IRM Work Plan - Indoor Air and Soil Vapor Mitigation

Ward Products Site
Amsterdam, New York
Site Code 4-29-004

Prepared by:

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RETEC Project Number: NWR01-15852-700

Prepared for:

New Water Realty Corporation
61 Edson Street
Amsterdam, New York 12010

August 31, 2005

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August 31, 2005

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Statement of Limitations

Work for this project was performed, and this remedial design prepared, in accordance with generally accepted professional practices for the nature and condition of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of New Water Realty Corporation for specific application to the Ward Products site in Amsterdam, New York. No other warranty, express or implied, is made.

1 Introduction

This document is the Design and Work Plan for an Interim Remedial Measure (IRM) at the Ward Products site in Amsterdam, New York.

This Plan describes the rationale and procedures for the mitigation of trichloroethene (also known as trichloroethylene, or TCE) that has been detected at some locations in the indoor air of the existing building at the Ward Products site in close proximity to the highest concentrations of TCE in groundwater.

This Plan is based on conclusions reached by the New York State Department of Health (NYSDOH), under its existing guidance, that TCE is present in the building's indoor air and sub-slab vapor in unacceptable concentrations that warrant mitigation measures to reduce the potential for exposures to contaminants.

This Plan has been prepared in accordance with Section V of the New York State Department of Environmental Conservation's (NYSDEC) Order on Consent for this site [NYSDEC, 1997].

1.1 Site Description

The Ward Products site lies in an industrial area at 61 Edson Street, as shown in Figure 1. The site is an 8.6-acre property that consists of a large paved parking lot, a 69,556 square-foot single story building, and lawn and wooded areas. There are no nearby residences, and the area is zoned commercial/industrial.

The site currently is an active industrial assembly plant (automobile antennas and wiring harnesses) operated by the tenant, Ward Products, LLC (WP). The property is owned by New Water Realty Corporation (NWR), a company unrelated to WP. WP employs several hundred persons working approximately 8-hour shifts.

1.1.1 Indoor Air History

In the Final Revised Remedial Investigation Report (RRIR) [NAI, 2005], the following information was reported (Note: All tables and figures from the RRIR are omitted; see the Appendices and Figure 2 of this Work Plan for summaries of relevant data):

> **RRIR Section 2.1.9 Indoor Air Sampling**
>
> Based on the concentrations of VOCs reported in on-site groundwater, The RETEC Group, Inc. (RETEC) performed an assessment of indoor air quality to evaluate the existence and impact, if any, of chemical vapor intrusion into the manufacturing building at the site in

November 2002. This work was intended to assist the evaluation in the Risk Assessment (RA) of whether the post-remediation presence of the VOCs (tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE) and cis-1,2-dichloroethene (cis-1,2-DCE)) in the groundwater or other media at or near the building could induce elevated levels in indoor air within the building itself sufficient to affect the conclusions in the RA. RETEC inspected the building and reviewed the floor plan to determine that four sample locations were appropriate and sufficient to identify and characterize the indoor air concentrations of the VOCs of interest.

In January 2005, in response to comments received from the NYSDOH, and to confirm the results of the November 2002 sampling, RETEC proposed to collect soil gas and additional indoor air samples from the manufacturing building at the site. The work was conducted in accordance with the NYSDEC- and NYSDOH-approved 2005 Work Plan for Indoor Air/Soil Gas Sampling.

RRIR Section 4.5 Indoor Air Quality

In the November 2002 samples, only PCE and TCE were detected above their method detection limits, and only in the sample collected from the manufacturing office (AS-1). The concentration of PCE was 4.7 $\mu g/M^3$, while the concentration of TCE was 4.8 $\mu g/M^3$. When compared with United States Environmental Protection Agency (U.S. EPA) and NYSDOH indoor and outdoor air quality data, these results fall within the 75^{th} percentile. The 75^{th} percentile represents the concentrations of these substances that would typically be expected in indoor air in approximately three out of four random samples, unrelated to the existence of a discrete source of contamination. The concentrations of PCE and TCE in these samples were also below their NYSDOH recommended exposure levels for residential indoor air. The detection limits in two of the three samples were almost four times higher (19 $\mu g/M^3$) than the 2005 NYSDOH air guidance level of 5 $\mu g/M^3$. Thus, the level of TCE in these samples could only be considered to be less than its detection limit.

Because of the elevated detection limits of the November 2002 samples and with the development of recommended guidance values for sub-slab vapor by the NYSDOH, in January 2005 RETEC collected both indoor air and sub-slab soil gas samples at three locations. TCE was the predominant VOC detected in the three indoor air samples at concentrations ranging from 6.4 to 13 $\mu g/M^3$, while chloroform was detected in two of the samples at concentrations less than 1 $\mu g/M^3$. The concentrations of the other VOCs of interest were all below their reported detection limits. The concentrations of TCE in the indoor air samples collected in January 2005 slightly exceeded NYSDOH's guidance level of 5 $\mu g/M^3$ for residential indoor air, but

are orders of magnitude less than the recommended exposure levels for workplace environments. The three TCE concentrations recorded in the January 2005 samples were slightly higher than the November 2002 results. This difference could be due to either the colder weather (January vs. November), or to normal variation between sampling events and analyses. TCE was the predominant VOC detected in the sub-slab soil gas samples collected in January 2005. The concentration of TCE ranged from 1,500 to 1,800 $\mu g/M^3$. The second highest concentration of VOC detected in the sub-slab soil gas samples was cis-1,2-DCE, which was detected in the sample collected from below the warehouse foundation at a concentration of 940 $\mu g/M^3$. It was at this location that the highest TCE concentration was also detected. The presence of TCE and cis-1,2-DCE in this sample may be due to the fact that cis-1,2-DCE is a byproduct of the natural degradation of TCE in the environment. When the results of the indoor air and the sub-slab vapor samples are compared with these 2005 guidance values, as recently proposed by the NYSDOH, the NYSDOH recommends mitigation to minimize existing or potential risks associated with soil vapor intrusion.

The suspected source of TCE in the sub-slab soil gas is the volatilization of this compound from the groundwater underlying the building. TCE has been detected in soil samples collected from below the building in the area of the former sludge drying pad (now the grinding room) and the former vapor degreaser, but the concentrations only ranged from 6 to 98 $\mu g/kg$. TCE has also been detected in the groundwater (MW-1, MW-1R, and MW-5) in the vicinity of the northeastern corner of the manufacturing building, near both the warehouse and the grinding room. The concentration of TCE in the groundwater in this area has ranged from 18 to 1,400 $\mu g/L$ with a mean concentration of 276 $\mu g/L$. Based on water level measurements recorded at MW-1, the depth to groundwater below the northern portion of the building could range from as shallow as one foot to greater than seven feet over a year depending on recharge conditions. This suggests that TCE-contaminated groundwater in the glacial till unit could represent a potential source for the TCE detected in the sub-slab soil gas.

RRIR Section 5.2.8 Trichloroethene

The predominant organic contaminant identified at the site is TCE, which was used from 1959 to 1983 in the vapor degreasing system. TCE has been detected in soil, sediment, groundwater and indoor air samples collected from the site at concentrations exceeding its cleanup objective, limits, standards, or guidance values. In soil, the highest concentrations of TCE were detected in two samples collected from test pits excavated below the drain pipe outside of the building. The

concentration of TCE in both of these samples slightly exceeded the NYSDEC Soil Cleanup Objective (SCO) of 700 μg/Kg (ppb). The suspected source of the TCE in these soils was the leakage of electroplating and degreasing solutions from the drain pipe. TCE was also detected in low concentrations (<15 μg/Kg) in soil samples collected from below the former sludge drying pad (inside the building) and from around the transformer pad (outside the building). The source of the low concentrations of TCE in the soils below the sludge drying pad may have been leakage through the base of the pad, while the source of the low concentrations of TCE in the soils around the transformer pad could have been the exhaust of the vapor degreaser or spills. As part of an IRM performed in 1999, the soils around the transformer pad were removed. Considering that TCE is no longer being introduced to the soils on site by the manufacturing operations and since it has only been detected at two locations (near the drain pipe) at concentrations slightly above its NYSDEC SCO, the probable fate of this VOC in the soils at the site will most likely be its continued volatilization and biodegradation. In the areas of open ground, the volatilization of TCE from the soils will result in its discharge into the atmosphere. Where TCE is present in soils and/or shallow groundwater that is covered by the manufacturing building, the volatilization of this compound could potentially result in chemical vapor intrusion into the building. As a result, TCE is considered a contaminant of concern in the shallow groundwater in the area overlain by the manufacturing building.

As mentioned, TCE was detected in indoor air samples collected from within the manufacturing building in one of three samples collected in 2002 and in all three samples collected in 2005. In the 2002 sample, TCE was detected at a concentration below the guidance value recently recommended by the NYSDOH for residential indoor air. In 2005, TCE was detected in all three indoor air samples and their associated sub-slab vapor samples at concentrations that, when compared with guidance values recently recommended by the NYSDOH, indicates that it should be considered a contaminant of concern in indoor air at the site.

The RRIR also provides complete descriptions of the site stratigraphy and hydrogeology, as well as the results of other environmental investigations conducted at the site.

1.1.2 Indoor Air Proposal

NYSDEC, in consultation with NYSDOH, has stated that addressing the indoor air issue will be a required element of any remedial plan for the site (there are additional environmental impacts beyond the scope of this work). NWR has, therefore, considered performing the mitigation now as an Interim Remedial Measure (IRM) to effectively address the soil vapor exposure

pathway. In early June 2005, counsel for NWR advised NYSDEC that mitigation of TCE would be proposed as an Interim Remedial Measure under the Order on Consent.

1.2 Project Responsibilities

The principal organizations involved in designing and construction of the proposed IRM will be NWR, NYSDEC, NYSDOH, RETEC, the Mitigation Contractor, and WP.

1.2.1 New Water Realty Corporation

As the site owner, NWR is responsible to NYSDEC for the remedial design, construction, and evaluation in accordance with the Order on Consent [NYSDEC, 1997]. NWR has the authority to monitor and control the quality of construction and related activities to ensure conformance with the engineering design plans and specifications. NWR has the authority to select and dismiss the Contractor(s) used to assist them with fulfilling these responsibilities. NWR also has the authority to select and accept or reject design plans, specifications, materials, and workmanship of the contractors and subcontractors.

1.2.2 NY State Dept. of Environmental Conservation

The NYSDEC Division of Environmental Remediation will review NWR's remedial designs, plans, and specifications for substantial compliance with the agency's regulations. Any substantial deviations from the requirements or approved design plans and their potential effect on the schedule must be approved by NYSDEC.

1.2.3 NY State Dept. of Health

The NYSDOH will review NWR's remedial designs, plans, and specifications, particularly those pertaining to the protection of human health, such as this proposed mitigation IRM.

1.2.4 RETEC Engineering, P.C.

RETEC is the engineer responsible for the IRM design. RETEC will also be the Prime Contractor and field engineer/supervisor during the work and will make recommendations to NWR regarding field decisions during construction. RETEC will prepare a Final Engineering Report.

1.2.5 Mitigation Contractor

The Mitigation Contractor ("Contractor") referred to in this Work Plan will be selected by NWR and RETEC from qualified radon or soil vapor mitigation contractors. The Contractor will be responsible for the performance of the work in accordance with the drawings and specifications incorporated in this Work Plan. The contractor will report directly to RETEC. The Contractor

will be given a copy of the Order on Consent and will be required to comply with it as a condition of their contracts.

The selected contractor shall have current certification from The National Radon Safety Board (NRSB), and/or The National Environmental Health Association's (NEHA) National Radon Proficiency Program.

1.2.6 Ward Products, LLC

The IRM must be coordinated with WP, the site operator and tenant in possession, so that the interference from installation and operation of the IRM is within the limits permitted by law and contract. WP will provide access to NWR and others so that the IRM can be implemented as provided in this Plan. WP has no responsibility for the remedial design, construction, and evaluation in accordance with the Order on Consent.

2 Design Basis

NYSDOH has determined that TCE, emanating from soil vapor from below the building's floor slab, is present in indoor air at unacceptable concentrations (up to 13 $\mu g/M^3$), and that mitigation is required. NYSDEC has also stated that addressing the indoor air issue will be a required element of any remedial plan for the site, and has suggested that this work be performed as an IRM. Subject to approval of this Work Plan, NWR is willing to proceed to address the alleged indoor air issue as an IRM.

The design of this IRM was based on information provided in the following:

- The Revised Remedial Investigations Report [Normandeau, 2005];
- Results of Indoor Air Sampling [RETEC, 2002];
- Results of January 2005 Indoor Air / Soil Gas Sampling [RETEC, 2005]; and
- Radon Mitigation Standards, Document #402-R-93-078 [U.S. EPA, 1994].

The most common mitigation method is the installation of a sub-slab depressurization system in conjunction with identifying and eliminating preferential soil vapor intrusion pathways. An active sub-slab depressurization system will, therefore, be installed as the mitigation (remedial) method.

The system, conceptually, will consist of approximately one dozen slab penetrations with riser vent pipes manifolded to approximately six vent fans. The radius of influence of each vent pipe is assumed to be approximately 25 feet. The floor area of concern is assumed to be the eastern third of the building. The system will be constructed in substantial compliance with the U.S. EPA's Radon Mitigation Standards [U.S. EPA, 1994].

The intent of this Indoor Air and Soil Vapor Mitigation IRM is to reduce the concentration of TCE in the building's indoor air to a concentration below 5 $\mu g/M^3$, or to the extent practicable. A sub-slab depressurization system is the generally accepted mitigation method. It cannot be predicted with certainty, however, that post-IRM air sampling will show a reduction of TCE in indoor air to <5 ug/M^3. The U.S. EPA's National Ambient VOCs Data Base Update [U.S. EPA, 1988], as referenced in the NYSDOH's Guidance for Evaluating Soil Vapor Intrusion [NYSDOH, 2005], states that the background concentration of TCE in homes and offices is expected to be as high as 4.5 ug/M^3.

In addition to the sub-slab vapors addressed by this IRM, sources of TCE at the Site could include vapors emanating from the existing building materials and equipment. TCE could also be associated with the high numbers of personnel and large volume of freight passing through the building, potentially transporting TCE from various offsite origins. TCE is often detected in structures that have no history of TCE use.

2.1 Site Contaminants

Concentrations of TCE in the indoor air samples ranged from non-detectable to 13 $\mu g/M^3$. The concentrations of TCE in the sub-slab soil gas ranged from 1,500 to 1,800 $\mu g/M^3$. The samples were collected in the winter months of November and January. Summary data tables and sample locations are presented in the Appendices and Figure 2.

These TCE concentrations are all several orders of magnitude lower than the permissible occupational exposure levels provided by the Occupational Safety and Health Administration (OSHA) (537,000 $\mu g/M^3$), the National Institute for Occupational Safety and Health (NIOSH) (134,000 $\mu g/M^3$), and the American Conference of Governmental Industrial Hygienists (ACGIH) (269,000 $\mu g/M^3$). The NYSDOH, however, has presented a draft guidance value for TCE of 5 $\mu g/M^3$ in (residential) indoor air, which they have stated is applicable to this site.

The sub-slab TCE vapors are assumed to originate from TCE-impacted groundwater, which is prevalent at the site. TCE has also been detected at low (less than the NYSDEC cleanup level) concentrations in soil samples collected from below the building floor slab.

Also detected in the sub-slab soil samples are several metals (cadmium, chromium, lead, nickel, and zinc) that are all typically in excess of the NYSDEC recommended cleanup level. Some of the soil may have the potential to be a hazardous waste, based on its TCLP cadmium concentration. For this reason, soil removed from the sub-slab shall be handled with special precautions and containerized for proper disposal (see Sections 3.3 and 3.8).

Material Safety Data Sheets (MSDSs) for TCE and cadmium are provided in the Health and Safety Plan and in Appendix C.

2.2 Project Approach

The project approach is to reduce the seepage and/or accumulation of TCE-impacted soil vapors into the building's indoor air. Technically, the approach will be identical to radon mitigation for an existing commercial structure.

The scope of work for this remedial action will include the following actions:

- Perform a building investigation, including additional testing (completed on June 28, 2005);

- Prepare a conceptual design (completed and incorporated herein);
- Solicit bids and comments from qualified radon contractors;
- Receive final approval from owner, tenant, and regulators;
- Mobilize to the site;
- Construct the mitigation system;
- Conduct performance testing;
- Prepare as-built drawings;
- Prepare final engineering report; and
- Conduct post-IRM air sampling in January 2006.

If at any time during the course of the work the conditions at the site are discovered to be substantially different than anticipated in this Work Plan, thereby affecting the purpose of the work and/or the health and safety of personnel, the work area will be returned to a safe condition and work will be halted. A conference will then be convened among representatives of NYSDEC, NWR, the Contractor(s), and RETEC to determine the appropriate actions and modifications to this Work Plan and/or the HASP. Work will then resume in accordance with the revised plans.

2.3 Performance Criteria and Testing

The remedial goals for this project will be met by the following criteria:

- Construction of a sub-slab depressurization system.
- Maintenance of a minimum of 0.004 inches of water pressure difference (vacuum) between the building interior and the sub-slab.
- Sealing of all soil vapor sources identified during the system performance testing.

After installation of the vapor mitigation system, the Contractor shall conduct system performance testing. Performance testing shall include sub-slab communication testing to measure the area and vacuum of the sub-slab pressure field extension. All floor cracks within the mitigation area shall be smoke tested to determine if sealing is necessary to prevent air flow. The contractor shall also measure the vacuum in the system vent pipes and verify the integrity of the fan mounting seals and all joints in the interior vent piping.

Post-IRM air sampling and analysis will be conducted in January 2006. Summa canisters and standard TO-15 analyses will be used. Indoor sampling locations will be the same as the January 2005 locations, i.e. IA-1, IA-2, IA-3. Outdoor sampling will include one upwind ambient and one downwind from the exhaust stacks. In addition, the individual stacks will be tested with colorimetric tubes (TCE detection limit approximately 0.125 ppm (670 $\mu g/M^3$)).

A sub-slab depressurization system, as proposed herein, is the generally accepted mitigation method. It cannot be predicted with certainty, however, that the post-IRM air sampling will show a reduction of TCE in indoor air to $<5\ \mu g/M^3$.

2.4 Required Permits

No local, New York State, or federal permits or approvals are known or believed to be required for the work. The work is being conducted under an Order on Consent with the NYSDEC.

2.5 Schedule

The work may proceed upon approval of this Work Plan by NWR, NYSDEC, and NYSDOH, and receipt of access agreements. NWR may elect to delay the work in light of new information.

At this time, the following schedule is assumed:

- 7/22/05 - NYSDEC and NYSDOH approval of this Work Plan.
- 8/29/05 - Begin construction.
- 9/12/05 - System start-up and performance testing.
- 1/27/06 - Post-IRM air sampling.

Field construction is anticipated to take approximately 2 weeks, following contractor selection and mobilization.

A Final Engineering Report will be prepared within 60 days of the performance testing event.

2.6 Contingency Plan

After receipt of the January 2006 post-IRM analytical results, the data will be reviewed and additional requirements, if any, will be determined in consultation with NYSDEC.

3 Technical Specifications

This section provides additional instructions to the Contractor for the implementation of the work.

3.1 General Specifications

The Contractor shall not disrupt or hinder the work of others.

The Contractor shall protect human health and the environment during all phases of the work, particularly the safety of on-site WP employees.

Contractor shall coordinate activities with the on-site WP representative in order to ensure minimal adverse impacts to their operations.

The Contractor shall review any available results from previous soil vapor tests to assist in developing an appropriate mitigation strategy.

The soil vapor mitigation system shall be designed and installed as a permanent, integral addition to the building.

The soil vapor mitigation system shall be designed to avoid the creation of other health, safety, or environmental hazards to building occupants, such as backdrafting of natural draft combustion appliances.

The soil vapor mitigation system shall be designed to maximize soil vapor reduction with consideration of the need to minimize excess energy usage, to avoid compromising moisture and temperature controls, and to minimize noise.

The soil vapor mitigation system and its components shall comply with the laws, ordinances, codes, and regulations of relevant jurisdictional authorities, including applicable mechanical, electrical, building, plumbing, energy, and fire prevention codes.

Contractor shall verify that no local, New York State, or federal construction permits are required for the work or, if there are such requirements, seek and obtain such construction permits or approvals.

Where installation of a soil vapor mitigation system requires pipes or ducts to penetrate a firewall or other fire resistance rated wall or floor, penetrations shall be protected in accordance with applicable building, mechanical, fire, and electrical codes.

The Contractor shall protect existing structures and properties to the extent practicable.

3.2 Building Investigation

On June 28, 2005, the Engineer and Contractor conducted a building investigation and developed the conceptual system design (see Figure 3).

The inspection identified specific building characteristics, configurations, and operational conditions that would affect the design, installation, and effectiveness of the soil vapor system.

The inspection also included a diagnostic test (with colorimetric tubes) to assist in evaluating suspected soil vapor entry points, specifically floor drains and sumps. No significant point sources of soil vapor entry were identified at the (qualitative) detection limit of approximately 300 $\mu g/M^3$.

3.3 Mobilization, Demobilization, and Decontamination

NWR, in consultation with WP, will provide designated equipment lay down areas to the Contractor. The Contractor shall confine their operations to the areas designated by NWR and WP.

The work areas shall be secured by the Contractor to ensure the safety of WP workers, visitors, and Contractor's personnel.

Contractor shall suppress and contain all visible dust.

Contractor shall minimize noise generation to the extent practicable.

Sanitary facilities for the Contractor's use are located within the building.

Soil removed from the sub-slab shall be containerized in sealed buckets or 55-gallon drums, labeled, sampled, characterized, and properly disposed of off site by RETEC. All sub-slab soil shall be handled with disposable gloves.

Concrete debris and other construction waste shall be considered non-impacted and shall be disposed of in the on-site solid waste dumpster.

3.4 Utility Clearance

Contractor is responsible for all utility clearances, including sub-slab drains and conduits.

The Contractor shall establish locations of overhead and subsurface structures, including utilities, pipes, and conduits, in the area of the work.

Contractor shall repair, at no additional cost, structures and utilities damaged due to the work.

3.5 Materials

All mitigation system electrical components shall be U.L. listed or of equivalent specifications.

Urethane sealants or equivalent shall be used when sealing cracks in slabs and other small openings. Non-shrink mortar (for floors) or expanding foam shall be used for larger openings.

When using sealants, caulks, or bonding chemicals containing volatile solvents, ventilation shall be provided as recommended by the manufacturer of the material. The use of compounds containing TCE or DCE will not be permitted.

3.6 Vent Pipes

All plastic vent pipes and fittings shall be made of Schedule 40 PVC or equivalent.

Cleaning solvents and adhesives used to join plastic pipes and fittings shall be as recommended by manufacturers for use with the type of pipe material. The use of compounds containing TCE or DCE will not be permitted.

All joints and connections shall be permanently sealed, except for installation of fan(s).

Soil vapor vent pipes shall be fastened to the structure of the building with hangers, strapping, or other supports that will adequately and permanently secure the vent material. Existing plumbing, ducts, or mechanical equipment shall not be used to support or secure a soil vapor vent pipe.

Supports for soil vapor vent pipes shall be installed at least every 6 feet on horizontal runs, or as recommended by manufacturer.

Soil vapor vent pipes shall be installed in a configuration that ensures that any rainwater or condensation within the pipes drains downward into the ground beneath the slab.

Soil vapor piping in areas subject to subfreezing conditions shall be protected to avoid the risk of vent pipe freeze-up.

Soil vapor vent pipes shall not block access to any areas required by WP, or interfere with any light, door, window, or equipment access area.

The point of exhaust discharge shall be above the eave of the roof and shall be ten feet or more horizontally and 2 feet or more vertically from any window, door, or other opening.

3.7 Vent Fans

The soil vapor vent fan(s) shall be designed or sealed to reduce the potential for leakage of soil gas from the fan housing.

The vent fan(s) shall be sized to provide the pressure difference and airflow characteristics necessary to achieve the soil vapor reduction goals.

The vent fan(s) shall be installed in a configuration that avoids condensation buildup in the fan housing.

The vent fan(s) shall be mounted on the exterior of the building and shall be rated for outdoor use or installed in a watertight protective housing.

The vent fan(s) shall be mounted and secured in a manner that minimizes transfer of vibration to the structural framing of the building.

The vent fan(s) shall be installed using removable couplings or flexible connections that can be tightly secured to both the fan and the vent pipe.

3.8 Suction Pits

To provide optimum pressure field extension below the slab, 3- to 5-gallons of material shall be excavated from the area immediately below the slab penetration point of the system vent pipes.

Soil excavated from the suction pits shall be containerized in sealed buckets or drums and shall be considered contaminated. See also Section 2.1 for discussion of known or suspected soil contaminants.

3.9 Sealing

Openings around vent pipe penetrations of the slab shall be cleaned, prepared, and sealed in a permanent, air-tight manner using compatible caulks or other sealant materials. Openings around other utility penetrations shall also be sealed.

Openings or cracks in the existing concrete floor that exhibit leakage (by smoke testing during the system performance testing), shall be sealed with urethane caulk or equivalent material. When the opening or channel is greater than 1/2 inch in width, a foam backer rod or other comparable filler material shall be inserted in the channel before application of the sealant.

3.10 Drains

The floor drains identified during the building inspection do not appear to be a source of soil vapor. The Contractor shall, however, seal the unused drain west of the Grinding Room entryway (see Figure 3), which was noted to be open to the subsurface and to ambient (outside) airflow.

3.11 Electrical

Wiring for the soil vapor mitigation system shall conform to provisions of the National Electric Code and any additional local regulations.

All electrical work shall be performed by an electrician licensed for the work.

Wiring may not be located in, or chased through, the mitigation soil vapor duct pipes or any other heating or cooling ductwork.

The soil vapor fans shall be provided with dedicated electrical circuits and circuit breakers. The circuit breakers will be used to deactivate the system for maintenance or repair.

3.12 Monitors and Labeling

A "Soil Vapor System" label shall be placed on each visible vent pipe. The label shall be legible from a distance of at least three feet.

The circuit breaker(s) controlling the system shall also be labeled "Soil Vapor System."

Vacuum gauges or manometers shall also be installed as necessary to evaluate the system performance.

Each vertical vent pipe shall include a vapor sampling port.

3.13 Site Restoration

All disturbed surfaces and areas shall be restored to their previous or better condition.

4 General Requirements

This section describes the general requirements for conducting the work, including health and safety requirements, quality assurance, the Technical Execution Plan, environmental monitoring and control, and project reporting.

4.1 Health and Safety

A Safety Qualification Form (provided by RETEC) shall be completed and submitted by the Contractor(s) during the bidding process for this work for RETEC's review and NWR's approval.

The selected Contractor shall read, sign, and comply with RETEC's site-specific HASP and the Order on Consent between NWR and NYSDEC.

RETEC will provide a copy of the HASP to the Contractor under separate cover. Subjects covered in the HASP include:

- Health & Safety Risk Analysis;
- Personal Protective Equipment;
- OSHA Air Monitoring & Action Levels;
- Site Control;
- Decontamination;
- Emergency Response Plan;
- Lockout/Tagout;
- Heavy Equipment Operations;
- Excavation and Trenching;
- Material Safety Data Sheets; and
- Health and Safety Records and Reports.

Hours of on-site operation shall be daylight hours between 8 AM and 5 PM, Monday through Friday, unless otherwise allowed in writing by NWR and WP.

Contractors shall comply with all OSHA, state, and local standards or regulations relating to worker safety, including fall protection and occupational contaminant exposure.

The contractor shall have a worker protection plan on file that is available to all employees.

The contractor shall ensure that all appropriate safety equipment is available on the job site during the work.

All electrical equipment used during the work shall be properly grounded.

The contractor shall ensure that fire extinguishers suitable for type A, B, and C fires are available in the immediate work area.

In any planned work area where it is suspected that friable asbestos may exist and be disturbed, work shall not be conducted until a determination is made that such work will be undertaken in a manner which complies with applicable asbestos regulations.

When mitigation work requires the use of sealants, adhesives, paints, or other substances that may be hazardous to health, the Contractor shall provide RETEC and the Contractor's employees with the applicable MSDSs and explain the required safety procedures.

4.2 Environmental Monitoring and Control

RETEC will periodically record the work area VOC concentration using a photoionization detector (PID) with an 11.7 eV bulb. The results of this monitoring will be used by RETEC to ensure that the action levels outlined in the site specific HASP are followed.

4.3 Quality Assurance

The work will utilize standard quality assurance procedures including submittal by the Contractor, prior to the work and for the Engineer's approval, of specific makes and models of proposed system components, and field verification by the Engineer that the work was performed according to the approved design.

4.4 Technical Execution Plan

A Technical Execution Plan (TEP) shall be prepared and submitted by the Contractor(s) during the bidding process for this work for RETEC's review and NWR's approval. The Contractor's TEP shall describe:

- A summary of the Contractor's building inspection;
- A conceptual design of the Contractor's proposed sub-slab depressurization system, including details and sketches regarding:
  - The materials, equipment, and methods to be used to perform the work;
  - Location of floor penetrations and vent stacks;
  - Approximate routing of exhaust manifolds;
  - Details of wall or roof penetrations;
  - Approximate location of exterior exhaust points;

  - Manufacturer's information for vent fans and pipe hangers;

- The proposed schedule for completing the work;
- A list of the assumptions made for costing purposes;
- Resumes of key project personnel;
- A summary of the Contractor's standard health, safety, and site monitoring procedures;
- A statement indicating compliance with U.S. EPA's Radon Mitigation Standards [U.S. EPA, 1994];
- A statement describing any system maintenance and annual costs that the building owner would be required to assume; and
- The conditions of any warranty or guarantee.

Any substantial modification to this Work Plan proposed by the Contractor in the TEP will require approval by NWR, WP, NYSDEC, and NYSDOH.

4.5 Project Reporting

Upon completion of construction, the Contractor shall provide RETEC with the following:

- Any pre- and post-mitigation system test data;
- Copies of sub-contracts, warranties, and manufacturers' cut-sheets;
- A description of the installed system and its basic operating parameters;
- A description of the proper operating procedures of any mechanical or electrical systems installed, including manufacturers' operation and maintenance instructions and warranties;
- An As-Built Floor Plan Sketch; and
- Descriptions of any deviations from the originally proposed design.

At the conclusion of each workday, the Contractor and RETEC will review the work completed and reach consensus on any relevant quantities for payment.

RETEC shall provide weekly Progress Reports to NWR, WP, and NYSDEC. Progress Reports will include:

- The previous week's actions;
- Next week's planned actions;
- Sampling and analytical results;
- Design changes and other modifications to the design; and
- Revised project schedules.

Upon completion of construction and the initial performance testing, RETEC will prepare a Final Engineering Report, approved by a professional engineer licensed in the State of New York. The following items will be included in the Final Report:

- An Operation & Maintenance Plan;
- A description of all field work performed;
- As-Built drawings;
- All pertinent analytical and diagnostic results; and
- Status of the site upon completion.

5 References

USEPA, 1988. National Ambient Volatile Organic Compounds Data Base Update, United States Environmental Protection Agency, Document #PB88-195631, 1988.

USEPA, 1994. Radon Mitigation Standards, United States Environmental Protection Agency, Document #402-R-93-078, October 1993 (Revised April 1994).

NAI, 2005. Revised Remedial Investigations Report, Ward Products Corporation Site, Normandeau Associates, Inc., May 2005.

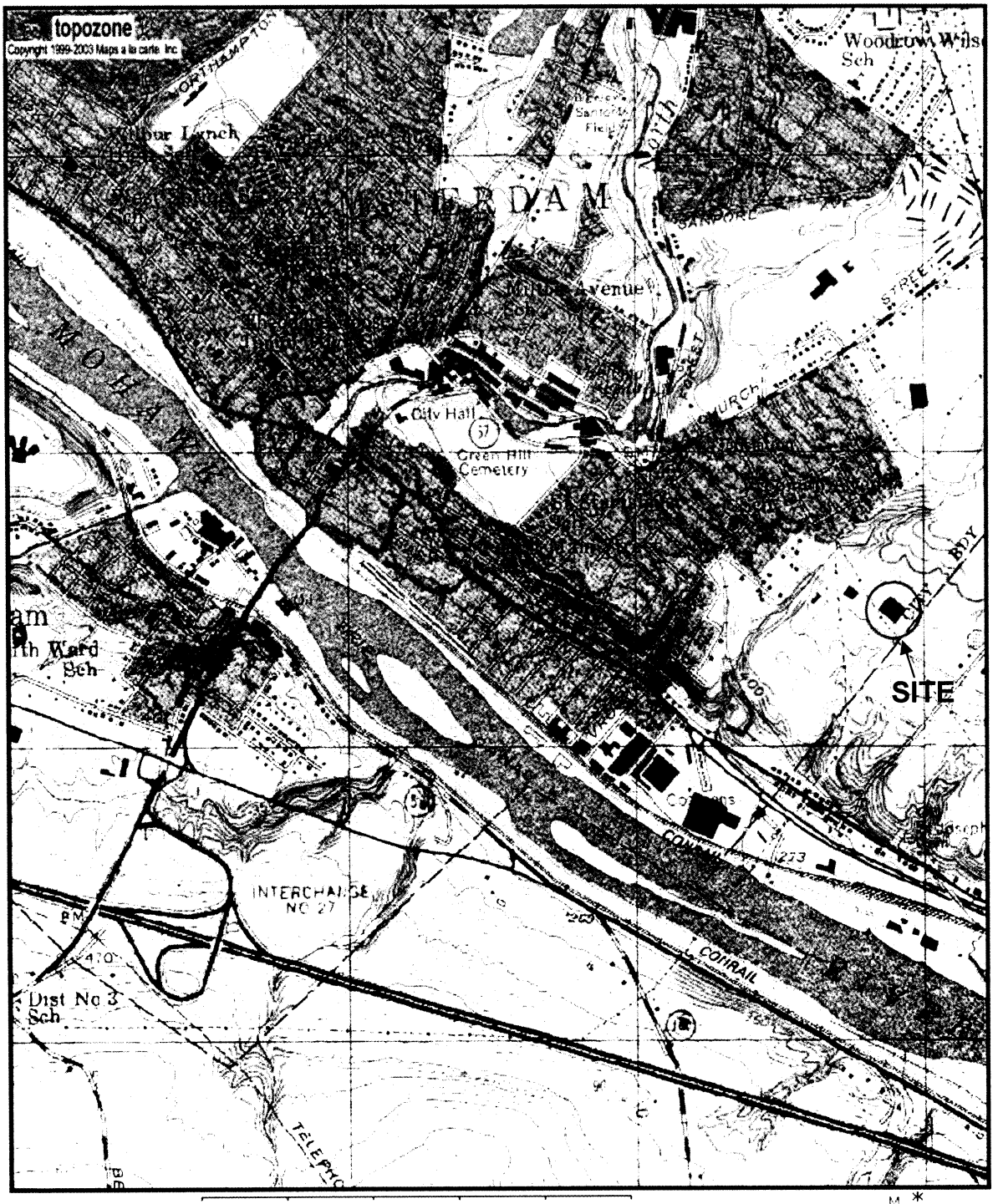
NYSDEC, 1997. Order on Consent, Ward Products, Inc. Index #W4-0762-96-06, Site Code #4-29-004, New York State Department of Environmental Conservation, 1997.

NYSDOH, 2005. Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Public Comment Draft, New York State Department of Health, February 2005.

RETEC, 2002. Results of Indoor Air Sampling, New Water Realty Corporation Site, The RETEC Group, Inc., December 2002.

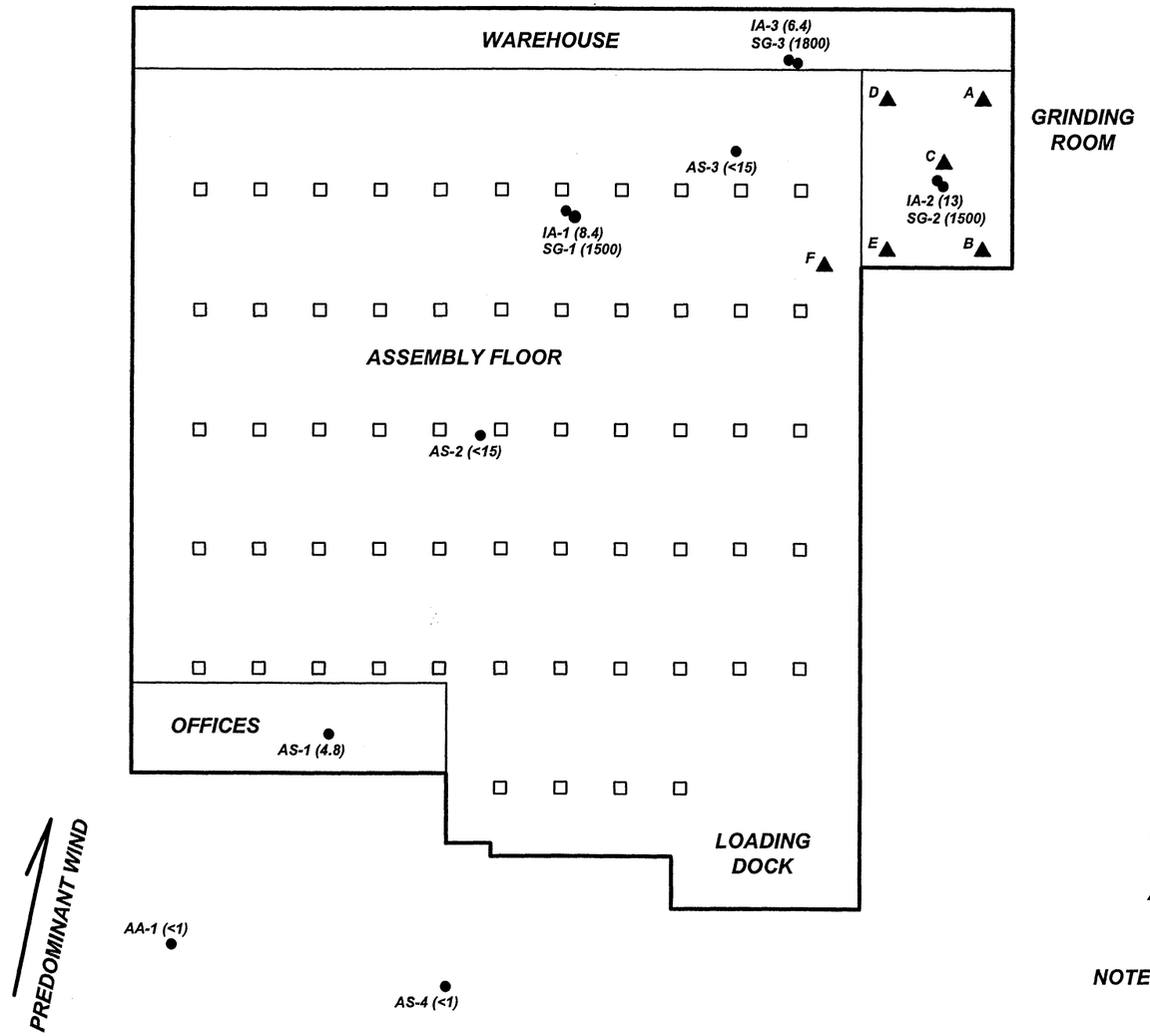
RETEC, 2005. Results of January 2005 Indoor Air / Soil Gas Sampling, Ward Products LLC Building, The RETEC Group, Inc., February 2005.

FIGURES



Map center is UTM 18 566553E 4753709N (WGS84/NAD83)
Amsterdam quadrangle
Projection is UTM Zone 18 NAD83 Datum

FIGURE 1
Site Location



▲ SUB-SLAB SOIL SAMPLE LOCATION

● AIR / VAPOR SAMPLE LOCATION (ug/M3 TCE)

AS 2002 AIR SAMPLE

AA 2005 AMBIENT AIR SAMPLE

IA 2005 INDOOR AIR SAMPLE

SG 2005 SOIL GAS SAMPLE

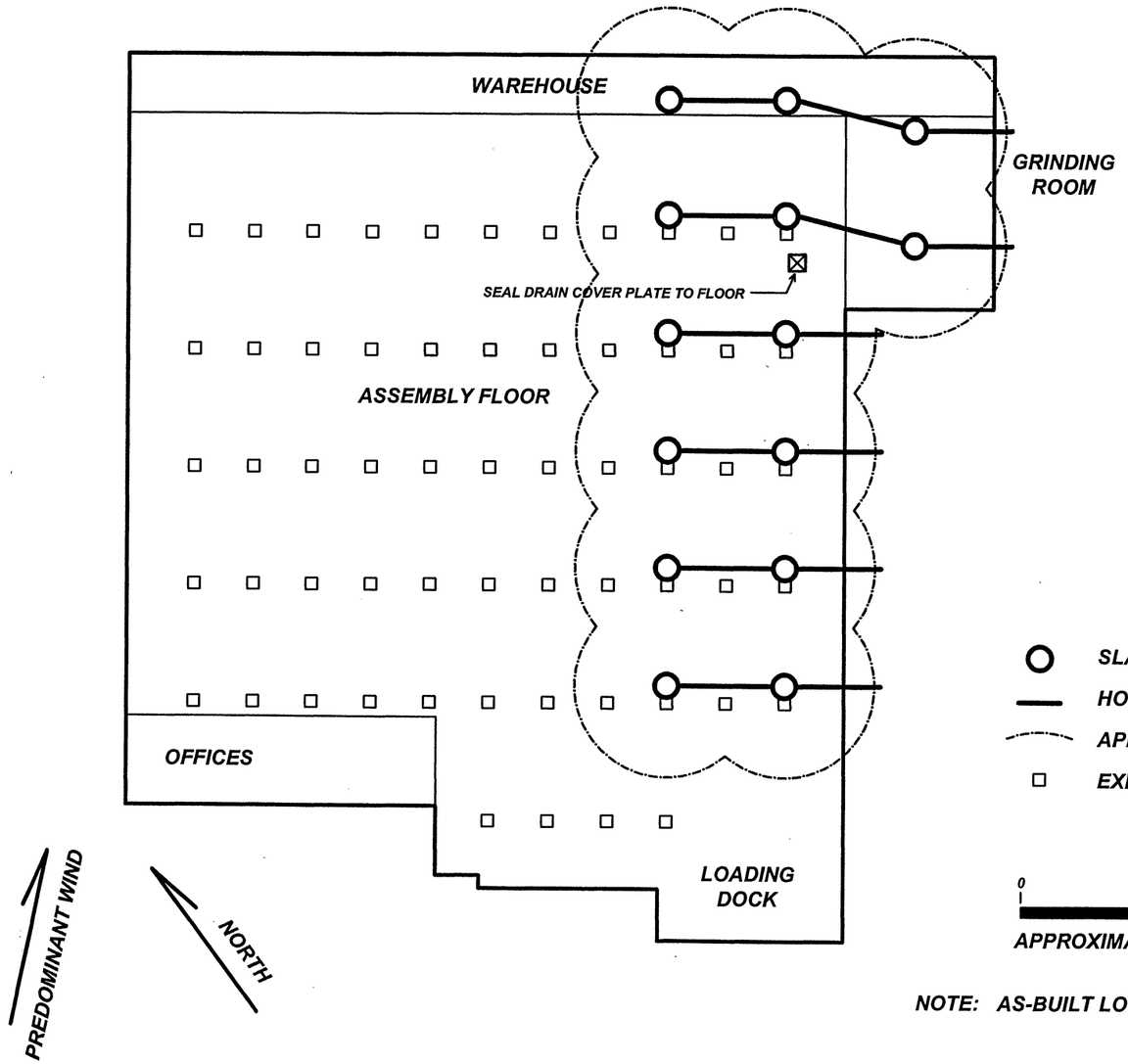
0 50 100

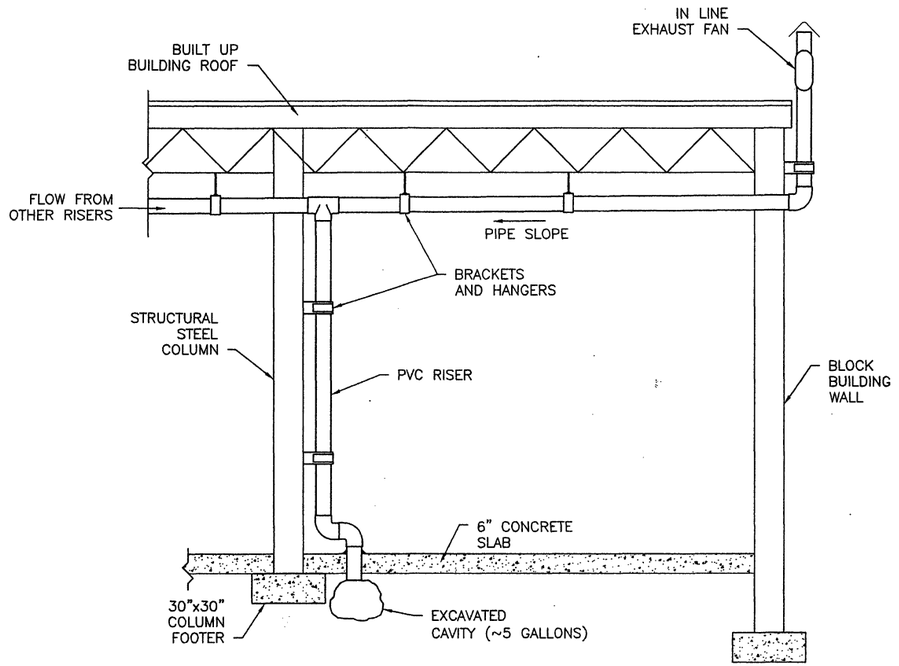
APPROXIMATE SCALE IN FEET

NOTE: SEE DATA SUMMARY TABLES FOR ADDITIONAL ANALYTICAL RESULTS

RETEC

Ward Products Site Amsterdam, NY NWR0-15852-300			INDOOR AIR, SOIL VAPOR, AND SUB-SLAB SOIL SAMPLING LOCATIONS	
DATE: 07/13/05	DRWN: MRH	FILE:	LAYOUT:	FIGURE 2





VENT PIPE DETAILS
NOT TO SCALE

SLAB PENETRATION AND VERTICAL VENT PIPE

HORIZONTAL VENT PIPE (FAN NOT SHOWN)

APPROXIMATE ZONE OF INFLUENCE

EXISTING STRUCTURAL SUPPORT COLUMNS

0 50 100

APPROXIMATE SCALE IN FEET

NOTE: AS-BUILT LOCATIONS OF PENETRATIONS AND PIPES MAY VARY

RETEC

Ward Products Site Amsterdam, NY NWR0-15852-300	**PROPOSED** **INDOOR AIR AND SOIL VAPOR** **MITIGATION SYSTEM**
DATE: 07/13/05 | DRWN: MRH | FILE:	LAYOUT: | **FIGURE 3**

APPENDIX A

Indoor Air and Soil Vapor
Data Summary Table

Summary of Indoor Air and Soil Gas Sampling Results

Former Ward Products Site

Compound	CAS#	Units	NOVEMBER 2002 RESULTS				JANUARY 2005 RESULTS							NYSDOH Indoor Guidance Value	Occupational Exposure Limits (TWA)
			Offices	Assembly Floor	Grinding Room	Ambient	Assembly Floor		Grinding Room		Warehouse		Ambient		
			AS-1 (Indoor Air)	AS-2 (Indoor Air)	AS-3 (Indoor Air)	AS-4 (Outside Air)	IA-1 (Indoor Air)	SG-1 (Soil Gas)	IA-2 (Indoor Air)	SG-2 (Soil Gas)	IA-3 (Indoor Air)	SG-3 (Soil Gas)	AA-1 (Outside Air)		
1-1 Dichloroethene	75-35-4	ug/M^3	< 2.1	< 11	< 11	< 0.75	< 0.60	< 0.60	< 0.60	3.3	< 0.60	79	< 0.60	NL	20,000 ACGIH
cis-1,2-Dichloroethene	156-59-2	ug/M^3	< 2.1	< 11	< 11	< 0.75	< 0.60	17	< 0.60	37	< 0.60	940	< 0.60	NL	793,000 ACGIH
Carbon Tetrachloride	56-23-5	ug/M^3	< 3.3	< 18	< 18	< 1.2	< 0.96	4.8	< 0.96	7.5	< 0.96	< 0.96	< 0.96	NL	31,000 ACGIH
Chloroform	67-66-3	ug/M^3	< 2.6	< 14	< 14	< 0.93	0.94	13	0.65	55	< 0.74	15	< 0.74	NL	49,000 ACGIH
Tetrachloroethene	127-18-4	ug/M^3	4.7	< 19	< 19	< 1.3	< 1.0	1.4	< 1.0	1.4	< 1.0	0.83	< 1.0	100	170,000 ACGIH
Trichloroethene	79-01-6	ug/M^3	4.8	< 15	< 15	< 1.0	8.4	1500	13	1500	6.4	1800	< 0.82	5	134,000 NIOSH

APPENDIX B

Sub-Slab Soil Data Summary Table

Sub-Slab Soil Data Summary - Ward Products Site, Amsterdam, NY

Sample ID	Average Sample Depth, feet		Total Cadmium, mg/Kg	TCLP Cadmium, mg/L	Total Chromium, mg/Kg	Hex Chromium, mg/Kg	Total Lead, mg/Kg	Total Nickel, mg/Kg	Total Zinc, mg/Kg
Soils Under Building									
Location A	0.50		< 1	---	47.0	< 10	< 61	52.8	99.0
Location A	1.50		5.0	---	139.0	11.2	< 61	110.0	217.0
Location B	0.50		7.9	---	162.0	14.7	< 61	270.0	128.0
Location B	1.50		16.4	---	273.0	11.8	< 61	309.0	588.0
Location B	2.50		1.2	---	37.0	< 10	< 61	17.2	52.0
Location C	0.50		31.9	< 1	153.0	< 10	< 61	18.1	28.0
Location C	1.50		56.9	< 1	24.3	< 10	< 61	18.4	63.0
Location D	0.50		26.6	1.75	70.7	< 10	< 61	73.4	86.0
Location D	1.50		72.4	---	59.2	< 10	< 61	20.7	74.0
Location E	0.50		263.0	1.82	54.1	< 10	< 61	45.5	193.0
Location E	1.50		314.0	1.42	51.4	< 10	< 61	44.8	241.0
Location F	0.50		62.8	1.75	27.4	< 10	< 61	19.5	75.0
Location F	1.50		1.2	---	17.3	< 10	< 61	22.7	57.0
Location F	2.50		65.9	1.69	35.8	< 10	< 61	20.7	72.0

Applicable Criteria:

TAGM 4046 Recommended Cleanup Levels	1		10	10	61	13	20
TCLP		1					
EPA Human Health Risk Screening Values	450		450	64	750	20,000	100,000

APPENDIX C

Material Safety Data Sheets

MSDS

MATERIAL SAFETY DATA SHEET **CHEMTREC:** 800-424-9300 (USA)

703-527-3887(Outside USA an Canada)

CANUTEC:

613-996-6666

From: Mallinckrodt Baker, Inc
222 Red School Lane
Phillipsburg, NJ 08865

NOTE: Use CHEMTREC and CANUTEC phone numbers only in the event of a chemical emergency.

Emergency Telephone Number: 908-859-2151

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

M A L L I N C K R O D T **J. T. B A K E R**

TRICHLOROETHYLENE

1. Product Identification

Synonyms:
Trichloroethene; TCE; acetylene trichloride; Ethinyl trichloride

CAS No.: 79-01-6

Molecular Weight: 131.39

Chemical Formula: C2HCl3

Product Codes:

J.T. Baker: 5376, 9454, 9458, 9464, 9473, 9474

Mallinckrodt: 8598, 8600, 8633

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Trichloroethylene	79-01-6	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS.

SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CANCER. Risk of cancer depends on level and duration of exposure.

Potential Health Effects

Inhalation:

Vapors can irritate the respiratory tract. Causes depression of the central nervous system with sym visual disturbances and mental confusion, incoordination, headache, nausea, euphoria, and dizziness Inhalation of high concentrations could cause unconsciousness, heart effects, liver effects, kidney and death.

Ingestion:

Cases irritation to gastrointestinal tract. May also cause effects similar to inhalation. May cause abdominal pain, diarrhea, dizziness, pulmonary edema, unconsciousness. Kidney failure can result in cases. Estimated fatal dose is 3-5 ml/kg.

Skin Contact:

Cause irritation, redness and pain. Can cause blistering. Continued skin contact has a defatting ac can produce rough, dry, red skin resulting in secondary infection.

Eye Contact:

Vapors may cause severe irritation with redness and pain. Splashes may cause eye damage.

Chronic Exposure:

Chronic exposures may cause liver, kidney, central nervous system, and peripheral nervous system ef Workers chronically exposed may exhibit central nervous system depression, intolerance to alcohol, increased cardiac output. This material is linked to mutagenic effects in humans. This material is suspect carcinogen.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, cardiovascular disorders, impaired liver or kidney or res function, or central or peripheral nervous system disorders may be more susceptible to the effects substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an un person. Call a physician.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contami clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes befor

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelid

occasionally. Get medical attention immediately.

Note to Physician:

Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. Fire Fighting Measures

Fire:

Autoignition temperature: 420C (788F)
Flammable limits in air % by volume:
lel: 8; uel: 12.5

Explosion:

A strong ignition source, e. g., a welding torch, can produce ignition. Sealed containers may ruptu heated.

Fire Extinguishing Media:

Use water spray to keep fire exposed containers cool. If substance does ignite, use CO2, dry chemic

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing a with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by- include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limit protection to the combustion products of this material.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protecti equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personne entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect l appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and p chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of repc quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physica Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of th may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnir precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

Trichloroethylene:
-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA), 200 ppm (Ceiling),
300 ppm/5min/2hr (Max)
-ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) 100 ppm (STEL);
listed as A5, not suspected as a human carcinogen.

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airbor Limits. Local exhaust ventilation is generally preferred because it can control the emissions of th contaminant at its source, preventing dispersion of it into the general work area. Please refer to document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for detai

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Bre quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Thi has poor warning properties. Where respirators are required, you must have a written program coveri basic requirements in the OSHA respirator standard. These include training, fit testing, medical ap cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appr prevent skin contact. Neoprene is a recommended material for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye was and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Chloroform-like odor.

Solubility:

Practically insoluble in water. Readily miscible in organic solvents.

Specific Gravity:

1.47 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

87C (189F)

Melting Point:

-73C (-99F)

Vapor Density (Air=1):
4.5
Vapor Pressure (mm Hg):
57.8 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Will slowly decompose to hydrochloric acid whe
to light and moisture.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decompos
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and alkalis, strong oxidizers, chemically active metals, such as barium, lithium, s
magnesium, titanium and beryllium, liquid oxygen.
Conditions to Avoid:
Heat, flame, ignition sources, light, moisture, incompatibles

11. Toxicological Information

Toxicological Data:

Trichloroethylene: Oral rat LD50: 5650 mg/kg; investigated as a tumorigen, mutagen, reproductive ef
Reproductive Toxicity:
This material has been linked to mutagenic effects in humans.

--------\Cancer Lists\----------

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Trichloroethylene (79-01-6)	No	Yes	2A

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, material is expected to quickly evaporate. When released to water, this material is expected to qui evaporate. This material has an experimentally-determined bioconcentration factor (BCF) of less tha material is not expected to significantly bioaccumulate. When released into the air, this material moderately degraded by reaction with photochemically produced hydroxyl radicals. When released intc this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be sligh to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent tc approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contaminatic product may change the waste management options. State and local disposal regulations may differ fr disposal regulations. Dispose of container and unused contents in accordance with federal, state ar requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL
International (Water, I.M.O.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL
International (Air, I.C.A.O.)

Proper Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Trichloroethylene (79-01-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Trichloroethylene (79-01-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Trichloroethylene (79-01-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

	-RCRA-	-TSCA-

Ingredient	CERCLA	261.33	8(d)
Trichloroethylene (79-01-6)	100	U228	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No

SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No

Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.
Australian Hazchem Code: No information found.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all

a physician. Note to physician: Do not administer adrenaline or epinephrine to a victim of chlorina poisoning.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8, 11.

Disclaimer:

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****

Prepared by: Strategic Services Division

Phone Number: (314) 654-1600 (U.S.A.)

SPECTRUM®

ISO 9002 CERTIFIED

GARDENA, CA
NEW BRUNSWICK, NJ

Material Safety Data Sheet

NFPA	HMIS	Personal Protective Equipment
	Health Hazard 3 Fire Hazard 1 Reactivity 0	 See Section 15.

Section 1. Chemical Product and Company Identification

Common Name/ Trade Name	**Cadmium**
Manufacturer	SPECTRUM CHEMICAL MFG. CORP. 14422 S. SAN PEDRO STREET GARDENA, CA 90248
Commercial Name(s)	Not available.
Synonym	Not available.
Chemical Name	Cadmium
Chemical Family	Metal. (Inert material.)
Chemical Formula	Cd
Supplier	SPECTRUM CHEMICAL MFG. CORP. 14422 S. SAN PEDRO STREET GARDENA, CA 90248

Code	C3020
CAS#	7440-43-9
RTECS	EU9800000
TSCA	TSCA 8(b) inventory: Cadmium
CI#	Not applicable.

IN CASE OF EMERGENCY
CHEMTREC (24hr) 800-424-9300

CALL (310) 516-8000

Section 2 Composition and Information on Ingredients

		Exposure Limits			
Name	**CAS #**	**TWA (mg/m³)**	**STEL (mg/m³)**	**CEIL (mg/m³)**	**% by Weight**
1) Cadmium	7440-43-9	0.01			100

Toxicological Data on Ingredients

Cadmium:
ORAL (LD50): Acute: 2330 mg/kg [Rat.]. 890 mg/kg [Mouse].
DUST (LC50): Acute: 50 ppm 4 hour(s) [Rat].

Section 3. Hazards Identification

Potential Acute Health Effects

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects

CARCINOGENIC EFFECTS: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to kidneys, lungs, liver.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Continued on Next Page

Section 4. First Aid Measures

Eye Contact	No known effect on eye contact, rinse with water for a few minutes.
Skin Contact	After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.
Serious Skin Contact	Not available.
Inhalation	Allow the victim to rest in a well ventilated area. Seek immediate medical attention.
Serious Inhalation	Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.
Ingestion	Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.
Serious Ingestion	Not available.

Section 5. Fire and Explosion Data

Flammability of the Product	May be combustible at high temperature.
Auto-Ignition Temperature	570°C (1058°F)
Flash Points	Not available.
Flammable Limits	Not available.
Products of Combustion	Some metallic oxides.
Fire Hazards in Presence of Various Substances	Non-flammable in presence of open flames and sparks, of heat, of oxidizing materials, of reducing materials, of combustible materials, of moisture.
Explosion Hazards in Presence of Various Substances	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.
Special Remarks on Fire Hazards	Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits toxic fumes.
Special Remarks on Explosion Hazards	Not available.

Section 6. Accidental Release Measures

Small Spill	Use appropriate tools to put the spilled solid in a convenient waste disposal container.
Large Spill	Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Continued on Next Page

Section 7. Handling and Storage

Precautions	Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.
Storage	Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.
Exposure Limits	TWA: 0.01 (ppm) Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical state and appearance	Solid. (Lustrous solid.)	**Odor**	Not available.
Molecular Weight	112.4 g/mole	**Taste**	Not available.
pH (1% soln/water)	Not applicable.	**Color**	Silvery.

Boiling Point	765°C (1409°F)
Melting Point	320.9°C (609.6°F)
Critical Temperature	Not available.
Specific Gravity	8.64 (Water = 1)
Vapor Pressure	Not applicable.
Vapor Density	Not available.
Volatility	Not available.
Odor Threshold	Not available.
Water/Oil Dist. Coeff.	Not available.
Ionicity (In Water)	Not available.
Dispersion Properties	Not available.
Solubility	Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

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Section 10. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	Not available.
Incompatibility with various substances	Reactive with oxidizing agents.
Corrosivity	Not considered to be corrosive for metals and glass.
Special Remarks on Reactivity	Reacts violently with potassium.
Special Remarks on Corrosivity	Not available.
Polymerization	No.

Section 11. Toxicological Information

Routes of Entry	Inhalation. Ingestion.
Toxicity to Animals	**WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.** Acute oral toxicity (LD50): 890 mg/kg [Mouse]. Acute toxicity of the dust (LC50): 229.9 mg/m^3 4 hour(s) [Rat].
Chronic Effects on Humans	**CARCINOGENIC EFFECTS**: Classified A2 (Suspected for human.) by ACGIH, 2 (Reasonably anticipated.) by NTP. The substance is toxic to kidneys, lungs, liver.
Other Toxic Effects on Humans	Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer).
Special Remarks on Toxicity to Animals	Not available.
Special Remarks on Chronic Effects on Humans	An allergen. 0047 Animal: embryotoxic, passes through the placental barrier.
Special Remarks on other Toxic Effects on Humans	May cause allergic reactions, exzema and/or dehydration of the skin.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Products of Biodegradation	Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Toxicity of the Products of Biodegradation	The products of degradation are as toxic as the original product.
Special Remarks on the Products of Biodegradation	Not available.

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Section 13. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local or regional authorities.

Section 14. Transport Information

DOT Classification	
Identification	
Special Provisions for Transport	
DOT (Pictograms)	

Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations	California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Cadmium California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium Pennsylvania RTK: Cadmium Massachusetts RTK: Cadmium TSCA 8(b) inventory: Cadmium SARA 313 toxic chemical notification and release reporting: Cadmium CERCLA: Hazardous substances.: Cadmium	
California Proposition 65 Warnings	California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Cadmium	
Other Regulations	OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).	
Other Classifications	**WHMIS (Canada)**	CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
	DSCL (EEC)	R26- Very toxic by inhalation. R45- May cause cancer.

HMIS (U.S.A.)

Health Hazard	3
Fire Hazard	1
Reactivity	0
Personal Protection	E

National Fire Protection Association (U.S.A.)

Health — Flammability — Reactivity — Specific hazard

WHMIS (Canada) (Pictograms)

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

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ADR (Europe)
(Pictograms)

Protective Equipment


Gloves.


Lab coat.


Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.


Safety glasses.

Section 16. Other Information

Catalog Number(s)	**C1005, C1006, C1010**
References	-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.
Other Special Considerations	Not available.

Validated by G. A. Binas on 2/17/2000.	**Verified by G. A. Binas.** **Printed 2/7/2001.**

CALL (310) 516-8000

Notice to Reader

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.