WASATCH CHEMICAL COMPANY SUPERFUND SITE

FIVE-YEAR REVIEW REPORT

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1.0  INTRODUCTION

Region VIII of the U.S. Environmental Protection Agency (EPA) and the State of Utah, Department of Environmental Quality (UDEQ) have conducted a Five-Year Review of the Wasatch Chemical Company Superfund Site (Site) and prepared this report under the requirements of Section 121(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, and Section 300.430(f) (4) (ii) of the National Contingency Plan (NCP). It is a statutory, Type I review which is applicable to sites at which remedial construction is complete as referenced in OSWER Directive 9355.7-02, May 23, 1991.

The purpose of a five-year review is to ensure that Remedial Actions (RAs) remain protective of public health and the environment and are functioning as designed. If the review determines that the remedies are no longer protective, appropriate action to correct the remedies may be initiated. A five-year review is required because hazardous substances remain on Site which prevent unlimited access and unrestricted use of the Site. Five-year reviews must be completed no less often than every five years after initiation of remedial action (RA) at the site. This Five-Year Review for the Wasatch Chemical Company Superfund Site was triggered by the RA involving land farming which was initiated on October 23, 1992.

2.0  SITE BACKGROUND

2.1 Site Description

The property, now owned by Interstate Land Corporation is located at 1987 South 700 West in Salt Lake City, Utah in an area dedicated to light and heavy industry. The property and adjoining parcels (Site), located in the south-western portion of the Salt Lake City metropolitan area, is roughly bounded by a railroad, a freeway, a city street, a former food distribution business and a steel fabrication business. The Site was placed on the National Priorities List (NPL) on February 11, 1991.
According to the Remedial Investigation (RI), the study area consisted of the former Wasatch Chemical Company property and certain adjoining parcels. The on-property area comprises approximately 18 acres. The Site can be described as encompassing three separate areas. These areas are divided on the basis of prior ownership, development, and use. The areas are shown on Site drawings as Lots 2 through 6. One area consists of 3.7 acres which is identified as Lot 6 (which was placed on the National Priorities List in February 1991). This area, which is largely undeveloped is on the northern portion of the property. The second area, Lots 2 through 5 have been developed and, at the time the RI was conducted, contained on-going industrial operations. The third area consists of the adjoining properties including the property operated by Steelco to the north of Lot 6, and the property owned by the Union Pacific Railroad to the east of the Site.

The topography is flat with no more than several feet elevation difference across the property. Soils are a mixture of natural and fill material. The material consists of clays, silts and fine to medium sand. Most surface drainages flow toward a small drainage ditch which connects to other industrial drainages and then to the Great Salt Lake. Sediments in the ditch consist of locally derived materials and are similar to the Site soils. Directly beneath the Site is a shallow aquifer which flows to the north and northwest with some discharge to the drainage ditch. Annual precipitation is 12 to 13 inches.

The Record of Decision (ROD) provided for expansion of the Site boundaries if contaminants from site activities are found to have been placed in or migrated to areas outside these boundaries. An Explanation of Significant Differences (ESD) which was issued in November 1995, expanded the Site boundaries under this provision of the ROD. The boundaries at the time the ROD was signed were delineated as follows:

To the east, the tracks of DRGWR; to the south, 2100 South Street; to the west, 700 West Street; and to the north, a line of demarcation extending across the Steelco property at a distance of 80 feet from the northern edge of Lot 6.

During Remedial Design, Entrada conducted an additional groundwater investigation. The results of that investigation indicated that groundwater contamination extended past the Site boundaries described in the ROD. Therefore, in accordance with the results of the additional groundwater investigation and the enabling provisions of the ROD, the Site boundaries were modified to include the newly defined areal extent of contamination. The eastern and western boundaries of the Site remain unchanged, but the northern boundary has been extended to coincide with the
Union Pacific rail spur in the south-central portion of the Steelco property. Additionally, it has been determined that contaminants from Site activities have not been placed on or migrated to the Mega Foods property on the southern boundary of the Site. Therefore, the southern site boundary now excludes the Mega Institutional Foods property. The Site boundaries as identified in the ROD are shown in Figure 1 of the ESD. Figure 2 of the ESD shows the modified Site boundaries.

2.2 History

The property has been in continuous operation from the mid-1950’s. Activities at the property have predominantly been the formulation, blending and repackaging of cleaners, acids, caustics, solvents, herbicides, pesticides, and fertilizer. There are approximately a half dozen buildings on the property. At the time the RI was developed, property activities included blending, formulation and repackaging of acids, caustics, cleaners and solvents. At the present time, there are no on-site industrial or business activities.

2.3 Regulatory and Initial Enforcement History

In June of 1984, the Utah Department of Health, Bureau of Solid and Hazardous Waste (BSHW) advised the potential responsible parties (PRPs) of an alleged release or threatened release of chemicals from the property to the environment. Based on field investigations, the BSHW completed a Preliminary Assessment (PA) and Site Investigation (SI) of the property in 1984 and 1985 respectively.

In January of 1986, the State of Utah filed a lawsuit in Federal District Court for the District of Utah against all PRPs, entitled Utah State Department of Health vs. Peter Ng, Civil No. 86-C-0023G (Utah).

Additional field investigations of groundwater, surface water, soils, and sediments were conducted by BSHW and/or EPA in 1986 and 1987.

A Unilateral Administrative Order was issued by EPA In the Matter of: Wasatch Lot 6, Doc. No. CERCLA VIII-86-03 (March 13,1986) pursuant to Section 106 of CERCLA, ordering certain PRPs (Huntsman-Christensen defendants) to undertake the removal of drums, cylinders, and containers, and the sampling and analysis of soils and water found on Lot 6. The respondents failed to act in a timely manner and EPA performed the removal action starting on March 17, 1986. The Removal Action was completed on June 6, 1986.
On July 2, 1986, the State filed a First Amended Complaint seeking past and future response costs and injunctive relief under Section 107 of CERCLA, Section 7002 of RCRA, and related State law claims under the Utah Solid and Hazardous Waste Act and the Utah Water Pollution Control Act.

In January of 1987, EPA proposed Lot 6 to be listed on the National Priorities List. In February 1987, EPA agreed to have BSHW serve as the lead agency for purposes of conducting the RI/FS at the Site.

In April of 1988, EPA authorized BSHW to be the lead agency for oversight of the RI/FS conducted by Entrada. Entrada and BSHW entered into a Partial Consent Decree in September 1988 to perform the RI/FS at the Site.

3.0 Pre-Remedial Activities

In June of 1986, EPA, in cooperation with BSHW, undertook a CERCLA 106 Fund lead removal action to remove approximately 50 drums, cylinders, and other containers of chemical waste from Lot 6 and to provide temporary on-property storage of several drums containing dioxin waste. The Removal Action was initiated on March 17, 1986 and completed on June 6, 1986.

In June of 1988, four drums were removed from the Site by the Great Western Chemical Company and disposed of at a disposal facility approved by Salt Lake City-County Health Department to accept soils contaminated with hydrocarbons. Two of the drums were empty and two had a small quantity of residual oil with the consistency and color of used crankcase oil. Samples were collected and analyzed. No hazardous substances were found.

4.0 Site-Wide Remedial Investigation (RI)

A Remedial Investigation Report (RI) for the Wasatch Chemical Company Superfund Site was completed by Entrada on March 30, 1990. The RI was conducted in two phases of field work. Selected information from the RI is provided in this section of the Five-Year Review. During Phases I and II, seven media were investigated at the Site: Waste (sludge and liquid), soil, sediment, surface water, groundwater, air and biota (flora and fauna). In each media, samples were analyzed for Target Compound List (TCL) chemicals. The TCL chemical classes were the volatiles (VOCs), Semivolatiles (SVOCs), herbicides, pesticides, dioxins/furans and metals.
Sampling of the waste media identified elevated concentrations of TCL Compounds in areas including a process drain system, a yard drain system, and an old septic/leach field. Soils and sediments are best characterized as having residual levels of TCL chemicals from past or present operations. According to the RI Report, elevated concentrations of significance appear limited to specific areas and do not appear to be widespread. In those areas where concentrations appear elevated, the compounds of concern include pesticides, herbicides, BNA’s, VOC’s and dioxins.

Contaminated surface soil has impacted the shallow groundwater aquifer. The principal contaminant is VOC’s which occur in limited areas. The air, biota, and surface water media are not characterized as having been significantly impacted by Site activities.

In the RI Report, an evaluation was made of source areas, areas of residual chemicals, and potential areas for remediation. Potential source areas were defined as distinct geographical areas of the property or physical structures present at the property, that were identified on the basis of waste management processes conducted during property operations and from data collected during the RI.

The Site was divided in the RI Report into several geographic areas or structures for discussion of chemical distribution in soils and waste sludges and potential source areas. These areas and structures which were considered for possible remediation are listed below and discussed in the sections which follow.

1. Portions of Lot 6 soils
2. Former Evaporation Pond
3. Southeastern process area
4. Process Drains
5. Yard Drains

Contamination at the Site was divided into three categories: source areas, soils, and groundwater. The source areas include the process drain system (including the former evaporation pond), yard drain system, and septic system. Dioxin waste, consolidated during the removal action conducted by EPA in 1986, was also considered to be a potential source of groundwater contamination. Soil contamination at the Site consisted of herbicides, pesticides, dioxins, volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Soil contamination was the result of spills, run-off accumulation in topographic low points, and transport of contamination from source areas. Groundwater contamination is also encountered at the Site and
consists of VOCs, SVOCs, herbicides, and pesticides. The groundwater contamination is believed to be due to the transport of contaminants from the source areas, particularly drain lines and evaporation pond.

**Drawings for the RI Report, March 30, 1990 are in Volume II of VII of the Report.**

### 5.0 Endangerment Assessment (EA)

A separate Endangerment Assessment (EA), dated January 26, 1990, was performed to evaluate potential adverse impacts to human health and the environment. Using the data collected during the RI, twelve indicator chemicals were chosen, pathways were identified and risk levels were calculated.

Potential pathways of exposure to receptor populations were discussed and those pathways with the highest potential for exposure (primary pathways) were quantified. These primary pathways included incidental ingestion of soil, dermal contact with soil, inhalation of fugitive dusts, and inhalation of chemicals volatilizing from soil and groundwater.

Although groundwater was not identified as a pathway in the EA, (groundwater is not used for drinking water, bathing, or recreational uses,) future use concerns may dictate remedial response actions especially for the VOC’s.

### 6.0 Feasibility Study

#### 6.1 Background

A Feasibility Study (FS) for the Site was issued on August 22, 1990. The FS developed and evaluated a range of remedial alternatives that (1) were feasible and implementable, (2) provided a range of alternative courses of remedial action that can be used to minimize the potential for human exposure to the chemicals of concern present at the Site, (3) minimized effects on the environment, and (4) were cost effective. The alternatives are evaluated with respect to nine criteria that are specified in the National Contingency Plan (NCP). These criteria are:

* Overall protection of human health and the environment,
* Compliance with Applicable or Relevant and Appropriate Requirements, Standards, Limitations, and Criteria (ARARs),

* Long-term effectiveness and permanence,

* Reduction of toxicity, mobility and volume,

* Short-term effectiveness,

* Implementability,

* Cost,

* State acceptance, and

* Community acceptance

Plate No. 3.1 of the FS shows the area of soils exceeding the target clean-up goals. Plate No. 7.1 of the FS shows the distribution of analytes in groundwater. Plate No. 8.1 of the FS shows the remediation features for the Site.

6.2 Description of Site Areas

6.2.1 Lot 6 Soils

Lot 6 is an undeveloped, unpaved area, that has been historically used for temporary storage of empty drums and storage of equipment. A former evaporation pond is located on Lot 6, and a railroad spur formerly crossed the northeastern portion of the area.

Herbicides and pesticides were detected at scattered locations on Lot 6. Two herbicides, (2,4-D and 2,4,5-T) and five pesticides (alpha- and gamma-chlordane, DDE, DDT and heptachlor) were detected in surface-soil collected from various areas of Lot 6.

6.2.2 Former Evaporation Pond

According to design drawings which specified construction parameters and use of the former evaporation pond (sometimes referred to as the vault), the structure accepted process wastewater pumped from a sump located near the south west corner of the pond. The RI indicated that liquids within the pond contained low concentrations of pesticides, herbicides and VOCs. Three of the samples also contained elevated concentrations of chlorinated phenols. Sludge samples within the pond contained low concentrations of VOCs, Base-Neutral/Acids extractable compounds (BNAs), and herbicides.
During the investigations conducted for the RI Report, there was no conclusive evidence of a sludge layer in the bottom of the former evaporation pond. However, design drawings, which were included in the RI Report show that a sludge layer is present. For purposes of the FS, the pond is assumed to contain a sludge layer. In Entrada’s comments regarding the Proposed Plan, it confirms that there was 8" of material in the bottom of the former evaporation pond.

6.2.3 Southeastern Area

Soil samples collected from the perimeter of the abandoned Fertilizer Building generally did not contain elevated concentrations of chemical compounds. However, since grab samples collected from residue on the concrete floor within the building contained elevated concentrations of some pesticides and BNAs, the residue on the concrete floor in the building is addressed in some of the remedial alternatives presented in the FS.

6.2.4 Process Drains

The Process Drains were used to transport waste liquids from the process area to the former evaporation pond. Some samples of the material in the sumps contained dioxins/furans, pesticides, VOCs and BNAs.

6.2.5 Yard Drains and Sumps

The Yard Drains were designed to transport surface water runoff from the paved areas to discharge points along the 700 west ditch. Concentrations of contaminants in the Yard Drains and Sumps were considerably lower than those encountered in the Process Drains.

6.2.6 Area Between Chlorine Building and Warehouse.

This area is located between the Chlorine Building and the Warehouse. Principal concerns are toluene and xylene which were detected in two samples obtained in the area.

6.2.7 Groundwater

Groundwater monitoring wells in the vicinity of the former evaporation pond contained elevated concentrations of VOCs, primarily tetrachloroethene (PCE) and trichloroethene (TCE). However, samples from the western-most well (MW-06) contained only low concentrations of VOCs. Groundwater samples collected from two monitoring wells in the northeastern process area contained numerous VOCs, including elevated levels of TCE and its degradation products.
Groundwater samples collected from the three monitoring wells located on the railroad property along the east side of the Site had detections of both TCE and PCE at least once in each of these wells. Detected concentrations were considerably lower than those reported for the northeastern process area and the area near the former evaporation pond. No analysis of on-site groundwater detected any dioxin or hexachlorobenzene.

The selected remedial actions are described in the following section, which addresses the Record of Decision for the Site.

7.0 Record of Decision

7.1 Description of the Remedy

The principal threats posed by contamination at this Site were addressed in one operable unit. The five focus areas for remediating the principal threats were: excavation and land-farming of hydrocarbon contaminated soils; In-Situ Vitrification (ISV) of highly contaminated soils and debris; limited removal of waste and debris; institutional controls; and groundwater remediation.

EPA and UDEQ issued a Record of Decision (ROD) on March 29, 1991. The major components of the remedy as stated in the ROD include the following:

* Excavation of all soils containing indicator chemicals above action levels, sludges from the yard and process drain systems, the septic system, and consolidation of these contaminated materials and dioxin removal wastes (approximately 3,587 cubic yards of soils and sludges and 650 gallons of liquid waste) in the former evaporation pond;

* Treatment of staged soils, sludges, and dioxin removal wastes by thermal destruction of contaminants through in-situ vitrification;

* Excavation and landfarming of approximately 1,100 cubic yards of hydrocarbon-contaminated soils;

* Surface sealing by asphalt paving;

* Extraction of on-site contaminated groundwater until maximum contaminant levels (MCLs) and proposed MCLs are met, and treatment, to the extent necessary, of extracted groundwater by air stripping to meet Publicly Owned Treatment Works (POTW) or Utah Pollution Discharge Elimination System (UPDES) standards;
* Disposal of any residuals remaining from the treatment of groundwater at an off-site hazardous material disposal facility; and,

* Implementation of institutional controls such as deed restrictions, denial of well permits, or acquisition of water rights, as practicable and to the extent allowable by law.

EPA and UDEQ issued an Explanation of Significant Differences (ESD) on November 30, 1995, which details minor modifications to the remedy. These modifications were based on additional information obtained in investigations carried out subsequent to the issuance of the ROD. The primary components of the ESD were modifications to the site boundary and elimination of asphalt paving of surface soils.

Additional, investigations for the Remedial Design/Remedial Action (RD/RA) indicated that a change in the Site boundary from that described in the ROD was required. Based on the results of the investigation, the northern boundary was extended and the Mega Institutional Foods property on the south-west corner of the Site was excluded from the original Site outline. The RA, with the new Site configuration, would thus address groundwater across the areal extent of the contamination.

The Site boundaries as identified in the ROD are shown on Figure 1 of the ESD. Figure 2 of the ESD shows the modified Site boundaries.

Asphalt paving was eliminated for it would not have improved the soil cleanup remedy, but rather, it would significantly increase the amount of storm water discharge to the 700 West Ditch.

Refer to Figures 1.1, 1.2, 5.1 and 5.2 of the ROD.

7.2 Remedial Action Objectives

Hazardous substances will remain at the Wasatch Chemical Site above health-based levels for unlimited use after completion of the remedial action. The objectives of the Wasatch Site’s remedial actions are to control present and future risks posed by direct contact with and ingestion of soils, sludges, groundwater; to control the migration of contaminants from soils and sludges to groundwater; and to prevent future human exposure to residual contamination in soils and dioxin removal wastes. The objectives will be met by attaining remedial action goals.
7.3 Remedial Action Goals

For soils, sludges and dioxin removal wastes, the remedial goal is treatment so that the level of contaminants remaining in these materials poses no unacceptable risk to human health or the environment. Since no Federal or State chemical-specific ARARs exist for soils and sludges, action levels were determined for indicator chemicals through a site-specific risk analysis. The indicator chemicals include Herbicides, Pesticides, Dioxins, Semi-volatile Organic Compounds and Volatile Organic Compounds.

The remediation goals for the groundwater extraction and treatment system are to: (1) restore the contaminated groundwater to be able to accommodate its potential future uses, (2) protect uncontaminated groundwater by minimizing the migration of solubilized contaminants from the area of attainment, and (3) ensure that the concentration of contaminants remaining in groundwater poses no unacceptable risk to human health or the environment. Because both UDEQ and EPA consider the groundwater at this Site to be a potential future source of drinking water, specific action levels for groundwater are Maximum Contaminant Levels (MCLs) and proposed MCLs as established under the Safe Drinking Water Act.

7.4 Selected Remedy for Soils

The soils in the area between the Chlorine Building and the Warehouse were determined to be contaminated with hydrocarbons. The remedy selected was landfarming. This involved excavating and placing the material in an on-site landfarming unit and treating the soil by blending additives, including nutrients, with the soils to promote biodegradation of the hydrocarbon contaminants.

Contaminated soils from the other areas of the Site were to be excavated and staged in the former evaporation pond in the north-east corner of Lot 6. The staged soils were to be treated using In-Situ Vitrification (ISV).

7.5 Selected Remedy for Groundwater

Groundwater is to be extracted and treated until MCLs and proposed MCLs are met. Treated water must meet Publicly Owned Treatment Works or Utah Pollution Discharge Elimination System standards. The extraction rate must be maintained at a rate sufficient to prevent off-site migration of the contaminated groundwater plume.
8.0 Remedial Design/Remedial Action

8.1 Implementation

In September of 1991, EPA, UDEQ, and Entrada (among others) signed a Consent Decree for Entrada to implement the ROD through the RD/RA. This agreement was lodged in the U.S. District Court, District of Utah on November 12, 1991.

8.2 Landfarming

During the Remedial Design, the soils to be treated by landfarming/biodegradation were sampled and analyzed for Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds, pH, and nutrients to establish baseline conditions for TPH biodegradation. The results indicated that the soil pH needed to be adjusted and nutrients added to optimize biodegradation.

The Action Level was set an 100 mg/Kg TPH. Soils contaminated above this level were believed to be only a few feet thick. However, additional studies revealed that groundwater was encountered at depths ranging from 1 to 4 feet. The excavation of hydrocarbon materials was therefore modified to proceed to the 100 mg/Kg action level or until groundwater was encountered. Entrada continued soil excavation to a depth approximately 2 feet below the groundwater table to provide an added level of assurance that contaminated material did not remain in the excavation.

The landfarming portion of the Remedial Action began on October 23, 1992 in an area between the Chlorine Building and the Warehouse Building. An estimated 1,000 cubic yards of hydrocarbon contaminated material was excavated and placed in the on-site containment cell. This RA was in response to elevated levels of xylene and toluene detected in two soil borings.

A landfarm design report for the excavation, placement and treatment of contaminated soils; design of landfarm containment cell; and testing and monitoring of the landfarming process was approved by EPA and UDEQ on October 16, 1992.

Entrada began landfarm remedial action activities on October 23, 1992. Soil excavation and consolidation to containment cells, as necessary, were completed on April 26, 1993.

The landfarm cell was divided into sections for sampling purposes. As sections were determined to meet the clean-up standard, soils within those sections were removed and used as backfill in their original location. Analytical results from the final sampling event in November 1993, indicated that the remaining landfarm soils exceeded clean-up levels. Since additional cover material was needed for the former evaporation
pond, which was to be treated with ISV, the remaining landfarm soils were used for pond cover material. Final treatment of this portion of the landfarm soils occurred as part of the ISV operation.

The landfarming portion of the RA was completed on December 23, 1993. EPA and UDEQ conducted the final inspection of the landfarming remedial action on January 13, 1994. EPA certified completion of the landfarm remedial action on January 19, 1994.

8.3 In-Situ Vitrification (ISV)

ISV was selected to remediate soils which exceeded the Action Levels. During the Remedial Design, treatability studies were performed to verify ISV’s effectiveness on this type of hazardous waste. Separate tests were conducted on the Dioxin contaminated liquids. Contaminated soils which exceeded Action Levels were consolidated in the former evaporation pond. The Action Levels identified for specific substances are:

<table>
<thead>
<tr>
<th>Indicator Chemical</th>
<th>Action Level</th>
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</thead>
<tbody>
<tr>
<td>Total Dioxins/Furans</td>
<td>1 ppb</td>
</tr>
<tr>
<td>Pentachlorophenol</td>
<td>10 ppb</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>22,000 ppb</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>103,000 ppb</td>
</tr>
<tr>
<td>2,4-D</td>
<td>N/A</td>
</tr>
<tr>
<td>2,4,5-T</td>
<td>N/A</td>
</tr>
<tr>
<td>4,4’DDD</td>
<td>26,000 ppb</td>
</tr>
<tr>
<td>4,4’DDE</td>
<td>19,000 ppb</td>
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<tr>
<td>4,4’DDT</td>
<td>19,000 ppb</td>
</tr>
<tr>
<td>Chlordane</td>
<td>7,000 ppb</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>2,000 ppb</td>
</tr>
<tr>
<td>Hexachlorobenzene</td>
<td>7,000 ppb</td>
</tr>
</tbody>
</table>

In the ROD, the estimated soil and waste sludge volumes to be remediated by ISV are:

- Former Evaporation Pond: 2,300 Cubic Yards
- Contaminated Soil: 1,189 Cubic Yards
- Yard Drains, Lot 6, Septic System, and Other Wastes: 100 Cubic Yards
- Dioxin Contaminated Liquids: 650 Gallons

ISV is an innovative on-site and in-situ treatment process that involves the electric melting of contaminated soil and/or other earthen materials for purposes of permanently destroying, removing, and/or immobilizing hazardous contaminants. ISV is one
of the few technologies that can simultaneously treat wastes with high concentrations of both organic and inorganic (heavy metal) contaminants. ISV destroys most organic compounds by thermally induced decomposition (pyrolysis) in the oxygen-depleted environment in and around the melt zone. Pyrolyzed compounds are typically broken down to their elemental components (carbon, hydrogen, chlorine, etc.). Volatile components travel to the surface of the melt where nearly all are oxidized; any remaining volatile components are treated by the off-gas treatment system. Components that remain in the molten soil (typically metal oxides) are incorporated into the nonleachable vitrified product. Typical soils undergo a 25% to 50% volume reduction due to densification.

The ISV process works by melting soil in place using electricity applied between four graphite electrodes. The electrodes are inserted 1 to 2 feet into the ground and 11 to 18 feet apart in a square configuration. A highly conductive graphite and glass frit starter path is spread on the ground between the electrodes. When electricity is applied to the electrodes and flows through the starter path, the path heats up and causes the surrounding soil to melt. Once the soil is molten, it becomes electrically conductive. Continued application of electricity results in joule heating within the molten soil between the electrodes. After the melt is fully established, the melt zone grows steadily downward and outward through the contaminated soil.

The residual vitrified product has outstanding physical, weathering, and chemical properties. It is typically 5 to 10 times stronger than unreinforced concrete. It is unaffected by wet/dry and freeze/thaw cycling. It is totally free of organic content, and it typically far surpasses TCLP leach testing criteria as a measure of heavy metal immobilization efficiency.

The vitrified product is analogous to natural obsidian and is estimated to have a geologic life expectancy of thousands to millions of years.

Mobilization of equipment to the Site occurred in November 1994. Contaminated soils, sludges, and debris were placed into a concrete evaporation pond. The evaporation pond was formerly used for evaporation of liquid process wastes. These wastes were discharged into the evaporation pond through an underground process drain system that received wastes from several buildings at the Site. The pond has a concrete floor that was built approximately one foot below grade level. Maximum contaminant concentrations in pond soils and sludge based on treatability test samples are shown in the following table:
A clean soil berm was placed around the concrete evaporation pond for containment prior to ISV remediation. Also soil, (from the landfarm remediation) was placed on top of the contaminated soil, sludges and debris in the concrete pond. It was determined that a seven foot melt depth would be performed in over 36 melt grids across the concrete pond.

During the second melt, it was found that melting into the standing water table was dangerous, because it caused excessive melt agitation and overheating of the hood which was used during the ISV operation to control off-gases. For subsequent melts, dewatering was needed to lower the water table to at least one foot below the level of the pond floor.

After each melt, the melt was allowed to cool for several hours allowing the off-gas system to operate before the hood was moved. Then the hood was repositioned, electrical piping systems reconnected, electrodes installed, and the process reinitiated. Entrada used a two hood operation, one hood was positioned and readied while the other hood was used for operation. The use of two hoods resulted in a more efficient and economical operation since down time between melts was minimized.

Thirty seven melts were required to complete the ISV process for the entire area of the former evaporation pond. The Dioxin wastes were treated in Melt No. 7. Verification samples were collected and analyzed to determined the effectiveness of the ISV process.

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration (Mg/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>dioxin</td>
<td>38</td>
</tr>
<tr>
<td>pentachlorophenol</td>
<td>4,000</td>
</tr>
<tr>
<td>xylene</td>
<td>3,500</td>
</tr>
<tr>
<td>chlordane</td>
<td>535</td>
</tr>
<tr>
<td>4,4-DDT</td>
<td>1</td>
</tr>
<tr>
<td>DDE</td>
<td>84</td>
</tr>
<tr>
<td>2,4-D</td>
<td>69</td>
</tr>
<tr>
<td>TCE</td>
<td>106</td>
</tr>
</tbody>
</table>
Entrada successfully remediated 5,600 tons of soil and sludge contaminated with various organics including dioxins, furans, pentachlorophenol, xylenes, toluene and pesticides and herbicides including DDE; DDT; 2,4-D and chlordane. Debris placed in the former evaporation pond for ISV included plastic sheeting, wooden timber, pieces of clay pipe, investigation derived wastes, and sample bottles.

8.4 Groundwater Remediation

The Remedial Design documents were issued in June 1994 and approved by EPA and UDEQ in August 1994. The Remedial Design included groundwater extraction and treatment, and groundwater monitoring. The design also included a Remedial Action Operation Plan which addressed extraction of the groundwater and operation of the groundwater treatment system.

Installation of the extraction wells and construction of the treatment facility began in September of 1994 and was completed in March of 1995. The first quarterly groundwater sampling event occurred in March of 1995. System operation began in August 1995.

The groundwater extraction system, pumping at an average rate of 6.35 gallons per minute, has provided containment and partial removal of the contaminant plume over its period of operation.

The groundwater treatment system utilizes an air stripper which is designed to decrease VOC concentrations in the influent groundwater stream using a maximum designed flow rate of 30 gallons per minute. In the treatment plant circuit, a liquid-phase granular activated carbon unit is used downstream of the air stripper as a polishing step.

The effluent water quality is discharged to the 700 West Ditch and must meet requirements of the Utah Pollutant Discharge Elimination System (UPDES) Permit.

During system operation, contaminant reduction will be monitored by evaluating indicator chemical concentrations at each performance and compliance monitoring well. Groundwater samples were collected and analyzed once before start-up of the system, and quarterly thereafter. Indicator chemical concentration data for each well will be plotted as a function of time.

The monitoring well network consists of nine extraction wells and one extraction trench (EX-11) within the area of attainment, two wells (MW-22 and MW-23) located up gradient of the area of attainment, and three wells (MW-24A, MW-25, and MW-26A) located down gradient of the area of attainment. The monitoring wells located up gradient of the area of attainment provide data to detect concentrations from off-site sources; the monitoring wells
and extraction trench located within the area of attainment provide data to monitor the effectiveness of the groundwater remedy and compliance with MCL performance standards; the wells located down gradient of the area of attainment provide data to detect contaminant migration. Water quality measurements for each of these wells are analyzed quarterly at the 15 monitoring sites to determine contaminant reduction. The Table below indicates the maximum values detected for each substance listed. In addition, quarterly groundwater elevation measurements are taken at monitoring and extraction wells, piezometers, and at the extraction trench to determine hydraulic capture of the contaminated plume.

A groundwater modeling study has been performed and determined that the minimum flow rate required to maintain containment in this formation is 2.5 gpm. This flow rate is the minimum rate required to reverse the hydraulic gradient at the leading edge of the plume.

**WASATCH CHEMICAL SITE GROUNDWATER INDICATOR COMPOUNDS AND ACTION LEVELS**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Maximum Value (µg/l)</th>
<th>Action Level (MCL µg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volatile Organic Compounds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrachloroethene (PCE)</td>
<td>1400(MW-12)</td>
<td>5</td>
</tr>
<tr>
<td>Trichloroethene (TCE)</td>
<td>8000(MW-07)</td>
<td>5</td>
</tr>
<tr>
<td>1,1-Dichloroethene (1,1-DCE)</td>
<td>230(MW-12)</td>
<td>7</td>
</tr>
<tr>
<td><strong>Semi-Volatile Organic Compounds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentachlorophenol (PCP)</td>
<td>630(MW-10)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Herbicides</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,4-Dichlorophenoxyacetic Acid (2,4-D)</td>
<td>26(MW-12)</td>
<td>70</td>
</tr>
</tbody>
</table>

The model study results are included in the Final Additional Studies Design Basis Report, March 17, 1993. The study concluded that to meet the 5-year cleanup goal by technically practicable means, contaminant removal must be enhanced. This was accomplished by installation of an infiltration trench to increase recovery rates and allow for increased flow rates.
The Compliance Monitoring Program is designed to show that concentrations of groundwater indicator chemicals are below the established cleanup levels or MCLs. It is also designed to enable the use of trend analysis to determine if the data are exhibiting a decreasing trend approaching MCLs. Data generated will also be used, after the five-year operating period, to determine whether there has been a 50% reduction (from baseline concentrations of contaminants) for those wells/parameters which still exceed MCLs. The Program is also intended to determine containment of the contaminated groundwater plume.

As set forth in the Consent Decree, treatment will continue until indicator chemical concentrations are below MCLs for five consecutive quarters. If this condition is met, treatment will be stopped and post-compliance monitoring will be initiated. If the concentrations of indicator chemicals remain below MCLs for three years during the post-compliance period, an application for a Certificate of Completion will be made. If evaluation of hydraulic enhancements and treatment enhancement indicate that no reasonable alternatives for improving system operations exist, alternative performance standards for the Site will be pursued in accordance with the Consent Decree.

8.5 Improvements to Groundwater Treatment System

Early in 1996, UDEQ and EPA reviewed the operating history of the treatment facility and evaluated field sampling and laboratory analytical practices. Problems were identified with the construction and maintenance of some of the extraction wells, with the overall reliability of the treatment system, and with field sampling and analytical practices. A letter was sent to Entrada advising them of EPA’s concerns and requesting that Entrada take steps to address these concerns.

In response to EPA’s request, Entrada has taken the following actions:

8.5.1 Maintenance and operation of the extraction wells was reviewed and corrective action was taken where necessary.

8.5.2 An additional groundwater modeling study was performed and a report summarizing the results was produced in August of 1996.

8.5.3 A historical data report was submitted by Entrada on November 16, 1996. The purpose of the Report is to document and validate the sampling and analysis procedures that have occurred during implementation of the Wasatch Chemical Site (WCS) pump and treat system and to set baseline concentrations and to evaluate the effectiveness
of the system. Specific information addressed in the report includes the sampling and analytical methodology used during the quarterly groundwater restoration performance and compliance monitoring. The first quarterly groundwater sampling event occurred on March 20, 1995. The **starting date for the five-year groundwater remediation period was established as August 1, 1995.**

8.5.4 The Groundwater Monitoring Plan (GWMP) was revised and a Final Report was issued in November, 1996.

The GWMP includes the sampling and analytical methodology to be used for the quarterly groundwater restoration performance and compliance monitoring and describes the methods for data evaluation and reporting. The Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) are included in the GWMP; the FSP presents a detailed description of the methodology to be used during groundwater elevation measurements and groundwater sampling. The QAPP defines the analytical and data validation procedures. In addition, a groundwater modeling study was performed: (1) to evaluate the current extraction well system’s ability in capturing the groundwater plume, (2) estimate the approximate long-term sustainable pumping rates for the containment system, and (3) evaluate the effectiveness of the system in removing contaminants from the affected aquifer.

8.5.5 The Treatment Plant was refined principally to improve its ability to handle high salinity groundwater and to add solids removal capability. The final design was dated August, 1996.

8.5.6 Construction of the improved facility was implemented after the design was approved by UDEQ and EPA. Construction Completion occurred in March, 1997. Representatives of UDEQ and EPA toured the facility on May 6, 1997 and subsequently certified that the facility was constructed as designed and was Operational and Functional.

8.5.7 A Pulse-Pumping Pilot Test was conducted from December 1996 thru March 1997. This was accomplished while the treatment plant was shut down for installation of system improvements. A final report was issued in March 1997 and contains information to optimize operation of the
8.5.8 Extraction Well EX-01 was pumped at a very low rate due to the presence of foam which created severe problems in the groundwater treatment facility. An electro-magnetic survey was conducted to check for underground structures which might be sources for this contamination. No underground structures were identified. EX-01 could not be sampled for the quarterly groundwater monitoring sampling event which occurred during the last week of February 1997. EX-01 was removed from service at that time.

8.5.9 In September 1997 an Extraction Trench and Drainage System was designed and installed in the general area of EX-01.

9.0 Community Acceptance

In February 1989 a Community Relations Plan was approved and implemented for the Site. The public was kept informed about activities at the Site thru Fact Sheets, Press Releases, Public Meetings and briefings for interested parties. A more detailed list of Community Relations activities can be found as Attachment A of the Responsiveness Summary for the Record of Decision dated March 29, 1991.

The public comment period for the Wasatch Chemical Proposed Plan was held from October 9, 1990 to November 8, 1990. The public was invited to comment on all remedial alternatives during that period. Based on the comments received, the community has no opposition to the preferred alternative. Some questions regarding the extent and implementation of the groundwater remedial were raised, however. Responses to community comments are found in the responsiveness summary.

10.0 Institutional Controls

Final institutional controls for the Site are categorized into access and land use restrictions. The Institutional Controls include:

10.1 Entrada Industries shall maintain the existing fencing and associated warning signs surrounding the Site perimeter to restrict access to the Site. The existing 6-foot-high, galvanized, chain-link fence includes three strands of barbed wire fencing strung along the
top of the fence.

10.2 Notification to any future owners of the property within the Site of its status as a Superfund Site.

10.3 Inclusion of a notice in each deed that the property is subject to the Consent Decree in United States of America v. Entrada Industries, Inc., et al., Civil Action No. 91-C-1194S and State of Utah v. Peter Ng, et al., Civil Action No. 86-C-0023G, and any restrictions applicable to the property under that Consent Decree.

10.4 Inclusion of a covenant prohibiting residential use of the property.

Institutional Controls for the Site have been adopted and are protective of human health and the environment.

11.0 Summary of Five-Year Review

This statutory five-year review was conducted according to procedures in OSWER Directives 9355.7-02 and 9355.7-02a, “Structure and Components of Five-Year Reviews and Supplement.” Activities for the review consisted of four primary tasks.

11.1 Review of Site related documents;

11.2 Review of Applicable or Relevant and Appropriate Requirements (ARARs)

11.3 Site Visits and Interviews; and

11.4 Preparation of Five-Year Review Report

11.1 Documents Review

1. Monthly Progress Reports (MPRs), #1 to 62, October 13, 1992 to October 13, 1997. (PROJECTED)

2. RI Phase I Activity Report, Wasatch Chemical Site, Salt Lake City, Utah, June 23, 1989, 2 Volumes

3. Remedial Investigation Report, Wasatch Chemical Site, Salt Lake City, Utah, March 30, 1990, 7 Volumes

4. Feasibility Study Report, Wasatch Chemical site, Salt Lake City, Utah, August 22, 1990, 2 Volumes

5. Record of Decision, Wasatch Chemical Site, Salt Lake City, Utah, March 29, 1991
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16. Wasatch Chemical Site, Groundwater Model, August, 1996

17. Groundwater Treatment System Improvements, Design Basis, August, 1996

18. Historical Data Review and Analysis, Wasatch Chemical Site, November, 1996


11.2 Review of Applicable or Relevant and Appropriate Requirements (ARARs)

As part of this Five-Year Review, an assessment of ARARs was conducted. The primary purpose of the review was to determine if any newly promulgated or modified requirements of federal or state environmental laws have changed the protectiveness of the remedies implemented at the site. At the time of this review, no such additional requirements were in place.

11.3 Site Visits and Interviews

A site visit was conducted by representatives of UDEQ and EPA on May 6, 1997 in order to certify Construction Completion of the improvements to the groundwater treatment system. Approval of the Operation and Maintenance Manual was issued in August 1997. Since this is an industrial area and the completion of remedial action had occurred just prior to development of this five-year review, no individual interviews were conducted.

12.0 Demonstration of Quality Assurance/Quality Control (A/QC) for Cleanup Activities

Activities at the Site were consistent with the ROD and END, and all work plans were issued to contractors for design and construction of the R.A., including sampling and analysis. The RD Report, including a Quality Assurance Project Plan, incorporated all EPA and UDEQ quality assurance and quality control (A/QC) procedures and protocol. EPA analytical methods were used for all validation and monitoring samples during R.A. activities. Sampling of soil and water followed EPA protocol Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. The facilities were constructed in conformance with the Remedial Design. The Monthly Progress Reports submitted by the PRPs contain documentation of sampling results for the Quarterly Groundwater Monitoring Program.

13.0 Activities and Schedule for Site Completion

Construction Completion Report for the final Remedial Action was approved by UDEQ and EPA in August of 1997. Institutional Controls are in place and the final Operation and Maintenance Manual for the Groundwater Monitoring, Extraction and Treatment
has been approved by UDEQ and EPA. No additional Remedial Actions are anticipated. A Preliminary Close Out Report was finalized on September 30, 1997.

14.0 Statement of Protectiveness

The Remedial Actions performed at the Wasatch Chemical Superfund Site remain protective of human health and the environment. No modifications or improvements to the implemented remedies are required at this time. EPA will continue to monitor the Site in the future through coordination with UDEQ and the PRPs.

15.0 Next Five-Year Review - Schedule

The next five-year review is scheduled for completion on or before September 23, 2002.