to acquire this information, maintain it, and train everyone to use it.

3. Implementation

Office Locations: Implementation of this program is the responsibility of the Office Manager.

Field Activities: Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Hazardous Material Inventory

1. Maintain a hazardous material inventory that lists all of the hazardous materials used at this workplace. Use chemical names consistent with the applicable MSDS's.

2. File a copy of the chemical inventory in the Safety Filing System.

B. Material Safety Data Sheets (MSDS's)

1. Obtain a MSDS for each chemical before it is used.

2. Review each MSDS when it is received to evaluate whether the information is complete and to determine if existing protective measures are adequate.

3. Maintain a collection of all MSDS's where they are accessible at all times.

4. Replace MSDS sheets when updated sheets are received. Communicate any significant changes to those who work with the chemical.

5. MSDS's are required for all hazardous materials used on site by project personnel.

C. Labels

Label all chemical containers with:

1. Identity of the hazardous chemical(s),

2. Appropriate hazard warnings, and

3. Name and address of the chemical manufacturer, importer, or other responsible party.

D. Hazardous Nonroutine Tasks

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, provide each employee with information about hazards to which they may be exposed during such an activity.

This information will include:

1. Specific chemical hazards.

2. Protective/safety measures which must be utilized.

3. Measures that have been taken to lessen the hazards including ventilation, respirators, presence of another employee and emergency procedures.

E. Informing Contractors/Subcontractors

Provide contractors/subcontractors the following information on chemicals used by or provided to URS personnel:

1. Names of hazardous chemicals to which they may be exposed while on the jobsite.

2. Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures.

3. Location of URS MSDS's and written chemical inventory.

F. Training

1. Conduct training of all employees potentially exposed to hazardous materials on the following schedule:

   a. Before new employees begin their jobs.

   b. Whenever new chemicals are introduced into the workplace, or

   c. Annually thereafter.

2. This training will include:

   a. Applicable regulatory requirements.

   b. Names of those responsible for implementing this program.

   c. Location of the program, inventory and MSDS 's.

   d. Chemicals used, and their hazards (chemical, physical and health).

   e. How to detect the presence or release of chemicals.

   f. Safe work practices.

   g. How to read an MSDS.

3. Document the training.

5. Documentation Summary

A. File these records in the Office Safety Filing System

1. Chemical Inventory.

2. Location of the MSDS inventory.

3. Training records.

4. Contractor/Subcontractor notifications.

B. File these records in the Project Safety File.

1. Chemical Inventory.
2. Location of the MSDS inventory.
3. Training records.
4. Contractor/Subcontractor notifications.

6. Resources

A. U.S. OSHA Technical Links - Hazard Communication (http://www.osha-slc.gov/SLTC/hazardcommunications/index.html)

B. U.K. - Control of Substance Hazardous to Health - Regulations

URS SAFETY MANAGEMENT STANDARD
Cold Stress

1. Applicability

This procedure applies to URS projects where field crews are working outdoors in damp and cool (below 50° F or 10°C) conditions or anytime temperatures are below 32°F or 0°C.

2. Purpose and Scope

The purpose of this procedure is to protect project personnel from the following conditions:

Hypothermia: Hypothermia results when the body loses heat faster than it can be produced. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are first affected. If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia. Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia may be seen in Attachment 59-1.

Frostbite: Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite can be categorized into:

- **Frost Nip or Initial Frostbite:** (1st degree frostbite) Characterized by blanching or whitening of skin.
- **Superficial Frostbite:** (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.
- **Deep Frostbite:** (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.

Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. The toes, fingers, cheeks, and ears are the most commonly affected. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues. The first symptom of frostbite is an uncomfortable sensation of coldness, followed by numbness. There may be tingling, stinging, or cramping. Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager and the field supervisor.

4. Requirements

A. Carefully plan work anticipated to be performed in cool or cold conditions. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

B. Monitor weather forecasts immediately prior to entering the field.

C. Observe and monitor weather conditions such as ambient temperature, wind speed, and precipitation while in the field. Use Attachment 59-2 to determine wind chill.

D. Wear at least 3 layers of clothing.

- An outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
- A middle layer of down, wool, or similar materials to provide insulation
- An inner layer of cotton or synthetic weave to allow ventilation

In addition:

- Wear a hat. Up to 40% of body heat can be lost when the head is left exposed.
- Wear insulated boots or other insulated footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- Do not wear tight clothing. Loose clothing allows better ventilation.

E. Use the following work practices:

- Use Attachment 59-3 to establish work/rest cycles in cold weather.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold

weather.

- Avoiding caffeine and alcohol. Alcohol will accelerate loss of body heat.
- Eat high calorie snacks to help maintain body metabolism.
- If possible, heavy work should be scheduled during the warmer parts of the day. Take breaks out of the cold.
- Work in pairs to keep an eye on each other and watch for signs of cold stress.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- Avoid exhaustion.

F. When possible, use the following engineering controls:

- Provide shelter to escape cold, wind and precipitation
- Provide a source of heat (such as warm packs or portable heaters)
- Use insulating materials on equipment handles when temperatures drop below 30°F or -1°C.

G. Watch for symptoms and signs of hypothermia (see Attachment 59-1).

H. Treat cold stress illness as follows:

- Hypothermia: Prompt treatment of hypothermia is essential. Once the body temperature drops below 95°F or 35°C, the loss of temperature control occurs, and the body can no longer rewarm itself. Initial treatment includes reducing heat loss by moving the individual out of the wind and cold, removal of wet clothing, applying external heat (such as a pre-warmed sleeping bag, electric blanket, or body-heat from other workers) and follow-up medical attention.
- Frost Bite: The initial treatment for frostbite includes bringing the individual to a warm location, removal of clothing in the affected area, and, **if help is delayed**, placing the affected parts in warm (100° to104° F or 38° to 40°C) water. Do not massage or rub the frostbite area. After

the initial treatment, wrap the affected area loosely in sterile gauze and seek medical attention.

For further discussion on Cold Stress treatment, please refer to Attachment 59-1

I. Hypothermia in Water:

Loss of body heat to the water is a major cause of deaths in boating accidents. Often the cause of death is listed as drowning; however the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around two to three degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE	EXHAUSTION	SURVIVAL TIME
32.5° F (0°C)	Under 15 min.	Under 15 to 45 min.
32.5 to 40°F (0 – 4°C)	15 to 30 min.	30 to 90 min.
40 to 50°F (4 – 10°C)	30 to 60 min.	1 to 3 hrs.
50 to 60°F (10 – 16°C)	1 to 2 hrs.	1 to 6 hrs.
60 to 70°F (16 – 21°C)	2 to 7 hrs.	2 to 40 hrs.
60 to 70°F (16 – 21°C)	3 to 12 hrs.	3 hrs. to indefinite
Over 80°F (27°C)	Indefinite	Indefinite

SOME POINTS TO REMEMBER:

- Wear your PFD. Review SMS 053 - Marine Safety and Boat Operations.
- If water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading) or if significant potential to fall in water.
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep your head out of the water. This will increase your survival time.

- Keep a positive attitude about your rescue. This will increase your chances of survival.
- If there is more than one person in the water, huddling is recommended.

J. Training

Workers at risk of developing hypothermia or cold-related injury will be trained in:

- recognition of the signs and symptoms of cold injury or impending hypothermia,
- proper re-warming procedures and appropriate first aid treatment,
- proper use of clothing,
- proper eating and drinking practices
- safe work practices appropriate to the work that is to be performed.

5. Documentation Summary

File these records in the Project Safety File.

A. Completed Project Hazard Analysis form (see Health and Safety Website – "Hazard Analysis")

B. Cold stress training records

6. Resources

A. OSHA Fact Sheets – "Protecting Workers in Cold Environments" http://www.osha-slc.gov/OshDoc/Fact_data/FSNO98-55.html

B. Attachment 59-1 "Signs of, and Treatment for, Cold Stress related Illnesses"

C. Attachment 59-2(a) "Wind Chill Index" (units in °F and miles/hour)

D. Attachment 59-2(b) "Wind Chill Index" (units in °C and Kilometers/hour)

E. Attachment 59-3 "TLVs Work/Warm-up Schedule for Outside Workers based on a Four-hour Shift"

Attachment 59-1
Signs of and Treatment for Cold Stress Related Illnesses

Condition	Signs/Symptoms	Treatment
Hypothermia **Mild** (98° - 90° F) (36° - 32°C)	• shivering • lack of coordination • stumbling, fumbling hands • slurred speech • memory loss • pale, cold skin	• move to warm area • stay active • remove wet clothes and replace with dry clothes or blankets • cover the head • drink warm (not hot) sugary drink
Hypothermia **Moderate** (90° - 86° F) (32° - 30°C)	• shivering stops • unable to walk or stand • confused and irrational	• All of the above, plus • Call for an ambulance • Cover all extremities completely • Place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest and groin
Hypothermia **Severe** (86° - 78° F) (30° - 26°C)	• severe muscle stiffness • very sleepy or unconscious • ice cold skin • death	• Call for an ambulance • Treat the victim very gently • Do not attempt to re-warm -- the victim should receive treatment in a hospital
Frostbite	• Cold, tingling, stinging or aching feeling in frostbitten area; numbness • Skin color turns red, then purple, then white or very pale skin, cold to the touch • Blisters in severe cases	• Seek medical attention • Do not rub the area • Wrap in soft cloth • If help is delayed, immerse in warm, not hot, water
Trench Foot	• Tingling, itching or burning sensation • Blisters	• Soak feet in warm water, then wrap with dry cloth bandages • Drink a warm, sugary drink

Source: Princeton University, Department of Environmental Health and Safety, posted 2/2/99.

Attachment 59-2(a)
Wind-Chill Index[1]
(miles per hour and °F.)

	ACTUAL THERMOMETER READING (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
Wind speed in mph	EQUIVALENT TEMPERATURE (°F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Over 40 mph (little added effect)	Little Danger (for properly clothed person)				Increasing Danger (Danger from freezing of exposed flesh)				Great Danger	

[1] Source: Fundamentals of Industrial Hygiene, Third Edition. Plog, B.A., Benjamin, G.S., Kerwin, M.A., National Safety Council, 1988

Attachment 59-2(b)
Wind-chill Index[1]
(Kilometers per hour and °C.)

Estimated wind speed	Actual temperature reading (°C)												
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
(in km/h)	Equivalent chill temperature (°C)												
0 (Calm)	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
8	9	3	-2	-7	-12	-18	-23	-28	-33	-38	-44	-49	-54
16	4	-2	-7	-14	-20	-27	-33	-38	-45	-50	-57	-63	-69
24	2	[illegible]	-11	-18	-25	-32	-38	-45	-52	-58	-65	[illegible]	-78
32	0	[illegible]	-14	-21	-28	-35	-42	-50	-56	-64	[illegible]	[illegible]	[illegible]
40	-1	[illegible]	-16	[illegible]	-31	-38	-46	-53	-60	-67	[illegible]	[illegible]	-90
48	-2	-10	-17	-25	-33	-40	-48	-55	-63	-70	[illegible]	[illegible]	-94
56	-3	-11	-18	-26	-34	-42	-50	-58	[illegible]	[illegible]	[illegible]	-89	-96
64	-3	-11	-19	-27	-35	-43	-51	-59	-66	-74	-82	-90	-98
(Wind speeds greater than 64 km/h have little additional effect.)	LOW HAZARD Risk of exposed dry skin being affected in less than one hour. Awareness of hazard low.				INCREASING HAZARD Danger from freezing of exposed flesh within one minute.			HIGH HAZARD Flesh may freeze within 30 seconds.					

The table was originally developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA, and is adapted from the 1995-1996 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, published by the ACGIH. The ACGIH publication provides the equivalent table with temperature in degrees Fahrenheit and wind speed in mph.

Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (96.8°F).

URS SAFETY MANAGEMENT STANDARD
Cold Stress

Attachment-59-3

TLVs Work/Warm-up Schedule for Outside Workers based on a Four-hour Shift*

The ACGIH has adopted the guidelines developed by the Saskatchewan Labour for working outdoors in cold weather conditions. These guidelines recommend protective clothing and limits on exposure time. The recommended exposure times are based on the wind chill factor, a scale based on air temperature and wind speed. The work-break schedule applies to any four-hour period with moderate or heavy activity. The warm-up break periods are of 10-minute duration in a warm location. The schedule assumes that "normal breaks" are taken once every two hours. At the end of a 4-hour period, an extended break (e.g. lunch break) in a warm location is recommended. More information is available in the ACGIH publications "2000 TLVs and BEIs" and "Documentation of TLVs and BEIs" and on the Saskatchewan Labour web page "Cold Conditions Guidelines for Outside Workers".

<table>
<tr><td colspan="12"></td></tr>
<tr><td colspan="2">Air Temperature - Sunny Sky</td><td colspan="2">No Noticeable Wind</td><td colspan="2">5 mph Wind</td><td colspan="2">10 mph Wind</td><td colspan="2">15 mph Wind</td><td colspan="2">20 mph Wind</td></tr>
<tr><td>°C (approx.)</td><td>°F (approx.)</td><td>Max. work Period</td><td>No. of Breaks* *</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td><td>Max. Work Period</td><td>No. of Breaks</td></tr>
<tr><td>-26° to -28°</td><td>-15° to -19°</td><td colspan="2">(Norm breaks) 1</td><td colspan="2">(Norm breaks) 1</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td></tr>
<tr><td>-29°to -31°</td><td>-20°to -24°</td><td colspan="2">(Norm breaks) 1</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td></tr>
<tr><td>-32° to -34°</td><td>-25°to -29°</td><td>75 min.</td><td>2</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td rowspan="5" colspan="2">Non-emergency work should cease</td></tr>
<tr><td>-35° to -37°</td><td>-30° to -34°</td><td>55 min.</td><td>3</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td rowspan="4" colspan="2">Non-emergency work should cease</td></tr>
<tr><td>-38° to -39°</td><td>-35° to -39°</td><td>40 min.</td><td>4</td><td>30 min.</td><td>5</td><td rowspan="3" colspan="2">Non-emergency work should cease</td></tr>
<tr><td>-40° to -42°</td><td>-40°to -44°</td><td>30 min.</td><td>5</td><td rowspan="2" colspan="2">Non-emergency work should cease</td></tr>
<tr><td>-43° & below</td><td>-45° & below</td><td colspan="2">Non-emergency work should cease</td></tr>
</table>

*2000 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati : American Conference of Governmental Industrial Hygienists (ACGIH), 2000 - page 176. Adopted from Saskatchewan Labour "Cold Conditions Guidelines for Outside Workers"

URS SAFETY MANAGEMENT STANDARD
Drilling Safety Guidelines

1. Applicability

This program applies to URS projects in which truck-mounted, or other engine powered, drill rigs are used. It is applicable to URS employees and URS owned rigs. For drill rigs operated by contractors, the primary responsibility for drilling safety is with the drilling contractor.

2. Purpose and Scope

The purpose of these guidelines is to provide an overview for working safely around drilling operations with truck-mounted and other engine-powered drill rigs. The procedure addresses off-road movement of drill rigs, overhead and buried utilities, use of augers, rotary and core drilling, and other drilling operations and activities.

3. Implementation

Field Activities — Drill rig safety and maintenance is the responsibility of the drill rig operator. URS employees are responsible for their own safety including recognizing and avoiding drill rig hazards. URS employees that observe a drill rig condition believed to be unsafe shall advise the drill rig operator of the unsafe condition.

4. Safety Guidelines

A. General Guidelines

URS technicians, geologists, engineers, or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements

Set up any sample tables and general work areas for the URS field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig.

URS engineers, technician, and geologists shall not assist the drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

B. Movement of Drill Rigs

Before moving a rig, the operator must do the following:

To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.

Check the brakes of the truck/carrier, especially if the terrain along the route of travel is rough or sloped.

Discharge all passengers before moving on rough or steep terrain.

Engage the front axle (on 4x4, 6x6, etc. vehicles) before traversing rough or steep terrain.

Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility must be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

Logs, ditches, road curbs, and other long and horizontal obstacles should be normally approached and driven over squarely, not at an angle.

When close lateral or overhead clearance is encountered, the driver of the rig should be guided by another person on the ground.

Loads on the drill rig and truck must be properly stored while the truck is moving, and the mast must be in the fully lowered position.

After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle should be blocked and other means of preventing the rig from moving or topping over employed.

C. Buried and Overhead Utilities

The location of overhead and buried utility lines must be determined before drilling begins, and the locations should be noted on boring plans and/or assignment sheets.

When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at least 20 feet (7 meters) or other distance as required by local ordinances, whichever is greater. The drill rig operator or assistant should walk completely around the rig to make sure that proper distance exists.

When the drill rig is positioned near an overhead line, the rig operator should be aware that hoist lines and power lines can be moved towards each other by wind. When necessary and approved by the Project

Manager (PM), the utility and/or power lines may be shielded, shut down, or moved by the appropriate personnel.

For additional information, please refer to SMS #34 "Utility Clearances and Isolation".

D. Clearing the Work Area

Before a drill rig is positioned to drill, the area on which the rig is to be positioned should be cleared of removable obstacles and the rig should be leveled if sloped. The cleared/leveled area should be large enough to accommodate the rig and supplies.

E. Safe Use of Augers

Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting the augers or rods over the top of another auger or rod in the ground or other hard surfaces, such as the drill rig platform.

Never allow feet to get under the auger or drill rod while they are being hoisted.

When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet.

Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

Do not wear loose clothing or jewelry while working near the drill rig. Long hair must be pulled back to avoid entanglement with moving parts.

Hearing protection is required when working near an operating drill rig.

F. Safe Use of Hand Tools

Regulations regarding hand tools should be observed in addition to the guidelines provided below:

Each tool should be used only to perform tasks for which it was originally designed.

Damaged tools should be repaired before use or discarded.

Safety goggles or glasses should be worn when using a hammer or chisel. Nearby co-workers and by-standers should be required to wear safety goggles or glasses also, or move away.

Tools should be kept cleaned and stored in an orderly manner when not in use.

G. Safe use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

Safety rules described in Title 29 Code of Federal Regulations (CFR) 1926.552 and guidelines contained in the Wire Rope User's Manual published by the American Iron and Steel Institute shall be used whenever wire line hoists, wire rope, or hoisting hardware are used. The driller should provide written reports (upon request) documenting inspections of equipment.

H. Traffic Safety

Drilling in streets, parking lots or other areas of vehicular traffic requires definition of the work zones with cones, warning tape, etc. and compliance with local police requirements.

I. Fire Safety

Fire extinguishers (type ABC) shall be kept on or near drill rigs for fighting small fires.

If methane or other flammable gases or vapors are suspected in the area, a combustible gas indicator (CGI) shall be used to monitor the air near the borehole with all work to stop at 20 percent of the Lower Explosive Limit (LEL).

Work shall stop during lightning storms.

J. Protective Gear

1. Minimum Protective Gear

Items listed below should be worn by all staff working within 30 feet (10 meters) of drilling activities.

Hearing Protection;

Hard Hat;

Eye Protection (safety glasses, goggles, or face-shield)

Safety Shoes (shoes or boots with steel toes)

2. **Other Gear**

Items listed below should be worn when conditions warrant their use. Some of the conditions are listed after each item.

Safety Harnesses and Lifelines: Safety harnesses and lifelines shall be worn by all persons working on top of an elevated derrick beam or mast. The lifeline should be secured at a position that will allow a person to fall no more than six feet (2 meters). OSHA Fall Protection (1926 Subpart M) requirements apply.

Life Vests: Use for work over water.

5. Resources

A. International Association of Drilling Contractors Safety Alerts http://iadc.org/alerts.htm

B. Fall Protection - SMS 040

C. Hearing Conservation - SMS 026

D. Subcontractor Health and Safety Requirements - SMS - 046

E. Utility Clearances and Isolation - SMS 034

URS SAFETY MANAGEMENT STANDARD
Electrical Safety

1. Applicability

This program applies to URS field operations in North American where electricity is used, electrical systems are installed or maintained, or where live electrical circuits are accessed. For work around overhead or underground utilities, see SMS 34, "Utility Clearances".

2. Purpose and Scope

This procedure describes requirements for working on electrical circuits with voltage greater than 50 volts. The primary hazards related to electricity are shock; burns; arc-blast; fire and explosions. This procedure is intended to reduce worker risk to electrical hazards.

3. Implementation

Office Locations - Implementation of this program is the responsibility of the Office Manager.

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Any work performed on live electrical systems must be done by a licensed or journeyman electrician.

B. Follow established lockout/tagout procedures. Refer to SMS 23, "Lockout and Tagout Safety".

1. Consider all electrical systems as hot until verified de-energized and grounded.

2. Do not work on or in close proximity to electrical circuits unless the circuit is de-energized, grounded or guarded.

C. Hazardous Locations

Determine if electric equipment and wiring will be installed in locations that are classified depending on:

1. The properties of flammable vapors, liquids or gases, or combustible dusts or fibers that may be present; as well as the likelihood that a flammable or combustible concentration or quantity

is present. (Refer to Attachment 12-1 for definitions of Hazardous Locations)

2. Consult Resources A, B, E, and F for information on working in classified locations.

D. Ground Fault Circuit Interrupters and Grounding

1. Ground Fault Circuit Interruptors

   a. Provide approved ground-fault circuit interrupters for all 120-volt, single phase, 15- and 20-ampere receptacle outlets on construction sites.

   b. Provide ground-fault circuit interrupters for all 120-volt, single phase, 15-and 20-ampere receptacle outlets within garages, bathrooms, kitchens and shops.

2. Grounding/Earthing

   Effectively ground all wiring, electrical circuits, and equipment, except portable tools & appliances protected by an UL-approved system of double insulation. Examples of equipment requiring grounding include:

   a. Portable and vehicle or trailer mounted generators.

   b. Electrically powered arc welders.

   c. Switches.

   d. Motor controller cases.

   e. Fuse boxes.

   f. Distribution cabinets.

   g. Frames.

   h. Non-current-carrying rails used for travel and motors of electrically operated cranes.

   i. Electric elevators.

j. Metal frames of non-electric elevators to which electric conductors are attached.

E. Circuits

1. Require that there are no missing blanks.

2. Close doors to circuit and fuse boxes when not in use.

3. Label every circuit located on a circuit breaker/fuse box and/or motor control center (MCC).

F. Temporary Wiring, Electrical Tools and Extension Cords

1. Require that temporary wiring is installed and used in accordance with references. Specifically:

   a. Guard, bury or isolate by elevation temporary wiring to prevent accidental contact by workers and equipment.

   b. Require that vertical clearance above walkways is not less than 10 feet (3 metres) from circuits carrying 600 volts or less.

   c. Support all exposed temporary wiring on insulators.

   d. Protect temporary wiring from accidental damage.

   e. Guard live parts of wiring.

   f. Mark temporary power lines, switch boxes, receptacle boxes, metal cabinets and enclosures around equipment to indicate the maximum operating voltage.

2. Require that lighting strings are installed and used in accordance with Resources A and B. Specifically:

   a. Use nonconductive lamp sockets and connections permanently molded to the conductor insulation.

   b. Require that lighting strings have lamp guards.

   c. Replace all broken or defective bulbs promptly.

d. Protect all lights used for illumination from accidental contact or breakage.

e. Ground metal-case sockets.

3. Require that extension cords are installed and used in accordance with Resources A and B. Specifically:

a. Use only 3-wire grounded type extension cords, designated for hard service or extra hard service and listed by Underwriters Laboratories, Inc.

b. Check cords for damage before use.

c. Do not exceed the rated load.

d. Do not use spliced cords.

e. Destroy and discard worn or frayed cords.

f. Do not fasten extension cords with staples, hang them by nails or suspend them by wire.

g. Do not wrap cords or cables around any conductive materials.

4. Require that portable electric tools brought onto the site are in good condition. Before use on any shift, visually inspect portable cord and plug connected equipment for external defects and evidence of possible internal damage.

G. Report to supervision potential electrical hazards or unexpected occurrences while electrical renovation or construction occurs.

H. Keep accurate records of all pertinent work performed on a project.

1. Keep as-built designs updated.

2. Share information on modifications with contractors on site.

I. Isolation of live electrical components

Isolate all live, unprotected electrical components through the use of barricades, fencing or other means to protect employees from contact.

J. Briefing

1. Brief workers on electrical hazards at the beginning of the job. Utilize Attachment 12-2 as a guide for proper PPE as applicable.

2. Brief new workers entering the site.

3. Brief workers when electrical conditions change or when hazards exist.

K. Inspection

Inspect the job site periodically using Attachment 12-3 to evaluate compliance with this standard.

5. Documentation Summary

Project Safety Files

A. Licensed/journeyman electrician for project (as necessary).

B. Attachment 12-3, "Audits."

C. Documented communications between URS, contractors, licensed/journeyman electricians, or others.

6. Resources

A. U.S. OSHA Standard - General Industry Electrical Safety - 29 CFR 1910, Subpart S

B. U.S. OSHA Standard - Construction Electrical Safety - 29 CFR 1926, Subpart K

C. U.S. OSHA Standard - Design Safety Standards for Electrical Systems - 29 CFR 1910, Subpart S

D. U.S. OSHA Standard - The Control of Hazardous Energy (Lockout/Tagout) - 29 CFR 1910.147

E. Australian Standards SAA HB94-1997 - Electrical Safety in the Workplace

F. American National Standards Institute. ANSI C-2.1996 National Electrical Safety Code

G. National Fire Protection Association, National Electric Code, NFPA-70

The following documents are PDF files requiring the use of Adobe Acrobat reader.

H. Attachment 12-1 - Hazardous Locations

I. Attachment 12-2 - PPE, Tools and Equipment

J. Attachment 12-3 - Electrical Hazard Check Sheet

URS SAFETY MANAGEMENT STANDARD
Hand Tools and Portable Equipment

1. Applicability

This procedure applies to URS operations involving the use of hand tools and/or power equipment, including chain saws, brush cutters, powder-actuated tools, and similar high-hazard implements.

2. Purpose and Scope

The purpose of this standard is to provide guidelines for the safe use and handling of hand tools and power equipment.

3. Implementation

Office/Facility Locations - Implementation of this program is the responsibility of the Office Manager.

Field Locations - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. General

1. Keep hand and power tools in good repair and used only for the task for which they were designed.
2. Remove damaged or defective tools from service.
3. Keep surfaces and handles clean and free of excess oil to prevent slipping.
4. Do not carry sharp tools in pockets.
5. Clean tools and return to the toolbox or storage area upon completion of a job.
6. Wrenches must have a good bite before pressure is applied.
    a. Brace yourself by placing your body in the proper position so that in case the tool slips you will not fall.
    b. Make sure hands and fingers have sufficient clearance in the event the tool slips.

c. Always pull on a wrench, never push.

7. When working with tools overhead, place tools in a holding receptacle or secure when not in use.

8. Do not throw tools from place to place, from person to person, or drop from heights.

9. Use non-sparking tools in atmospheres with fire or explosive characteristics.

10. Inspect all tools prior to start-up or use to identify any defects.

11. Powered hand tools should not be capable of being locked in the on position.

12. Require that all power fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.

13. Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn while working with power tools.

14. Do not use cheater pipes.

15. Make provisions to prevent machines from automatically restarting upon restoration of power.

B. Grinding Tools

1. Inspect work rests and tongue guards for grinders.

   a. Work rest gaps should not exceed 1/8 inch (3 mm).

   b. Tongue guards gap should not exceed ¼ inch (6 mm).

2. Do not adjust work or tool rests while the grinding wheel is moving.

3. Inspect the grinding wheel for cracks, chips or defects. Remove from service if any defects are found.

4. Wear goggles when grinding. A clear full face shield may be worn with the goggles.

5. Do not use the side of a grinding wheel unless the wheel is designed for side grinding.

6. Always stand to the side of the blade, never directly behind it.

7. Use grinding wheels only at their rated speed.

8. Grinding aluminum is prohibited.

9. For U.K. operations:

    a. No grinding wheels exceeding 55mm are to be used.

    b. All wheels are to be marked with their safe maximum speed.

    c. Abrasive wheels will only be operated by personnel who have been specifically trained and specified competent by URS.

    d. Abrasive wheels will only be operated by persons specified as competent, under the 'Abrasive Wheels" Regulations.

    e. Abrasive wheels must only be operated if the manufacturer's guard is fitted and they are in good working order.

C. Power Saws

1. Require that circular saws are fitted with blade guards.

2. Remove damaged, bent or cracked saw blades from service immediately.

3. Require that table saws are fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.

4. Require guards that cover the blade to the depth of the teeth on hand held circular saws. The guard should freely return to the fully closed position when withdrawn from the work surface.

D. Wood Working Machinery

1. Do not use compressed air to remove dust, chips and from wood working machinery.

2. Locate the on-off switch to prevent accidental start up. The operator must be able to shut off the machine without leaving the work station.

3. Guard planers and joiners to prevent contact with the blades.

4. Use a push stick when:

    a. The cutting operation requires the hands of the operator to come close to the blade.

    b. Small pieces are being machined.

5. Adjust saw blades so they only clear the top of the cut.

6. Automatic feed devices should be used whenever feasible.

E. Pneumatic Tools and Equipment

1. Require that pneumatic tools have:

    a. Tool retainers to prevent the tool from being ejected from the barrel during use.

    b. Safety clip or tie wire to secure connections between tool/hose/compressor if they are of the quick connection (Chicago fittings) type.

2. Do not lay hose in walkways, on ladder or in any manner that presents a tripping hazard.

3. Never use compressed air to blow dirt from hands, face or clothing.

4. Compressed air exhausted through a chip guarded nozzle shall be reduced to less than 30 psi. Proper respiratory, hand, eye and ear protection must be worn.

5. Never raise or lower a tool by the air hose.

F. Powder Actuated Fastener Tools

1. Use powder actuated tools that comply with the requirements of the American National Standards Institute (ANSI) standard A 10.3 - 1970.

2. Use only individuals that have been trained by a manufacturer's representative and possess the proper license to operate, repair, service and handle powder actuated tools.

3. Never use a powder actuated tool in a flammable or explosive atmosphere.

4. Require the use of goggles or a full face shield as well as safety glasses during operation of powder actuated tools.

5. Powder actuated tool must not be able to be fired unless the tool is pressed against the work surface.

6. The tool must not be able to fire if the tool is dropped when loaded.

7. Firing the tool should require two separate operations, with the firing movement being separate from the motion of bringing the tool to the firing position.

8. Never fire into soft substrate where there is potential for the fastener to penetrate and pass through, creating a flying projectile hazard.

9. Do not use powder actuated tools in reinforced concrete if there is the possibility of striking the re-bar.

10. Do not use on cast iron, glazed tile, surface hardened steel, glass block, live rock or face brick.

11. Never load and leave a powder actuated tool unattended. It should only be loaded prior to intended firing.

12. Test tools each day prior to loading by testing safety devices according to manufacturer's recommended procedure.

G. Chain Saws

1. Inspect the saw prior to each use and periodically during daily use.

2. Operate the chain saw with both hands at all times.

3. Never cut above chest height.

4. Require that the idle is correctly adjusted on the chain saw. The chain should not move when the saw is in the idle mode.

5. Start cutting only after a clear escape path has been made.

6. Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.

7. Require applicable protective gear. This may include, but is not limited to:

    a. Loggers safety hat.

    b. Safety glasses.

    c. Steel-toed boots.

    d. Protective leggings.

    e. Hearing protection.

8. Inspect saws to require that they are fitted with an inertia break and hand guard.

9. *Never* operate a chain saw when fatigued.

10. Do not allow others in the area when chain saws are operated.

11. Make sure there are no nails, wire or other imbedded material that can cause flying particles.

12. Do not operate a chain saw that is damaged, improperly adjusted, or is not completely and securely assembled. Always keep the teeth sharp and the chain tight. Worn chains should immediately be replaced.

13. Keep all parts of your body away from the saw chain when engine is running.

14. For U.K. operations, only personnel specifically trained and certified as competent by URS can operate chain saws.

H. Hand Operated Pressure Equipment

1. Pressure equipment such as grease guns, paint and garden sprayers shall be directed away from the body and other personnel in the area. The person operating any equipment such as this, which has a potential for eye injury, must wear protective goggles.

2. The noise produced when using certain types of pressure equipment may require the use of hearing protection.

3. Never allow the nozzle of a pressurized tool to come in contact with any body parts while operating. There is potential for injection of a chemical directly into the user's body, resulting in severe injury or death.

I. Gasoline Powered Tools

1. Never pour gasoline on hot surfaces.

2. Never fuel around open flame or while smoking.

3. Shut down the engine before fueling.

4. Provide adequate ventilation when using in enclosed spaces.

5. Use only OSHA approved safety cans to transport flammable liquids.

J. Inspection

Inspect all hand tools on a regular basis. Defective tools shall be immediately removed from service, tagged or destroyed to prevent further use.

5. Documentation Summary

Place in the Project Safety File:

A. Site briefings regarding tool use.

B. Records of tools removed from service.

C. Copies of powder actuated tool licenses (as applicable).

D. Tool inspection documentation.

6. Resources

A. U.S. OSHA Standard - Hand and Portable Power Tools - 29 CFR 1910, Subpart P

B. U.S. OSHA Standard - Construction Tools - Hand and Power - 29 CFR 1926, Subpart I

C. ANSI A10.3 – 1970

D. National Association of Demolition Contractors

E. U.K. - 'Abrasive Wheel' Regulations

F. U.K. - 'Wood-Working Machine' Regulations

G. U.K. - 'Provision and Use of Work Equipment' Regulations

H. Australian Standards Collection 26 - Occupational Health & Safety - Powered Machining and Tools

URS SAFETY MANAGEMENT STANDARD
Hazardous Waste Operations

1. Applicability

This standard applies to URS field operations involving the investigation or remediation of sites impacted with hazardous wastes or hazardous materials including those associated with underground storage tanks.

Investigation projects for real estate transactions conducted to confirm that a site is "clean" are not covered under this standard. Reference related Safety Management Standards for such operations.

2. Purpose and Scope

The purpose of this standard is to provide guidance designed to minimize hazardous chemical exposures to URS personnel while URS is conducting hazardous waste field operations.

Investigation techniques included under this standard include, but are not limited to, hand auger, soil gas evaluation, test pits, and all types of power drilling, including direct push. Remediation techniques included under this standard include, but are not limited to, excavation, groundwater treatment, soil gas treatment, containment, and landfarming and similar insitu methods.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager or Superintendent.

4. Requirements

A. Project Evaluation

Assess the technical and field aspects of every hazardous waste site project to evaluate:

1. Risk of exposure to hazardous chemicals, with particular attention to suspected or known human carcinogens.
2. Personal protective equipment requirements.
3. Air monitoring requirements.
4. Emergency services requirements.
5. Hazards addressed by other URS Safety Management Standards.

6. Logistical considerations, such as access, distance from population centers.

7. Other safety and health hazards associated with site operations.

B. Client/Contract Evaluation

1. Review contract documents to determine whether the client has any special internal or regulatory requirements for hazardous waste site operations.

2. Implement client requirements in addition to those of this standard. Those requirements that are the most protective (e.g., most stringent) will be used.

C. Site-specific Health and Safety Plan

1. Prepare a site-specific Health and Safety Plan (HSP) for every project under this standard.

2. HSPs must be written or reviewed by a URS Health and Safety Regional Health and Safety Manager (RHSM) or a safety professional specifically approved by the RHSM.

3. Evaluate client and agency requirements prior to preparing the HSP, particularly if the client or an agency will approve the HSP prior to implementation.

D. Training

Verify that each assigned URS employee has completed required training. In general, the following are required for operations within North America:

1. 40-hours of initial training from an approved training provider.

2. 3-days of on-the-job training.

3. 8-hours of refresher training completed within 12 months of the initial or subsequent refresher training.

4. 8-hours of Site Safety Officer (Supervisor) training for directing the activities of any other URS employee.

5. Additional training for the Site Safety Officer as described below.

E. Site Safety Officer

1. Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project.

2. Assure that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health.

3. Verify that the SSO has completed basic supervisor training, and has additional required training and experience as applicable:

   a. Advanced respiratory protection training is required for projects where supplied air respirators may be used.

   b. Heavy equipment/construction safety.

   c. Personal air monitoring.

F. Exposure Monitoring

Require that exposure monitoring is conducted in accordance with the HSP on all hazardous waste projects.

G. Project Equipment

1. Provide all health and safety equipment as described by the project Health and Safety Plan.

2. Provide all personal protective equipment as described by the project Health and Safety Plan.

H. Medical Surveillance

Verify that each URS employee assigned to the project meets the minimum requirements of the URS Medical Surveillance Program. This typically includes:

1. Baseline examination.

2. Annual examination.

3. Appropriate clearance for respirator use.

5. Documentation Summary

In the Project Safety File:

A. Completed Health and Safety Plan.

B. Completed and signed HSP approval form.

C. Signed HSP acceptance form.

D. Completed H&S field forms that are included in each HSP.

E. Training and Medical Surveillance Clearance documentation for project personnel.

6. Resources

A. U.S. OSHA Technical Links - Hazardous Waste Operations

The following documents are PDF files which must be read with Adobe Reader:

B. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities - NIOSH 85-115

C. USACE EM 385-1-1 - Hazardous, Toxic and Radioactive Waste

URS SAFETY MANAGEMENT STANDARD
Heat Stress

1. Applicability

This procedure applies to URS field projects where ambient (not adjusted) temperatures exceed 70°F (21°C) for personnel wearing chemical protective clothing, including Tyvek coveralls, and 90°F (32°C) for personnel wearing normal work clothes.

2. Purpose and Scope

The purpose of this procedure is to protect project personnel from the effects of heat related illnesses.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Monitor ambient temperatures and conduct Heat Stress Monitoring when threshold temperatures (see Section 1) are reached.

B. Conduct initial monitoring to determine first rest break.

1. Measure the air temperature with a standard thermometer with the bulb shielded from radiant heat; this yields T (actual).

2. Estimate the fraction of sunshine by judging what percent time the sun is not shielded by clouds that are thick enough to produce a shadow. 100 percent sunshine - no cloud cover = 1.0; 50 percent sunshine - 50 percent cloud cover = 0.5; 0 percent sunshine - full cloud cover = 0.0.

3. Plug these variables into the following equation to determine the adjusted temperature:

   T (adjusted) = T (actual) + (13 x fraction sunshine)

4. Use Attachment 18-1 to determine the length of the first work shift. At the first break, initiate the heart rate monitoring or body temperature monitoring as described below.

C. Body Temperature Monitoring

1. Monitor oral body temperature to determine if employees are adequately dissipating heat buildup. Ear probe thermometers which are adjusted to oral temperature are convenient and the preferred method of measurement. Determine work/rest regimen as follows:

    a. Measure (oral adjusted) temperature at the end of the work period.

    b. If temperature exceeds 99.6 °F (37.5°C)., shorten the following work period by 1/3 without changing the rest period.

    c. If temperature still exceeds 99.6 °F (37.5°C), shorten the following work period by 1/3.

    d. Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6 °F (38.1°C).

2. Oral temperatures are to be obtained prior to the employee drinking water or other fluids.

D. Record monitoring results on Heat Stress Monitoring Form (Attachment 18-2).

E. Investigate the use of auxiliary cooling devices in extreme heat conditions.

F. Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring. Review the information provided in Attachment 18-3.

G. Provide water and electrolyte replacement drinks fluids as described in Attachment 18-3.

H. Allow employees who are not accustomed to working in hot environments appropriate time for acclimatization (see Attachment 18-3).

I. Provide break areas as described in Attachment 18-3.

5. Documentation Summary

File these records in the Project Safety File.

A. Heat Stress Monitoring Forms.

B. Employee Safety Briefing Verification Forms.

6. Resources

A. NIOSH - "Working in Hot Environments"

B. AFL-CIO Building Trades Division - "Heat Stress in Construction"

C. Attachment 18-1 - Initial Work Monitoring Cycles

D. Attachment 18-2 - Heat Stress Monitoring Record

E. Attachment 18-3 -Informational Supplement

URS Corporation

URS Corporation Health and Safety Program

INITIAL WORK/MONITORING CYCLES

ADJUSTED TEMPERATURE	NORMAL WORK CLOTHES	PROTECTIVE CLOTHING
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

URS Corporation

URS Corporation Health & Safety Program
EMPLOYEE HEAT STRESS EXPOSURE MONITORING RECORD

DATE: ____________________ SAFETY REPRESENTATIVE: ____

WORKER'S NAME: __________________________________ SUBCONTRACTOR: ______________________

WORK ACTIVITY: ____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

DATE: ____________________ SAFETY REPRESENTATIVE: ____

WORKER'S NAME: __________________________________ SUBCONTRACTOR: ______________________

WORK ACTIVITY: ____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

DATE: ____________________ SAFETY REPRESENTATIVE: ____

WORKER'S NAME: __________________________________ SUBCONTRACTOR: ______________________

WORK ACTIVITY: ____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

URS Corporation

HEAT STRESS INFORMATIONAL SUPPLEMENT

SIGNS, SYMPTOMS AND FIRST AID

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by unevaporated sweat. The papules may become infected unless treated.

First Aid for Heat Rash - to prevent heat rash: shower after work, dry off thoroughly, and put on clean, dry underwear and clothes. Try to stay in a cool place after work. If, in spite of this, you develop heat rash, see your physician.

Heat Cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- Muscle spasms.
- Pain in the hands, feet and abdomen.

First Aid for Heat Cramps - leave the work area, and rest in a cool, shaded place. Drink one or two glasses of electrolyte replacement drink, and try to gently massage the cramped muscle. Once the spasms disappear, you may return to work; taking adequate breaks and drinking electrolyte replacement drink should prevent the cramps from returning.

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circu'ation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin.
- Heavy sweating.
- Dizziness.
- Nausea.
- Fainting.

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated. It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

First Aid for Heat Exhaustion - leave the work area immediately, go through decon and remove all chemical protective clothing. Rest in a cool, shaded place and open your clothing to allow air circulation; lay flat except when taking fluids. Drink plenty of cooled electrolyte replacement drinks. Your work is over for the day; do not attempt to return. Medical assistance in severe cases may be warranted.

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot, usually dry skin.
- Lack of or reduced perspiration (lack of perspiration may be masked for those wearing chemical protective clothing since perspiration from earlier in the day will be present).
- Nausea.
- Dizziness and confusion
- Strong, rapid pulse.
- Coma.

First Aid for Heat Stroke - **THIS IS A MEDICAL EMERGENCY! SUMMON MEDICAL ASSISTANCE IMMEDIATELY!** Remove the victim from the work area, perform a gross decon, and remove all PPE. Have the victim lie down in a cool, shady area. Attempt to bring the victim's temperature down by increasing air movement (electric fan) or placing wetted sheets or towels on them. Place an ice bag on the victim's head. The victim must not be sent home or left unattended without a physician's specific order.

HEAT STRESS PREVENTION

The best approach to avoiding heat-related illnesses is through preventative heat stress management. The site manager and site safety officer are responsible for implementing this program.

Rest areas - a relatively cool, shaded area must be provided for breaks when ambient temperatures exceed 70°F and workers are wearing chemical protective clothing (including uncoated Tyvek), or if temperatures exceed 90°F and workers are wearing "Level D" coveralls or work clothes. A car or van is an oven, not a rest area. For Hazardous Waste Sites, the rest area should be *located in the support zone adjacent to the contamination reduction zone*, situated so that part of it is in the decon area so workers can take breaks without going through full decon. If shade is not available, build some: use a plastic "dining canopy", which can be obtained at sporting goods stores. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.

Liquids - encourage employees to drink plenty of cool plain water and electrolyte replacement drinks. Supplementing water with cool electrolyte replacement drinks, such as Gatorade, Squench or Quik-kick (drink) is helpful to employees who tend to sweat a lot. Do not use "community cups"; use paper cups. Have workers drink 16 ounces of drink before beginning work, such as in the morning and after lunch. At each break, workers should take 8-16 ounces of drink. Don't wait until you are thirsty to drink.

Discourage the use of alcohol during non-working hours, and discourage the intake of coffee during work hours, as these make heat stress control more difficult.

Acclimatization - this is the process by which your body "gets used to" hot work environments. This is achieved by slowly increasing workloads. Start at 50 percent capacity on day one, and increase by 10 percent per day; on day six, you'll be at 100 percent. You don't lose acclimatization over a weekend, but it'll start to decrease after three to four days. If you don't do hot work for a week, it is gone. You don't have to do full shift hot work to achieve or retain acclimatization; a minimum of 100 minutes of continuous hot work exposure per day is adequate.

Auxiliary Cooling - auxiliary cooling is usually obtained by providing workers with a specially-designed vest, which is worn under the protective clothing, but over any underclothing. These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.

The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.

The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.

Auxiliary cooling should be considered when the following conditions exist:

- Ambient temperature over 80°F
- Workers wearing impermeable garments (PE Tyvek, Saranex, Chemrel, etc.)
- It is desirable to have long work shifts with minimum interruption

URS SAFETY MANAGEMENT STANDARD
Heavy Equipment Operations

1. Applicability

This procedure applies to URS field projects where heavy equipment is in operation.

2. Purpose and Scope

The purpose of this procedure is to require that heavy equipment is operated in a safe manner, that the equipment is properly maintained and that ground personnel are protected.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Authorized Operators

1. Evaluate operators through documentable experience (resume) and a practical evaluation of skills.
2. Allow only qualified operators to operate equipment.
3. Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.
4. Maintain a list of operators for the project and the specific equipment that they are authorized to operate.
5. Require operators to use seat belts at all times in all equipment and trucks.
6. Operators shall maintain three points of contact whenever entering and exiting a piece of equipment.
7. Brief operators on the following rules of operation:
    a. Operators are in control of their work area.
    b. Equipment will be operated in a safe manner and within the constraints of the manufacturer's Operation Manual.

c. Operators will stop work whenever unauthorized ground personnel or equipment enter their work area and only resume work when the area has been cleared.

B. Ground Personnel

1. Require that ground personnel on the site have received training and comply with the following rules of engagement:

   a. All ground personnel must wear orange protective vests when in work areas with any operating equipment.

   b. Ground personnel will stay outside of the swing zone or work area of any operating equipment.

   c. Ground personnel may only enter the swing or work area of any operating equipment when:

      1. They have attracted the operator's attention and made eye contact.

      2. The operator has idled the equipment down and grounded all extensions.

      3. The operator gives the ground personnel permission to approach.

   d. Ground personnel shall never walk or position themselves between any fixed object and running equipment or between two running pieces of equipment.

C. Equipment

1. Maintain operations manuals at the site for each piece of equipment that is present on the site and in use.

2. Require that operators are familiar with the manual for the equipment and operate the equipment within the parameters of the manual.

3. Require that all equipment is provided with roll-over protection systems (ROPS). Tracked excavators are exempt from ROPS requirements but must have a cab which provides protection from overhead hazards

4. Verify that seatbelts are present and functional in all equipment.

5. Prohibit the use of equipment which has cab glass which is cracked, broken or missing.

6. Require that backup alarms are functional on all trucks and equipment. Tracked excavators must have bidirectional alarms or the operator must be provided with a spotter whenever tracking in either direction.

7. Require all extensions such as buckets, blades, forks, etc. to be grounded when not in use.

8. Require brakes to be set and wheels chocked (when applicable) when not in use.

D. Inspection and Maintenance

1. Require daily inspections of equipment by operators using Attachment 19-1.

2. Prohibit use of equipment deemed to be unsafe as a result of daily inspection until required repairs or maintenance occur.

3. Conduct maintenance as prescribed by the manufacturer in the Operations Manuals for each piece of equipment.

4. During maintenance/repair, require that:

a. Motors are turned off.

b. All extensions are grounded or securely blocked.

c. Controls are in a neutral position.

d. Brakes are set.

5. Documentation Summary

File the following documents in the Project Health and Safety File.

A. List of authorized operators.

B. Operator qualifications.

C. Daily Equipment Inspection Logs.

D. Site Briefing documentation for operator rules and ground personnel "rules of engagement".

6. Resources

A. U.S. OSHA Standard - Motorized Vehicles and Mechanized Equipment - 29 CFR 1926, Subpart O

B. National Association of Demolition Contractors – Safety Manual

C. Queensland Workplace Health and Safety - Competency Standard for Users & Operators of Industrial Equipment

D. Attachment 19-1 - Equipment Inspection Form

URS	Health and Safety Program DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST	Attachment 19-1 Revised: March 2002

Equipment Id No. _____ Inspector's Name _____

Equipment Name _____ Employee No. _____

Beg. Hours _____ End Hours _____ Date _____

INSTRUCTIONS: Each shift shall inspect all applicable items indicated. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS
Falling Object Protective Structure (FOP)		
Roll-Over Protection Structure (ROP)		
Seat Belts		
Operator Seat Bar(s)		
Side Shields, Screens or Cab		
Lift Arm Device		
Grab Handles		
Back-up Alarm – Working		
Lights		
Guards		
Horn		
Windshield Wipers		
Glass, Mirrors		
Anti-Skid Tread Clear of Mud		
Safety Signs (i.e., counterbalance swing area)		
Fire Extinguisher		
General Condition		
Fuel Connection		
Oil (fuel and no leaks)		
Clear of Extra Materials		
Controls Function Properly		
Damaged Parts		
Hydraulic System (full and no leaks)		
Parking Brake		
Lift Arm and Bucket		
Tires/Tracks		
Steering		
Breathing Air System		
Blast Shields		
Gallons of Fuel Added		
Quarts of Oil Added		

Operator Signature _____

URS SAFETY MANAGEMENT STANDARD
Medical Screening & Surveillance

1. Applicability

This program applies to employees assigned to work environments where there is a potential for exposure to chemical, biological, and/or physical hazards. Individuals will be selected for medical screening based on regulatory standards, project health and safety plan assessments, the expected use of personal protective equipment, and client contract requirements.

2. Purpose and Scope

The overall goal of this program is to prevent occupational illness and injury by early identification of exposure-related health effects before they result in disease. Medical examinations will be performed in order to determine if employees are capable of safely performing assigned tasks, to verify protective equipment and controls are effectively providing protection, and to comply with governmental regulations. Included are provisions for emergency medical consultation and treatment.

3. Implementation

Office/laboratory locations – Implementation is the responsibility of the Office Manager.

Field activities – Implementation is the responsibility of the Project Manager.

Program Administration – The Occupational Health Specialist (OHS) is responsible for development and administration of this program in coordination with the URS Medical Service Provider (MSP). The OHS will maintain current injury and illness data and participate with Corporate Health & Safety Managers in evaluation of this program. The MSP will provide board certified occupational medicine oversight for the program and will approve medical surveillance protocols.

The United States and Canada locations will follow all requirements of this program.

International locations will follow sections B.1,2,3,5,6,7,8; G.3; and H.1 of this program.

4. Requirements

A. Selection of program participants.

1. The Medical Surveillance Evaluation (MSE) form provides the primary guidance for determining whether medical screening is required for an employee and the frequency of periodic exams. The MSE is to be completed by the employee and their supervisor at time of hire for any employee who may work outside an office environment and is to be reviewed for accuracy at each annual performance review. Other reviews are required whenever there is a change in job tasks.

2. Additional site/project specific biological monitoring or toxicological screening may be required in addition to this program's core exam schedule. These medical tests will be specified by the project-specific health and safety plan and will be authorized by the MSP on the exam appointment protocol. Note: See section D.2 if employee will have an initial assignment at a HAZWOPER site.

B. Types of medical screening and surveillance exams

1. A baseline or preassignment baseline exam will be conducted prior to the start of work assignments requiring medical surveillance.

2. Periodic exam schedules are established by the MSP using the following criteria:

   a. Employees performing the following types of work will receive annual exams: construction activities in the exclusion zone of HAZWOPER sites, field work activities in the exclusion zone of HAZWOPER sites for 30 or more days per year, projects involving exposure to OSHA-regulated materials at or above established action levels.

   b. Employees performing the following types of work will receive biennial exams: field work activities at HAZWOPER sites less than 30 days per year; waste disposal activities; non-HAZWOPER environmental sampling; chemistry laboratory, pilot plant projects, or bench scale operations for 30 or more days per year.

3. Employees currently participating in an examination program will receive exit exams when they leave their work assignment as identified in the Exit Exam Determination. In the event an employee declines the exit exam, the employee will be requested to sign a Waiver of Exit Medical Surveillance Exam.

4. Department of Transportation (DOT) exams will be conducted biennially when an employee is assigned to drive a vehicle with a gross weight rating of more than 10,000 pounds or when driving a placarded vehicle of any size used to transport hazardous chemicals. DOT exam certification can be added to a routine baseline or periodic exam protocol when scheduling with the MSP.

5. When noise levels in the employee's work environment equal or exceed an 8-hour time-weighted average of 85 decibels as measured on the A-scale (dBA), annual audiograms will be performed. For employees involved in construction activities or management of construction, enrollment in this program will be required if more than 50% of their time is spent in an active construction area.

6. Individual radiation dose monitoring will be conducted as required by the site-specific health and safety plan with approval by a Radiation Safety Officer. Personal dosimetry (film badges) are typically required, however, depending on the specific radiation hazard, additional excretory monitoring or thyroid scans may be required.

7. In order to determine an employee's ability to wear a respirator, a medical evaluation will be performed before an employee is fit tested or assigned to wear a respirator.

8. Employees assigned to work environments with airborne concentrations of asbestos fibers at or above the established action level will receive asbestos-specific baseline and annual exams. Exit exams will be performed if an exam has not been performed within the past 6 month period or if an employee has medical complaints related to asbestos exposure.

C. Exam protocols

1. The Medical Screening & Surveillance Exam Protocol identifies the medical exam components of this program.

D. Scheduling of exams

1. The Office or Project Manager, usually with assistance of the local H&S Representative, is responsible for contacting the MSP when baseline, exit, and project specific exams are required. The MSP maintains an employee scheduling database for tracking periodic

exams and will contact the employee for scheduling the month their exam is due. These steps are detailed in the Medical Surveillance Exam Process.

2. Construction Services Division employees hired with an initial assignment to work at a OSHA HAZWOPER site whose work duties require passing a physical exam or who have an essential job function of wearing a respirator, will receive a job offer contingent upon passing a preassignment baseline exam. See HAZWOPER & Respirator Preassignment Baseline Exam Process. In the event of an urgent business necessity a temporary clearance to begin work the day of the exam, issued by the local physician and good for 14 days until the MSP physician final clearance is received, may be requested at the time a baseline exam is scheduled through the MSP.

3. If an exam becomes due during an employee's pregnancy, it is advised to defer the exam until after delivery and the employee returns to work from family/medical leave status.

E. Exam Follow Up

1. Following each exam, the MSP will issue a physician's written opinion (Health Status Medical Report) to the site Health & Safety Representative which will include any medical restrictions and address the employee's ability to use personal protective equipment. See Exam Follow Up Procedures.

2. The MSP will mail the exam invoice to the site H&SR who will approve the charge and forward the invoice to the accounts payable department for payment.

3. The MSP will mail an exam results letter that is confidentially addressed to the employee at their home address within 30 days of the exam date.

F. Emergency Medical Care

1. Preplanning is essential to a prompt and proper response to a medical emergency. Site specific emergency procedures will be provided in the site Health & Safety Plan. See Field First Aid Kit Supply List for recommended supplies. The contents of the first aid kit shall be checked prior to being sent out to each site/project and periodically thereafter to ensure the expended items are replaced.

2. A MSP occupational physician can be reached 24 hours a day for phone consultation at WorkCare™ 1-800-455-6155.

3. A workers' compensation claim should be filed by the Human Resource Representative with AIG Claim Services (1-877-366-8423) for an injured employee who receives professional medical care or who is disabled from working beyond the initial date of injury.

4. In order to comply with OSHA reporting regulations, immediately notify the OHS or a Division Health & Safety Manager if there is a work-related hospitalization or death.

G. Medical Records

1. Medical records are maintained and preserved in confidential, locked files in the custody of the MSP for at least the duration of employment plus 30 years. Only information regarding the employee's ability to perform the job assignment will be provided to company representatives.

2. Upon request, each employee (or designated representative) will have access to the employee's medical record. Prior to the release of health information to the employee (or designated representative), a specific written consent must be signed by the employee.

3. International records (excluding the United States and Canada) will be maintained in country at the local clinic.

H. Program evaluation

1. The OHS and Division Health & Safety Managers will evaluate this program annually and as needed. Issues to review include program efficacy and efficiency, employee satisfaction, and cost effectiveness.

2. The MSP will prepare an Annual Medical Trending Report specifying the number and types of exams performed and anonymous statistical exam results in group data format.

3. Each employee is mailed a Post-Exam Evaluation by the MSP. Employee feedback regarding the clinic, medical staff, and exam

procedures are reviewed and corrective actions are identified and acted upon as needed.

5. Documentation Summary

The H&SR will file the Medical Surveillance Evaluation and the Health Status Medical Report in the site health & safety records.

6. Resources

A. U.S. OSHA Technical Links - Medical Screening/Surveillance

B. U.S. OSHA Publication 3162 (1999) Screening and Surveillance: A Guide to OSHA Standards

C. Attachment 24-1 WorkCare Medical History Questionnaire

D. Attachment 24-2 Medical Surveillance Evaluation

E. Attachment 24-3 Medical Screening & Surveillance Exam Protocol

F. Attachment 24-4 Medical Surveillance Exam Process

G. Attachment 24-5 HAZWOPER/Respirator Preassignment Baseline Exam Process

H. Attachment 24-6 Exit Exam Determination

I. Attachment 24-7 Waiver of Exit Medical Surveillance Exam

J. Attachment 24-8 Exam Follow Up Procedures

K. Attachment 24-9 Field First Aid Kit Supply List

L. SMS 8 Asbestos Survey and Oversight Operations

M. SMS 17 Hazardous Waste Operations

N. SMS 42 Respiratory Protection

URS SAFETY MANAGEMENT STANDARD

Biological Hazards

1. Applicability

This program applies to job activities performed primarily in outdoor environments.

2. Purpose and Scope

The primary goal of this program is to eliminate or reduce illnesses and injuries transmitted by plants, insects, and animals. Although there are many animals and insects that are potentially harmful to humans (i.e. bees, spiders, bears, and rodents), this safety management standard focuses on four common biological hazards: ticks, poison plants, mosquitoes, and snakes.

3. Implementation

The Project Manager, with support from the URS H&S Regional Managers and Occupational Health Specialist, will be responsible for implementation of this program.

4. Requirements

A. Ticks

1. Precautionary Measures

Background information: Ticks do not jump, crawl, or fall onto a person. They are picked up when clothing or hair brushes a leaf or other object the tick is on. Ticks are generally found within three feet of the ground. Once picked up, they will crawl until they find a likely site to feed. Often they will find a spot at the back of the knee, near the hairline, behind the ears, or at pressure points where clothing presses against the skin (underwear elastic, belts, neckline). The best way to prevent tick borne diseases is not to be bitten by a tick. Ticks can carry a number of diseases including:

- Lyme Disease is an infection caused by the corkscrew-shaped bacteria *Borrelia burgdorferi* that is transmitted by the bite of deer tick (ixodes) and western black-legged ticks. The disease occurs in the forested areas of North America, Europe, and Asia. Symptoms which occur 3-30 days following a tick bite include: a spreading 'bulls-eye" rash, fever, fatigue, headache, and joint and muscle aches. Prompt treatment with antibiotics is essential in order to prevent more serious complications that may occur if left untreated.

- Rocky Mountain Spotted Fever is an infection caused by the bacteria *Rickettsia rickettsii*. The disease occurs in North, Central, and South America. Other Rickettsia organisms cause disease worldwide (Mediterranean, Japan, Africa, North Asia). Symptoms which occur 2-6 days following a tick bite include: fever, nausea, vomiting, diarrhea, rash, muscle and joint pain. The disease is treated with antibiotics.

- Babesiosis is caused by hemoprotozoan parasites of the genus *Babesia*. It is transmitted by the ixodid tick. The geographic distribution is worldwide. Symptoms include fever, chills, fatigue, muscle aches, and an enlarged spleen and liver. The disease is treated with anti-protozoan drugs.

- Ehrlichiosis is caused by several bacteria of the genus *Ehrlichiae*. The geographic distribution is global, primarily in temperate regions. Symptoms which occur 5-10 days following a tick bite include fever, headache, fatigue, muscle aches, nausea, vomiting, diarrhea, confusion, and occasionally a rash. The disease is treated with antibiotics.

a. Avoidance of tick habitats

Whenever possible, persons should avoid entering areas that are likely to be infested with ticks, particularly in spring and summer when nymphal ticks feed. Ticks favor a moist, shaded environment, especially that provided by leaf litter and low-lying vegetation in wooded, brushy, or overgrown grassy habitat. Both deer and rodent hosts must be abundant to maintain the life cycle of the tick.

b. Personal Protective Equipment

1. Wear light colored clothing or white Tyvek® to allow you to see ticks that are crawling on your clothing.

2. Tuck your pant legs into your socks or boots, wear high rubber boots, or use tape to close the opening where they meet so that ticks cannot crawl up the inside of your pant legs.

3. Wear a hat, tie back long hair.

4. Apply repellents to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing and will last for several days. Repellents containing DEET (n,n-diethyl-

m-toluamide) can be applied to the skin, but will last only a few hours before reapplication is necessary. Apply according to Environmental Protection Agency guidelines to reduce the possibility of toxicity.

c. Tick Check

1. Change clothes when you return from an area where ticks may be located.

2. Shower to wash off any loose ticks.

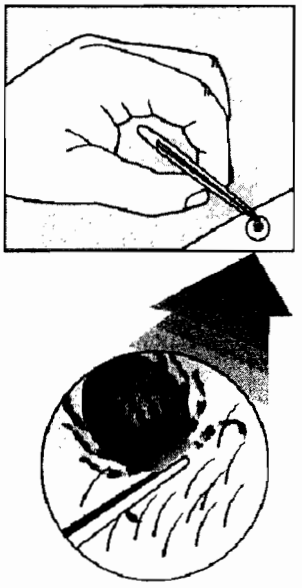
3. Check your entire body for ticks. Use a hand held or full-length mirror to view all parts of your body.

4. Place clothing worn in tick infested areas into the dryer for at least 30 minutes in order to kill any ticks.

2. Tick Removal

Because it takes several hours of attachment before microorganisms are transmitted from the tick to the host, prompt removal of attached or crawling ticks is an important method of preventing disease. Remember, folklore remedies of tick removal to do not work! Methods such as the use of petroleum jelly or hot matches may actually make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting disease.

The best method to remove an attached tick is with a set of fine tipped tweezers.



a. Use fine-tipped tweezers. When possible, avoid removing ticks with bare hands.

b. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers.

c. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms.

d. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

e. Disinfect the tweezers.

f. Save the tick for identification in case you become ill. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag and put it in the freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.

3. Medical Follow-Up

In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, individuals who are bitten by a tick

should seek medical attention if any signs and symptoms of tick borne disease develop over the weeks following the tick bite.

B. Poisonous Plants

1. Background Information

Poison ivy and poison oak plants are the most common cause of allergic contact dermatitis in North America. These poisonous plants can be a hazard for many various outdoor activities at work, home, and play. Skin contact with the oleoresins (urushiol) from these plants can cause an itchy, red, oozing, blistered rash in sensitive individuals. Oil content in the plants is highest in the spring and summer, however the plants are even hazardous in the winter when they have dropped their leaves. There are three types of exposure:

- Direct contact: An initial skin exposure in necessary to "sensitize" the individual. Subsequent contact in a sensitized person will result in a rash appearing within 4 to 48 hours. Approximately 50-70 % of the population is sensitized. Poison plant dermatitis is usually characterized by areas of linear or streaked patches where branches of the plant brushed the skin.

- Indirect contact: Skin exposure can happen indirectly. Clothing, shoes, tools, personal protective equipment and other items can be contaminated with the oils and maintain potency for months.

- Airborne smoke contact: Never burn poison plants. Droplets of oil can be carried by smoke and enter the respiratory system causing a severe internal outbreak.

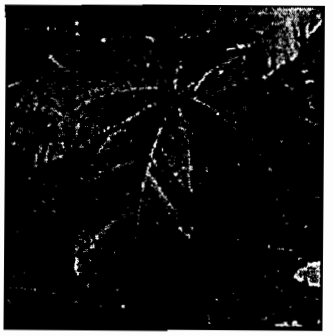
Poison plant rash is not contagious. Skin contact with blister fluid from an affected individual will not cause dermatitis in another sensitized person. Scratching the rash can only spread it to other parts of your body if the oil is still on your skin. After the oil has been washed off or absorbed by the skin, scratching will not spread the rash.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each and are green in the summer and red in the fall. Both plants also have greenish-white flowers and berries that grow in clusters. All parts of these plants are toxic.

Poison Ivy grows as a small plant, vine, and as a shrub. Leaves always consist of three glossy leaflets.

Poison Ivy

Poison Oak grows as a shrub or vine. It has three leaflets that resemble oak leaves.



Eastern Poison Oak

Poison Sumac grows as a woody shrub or small tree from 5 to 25 feet tall. It has 7 to 13 leaves that grow opposite each other with a leaflet at the tip.

Poison Sumac

1. Precautionary Measures

   - The best approach is to learn to identify the plants and avoid them.
   - Wear long pants and long sleeves, boots and gloves.
   - Barrier skin creams may offer some protection if applied before contact.

- Avoid indirect contact from tools, clothing or other objects that have come into contact with a crushed or broken plant. Don't forget to wash contaminated clothing and clean up contaminated equipment.

- If you can wash exposed skin areas within 3-5 minutes with cold running water, you may keep the urushiol from penetrating your skin. Proper washing may not be practical in remote areas, but a small wash-up kit with pre-packaged alcohol-based cleansing tissues can be effective.

2. Medical Follow-Up

   Home treatment: Calamine lotion and an oatmeal (one cup to a tub full of water) bath can help relieve itching. To prevent secondary skin infection, scratching is not helpful and the finger nails should be cut to avoid damage to the skin. Over-the-counter hydrocortisone cream can decrease inflammation and itching, however read the label and use according to directions.

   When to see the doctor: Severe cases may require further treatment. A physician should be seen if the rash appears infected, is on the face or other sensitive body areas, or is too extensive to be easily treated at home.

C. Mosquito Borne Diseases

1. Background Information

   a. Arboviral encephalitis is a viral illness causing inflammation of the brain and is transmitted to humans by the bite of infected mosquitoes. Globally there are several strains including: Eastern equine, Japanese, La Crosse, St. Louis, West Nile, and Western equine encephalitis. Some of the strains have a vaccine. Symptoms of infection are nonspecific and flu-like: fever, headache, and tiredness. Fortunately, only a small proportion of infected people progress to encephalitis. Treatment is supportive, antibiotics are not effective.

   b. Malaria is a serious but preventable disease spread by the bite of an infected anopheline mosquito. It is caused by four species of the parasite *Plasmodium (P. falciparum, P. vivax, P. ovale, and P malariae)*. Malaria-risk areas include primarily tropical areas of Central and South America, Africa, India, Southeast Asia, and the Middle East. Symptoms of malaria which occur 8 days to 1 year after infection

include fever, shaking chills, headache, muscle ache, tiredness, jaundice, nausea, vomiting, and diarrhea. Malaria can be cured with prescription drugs.

c. Dengue Fever is a potentially life-threatening viral illness transmitted by the bite of the Aedes mosquito, found primarily in urban areas. The disease is found in most of tropical Asia, the Pacific Islands, Central and South America, and Africa. There are four dengue virus serotypes. Symptoms include sudden onset, high fever, severe headache, joint and muscle pain, rash, nausea and vomiting. There is no specific treatment and no vaccine.

d. Yellow Fever is a viral disease transmitted between humans by mosquitoes. It occurs only in Africa and South America. There is a vaccine that confers immunity lasting 10 years or more. Symptoms begin 3-6 days after the mosquito bite and include fever, nausea, vomiting, headache, slow pulse, muscle aches, and restlessness. Treatment is symptomatic.

2. Precautionary Measures

- Insect Repellent – Use insect repellants that contain DEET. The effect should last about 4 hours. Always use according to label directions. Use only when outdoors and wash skin after coming indoors. Do not breathe in, swallow, or get into the eyes. Do not put on wounds or broken skin.

- Protective Clothing – wear long sleeved shirts and long pants, especially from dusk to dawn. Or avoid going outdoors during these hours.

- Mosquito netting – Travelers who will not be staying in well-screened or air conditioned rooms should use a pyrethroid containing flying insect spray in living and sleeping areas during evening and nighttime hours. Sleep under mosquito netting (bed nets) that have been sprayed with permethrin.

- Malaria prophylaxis medications may be prescribed, however they do not provide complete protection. The type of medication given depends on the area of travel.

D. Poisonous Snakes

1. Background Information

No single characteristic distinguishes a poisonous snake from a harmless one except the presence of poison fangs and glands. Only in dead specimens can you determine the presence of these fangs and glands without danger. Most poisonous snakes have both neurotoxic and hemotoxic venom, however, one type is dominant and the other is weak.

a. Hemotoxic venom. The folded-fang snakes (fangs can raise to an erect position) have venoms that affect the circulatory system, destroying blood cells, damaging skin tissues, and causing internal hemorrhaging.

b. Neurotoxic venom. The fixed-fang snakes (permanently erect fangs) have venoms that affect the nervous system, making the victim unable to breathe.

c. Poisonous snakes in the Americas: copperhead, coral snake, cottonmouth, and rattlesnake.

d. Poisonous snakes in Europe: adder, viper.

e. Poisonous snakes of Africa and Asia: viper, cobra, adder, green mamba.

f. Poisonous snakes in Australia: copperhead, adder, taipan, tiger snake.

2. Precautionary Measures

Bites occur when you don't hear or see the snake, when you step on them, or when you walk too close to them. Follow these simple rules to reduce the chance of accidental snakebite:

- Don't put your hands into dark places, such as rock crevices, heavy brush, or hollow logs, without first investigating.

- Don't step over a fallen tree. Step on the log and look to see if there is a snake resting on the other side.

- Don't walk through heavy brush or tall grass without looking down. Look where you are walking.

- Do not pick up any live snake. If you encounter a snake, walk around the snake, giving it plenty of room. A snake can strike half its length.

- Don't pick up freshly killed snakes without first severing the head. The nervous system may still be active and a dead snake can deliver a bite.

3. Medical Follow-up

   If you are bitten by a snake, the primary goal is to get to a hospital as soon as possible to receive professional medical evaluation and possible treatment with antivenom if warranted. Initial first aid should include: Wash the bite with soap and water. Immobilize the bitten area and keep it lower than the heart. Try to remain calm. If you are unable to reach a hospital within 30 minutes, a bandage, wrapped two to four inches above the bite, may help slow the venom. The bandage should not cut off blood flow from a vein or artery, make sure the band is loose enough that a finger can slip under it. A suction device from a commercial snakebite kit may be placed over the bite to help draw venom out of the wound.

   Research has shown the following to be potentially harmful, DO NOT: apply ice, use a tourniquet, or make incisions into the wound.

5. Documentation Summary

Complete and distribute a URS Incident Report form 49-1 for all work-related biological exposure incidents.

6. Resources

Centers for Disease Control
http://www.cdc.gov

U. S. Occupational Safety and Health Administration
http://www.osha.gov

U.S. Food and Drug Administration
Treating and Preventing Venomous Snake Bites

URS Safety Management Standard
Personal Protective Equipment

1. Applicability

This program applies to URS Corporation laboratory and field operations where the use of Personal Protective equipment (PPE) is warranted. Refer to SMS 42, "Respiratory Protection", for respiratory hazards. Hearing Protection issues are additionally addressed in SMS 26, "Noise and Hearing Conservation."

2. Purpose and Scope

This procedure provides information on recognizing those conditions that require personal protective equipment as will as selecting personal protective equipment for hazardous activities.

3. Implementation

Shop/Lab Locations - Implementation of this program is the responsibility of the Office Manager.

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Perform hazard assessments for those work activities that are likely to require the use of PPE.

1. Use Attachment 29-1 to perform the assessment.

2. Reevaluate completed hazard assessments when the job changes.

B. Eliminate the hazards identified in Attachment 29-1, if possible, through engineering or administrative controls.

C. Select PPE that will protect employees if hazards cannot be eliminated.

1. See Attachment 29-1 for recommended PPE.

2. Review Material Safety Data Sheets for chemicals used for PPE recommendations.

3. If needed, consult with the URS Health and Safety Representative for assistance in selecting PPE.

D. Provide required PPE to employees free of charge (excluding in some instances components of standard work attire such as steel-toed boots), assuring that it fits properly giving them a choice if more than one type is available.

E. Whenever a hazard is recognized, and PPE is required, the employees will be provided with the appropriate PPE. However, when a PPE is not required, and the employee selects to wear his or her own PPE, the project manager shall ensure that the employee is properly trained in the fitting, donning, doffing, cleaning, and maintenance of his or her employee owned equipment.

F. Conduct and document employee training.

1. Train all employees who are required to wear PPE.
2. Require that training includes:
    a. When PPE is necessary to be worn.
    b. What PPE is necessary.
    c. How to properly don, doff, adjust and wear PPE.
    d. Limitations of PPE
    e. Proper care, maintenance, useful life and disposal of PPE.
3. Training must be conducted before PPE is assigned.
4. Refresher training is needed when:
    a. New types of PPE are assigned to the worker.
    b. Worker cannot demonstrate competency in PPE use.
5. Keep written records of the employees trained and type of training provided, including the date of training.

G. Maintain Protective Equipment

1. Check personal protective equipment for damage, cracks, and wear prior to each use. Replace or repair equipment not found in good condition.

2. Wash off contaminated protective equipment with water and mild soap, if necessary, to prevent degradation of the equipment.

H. Periodically inspect worksites where employees are using personal protective equipment, using Attachment 29-2.

1. Field activities – inspect work sites at least monthly.

2. Office locations – inspect work sites semi-annually.

5.0 Documentation Summary

A. Records required in the Project Safety File:

1. Completed Hazard Assessment Certification Forms (Attachment 29-1)

2. Completed Personal Protective Equipment Inspection Sheet (Attachment 29-2)

3. Documentation of employee training.

B. Records required in the Laboratory Safety Filing System:

1. Completed Hazard Assessment Certification Forms (Attachment 29-1)

2. Completed Personal Protective Equipment Inspection Sheet (Attachment 29-2)

3. Documentation of employee training.

6.0 Resources

A. U.S. OSHA Standards - Personal Protective Equipment -29CFR 1910 Subpart I (http://www.osha-slc.gov/SLTC/lead/index.html)

B. U.S. OSHA Construction Standard - Personal Protective Equipment –29 CFR 1926 Subpart E (http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1926_SUBPART_E.html)

C. U.S. OSHA Technical Links - Personal Protective Equipment (http://www.osha-slc.gov/SLTC/personalprotectiveequipment/index.html)

D. Australian Standards SAA HB9-1994 - Occupational Personal Protection

E. American National Standards Institute, ANSI Z89.1-1986, Protective Headwear (http://www.ansi.org/cat_top.html)

F. American National Standards Institute, ANSI Z87.1 - 1989, Eye and Face Protection (http://www.ansi.org/cat_top.html)

G. American National Standards Institute, ANSI Z41.1 - 1991, Foot Protection (http://www.ansi.org/cat_top.html)

H. SMS 40 - Fall Protection

I. Attachment 29-1 Hazard Assessment Form

J. Attachment 29-2 PPE Inspection Form

URS Corporation

URS Corporation Health & Safety Program
HAZARD ASSESSMENT CERTIFICATION FORM

Location:_____ **Job No:**_____

Date : _____ **Assessment Conducted by:** _____

Specific tasks performed at this location: _____

	Are any of the following present during the task?	No	Yes (Hazard Present)	Eliminate Hazard or Use Following PPE
	Overhead Hazards			
1.	Suspended loads that could fall			Hard hat, ANSI Class A, B
2.	Overhead beams or load that could strike head			Hard hat, ANSI Class A, B
3.	Energized wires or equipment that could strike head			Hard hat, ANSI Class B
4.	Employees working above at an elevated site who could drop objects on others below			Hard hat, ANSI Class A, B
5.	Sharp objects or corners at head level			Hard hat, ANSI Class A, B or C
	Eye Hazards			
6.	Chemical splashes or irritating mists			Chemical protective goggles See Attachment 29-3
7.	Excessive dust			Safety glasses or impact goggles
8.	Smoke & fumes			Chemical protective goggles
9.	Welding operations			See Attachment 29-3 and 29 T-1
10.	Lasers/optical radiation			See Attachment 29-3 and Reference F
11.	Projectiles			See Attachment 29-3
12.	Sawing, cutting, chipping, grinding			See Attachment 29-3
	Face Hazards			
13.	Chemical splashes or irritating mists			Face shield if chemical is irritating to the skin or is corrosive. See Attachment 29-3
14.	Welding operations			See Attachment 29-3 and 29-T1
15.	Projectiles			See Attachment 29-3 and face shield
	Hand Hazards			
16.	Chemical exposure			Use resistant gloves as recommended by manufacturer - See Best Chemrest Guide
17.	Sharp edges, splinters, etc.			Leather gloves

Location :_____ **Job No:**_____

	Are any of the following present during the task?	No	Yes (Hazard Present)	Eliminate Hazard or Use Following PPE
18.	Temperature extremes - heat			Leather gloves; hot mill gloves; Kevlar gloves, welders' gloves
19.	Temperature extremes - cold			Leather gloves; insulated gloves
20.	Blood, fungus			Nitrile gloves
21.	Exposure to live electrical current			Electrical gloves - See Reference H
22.	Sharp tools, machine parts, etc.			Leather gloves, kevlar gloves
23.	Material handling			Leather gloves
	Foot Hazards			
24.	Heavy materials (greater than 50 pounds) handled by employees			Safety shoes or boots
25.	Potential to crush whole foot			Safety shoes or boots with metatarsal guard
26.	Sharp edges or points - puncture risk			Safety shoes or boots
27.	Exposure to electrical wires			Safety shoes or boots with electrical protection
28.	Unusually slippery conditions			Rubber soled boots or grips
29.	Chemical contamination			Rubber, nitrile boots or boot covers
30.	Wet conditions			Rubber boots or boot covers
31.	Construction/demolition			Safety shoes or boots with metatarsal guard if who foot crushing hazard exists.
	Fall Hazards			
32.	Elevations above 6 feet without guardrails			Full body harness, ANSI A-10.14 - 1991 - See Reference G
33.	Suspended scaffolds, boatswain's chairs, float scaffolds, suspended staging.			ANSI Type II - full body harness - See Reference G
34.	Working in trees			ANSI Type I full body harness - See Reference G
35.	Working in vehicle mounted, elevating work platforms (bucket trucks, pin-on platforms, etc.)			ANSI Type II full body harness - see Reference G
	Water Hazards			
36.	Working on or above water where drowning hazards exist			U.S. Coast Guard approved personal flotation device, Type I, II, or III PFD
	Excessive Heat or Flame			
37.	Full body chemical protective clothing in temperatures greater than 80 degrees			Cooling vest
38.	Work around molten metal or flame			Nomex or kevlar clothing

Location :_____ **Job No:**_____

	Are any of the following present during the task?	No	Yes (Hazard Present)	Eliminate Hazard or Use Following PPE
39.	Welding activities			Welding leathers for those areas that are exposed to flame, spark or molten metal
	Respiratory Hazards			
40.	See SMS for RESPIRATORY PROTECTION for selection guidance			
	Excessive Noise			
41.	Exposure to noise			Ear plugs or muffs
	Body and Leg Protection			
42.	Chemical exposure			Have local DMG H&S representative assist you in proper selection
43.	Using chainsaw, cutting brush			Chainsaw chaps

I certify that the above inspection was performed to the best of my knowledge and ability, based on the hazards present on _____.

_____

Signature

URS	Health and Safety Program PERSONAL PROTECTIVE EQUIPMENT INSPECTION SHEET	Attachment 29-2

Name of Inspector _____ **Date Inspected** _____

	True	False (= Hazard - Needs to be fixed)
Hard Hats		
1. The brim or shell does not show signs of exposure and excessive wear, loss of surface gloss, chalking or flaking.		
2. Suspension system in hard hat does not show signs of deterioration including cracking, tearing or fraying.		
3. The brim or shell is not cracked, perforated or deformed.		
4. Employees use hard hats in marked areas.		
5. Hard hat areas are marked.		
Safety Shoes		
6. Safety shoes used by employees do not show signs of excessive wear.		
7. Safety shoe required areas are marked.		
Work Gloves		
8. Gloves are worn when needed.		
9. Gloves do not show signs of excessive wear such as cracks, scrapes, or lacerations, thinning or discoloration or break through to the skin.		
Protective Clothing		
10. Protective clothing is worn by employees when required.		
Hearing Protection		
11. Noise hazardous areas are marked.		
12. Employees are using earplugs or muffs when using noise hazardous equipment or working in noise hazardous areas.		
Safety Glasses		
13. Eye hazardous areas are marked or posted.		
14. Employees use safety glasses when working in eye hazardous areas or working with eye hazardous equipment.		

REMARKS

_____

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_____

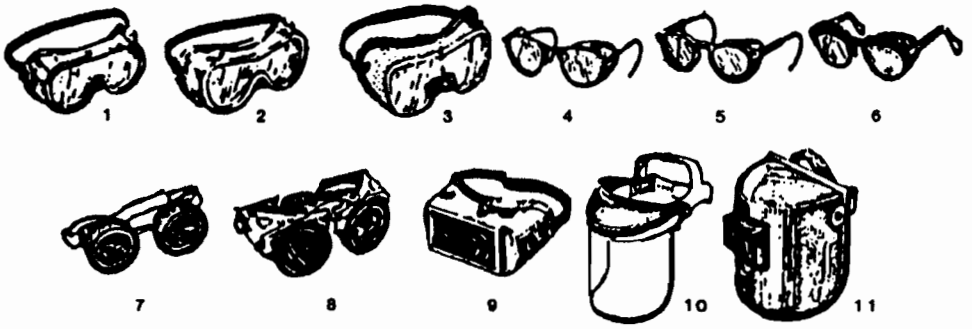
_____

_____

URS Corporation

URS Corporation Health & Safety Program

EYE AND FACE PROTECTOR SELECTION GUIDE



1. **GOGGLES,** Flexible Fitting, Regular Ventilation
2. **GOGGLES,** Flexible Fitting, Hooded Ventilation
3. **GOGGLES,** Cushioned Fitting, Rigid Body
*4. **SPECTACLES,** Metal Frame, with Sideshields
*5. **SPECTACLES,** Plastic Frame, with Sideshields
*6. **SPECTACLES ,** Metal-Plastic Frame, with Sideshields
*7. **WELDING GOGGLES,** Eyecup Type, Tinted Lenses (Illustrated)

7A. **CHIPPING GOGGLES,** Eyecup Type, Clear Safety Lenses (Not Illustrated)

*8. **WELDING GOGGLES,** Coverspec Type, Tinted Lenses (Illustrated)

8A. **CHIPPING GOGGLES,** Coverspec Type, Clear Safety Lenses (Not Illustrated)

*9. **WELDING GOGGLES,** Coverspec Type, Tinted plate Plate Lens

10. **FACE SHIELD,** (Available with Plastic or Mesh Window)

11. **WELDING HELMETS**

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS Bold Type Numbers Slightly Preferred Protection
ACETYLENE-BURNING ACETYLENE-CUTTING ACETYLENE-WELDING	SPARKS, HARMFUL RAYS MOLTEN METAL, FLYING PARTICLES	**7,8,9**
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	**2,10** (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	**1,3,4,5,6,7A,8A**
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	**9,11** (11 in combination with 4,5,6 in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	**7,8,9** (For severe exposure add 10)
GRINDING-LIGHT	FLYING PARTICLES	**1,3,4,5,6,10**
GRINDING -HEAVY	FLYING PAPTICLES	**1,3,7A,8A** (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	**2** (10 when in combination with 4,5,6)
MACHINING	FLYING PARTICLES	**1,3,4,5,6,10**
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	**7,8** (10 in combination with 4,5,6 in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	**1,3,4,5,6,10**

*Non-side shield spectacles are available for limited hazard use requiring only frontal protection.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(R)

MSDS Number: A2052 --- *Effective Date: 02/21/00*

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(R) proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
No information found.

Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
15 mg/m3 total dust, 5 mg/m3 respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m3 total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels

are not known, use a full-facepiece positive-pressure, air-supplied respirator.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White powder interspersed with cream colored flakes.
Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:

No information found.

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Alconox(R) proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Alconox(R) proprietary detergent mixture	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.

Alconox(R) proprietary detergent mixture	No	No	Yes	No

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Alconox(R) proprietary detergent mixture	No	No	No	No

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Alconox(R) proprietary detergent mixture	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:

MSDS Section(s) changed since last revision of document include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: ISOBUTYLENE

SYNONYMS: 2-Methylpropane; Isobutylene USP
CHEMICAL FAMILY: Alkane (hydrocarbon)
FORMULA: C_4H_8

	Document Number: 20103
PRODUCT USE:	For fuel and synthetic chemical use; food additive, agricultural uses, aerosol propellant, refrigerant.
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA CORPORATION
ADDRESS:	2700 Post Oak Drive Houston, TX 77056-8229
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	
	General MSDS Information: 1-713/896-2896
	Fax on Demand: 1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER ppm
Isobutylene	115-11-7	> 99%	There are no specific exposure limits for Isobutylene. Isobutylene is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Maximum Impurities		< 1%	None of the trace impurities in this product contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalents standards.					

NE = Not Established C = Ceiling Limit

NOTE: all WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

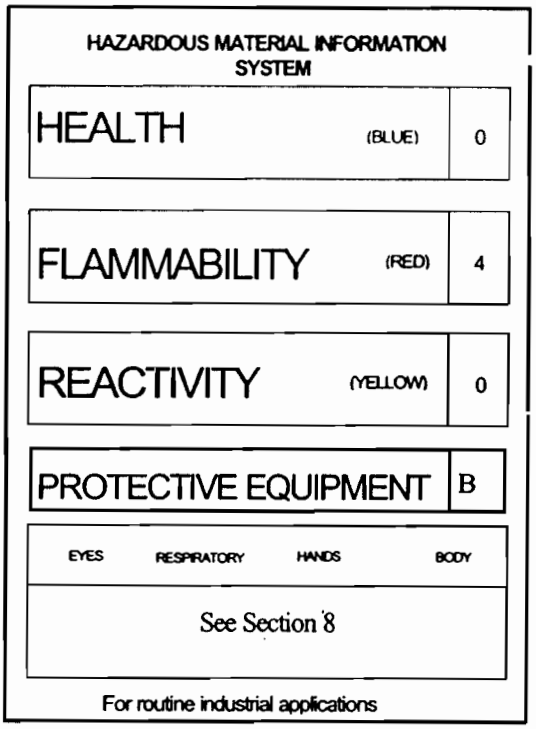
3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, liquefied, flammable gas. The gas has an unpleasant odor similar to burning coal. Both the liquid and gas pose a serious fire hazard when accidentally released. Rapid evaporation of liquid from cylinder may cause frostbite. Flame or high temperature impinging on a localized area of the cylinder of this product can cause the cylinder to burst or rupture without activating the cylinder's relief devices. Isobutylene is an asphyxiant and presents a significant health hazard by displacing the oxygen in the atmosphere. Isobutylene can also be a narcotic at high concentrations. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Isobutylene also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. High concentrations of this gas can cause an oxygen-deficient environment. It should be noted that before suffocation could occur, the lower flammability limit of Isobutylene in air would be exceeded; possibly causing an oxygen-deficient and explosive atmosphere. Individuals breathing an oxygen deficient atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION	SYMPTOM OF EXPOSURE
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.



OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: The most significant hazard associated with this product is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, and, at high concentrations, unconsciousness or death may occur. The skin of a victim of over-exposure may have a blue color. Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to the components of this compressed gas.

TARGET ORGANS: Respiratory system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

4. FIRST-AID MEASURES (Continued)

SKIN EXPOSURE: Exposure to the liquefied gas can cause frostbite. Remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Seek medical assistance immediately, preferably an ophthalmologist.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

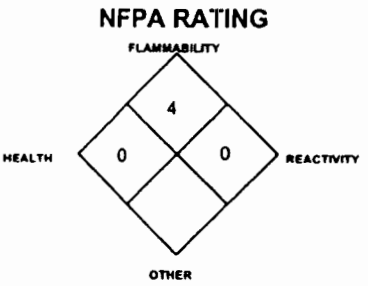
5. FIRE-FIGHTING MEASURES

FLASH POINT: -10°C (< 14°F)

AUTOIGNITION TEMPERATURE: 465°C (869°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 1.8%
Upper (UEL): 9.6%



FIRE EXTINGUISHING MATERIALS: Extinguish Isobutylene fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may decompose and produce toxic gases including carbon monoxide and carbon dioxide.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause this product to ignite explosively, if released.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposures, evacuate the area. The North American Emergency Response Guidebook (Guide #115) recommends 0.5 miles. Other information for pre-planning can be found in the American Petroleum Institute Publications 2510 and 2510A.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Evacuate immediate area. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a gas release, clear the affected area, protect people, and respond with trained personnel.

Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. If the gas is leaking from cylinder or valve, contact the supplier. Adequate fire protection must be provided. Use only non-sparking tools and equipment during the response.

Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves and Self-Contained Breathing Apparatus.** Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate.

6. ACCIDENTAL RELEASE MEASURES (Continued)

Combustible gas concentration must be below 10% of the LEL (1.8%) prior to entry. Monitor the surrounding area for combustible gas levels and oxygen level. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms. Non-sparking tools should be used.

STORAGE AND HANDLING PRACTICES: Specific requirements are listed in NFPA 58. Cylinders should be stored upright (with valve-protection cap in place) and firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials which can burn. Do not allow area where cylinders are stored to exceed 52 °C (125 °F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Protect cylinders against physical damage.

Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity).

Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers).

Keep the smallest amount on-site as is necessary. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time.

Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used in gas-handling operations, or located in storage areas, should be non-sparking or explosion proof. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Do not "crack" valve open before connecting it, since self-ignition may occur. Leak check system with leak detection solution, never with flame. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, casing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit.

After Use: Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers designed for flammable gas storage. Earth-ground and bond all lines and equipment associated with this product. Close valve after each use and when empty.

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA: Use the proper connections, DO NOT USE ADAPTERS:

THREADED: 0-500 PSIG - CGA 510
PIN-INDEXED YOKE: Not Applicable.
ULTRA HIGH INTEGRITY: Not Applicable.

7. HANDLING and USE (Continued)

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Provide natural or explosion-proof ventilation adequate to ensure Isobutylene does not reach its lower flammability limit of 1.8%. Local exhaust ventilation is preferred, because it prevents gas dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of flammable gas.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% (air-purifying respirators will not function) or during emergency response to a release of this product. During an emergency situation, before entering the area, check for flammable gas level as well as oxygen-deficient atmospheres. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: Wear leather gloves when handling cylinders of this product. Otherwise, wear glove protection appropriate to the specific operation for which this product is used. Use low-temperature protective gloves when working with containers of Liquid Isobutylene.

BODY PROTECTION: Use body protection appropriate for task. Cotton clothing is recommended for use to prevent static electric build-up. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require use of fire retardant clothing.

9. PHYSICAL and CHEMICAL PROPERTIES

GAS DENSITY @ 21.1°C (70°F) and 1 atm: 0.14957 lb/ft^3 (2.3959 kg/m^3)
BOILING POINT: -6.9°C (19.6°F)
FREEZING/MELTING POINT @ 10 psig: -140°C (-220.6°F)
SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 1.997
SOLUBILITY IN WATER vol/vol @37.8°C (100°F): Insoluble.
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: Not determined.
VAPOR PRESSURE @ 21.1°C (70°F) psig: 23.85
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
pH: Not applicable.
MOLECULAR WEIGHT: 56.108
EXPANSION RATIO: Not applicable.
SPECIFIC VOLUME (ft^3/lb): 6.54

APPEARANCE AND COLOR: Colorless gas which is shipped as a liquefied gas under its own vapor pressure. The gas has an unpleasant odor similar to burning coal.

HOW TO DETECT THIS SUBSTANCE (warning properties): The unpleasant odor may be a warning property. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: : When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide, carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicity data are applicable for pure Isobutylene.

LC50 (inhalation, rat) = 620,000 mg/kg/4 hours
LC50 (inhalation, mouse) = 415,000 mg/kg

SUSPECTED CANCER AGENT: Isobutylene is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA; therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Isobutylene can cause some irritation to mucus membranes. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Isobutylene is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Isobutylene on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for Isobutylene gas.
Embryotoxcity: No embryotoxic effects have been described for Isobutylene gas.
Teratogenicity: No teratogenicity effects have been described for this Isobutylene gas.
Reproductive Toxicity: No reproductive toxicity effects have been described for Isobutylene gas.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to the components of this product.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Isobutylene.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms; reduce or eliminate exposure.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen deficient environments. No adverse effect is anticipated to occur to plant-life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Air Liquide. Do not dispose of locally.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors, away from all sources of ignition.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

		Alternate Description:
PROPER SHIPPING NAME:	Isobutylene	Petroleum gases, liquefied
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1055	UN 1075
PACKING GROUP:	Not applicable.	Not applicable.
DOT LABEL(S) REQUIRED:	Flammable Gas	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

14. TRANSPORTATION INFORMATION (Continued)

MARINE POLLUTANT: Isobutylene is not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

NOTE: Shipment of compressed gas cylinders which have not been filled with the owners consent is a violation of Federal law (49 CFR, Part 173.301 (b).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Isobutylene is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL INVENTORY STATUS: Isobutylene is listed on the Canadian DSL Inventory.

U.S. TSCA INVENTORY STATUS: Isobutylene is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS:

- Isobutylene does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for of this gas is 10,000 pounds.
- Depending on specific operations involving the use of this product, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Isobutylene is not listed in Appendix A, however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lbs (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.
- Isobutylene is listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases as a flammable substance. The threshold quantity for Isobutane under this regulation is 10,000 lbs.

OTHER CANADIAN REGULATIONS: Isobutylene is categorized as a Controlled Product, Hazard Classes A, and B1 as per the Controlled Product Regulations.

U.S. STATE REGULATORY INFORMATION: Isobutylene is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Liquefied Petroleum Gas.
California - Permissible Exposure Limits for Chemical Contaminants:
Florida - Substance List: Isobutylene.
Illinois - Toxic Substance List: Liquefied Petroleum Gas.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Isobutylene.
Minnesota - List of Hazardous Substances: Isobutylene.
Missouri - Employer Information/Toxic Substance List: Liquefied Petroleum Gas.
New Jersey - Right to Know Hazardous Substance List: Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Isobutylene.
Rhode Island - Hazardous Substance List: Liquefied Petroleum Gas.
Texas - Hazardous Substance List: Liquefied Petroleum Gas.
West Virginia - Hazardous Substance List: Liquefied Petroleum Gas.
Wisconsin - Toxic and Hazardous Substances: Liquefied Petroleum Gas.

CALIFORNIA PROPOSITION 65: Isobutylene is not on the California Proposition 65 lists.

16. OTHER INFORMATION

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	*"Safe Handling of Compressed Gases in Containers"*
P-14	*"Accident Prevention in Oxygen-Rich and Oxygen Deficient Atmospheres"*
SB-2	*"Oxygen Deficient Atmospheres"*
	"Handbook of Compressed Gases"

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

MSDS Number: H3880 --- *Effective Date: 11/17/99*

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5839, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2612, 2624, 2626, 5587, H611, H613, H987, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR

INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Extreme heat or contact with metals can release flammable hydrogen gas.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking

tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.
Odor:
Pungent odor of hydrogen chloride.
Solubility:
Infinite in water with slight evolution of heat.
Density:
1.18
pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
% Volatiles by volume @ 21C (70F):

100
Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)
Melting Point:
-74C (-101F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight.

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes

Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.

Revision Information:
No changes.
Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

MSDS Number: N3660 --- *Effective Date: 07/13/00*

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 411D, 5371, 5555, 5801, 5826, 5876, 9597, 9598, 9600, 9601, 9602, 9604, 9606, 9607, 9616, 9617
Mallinckrodt: 1409, 2703, 2704, 6623, H988, H993, H998, V069, V077, V336, V561, V633, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER

MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:

Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:

Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information:

Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:

Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

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11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None

Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 75LB

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 75LB

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8

UN/NA: UN2031
Packing Group: II
Information reported for product/size: 75LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED.

INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 1.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)