First Five-Year Review Report

Sprague Road Ground Water Plume Superfund Site
Odessa, Ector County, Texas

September 2008

Superfund Division
U.S. Environmental Protection Agency
Region 6
Dallas, Texas

FIRST FIVE-YEAR REVIEW REPORT
Sprague Road Ground Water Plume Superfund Site
EPA ID No. TX0001407444
Ector County, Texas

This memorandum documents the United States Environmental Protection Agency's (EPA's) performance, determinations, and approval of the Sprague Road Ground Water Plume Superfund Site (Site) first five-year review under Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code § 9621(c), as provided in the attached First Five-Year Review Report.

Summary of First Five-Year Review Findings

The assessment of the Site during this First Five-Year Review is that the remedy is functioning as designed, and the extraction, treatment, and monitoring of the ground water is being conducted as required under the 2000 Record of Decision (ROD). The remedy was implemented to prevent further migration of a chromium plume in the Trinity aquifer and restore the aquifer to its beneficial use as a drinking water supply. The implemented remedy consists of a multi-well ground water extraction system, a treatment plant utilizing ion exchange to remove chromium from the ground water, and a multi-well injection system to return the treated water to the aquifer. The pump and treat (P&T) system has not achieved cleanup of the aquifer but chromium concentrations have generally declined since system start-up.

The following issues identified during this Five-Year Review may affect the long-term effectiveness of the remedy:

- **Corrosion of electrical components in the well vaults**—Electrical pull boxes at the Machine and Casting (M&C) facility were flooded at the time of Site inspection as a result of rainfall earlier in the week. The Site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem and prevent water migrating along the conduit and flooding the well vaults. Corroded electrical components were replaced in numerous recovery and injection well vaults in 2007, and Coyote Pump Protectors were installed on select recovery wells in order to make the wells less vulnerable to flooding.

- **Increasing trend of chromium concentrations at select recovery wells in the National Chromium Corporation (NCC) extraction system**—The chromium concentrations in the southeastern (downgradient) portion of the NCC plume increased in August 2007 at recovery wells NRW-14, NMW-17, NRW-23, and NRW-24. Concentrations in NRW-23 and NRW-24 subsequently declined in November 2007 and March 2008.

- **Improve the capture zone evaluation for the ground water extraction system**—Evaluation of the existing ground water model revealed that the model should be replaced to better simulate transient conditions rather than steady-state conditions and to create two models by separating the M&C model from the LM and NCC model. These updated models can be utilized to propose modifications to the flow rates and more accurately predict the capture zone for the ground water recovery system.

- **The ROD did not include the use of institutional control to protect the remedy effectiveness because the remedy was anticipated to achieve the cleanup goals throughout the aquifer**—The use of institutional controls may be necessary to alert potential property purchasers concerning the presence of ground water contamination at the Site. While the

presence of operation and maintenance personnel, along with the periodic presence of remediation personnel, make it unlikely that the installation of ground water wells for drinking or irrigation would go undetected, such institutional controls may be necessary for the long-term protection of public health.

- **During the Site inspection, several monitor wells were found to be in need of minor repairs**—The expansion plugs on some monitor wells are worn and may not provide an effective long-term seal against surface water intrusion into the monitor wells, and the well vaults on some monitor wells need new O-rings to prevent surface water intrusion into the well vaults. The well pads, skirts, and lids were generally in good condition.

- **Improve Public Outreach**—Local residents contacted during the Site interviews requested that the sampling results and the remedy progress be reported on a more frequent basis.

Actions Recommended

To address these issues, the following recommendations and follow-up actions have been identified:

- Complete maintenance and repair work on the electrical components for the ground water extraction and injection network. The installation of Coyote Pump Protectors, drainage holes in electrical pull boxes, and replacement of corroded electrical components should be completed as planned.

- Expand the ground water monitoring network near the leading edge of the NCC chromium plume. Additional data is needed to assist in evaluating the changes in chromium concentrations recorded in select recovery wells.

- Complete the development of a replacement ground water model to improve the capture zone evaluation for the ground water recovery system. Development of the new models is currently underway and is expected to be completed in time for the 2008 Annual Operation and Maintenance Report.

- Identify available institutional controls to protect the remedy effectiveness and prevent accidental exposure via private wells installed through the contaminated portion of the aquifer.

- Perform maintenance and repair work on the Site monitor wells. The locks should be replaced on all conventional monitor wells in order to prevent unauthorized access to the wells. The expansion plugs and polyvinyl chloride (PVC) well caps should be replaced where necessary to prevent surface water infiltration into the monitor wells. The O-rings on the well vault lids should be replaced where necessary to prevent surface water infiltration into the well vaults.

- Increase the frequency of public updates concerning the sampling results and the progress of the remedy.

Determinations

I have determined that the remedy for the Sprague Road Ground Water Plume Superfund Site currently protects human health and the environment. The ground water extraction system has been constructed in accordance with the requirements of the ROD, and extraction, treatment and monitoring of the ground

water is being conducted as required. Long-term protectiveness of the remedy will be verified by continued monitoring of the ground water recovery and treatment system; sampling and analysis of the ground water; and, by implementing the necessary actions to address the issues discussed in this Five-Year Review Report. The remedy is expected to be fully protective when the ground water performance goals are achieved through continued operation of the ground water extraction and treatment system.

By: Pam Phillips, Acting 9/19/08

Samuel Coleman, Director Date
Superfund Division
U.S. Environmental Protection Agency, Region 6

CONCURRENCES:

FIRST FIVE-YEAR REVIEW REPORT
SPRAGUE ROAD GROUND WATER PLUME SUPERFUND SITE
EPA ID No. TX0001407444

Vincent Malott, Remedial Project Manager
Superfund Remedial Branch

9-11-2008
Date

Carlos A. Sanchez, Chief
AR/TX Section, Superfund Remedial Branch

9/16/08
Date

Donald H. Williams, Deputy Associate Director
Superfund Remedial Branch

9/16/08
Date

Charles Faultry, Associate Director
Superfund Remedial Branch

9/17/08
Date

Anne Foster, Assistant Regional Counsel
Superfund Branch, Office of Regional Counsel

9-11-08
Date

Mark A. Peycke, Chief
Superfund Branch, Office of Regional Counsel

09/18/08
Date

Pamela Phillips, Deputy Director
Superfund Division

9/19/08
Date

CONTENTS

Attachments

LIST OF TABLES

LIST OF ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DBS&A	Daniel B. Stephens and Associates, Inc.
1,1-DCE	1,1-dichloroethene
EA	EA Engineering, Science, and Technology, Inc.
EPA	U.S. Environmental Protection Agency
Etech	Etech Environmental and Safety Solutions, Inc.
FS	Feasibility study
gpm	gallons per minute
HDPE	High-density polyethylene
LTRA	Long-Term Response Action
LM	Leigh Metal
M&C	Machine and Casting
MCL	Maximum contaminant level
mg/kg	Milligram(s) per kilogram
mg/L	Milligram(s) per liter
NCC	National Chromium Corporation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&F	Operational and functional
O&M	Operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable unit
P&T	Pump and treat
PVC	Polyvinyl chloride
RA	Remedial action
RAO	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RI	Remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Site	Sprague Road Ground Water Plume Superfund Site
TBCs	“To-be-considereds”
TCLP	Toxicity Characteristic Leaching Procedure
TDWR	Texas Department of Water Resources
TWC	Texas Water Commission
µg/L	Microgram(s) per liter
UIC	Underground Injection Control

EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) Region 6 has conducted the first five-year review of the remedial action (RA) implemented at the Sprague Road Ground Water Plume Superfund Site, hereafter referred to as "the Site", in Ector County, Texas. The purpose of this first five-year review was to determine whether the selected remedy for the Site continues to protect human health and the environment. This review was conducted from April to June 2008 and its findings and conclusions are documented in this report. Remedial action construction activities were completed in September 2003; this established the first five-year review period of 2003 to 2008.

The Site consists of three abandoned metal plating facilities located within one mile of each other. Electroplating activities at these facilities, including the repair and reconditioning of oil field equipment, generated sludge and chromic acid rinse water. The past operations and waste disposal practices at each of the three facilities have resulted in the release of chromium to the ground water (EA 2008b).

The Leigh Metal (LM) facility is approximately 3.6 acres in size and is located near the intersection of Sprague Road and 81st Street (Figure 1). The LM facility consists of an abandoned main office/machine shop building and a second building that contained a chrome plating shop. The facility operated from 1976 to 1992, and chromium acid was released from two plating tanks inside the plating shop (EA 2008b).

The National Chromium Corporation (NCC) facility is approximately 2.5 acres in size and is located near the intersection of Sprague Road and Steven Road (Figure 1). The NCC facility consists of an abandoned main office/machine shop, approximately 850 feet south of the LM facility. The facility operated from 1979 to 1993, and chromic acid waste was disposed of in a 20,000 gallon evaporation pond (EA 2008b).

The Machine and Casting (M&C) facility is approximately 2 acres in size and is located near Sprague Road and Hillmont Road (Figure 1). The M&C facility consists of an abandoned office/machine shop building, approximately 1,500 feet north of the LM facility. The facility operated from 1978 to 1988, and chromic acid waste was released from a sump located beneath a former plating room (EA 2008b).

The ground water beneath all three facilities has been impacted by chromium in excess of the drinking water standard maximum contaminant level (MCL) (100 micrograms per liter [µg/L] total chromium) (EA 2008b).

The Site was listed on the National Priorities List (NPL) in 1997 (EPA 2008a). The EPA signed the record of decision (ROD) for the Site on 29 September 2000. The remedial action objectives (RAOs), selected remedy, and implementation status are discussed in the following paragraphs.

The RAOs were as follows:

- Prevent exposure to contaminated ground water, above acceptable risk levels;
- Prevent or minimize further migration of the ground water contaminant plume;
- Prevent or minimize further migration of contaminants from source materials to ground water; and
- Return ground waters to their expected beneficial uses wherever practicable.

The selected remedy according to the ROD consisted of the following:

- Installation of ground water extraction wells at each contaminant plume to maximize contaminant reduction and prevent further migration of the plume;
- Treatment of the contaminated ground water utilizing one of the presumptive remedies described in the Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites (Office of Solid Waste and Emergency Response (OSWER) Directive 9283.1-12, October 1996). Wastes generated during the treatment process would be transported to an off-site location for disposal in accordance with Resource Conservation and Recovery Act (RCRA) and CERCLA requirements;
- The re-injection of the treated water into the aquifer utilizing one or a combination of the following: injection wells, dry wells, and/or infiltration galleries;
- The use of infiltration galleries or other means to flush the hexavalent chromium from the vadose zone to levels that will ensure the area does not act as a potential source of contamination or prevent the restoration of the ground water under future land-use scenarios; and
- Long-term ground water monitoring to evaluate the effectiveness of the ground water extraction and disposal system and ensure there is no further exposure to contaminated ground water above the applicable drinking standards.

Construction began in October 2002 and was completed in August 2003. The EPA prepared a preliminary closeout report in September 2003. The remedy was determined to be Operational and Functional (O&F) in September 2004. Long-Term Response Action (LTRA) activities, including operation and maintenance of the system and ground water monitoring, were initiated 30 September 2004. Ground water monitoring was conducted three times in 2003 and 2004, two times in 2005, once in 2006, four times in 2007, and once in 2008.

Documents reviewed for this five-year review included, but were not limited to, the following documents: (1) ROD, (2) Remedial Design (RD) Report, (3) Remedial Action (RA) Report, (4) O&M Work Plan, (5) Annual and Semiannual Operating Reports, and (6) Ground Water Monitoring Reports.

Two of the three responses to the Site interview questionnaires were generally favorable. However, one response was not favorable. All returned interview records are included in Attachment 5 of this report.

The first five-year review focused on the data obtained during routine operation and maintenance of the system and ground water monitoring events conducted at the Site during 2003 through 2008. At this time, the selected remedy is performing in an overall protective manner as intended, with the following issues noted:

- **Corrosion of electrical components in the well vaults**—Electrical pull boxes at the Machine and Casting (M&C) facility were flooded at the time of Site inspection as a result of rainfall earlier in the week. The Site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem and prevent water migrating along the conduit and flooding the well vaults. Corroded electrical components were replaced in numerous recovery and injection well vaults in 2007, and Coyote Pump Protectors were installed on select recovery wells in order to make the wells less vulnerable to flooding.

- **Increasing trend of chromium concentrations at select recovery wells in the National Chromium Corporation (NCC) extraction system**—The chromium concentrations in the southeastern (downgradient) portion of the NCC plume increased in August 2007 at recovery wells NRW-14, NMW-17, NRW-23, and NRW-24. Concentrations in NRW-23 and NRW-24 subsequently declined in November 2007 and March 2008.

- **Improve the capture zone evaluation for the ground water extraction system**—Evaluation of the existing ground water model revealed that the model should be replaced to better simulate transient conditions rather than steady-state conditions and to create two models by separating the M&C model from the LM and NCC model. These updated models can be utilized to propose modifications to the flow rates and more accurately predict the capture zone for the ground water recovery system.

- **The ROD did not include the use of institutional controls to protect the remedy effectiveness because the remedy was anticipated to achieve the cleanup goals throughout the aquifer**—The use of institutional controls may be necessary to alert potential property purchasers concerning the presence of ground water contamination at the Site. While the presence of operation and maintenance personnel, along with the periodic presence of remediation personnel, make it unlikely that the installation of ground water wells for drinking or irrigation would go undetected, such institutional controls may be necessary for the long-term protection of public health.

- **During the Site inspection, several monitor wells were found to be in need of minor repairs**—The expansion plugs on some monitor wells are worn and may not provide an effective long-term seal against surface water intrusion into the monitor wells, and the well

vaults on some monitor wells need new O-rings to prevent surface water intrusion into the well vaults. The well pads, skirts, and lids were generally in good condition.

- **Improve Public Outreach**—Local residents contacted during the Site interviews requested that the sampling results and the remedy progress be reported on a more frequent basis.

Actions Recommended

To address these issues, the following recommendations and follow-up actions have been identified:

- Complete maintenance and repair work on the electrical components for the ground water extraction and injection network. The installation of Coyote Pump Protectors, drainage holes in electrical pull boxes, and replacement of corroded electrical components should be completed as planned.

- Expand the ground water monitoring network near the leading edge of the NCC chromium plume. Additional data is needed to assist in evaluating the changes in chromium concentrations recorded in select recovery wells.

- Complete the development of a replacement ground water model to improve the capture zone evaluation for the ground water recovery system. Development of the new models is currently underway and is expected to be completed in time for the 2008 Annual Operation and Maintenance Report.

- Identify available institutional controls to protect the remedy effectiveness and prevent accidental exposure via private wells installed through the contaminated portion of the aquifer.

- Perform maintenance and repair work on the Site monitor wells. The locks should be replaced on all conventional monitor wells in order to prevent unauthorized access to the wells. The expansion plugs and PVC well caps should be replaced where necessary to prevent surface water infiltration into the monitor wells. The O-rings on the well vault lids should be replaced where necessary to prevent surface water infiltration into the well vaults.

- Increase the frequency of public updates concerning the sampling results and the progress of the remedy.

The remedy implemented at the Sprague Road Ground Water Plume Superfund Site currently protects human health and the environment. The ground water extraction system has been constructed in accordance with the requirements of the ROD, and extraction, treatment and monitoring of the ground water is being conducted as required. Long-term protectiveness of the remedy will be verified by continued monitoring of the ground water recovery and treatment system; sampling and analysis of the ground water; and, by implementing the necessary actions to address the issues discussed in this Five-Year Review Report. The remedy is expected to be fully protective when the ground water performance goals are achieved through continued operation of the ground water extraction and treatment system.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name (from WasteLAN): Sprague Road Ground Water Plume Superfund Site

EPA ID (from WasteLAN): TX0001407444

Region: 6	**State:** Texas	**City/County:** Odessa/Ector County

SITE STATUS

NPL Status: ☒ Final ☐ Deleted ☐ Other (specify) _____

Remediation Status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete

Multiple OUs?* ☐ YES ☒ NO **Construction Completion Date:** 29 September 2003

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Reviewing Agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author Name: Vince Malott

Author Title: Remedial Project Manager **Author Affiliation:** U.S. EPA Region 6

Review Period:** April 2008 to June 2008

Date(s) of Site Inspection: 14 May 2008

Type of Review:
☐ Statutory
☒ Policy ☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review Number: ☒ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering Action:
☐ Actual RA On-site Construction at OU ☐ Actual RA Start
☒ Construction Completion ☐ Previous Five-Year Review Report
☐ Other (specify)_____

Triggering Action Date (from WasteLAN): 29 September 2003

Due Date (Five Years After Triggering Action Date): 29 September 2008

* "OU" refers to operable unit.

** The review period refers to the period during which the five-year review was conducted.

Five-Year Review Summary Form (Continued)

Issues:

- **Corrosion of electrical components in the well vaults**—Electrical pull boxes at the Machine and Casting (M&C) facility were flooded at the time of Site inspection as a result of rainfall earlier in the week. The Site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem and prevent water migrating along the conduit and flooding the well vaults. Corroded electrical components were replaced in numerous recovery and injection well vaults in 2007, and Coyote Pump Protectors were installed on select recovery wells in order to make the wells less vulnerable to flooding.

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- **Improve the capture zone evaluation for the ground water extraction system**—Evaluation of the existing ground water model revealed that the model should be replaced to better simulate transient conditions rather than steady-state conditions and to create two models by separating the M&C model from the LM and NCC model. These updated models can be utilized to propose modifications to the flow rates and more accurately predict the capture zone for the ground water recovery system.

- **The ROD did not include the use of institutional controls to protect the remedy effectiveness because the remedy was anticipated to achieve the cleanup goals throughout the aquifer**—The use of institutional controls may be necessary to alert potential property purchasers concerning the presence of ground water contamination at the Site. While the presence of operation and maintenance personnel, along with the periodic presence of remediation personnel, make it unlikely that the installation of ground water wells for drinking or irrigation would go undetected, such institutional controls may be necessary for the long-term protection of public health.

- **During the Site inspection, several monitor wells were found to be in need of minor repairs**—The expansion plugs on some monitor wells are worn and may not provide an effective long-term seal against surface water intrusion into the monitor wells, and the well vaults on some monitor wells need new O-rings to prevent surface water intrusion into the well vaults. The well pads, skirts, and lids were generally in good condition.

- **Improve Public Outreach**—Local residents contacted during the Site interviews requested that the sampling results and the remedy progress be reported on a more frequent basis.

Five-Year Review Summary Form (Continued)

Actions Recommended:

To address these issues, the following recommendations and follow-up actions have been identified.

- Complete maintenance and repair work on the electrical components for the ground water extraction and injection network. The installation of Coyote Pump Protectors, drainage holes in electrical pull boxes, and replacement of corroded electrical components should be completed as planned.

- Expand the ground water monitoring network near the leading edge of the NCC chromium plume. Additional data is needed to assist in evaluating the changes in chromium concentrations recorded in select recovery wells.

- Complete the development of a replacement ground water model to improve the capture zone evaluation for the ground water recovery system. Development of the new models is currently underway and is expected to be completed in time for the 2008 Annual Operation and Maintenance Report.

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- Increase the frequency of public updates concerning the sampling results and the progress of the remedy.

Protectiveness Statement:

The remedy implemented at the Sprague Road Ground Water Plume Superfund Site currently protects human health and the environment. The ground water extraction system has been constructed in accordance with the requirements of the ROD, and extraction, treatment and monitoring of the ground water is being conducted as required. Long-term protectiveness of the remedy will be verified by continued monitoring of the ground water recovery and treatment system; sampling and analysis of the ground water; and, by implementing the necessary actions to address the issues discussed in this Five-Year Review Report. The remedy is expected to be fully protective when the ground water performance goals are achieved through continued operation of the ground water extraction and treatment system.

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Region 6 has conducted the first five-year review of the remedial action (RA) implemented at the Sprague Road Ground Water Plume Superfund Site, hereafter referred to as "the Site", in Ector County, Texas. The purpose of a five-year review is to determine whether the remedy at a site remains protective of human health and the environment, and to document the methods, findings, and conclusions of the five-year review process in a Five-Year Review Report. Five-Year Review Reports identify issues found during each review, if any, and make recommendations to address the issues. This First Five-Year Review Report documents the results of the review for the Site, conducted in accordance with EPA guidance (EPA 2001a) on five-year reviews.

The five-year review process is required by federal statute. EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, states the following:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented."

NCP Section 300.430(f)(4)(ii) states the following:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."

The EPA five-year review guidance further states that a five-year review should be conducted as a matter of policy for the following types of actions:

- A pre-Superfund Amendments and Reauthorization Act (SARA) RA that leaves hazardous substances, pollutants, or contaminants on-site above levels that allow for unlimited use and unrestricted exposure;

- A pre- or post-SARA RA that, once completed, will not leave hazardous substances, pollutants, or contaminants on-site above levels that allow for unlimited use and unrestricted exposure but will require more than five years to complete; and

- A removal-only site on the National Priorities List (NPL) where the removal action leaves hazardous substances, pollutants, or contaminants on-site above levels that allow for unlimited use and unrestricted exposure and no RA has or will be conducted.

As specified in the Record of Decision, dated 29 September 2000, the remedial action implemented at the Site will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Since the remedy will take more than five years to attain the remedial action objectives and cleanup levels, a policy review may be conducted within five years of construction completion for the Site to ensure that the remedy is, or will be, protective of human health and the environment.

This is the first five-year review for the Site. The triggering action for this policy review was the remedial action construction completion in September 2003. This first five-year review was conducted from April through June 2008; its methods, findings, conclusions, and recommendations are documented in this report.

This report documents the five-year review for the Site by providing the following information: Site chronology (Section 2.0), background information (Section 3.0), overview of the RA (Section 4.0), progress since the previous five-year review (if applicable) (Section 5.0), discussion of the first five-year review process (Section 6.0), technical assessment of the Site (Section 7.0), issues (Section 8.0), recommendations and follow-up activities (Section 9.0), protectiveness statement (Section 10.0), and discussion of the next review (Section 11.0). Attachment 1 provides Site figures. Attachment 2 provides a list of documents reviewed. Attachment 3 provides the Site inspection checklist. Attachment 4 provides the Site inspection photographs. Attachment 5 provides the interview records. Attachment 6 provides the legal descriptions of site properties.

2.0 SITE CHRONOLOGY

Table 1 presents a chronology of events for the Site. Additional historical information for the Site is available online at: http://www.epa.gov/earth1r6/6sf/pdffiles/0605023.pdf (EPA 2008b).

TABLE 1
CHRONOLOGY OF SITE EVENTS

Date	Event
12 April 1996	Site discovery
April 1996 through May 1998	NPL responsible party search
March 1997	Preliminary assessment
20 March 1997	Site Inspection completed
28 March 1997	Hazard Ranking System scoring completed
1 April 1997	Proposed for inclusion on NPL
September 1997 through September 2000	RI/FS performed
25 September 1997	Final NPL listing
January 1999 through February 2000	Removal action
August 2000 through September 2002	Remedial design
29 September 2000	ROD issued
September 2000 through November 2000	Removal action
September 2002 through September 2003	Remedial action construction
20 September 2002	Final Design Report submitted
15 September 2003	RA Report submitted
29 September 2003	Preliminary Close Out Report completed
28 June 2004	Operation and Maintenance Plan submitted
29 September 2004	Remedy is Operational and Functional
30 September 2004	LTRA activities initiated
January 2005	Annual Operating Report submitted
February 2005	Quarterly Ground Water Monitoring Report for December 2004 sampling event submitted
May 2005	Quarterly Ground Water Monitoring Report for March 2005 sampling event submitted

Date	Event
March 2006	Annual Operating Report submitted
January 2007	Quarterly Ground Water Monitoring Report for October 2006 sampling event submitted
April 2007	Quarterly Ground Water Monitoring Report for February 2007 sampling event submitted
April 2007	Semi-Annual Operating Report submitted
July 2007	Quarterly Ground Water Monitoring Report for May 2007 sampling event submitted
October 2007	Annual Operating Report submitted
October 2007	Quarterly Ground Water Monitoring Report for August 2007 sampling event submitted
March 2008	Quarterly Ground Water Monitoring Report for November 2007 sampling event submitted
April 2008	Semi-Annual Operating Report submitted
May 2008	Ground Water Monitoring Report for March 2008 sampling event submitted

Notes:
LTRA Long -Term Response Action
NPL National Priorities List
RI/FS Remedial Investigation and Feasibility Study
RA Remedial Action
ROD Record of Decision
Sources: EPA 2000a, 2008a; Tetra Tech 2002, 2003, 2004, 2005a, 2005b, 2005c, 2006; EA 2007a, 2007b, 2007c, 2007d, 2007e, 2007f, 2008a, 2008b, 2008c.

3.0 BACKGROUND

This section discusses the Site's physical characteristics, land and resource use near the Site, history of site contamination, initial response to the Site, and the basis for the response.

3.1 PHYSICAL CHARACTERISTICS

The Site consists of three abandoned metal plating facilities located within one mile of each other. Electroplating activities at these facilities, including the repair and reconditioning of oil field equipment, generated sludge and chromic acid rinse water. The past operations and waste disposal practices at each of the three facilities have resulted in the release of chromium to the ground water (EA 2008b).

The Leigh Metal (LM) facility is approximately 3.6 acres in size and is located near the intersection of

Sprague Road and 81st Street (Figure 1). The LM facility consists of an abandoned main office/machine shop building and a second building that contained a chrome plating shop. The facility operated from 1976 to 1992, and chromium acid was released from two plating tanks inside the plating shop (EA 2008b).

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The Machine and Casting (M&C) facility is approximately 2 acres in size and is located near Sprague Road and Hillmont Road (Figure 1). The M&C facility consists of an abandoned office/machine shop building, approximately 1,500 feet north of the LM facility. The facility operated from 1978 to 1988, and chromic acid waste was released from a sump located beneath a former plating room (EA 2008b).

The Site is located in Ector County, Texas, immediately north of the Odessa City limits. The population within ½ mile of the Site is approximately 400; the population within 4 miles of the Site is approximately 18,600 (EPA 2008b).

The stratigraphy encountered at the Site is characterized by the following general units listed from youngest to oldest (Tetra Tech 2002).

1. Soil: Quaternary windblown sand and silt, alluvium, and playa lake deposits, generally brown in color, that compose the 0 to 5 feet below ground surface (bgs) interval. Minor lenses of silts, clays, and calcium carbonate cemented sand also exist within this interval.

2. Caliche and Sandy Caliche: A calcium carbonate cemented zone, commonly called the Ogallala caprock, that composes the 5 to 15 feet bgs interval at the LM and M&C facilities. At the NCC plume, the caliche was encountered at depths of up to 30 feet bgs. The caliche is Plio Pleistocene in age, consists of fine grained silty sand, varies from pinkish white to pale brown, and is dry to slightly moist.

3. Tertiary Ogallala Sandstone: A well sorted, fine to coarse grained, subrounded silty sandstone with occasional hard calcium carbonate cemented layers and stringers of claystone and gravel, extending to a depth of approximately 70 feet bgs. This depth is defined approximately because the basal Cretaceous sand (Trinity Sand) below the Ogallala is virtually indistinguishable from the Ogallala Formation. The Ogallala sandstone is brownish yellow to reddish brown and is slightly moist.

4. Trinity Sand: A basal Cretaceous sand extending from approximately 70 to 150 feet bgs and increasing in thickness to the east. It is a southeastwardly dipping, poorly sorted sandstone that consists of varying mixtures of sandstone, siltstone, and conglomerate. Calcium carbonate is the predominant cement, with occasional iron oxide cementation. The major constituents of the Trinity Sand are well rounded grains of quartz, chert, and feldspar. The Trinity Sand is yellowish in color and is moist to saturated. The Trinity Sand is the principal water bearing formation at the Site.

   Within the Site, interbedded mudstones or sandy clay zones were encountered in the Trinity Sand at some locations. These finer grained units were more commonly encountered near the base of the Trinity Sand above the contact with the Chinle Formation.

5. Triassic Chinle Formation (red beds of the Upper Dockum Group): A comparatively impermeable formation underlying the Trinity. Regionally, the unconformable contact between the Trinity Sand and the Chinle Formation dips to the east. The top of the Chinle Formation was encountered at approximately 140 feet bgs in the western part of the Site and at about 150 feet bgs in the eastern part of the Site, indicating a local southeastwardly dip of the Chinle contact. Bedding in the Chinle Formation dips west.

The hydrogeologic units at the Site include the Ogallala Formation and the Trinity Sand (basal Cretaceous sand). The Ogallala Formation at the Site has no saturated thickness, yet is of hydraulic significance because it acts as a medium through which contaminants enter the underlying Edwards Trinity aquifer. The Ogallala Formation extends from approximately 15 feet bgs to approximately 60 feet bgs at the Site. The underlying Trinity Sand is the only water bearing zone at the Site, and forms part of the Edwards Trinity aquifer. The Trinity Sand extends from approximately 70 feet bgs to approximately 150 feet bgs. The Edwards Trinity aquifer is an unconfined aquifer that overlies the impermeable Chinle Formation (Tetra Tech 2002).

According to the March 2008 Potentiometric Surface Map, the ground water flows from the western portion of the Site to the east and southeast (Figure 2). This is consistent with the measured ground water flow direction in June 2003, which predates the startup of the treatment system (Tetra Tech 2005b).

3.2 LAND AND RESOURCE USE

The land uses adjacent to the LM facility consist primarily of active and abandoned industrial facilities with scattered abandoned and inhabited residential properties within the area. EPA has conducted a site assessment of the adjacent Gulf Nuclear site and a separate emergency removal action was conducted by the EPA Radiological Emergency Response Team in 2001 (EPA 2000a, 2007).

The adjacent industrial facilities and residential properties are connected to the City of Odessa water supply. As a result, the ground water use is for non-potable uses such as industrial operations or lawn irrigation. Prior to the area being connected to the City of Odessa water supply, the adjacent residences were dependent on private wells for their drinking water supply and many of the residences still maintain wells for use in lawn and garden irrigation. However, ground water is utilized as a drinking water source at residences east of the LM facility. The ground water flows in a west to east direction, and the residences dependent on ground water for their drinking water supply are located downgradient of the LM facility. Because the area is in an arid environment, the potential beneficial use of the ground water remains as a drinking water supply (EPA 2000a).

Land use adjacent to the NCC facility consists primarily of active and inactive industrial facilities north of Steven Road, and residential properties south of Steven Road. The adjacent industrial facilities are connected to the City of Odessa water supply and do not utilize private wells. The residences south of Steven Road are dependent on ground water for their drinking water supply. The ground water flows in a northwest to southeast direction, and the residences dependent on ground water for their drinking water supply are located downgradient of the NCC facility (EPA 2000a).

The land uses adjacent to the M&C facility consist primarily of active and inactive industrial facilities to the north and south of the property, and inhabited residential properties immediately east of the property. Based on interviews with the owner/operators of the adjacent facilities, private wells are used to supply water for their industrial operations and sanitary systems and bottled water is used for their drinking water. The residences east of the M&C facility utilize ground water for their drinking water supply. The ground water flows in a west to east direction and the residences dependent on ground water for their drinking water supply are located downgradient of the M&C facility (EPA 2000a).

3.3 HISTORY OF CONTAMINATION

Leigh Metal

In March 1984, an unknown volume of chromic acid from two chromic acid plating tanks at the LM facility was released inside the chrome plating shop. The rinsewater entered the soil beneath the chrome-plating shop through cracks in the concrete floor. Prior to a Texas Water Commission (TWC) inspection in February 1985, LM had approximately 211 cubic yards of contaminated soil beneath the plating shop excavated and disposed of at an off-site landfill. The excavation area underneath the

building is approximately 5 to 6 feet deep and is protected by a metal awning erected on the west side of the chrome plating shop (EPA 2000a).

The TWC issued an Agreed Enforcement Order in May 1991 requiring LM to investigate contaminated soils from both active and inactive solid waste management units at the facility. On 1 August 1991, a citizen complaint reported green, discolored ice cubes at a nearby residence. TWC responded in August 1991 with a ground water quality survey in the vicinity of the LM facility and identified chromium contamination above drinking water standards in six wells east of the LM facility with concentrations ranging from 0.080 to 5.24 milligrams per liter (mg/L). The LM facility failed to meet the requirements of a subsequent Emergency Order issued by TWC in August 1991 for the ground water contamination. On 6 October 1992, the LM facility was abandoned following an Order for Relief entered by the United State Bankruptcy Court in the bankruptcy proceedings of Leigh Metal Coatings and Machining, Inc. (EPA 2000a).

National Chromium Corporation

Numerous compliance inspections were conducted at the NCC facility from 1980 to 1991 by the TWC and the Texas Department of Water Resources (TDWR). TDWR issued two non-compliance notices to NCC in 1982, and a 1983 inspection noted that waste chrome solution was discharged into a 20,000 gallon surface impoundment without treatment. The waste stream contained 50.4 mg/L total chromium and soil contamination contained 378 mg/L total chromium. A May 1983 TDWR enforcement report cited several violations, including improper storage of hazardous waste, unauthorized discharge of industrial wastewater, and failure to implement a ground water monitoring program. TDWR and TWC compliance inspections referenced closure activities for the surface impoundment between 1984 and 1988, as well as continued chromic acid seepage from the building onto the soil. A TWC enforcement action in 1987 required NCC to close the impoundment and remove the wastes and soil. While NCC proceeded with closure of the surface impoundment between 1988 and 1989, all of the requirements had not been met prior to the facility closing in 1993. Closure of the surface impoundment included the excavation of the liquids, sludges, and liner along with the excavation of other nearby spill areas (EPA 2000a).

Machine and Casting

A TDWR compliance inspection at the M&C facility in 1980 found an abandoned plating room, which contained a full chrome plating vat, and staining on the floors and walls of the room. A TWC compliance inspection in 1988 identified a chrome waste spill in the northeast portion of the facility property; also,

the full plating vat was still present, and a large hole was discovered in the concrete floor of the plating room. Under the direction of the TWC, 48 drums of chromium-contaminated soil, 18 over-packed drums of chromium-contaminated debris, the plating vat, and 220 gallons of spent chrome plating solution were removed from the facility. The facility was abandoned in 1988. TWC sampled the ground water from nearby wells between 1989 and 1992 and identified chromium contamination in a private well 150 feet north of the M&C building at concentrations ranging from 0.825 to 3.84 mg/L (EPA 2000a).

EPA combined the three contaminant plumes into one site in 1996; during this time the Site was known as the Odessa Super Site. As a result, EPA realized cost savings by designing one centralized treatment facility to address all three contaminant plumes (EPA 2000a).

Chromium is the primary contaminant of concern (COC) at the Site. Additionally, 1,1-dichloroethene (1,1-DCE) was detected in two onsite monitoring wells at the NCC facility but was not detected at the LM or M&C facilities. Table 2 lists the contaminants that were detected during the remedial investigation/feasibility study (RI/FS) in various site media above human health-based standards (EPA 2000a).

TABLE 2
CONTAMINANTS OF CONCERN

Media	Contaminant	Concentration Range
Surface soils	Chromium	151 – 8,040 mg/kg
Vadose zone	Chromium	1.6 – 1,170 mg/kg
Ground water	Chromium	0.270 – 11.2 mg/L
	1,1-DCE	0.007 – 0.009 mg/L

Notes:
mg/L Milligram per liter
mg/kg Milligram per kilogram
1,1-DCE 1,1-dichloroethene

Source: EPA 2000a

3.4 INITIAL RESPONSE

In 1996, EPA proceeded with a removal assessment at all three facilities. During the removal activities at the LM facility, liquid and sludge wastes were removed from 13 vats, 85 drums, 83 pails, and numerous small containers. The emptied drums and pails were crushed and placed in the empty vats in the plating

shop. A total of 4,070 gallons of liquid waste and 2,550 gallons of solid waste were removed for off-site disposal. A total of 115,700 pounds of vat and tank sludge, 40,620 pounds of tank liquid waste, and 5,187,340 pounds of soil waste were removed from the NCC facility for off-site disposal. The remaining excavated soil from the waste pile was consolidated into the former surface impoundment and covered with backfill dirt. Staged backfill dirt was levelled across the rest of the site (EPA 2000a).

A second EPA emergency response action in 1998 addressed the risk to human health caused by exposure to the chromium contaminated ground water present in private drinking water wells by supplying bottled water to adjacent residences (EPA 2000a).

3.5 BASIS FOR RESPONSE

Based on the data collected during the remedial investigation and feasibility study (RI/FS), it was determined that if the selected remedy in the ROD was not implemented, hazardous substances could be released from the Site and endanger public health, welfare, or the environment. The most significant threat is the current and future risks for an off-site resident exposed to hexavalent chromium in ground water. Initially, the ROD did not require remediation of the surface soil because the RI/FS did not identify the surface soils as a risk to human health and environment (EPA 2000a). However, during the Remedial design (RD) phase, it was determined that hexavalent chromium in vadose zone soil presented a possible continuing source of ground water contamination. An interim cleanup level for hexavalent chromium in vadose zone soil was set at 1.0 milligram per kilogram (mg/kg), which is consistent with the applicable or relevant and appropriate requirements (ARARs) for ground water, attains EPA's risk management goal for the RA, and has been determined by EPA to be protective. Results of the predictive modeling conducted during the RD indicated that concentrations of hexavalent chromium in soil at the M&C and LM facilities were not sufficient to cause significant future ground water contamination. Accordingly, only the vadose zone soils at the NCC facility are addressed in the LTRA. The interim soil cleanup level for vadose zone soil must be met at the NCC facility at the completion of the LTRA (Tetra Tech 2005b).

4.0 REMEDIAL ACTIONS

This section discusses the selected remedy, remedy implementation, and operation and maintenance (O&M) activities/costs.

4.1 SELECTED REMEDY

The EPA signed the ROD on 29 September 2000. The ROD addressed long-term environmental and human health risks associated with contaminated ground water. Details of the RAOs and the selected remedy are discussed in the following paragraphs.

The RAOs established in the ROD were as follows (EPA 2000a):

- Prevent exposure to contaminated ground water, above acceptable risk levels;
- Prevent or minimize further migration of the ground water contaminant plume;
- Prevent or minimize further migration of contaminants from source materials to ground water; and
- Return ground waters to their expected beneficial uses wherever practicable.

The remedy selected in the ROD included the following (EPA 2000a):

- Installation of ground water extraction wells at each contaminant plume to maximize contaminant reduction and prevent further migration of the plume;
- Treatment of the contaminated ground water utilizing one of the presumptive remedies described in the Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Ground Water at CERCLA Sites (Office of Solid Waste and Emergency Response (OSWER) Directive 9283.1-12, October 1996). Wastes generated during the treatment process would be transported to an off-site location for disposal in accordance with Resource Conservation and Recovery Act (RCRA) and CERCLA requirements;
- The re-injection of the treated water into the aquifer utilizing one or a combination of the following: injection wells, dry wells, and/or infiltration galleries;
- The use of infiltration galleries or other means to flush the hexavalent chromium from the vadose zone to levels that will ensure the area does not act as a potential source of contamination or prevent the restoration of the ground water under future land-use scenarios; and
- Long-term ground water monitoring to evaluate the effectiveness of the ground water extraction and disposal system and ensure there is no further exposure to contaminated ground water above the applicable drinking standards.

Table 3 shows the remedial goals for the ground water as specified in the ROD.

TABLE 3
REMEDIAL GOALS

Media	Contaminant	Remedial Goals
Vadose zone	Chromium	1.0 mg/kg
Ground water	Chromium	0.1 mg/L (100 µg/L)
	1,1-DCE	0.007 mg/L

Notes:
mg/L Milligram per liter
mg/kg Milligram per kilogram
µg/L Microgram per liter
1,1-DCE 1,1-dichloroethene
Source: EPA 2000a

4.2 REMEDY IMPLEMENTATION

The remediation system at the Site consists of a ground water recovery system, a treatment system, and an injection system. System operation involves ground water extraction by the recovery system, followed by treatment, then re-injection. System operation is fully automated, and control is shared by three control centers—one at each of the three facilities. The ground water treatment system is located at the LM facility (Tetra Tech 2004).

A network of recovery wells (7 at M&C, 27 at LM, and 23 at NCC) forms the ground water recovery system. Recovery systems at M&C and NCC pump contaminated ground water into local collection tanks. Transfer pumps transfer water from their respective collection tanks to the surge tank located in the LM facility. The recovery wells at the LM facility pump water directly to the surge tank (Tetra Tech 2004).

The recovery system is designed to provide containment in the event of contaminated water leakage from the carrier pipe. The containment annulus of the double-walled high-density polyethylene (HDPE) pipe is connected at low points to 32 leak detection sumps across the Site. Each sump has a water sensing probe connected to a continuous monitor. In the event of a carrier pipe leak, the containment pipe will convey the water to the closest downstream sump. The water sensing probe in that sump will alert the continuous leak detection sump monitor in one of the facilities. The monitor beeps and prints out information pertaining to the leak, including its location (Tetra Tech 2004).

The treatment system is located at the LM facility and includes a surge tank (tank T-1), a pump tank (tank T-1A), pumps, bag filters, and an ion exchange system. The ion exchange system consists of two banks, each consisting of five resin tanks. Resin tanks within a bank are connected in parallel, and the two banks are connected in series. At any given time one bank acts as the worker (or primary) resin, and the other acts as the polisher (or secondary) (Tetra Tech 2004).

Water that collects in tank T-1 gravity-flows into tank T-1A through a 10-inch horizontal pipe connecting the two tanks about 11 feet above the finished floor. Settleable solids sink to the bottom of tank T-1 before water flows from tank T-1 into tank T-1A. Pump P-1 (or P-2) transfers water out of tank T-1A, through the bag filter BF-1 (or BF-2), the ion exchange system, and into tank T-2. The bag filter removes all solids larger than 10 microns. The ion exchange system removes hexavalent chromium from the influent, producing an effluent with hexavalent chromium concentrations less than 0.05 mg/L (Tetra Tech 2004). After a resin release in 2005, a cartridge filter system was installed between the ion exchange system and T-2 to prevent future releases (Tetra Tech 2006).

The injection system consists of three separate networks of injection wells (8 wells at M&C, 8 wells at LM, and 27 wells at NCC) and a vadose zone flushing system at NCC. Injection pumps in the treatment building deliver treated water from tank T-2 to each of these networks. Pumps MIP-1 and MIP-2 deliver water to the M&C injection well network; pumps LIP-1 and LIP-2 deliver water to the LM injection well network; and pumps NIP-1 and NIP-2 deliver water to the NCC injection well network and the vadose zone flushing system (Tetra Tech 2004).

4.3 OPERATION AND MAINTENANCE

O&M activities were initiated in September 2003 upon completion of the ground water treatment system (Tetra Tech 2005b). These activities are conducted to ensure the effectiveness, protectiveness, and integrity of the remedy. The O&M activities for the Site included routine operation and maintenance of the ground water treatment system, as well as ground water monitoring to monitor the effectiveness of the remedy. These activities are currently being conducted under the LTRA.

4.3.1 System Operation

The treatment system at the Site is designed to run continuously; system shutdown is not a component of routine system operation. The system is designed to operate during routine maintenance, such as

change-out of the ion exchange resin or replacement of the bag filter. Therefore, there is no routine down-time (EA 2008b).

Site and systems assessments are performed daily and include the following: (Tetra Tech 2004)

- Driving to remote buildings M&C and NCC and observing the yards, buildings, and wells;
- Checking all above-ground system components (e.g., piping, tanks, flowmeters, and gate valves) for integrity on a daily basis;
- Driving to all wells and along pipeline routes to visually check for leaks;
- Checking all electrical panels and physical fixtures for any possible problems at remote buildings M&C and NCC and at LM; and
- Verifying that the computer system at LM (in conjunction with visual inspection) is operating properly.

In order to determine whether the treatment system performs as required and discharge (treatment) criteria are met (the treatment criterion for hexavalent chromium is 50 µg/L), the treatment system influent and effluent are monitored on a daily basis. Influent and effluent samples are collected and analyzed daily for hexavalent chromium using a Hach® Pocket Colorimeter™ field test kit. The Hach® field test kit was determined to be appropriate for daily influent and effluent testing based on a correlation study. One effluent sample per week is submitted to a fixed laboratory for total chromium analysis in order to verify the daily testing (EA 2008b). The effluent data concentrations are discussed in Section 6.3.

4.3.2 Monitoring Program

Routine ground water monitoring was initiated in March 2003, before RA activities were completed. Ground water monitoring was conducted three times in 2003, three times in 2004, twice in 2005, once in 2006, four times in 2007, and once in 2008 (EA 2008c). Selected monitor wells, private wells, and recovery wells are sampled at the discretion of the EPA.

TABLE 4
SCHEDULE FOR LONG-TERM GROUND WATER MONITORING

Year	Number of Ground Water Sampling Events	Comments
2000	1	
2001	1	
2002	2	
2003	3	Ground water treatment system was completed.
2004	3	
2005	2	
2006	1	
2007	4	
2008	1	Two additional sampling events will be conducted in 2008.
Remaining years	3 times per year	

The monitoring well network consists of 18 monitor wells and 21 privately owned wells at LM, 10 monitor wells and 18 privately owned wells at M&C, and 17 monitor wells and 6 privately owned wells at NCC. Figure 1 provides a site layout map that illustrates the current monitoring well network. Samples collected from the monitoring network are analyzed for total metals by EPA method 200.7. The chromium results are presented in ground water monitoring and semiannual operating reports. Data trends are discussed in Section 6.3.

4.4 OPERATION AND MAINTENANCE COST

The total cost of operation and maintenance at the Site from October 2006 through April 2008 is listed below:

- August – December 2006 $277,000
- January – December 2007 $900,000 (includes $75,000 for system repairs and upgrades)
- January – April 2008 $293,000

The average monthly cost during this time period was approximately $67,800, which equates to an average annual cost of $813,600. These costs include but are not limited to routine O&M of the Site, ground water sampling and analysis, repairs and upgrades to the system, and consulting and reporting

activities. The O&M cost records prior to August 2006 have been archived and were not available for review at the time of this report.

5.0 PROGRESS SINCE THE PREVIOUS FIVE-YEAR REVIEW

This is the first five-year review for the Site.

6.0 FIRST FIVE-YEAR REVIEW PROCESS

This section presents the process and findings of the first five-year review. Specifically, this section presents the findings of the document review, data review, ARAR review, Site inspection, and interviews.

6.1 ADMINISTRATIVE COMPONENTS

The first five-year review for the Site was led by Mr. Vince Malott, EPA Remedial Project Manager. EA Engineering, Science, and Technology, Inc. (EA), assisted in the review process. Ms. Kim Wallace-Wymore was the EA representative during the Site inspection.

In April 2008, the review team established the review schedule, which included the following components:

- Document review;
- Data review;
- ARAR review;
- Site inspection; and
- Interviews.

6.2 DOCUMENT REVIEW

The five-year review for the Site included a review of relevant documents, including the ROD, Final Design Report, RA Report, O&M Plan, Operating Reports, and Ground Water Monitoring Reports. Complete references for the documents reviewed are provided in Attachment 2.

6.3 DATA REVIEW

Data reviewed consisted of:

- Quarterly Ground Water Monitoring Report, December 2004 (Tetra Tech 2005a);
- Annual Report for Operation and Maintenance, 1 October 2003 through 30 September 2004 (Tetra Tech 2005b);
- Quarterly Ground Water Monitoring Report, March 2005 (Tetra Tech 2005c);
- Annual Report for Operation and Maintenance, 1 October 2004 through 19 October 2005 (Tetra Tech 2006);
- Quarterly Ground Water Monitoring Report, October 2006 (EA 2007a);
- Quarterly Ground Water Monitoring Report, February 2007 (EA 2007c);
- Semi-Annual Operating Report, 1 October 2006 through 31 March 2007 (EA 2007f);
- Quarterly Ground Water Monitoring Report, May 2007 (EA 2007d);
- Quarterly Ground Water Monitoring Report, August 2007 (EA 2007e);
- Annual Operating Report, 1 October 2006 through 30 September 2007 (EA 2007b);
- Quarterly Ground Water Monitoring Report, November 2007 (EA 2008a);
- Semi-Annual Operating Report, 1 October 2007 through 31 March 2008 (EA 2008b); and
- Ground Water Monitoring Report, March 2008 (EA 2008c).

6.3.1 Ground Water Data Review

The goal of ground water monitoring at the Site is to evaluate the effectiveness of the treatment system and to ensure that there is no exposure to contaminants above the drinking water MCLs (EPA 2000a). Ground water samples are analyzed for total metals by EPA method 200.7. 1,1-DCE has only been detected in the NCC plume and has historically been detected infrequently at low levels. It is not expected to be present in concentrations exceeding the MCL at the treatment plant due to the volume of influent water and attendant dilution. Therefore, in accordance with EPA direction, neither the RD nor the RA considered treatment or monitoring of 1,1-DCE (Tetra Tech 2005b). Evaluation of chromium data for each facility is presented in the following paragraphs.

Leigh Metal

The chromium concentration trends for selected wells during this review period are listed below:

- LMW-16—This well is located on the downgradient edge of the plume. The concentration reported in August 2007 is the first to exceed the MCL since October 2003. The sample collected in March 2008 was below the MCL.

- LRW-19—This well is located in the downgradient portion of the plume. The concentration reported in August 2007 (776 µg/L) is the highest reported since December 2004. Concentrations in November 2007 and March 2008 have declined but remain above the MCL.

- LRW-24—This well is located on the eastern edge of the plume. Concentrations have remained fairly stable during the last year, but increased slightly during August 2007.

- L-27—This well is located downgradient of LRW-24. Concentrations have not exceeded the MCL at this location.

The highest chromium concentrations are located on the WFJ Drilling property, downgradient of the LM facility (Figure 2 and Figure 3). The overall size of the ground water plume remains similar to the footprint of the plume at startup, and it appears that the ground water extraction and treatment system is maintaining capture at this facility. Concentrations in several locations increased during the summer of 2007, which may correspond to the excessive amount of rainfall received during this time. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing; however, the maximum concentrations of chromium detected within the plume has decreased over time, from 14,000 µg/L prior to system startup (June 2003) to 3,440 µg/L in March 2008.

National Chromium Corporation

The chromium concentration trends for selected wells during this review period are listed below:

- N-7—This well is located in the downgradient portion of the plume. Concentrations in this well have fluctuated during this review period. Concentrations were below the MCL from October 2003 through October 2005, but have exceeded the MCL since October 2006.

- NMW-9 / NMW-16—NMW-9 (shallow) and NMW-16 (deep [or fully-penetrating]) are paired wells located near the center of the plume. The samples collected from NMW-9 in August 2007 and March 2008 were below the MCL. The highest concentration in NMW-9 (8,400 µg/L) was recorded during the June 2003 sampling event. The highest concentration in NMW-16 (1,120 µg/L) was recorded during October 2005. Concentrations in both wells have shown a general declining trend.

- NMW-11—This well is located on the downgradient (southeast) edge of the plume. Concentrations have not exceeded the MCL since March 2004.

- NMW-12—This well is located at the downgradient edge of the plume. Concentrations have not exceeded the MCL at this location.

- NMW-15—This well is located in the center of the plume. The highest concentration (5,300 µg/L) was recorded in January 2004. Concentrations have fluctuated in this well during the five most recent sampling events from 251 µg/L in October 2005 to 1,020 µg/L in March 2008.

- NMW-17—The concentration detected in March 2008 (415 µg/L) is the highest ever reported in this well, which is located on the downgradient edge of the plume.

- NRW-23—This well is located on the downgradient edge of the plume. The concentration increased from 10.1 µg/L in May 2007 to 282 µg/L in August 2007, which is the highest ever reported in this well. No chromium was detected in November 2007 or March 2008.

- NRW-24—This well is located on the downgradient edge of the plume, east of NRW-23. The concentration increased from 21.6 µg/L in May 2007 to 304 µg/L in August 2007. Concentrations were below the MCL in November 2007 and March 2008.

The overall footprint of the ground water plume remains similar to the footprint of the plume at startup. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing; however, the maximum concentrations of chromium detected within the plume has decreased over time, from 13,200 µg/L just after system startup (January 2004) to 7,630 µg/L in March 2008. Concentrations in the southeastern corner of the plume have increased, which could be associated with the excessive amount of rainfall received during the summer of 2007 or could also indicate an issue with plume capture.

Machine and Casting

The chromium concentration trends for selected wells during this review period are listed below:

- MMW-4—This well is located on the western portion of the plume. The concentration detected in March 2008 (1,620 µg/L) is the highest reported since October 2003. Concentrations have exceeded the MCL at this location since June 2003.

- MMW-6—This well is located in the center of the plume. Concentrations have shown an increasing trend since January 2004. The concentration detected in March 2008 (902 µg/L) is the highest ever reported from this well.

- MMW-7—This well is located in the eastern portion of the plume. Concentrations have shown an increasing trend at this location since October 2006.

- MRW-5—This well is located on the downgradient edge of the plume, downgradient of MMW-7. Concentrations increased during May 2007 and August 2007, but declined in March 2008.

The overall footprint of the ground water plume remains similar to the footprint of the plume at startup, and it appears that the ground water extraction and treatment system is maintaining capture at this facility. Concentrations in several locations increased during the summer of 2007, which may correspond to the excessive amount of rainfall received during this time. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing; however, the maximum concentrations of chromium detected within the plume has decreased over time, from 9,870 µg/L prior to system startup (June 2003) to 1,680 µg/L in March 2008.

6.3.2 System Flowrates

Since the system was started in 2003, approximately 2,537 pounds of chromium have been removed and 430 million gallons of water have been extracted and treated. The average monthly flowrates for the treatment system during the reporting period of 1 October 2007 through 31 March 2008 ranged from 94 to 150 gallons per minute (gpm). The average flowrate was 132 gpm, which is below the design rate of 528 gpm (Tetra Tech 2002a, EA 2008b). The treatment system has never operated at the designed flowrate. The design rate was predicted by the ground water model, which was based on hydraulic parameters obtained from short-term single well pumping tests and two 24-hour pumping tests. Neither type of pumping test was of sufficient duration to observe long-term sustained yield (EA 2008b).

An evaluation of the ground water model was conducted in June 2008. The evaluation indicated that the existing model, which was calculated assuming steady-state ground water flow conditions and incorporated data from all three facilities, should be replaced by two models (one M&C model and one model for LM and NCC) simulating transient flow conditions. The M&C facility is sufficiently separated from the LM and NCC facilities to not be influenced by withdrawals or injections from LM or NCC. Additionally, the existing model incorporated extraction from the Colorado River Municipal Water Supply District wells, which are no longer being used for water supply (DBS&A 2008). The updated ground water models should be utilized to more accurately predict the ground water conditions and can be used to adjust flow rates to optimize contaminant extraction. Development of the new models is currently underway and is expected to be completed in time for the 2008 annual operating report.

6.3.3 System Influent and Effluent Concentrations

During the initial startup, the average monthly influent concentrations ranged from 670 µg/L to 1,060 µg/L (Tetra Tech 2005b). The average monthly influent concentrations from the most recent reporting period (October 2007 through March 2008) ranged from 200 to 560 µg/L, which represents a decline from the initial influent concentrations (EA 2008b). The treatment system design was based on an influent concentration of 2,600 µg/L, which is significantly greater than the average observed influent concentrations. The influent concentrations estimated during the design phase were based on the highest observed chromium concentrations at each plume. The use of the maximum concentrations was determined to be conservative and would ensure sufficient treatment capacity (Tetra Tech 2005b).

Since the system was installed in 2003, daily effluent concentrations exceeded the discharge criterion for total chromium (100 µg/L) on eight occasions in 2003 and one occasion in March 2007. Effluent concentrations exceeded the treatment criterion for hexavalent chromium (50 µg/L) on eight occasions between October 2006 and March 2007 and once in January 2008. This equates to an exceedance rate of approximately 1.1 percent since system startup. The resin in the primary ion exchange tanks was changed out after an exceedance was observed. Following the three exceedances in May 2007, EA, with EPA concurrence, modified the concentration at which the ion exchange resin was exchanged from 0.05 to 0.04 mg/L hexavalent chromium as measured with the Hach® test kit (Tetra Tech 2005b, EA 2007b, EA 2008b). Based on the average monthly influent and effluent hexavalent chromium concentrations, the treatment system had an average operating efficiency of 95.5 percent for the October 2007 through March 2008 reporting period (EA 2008b).

6.4 ARAR REVIEW

ARARs for the Site were identified in the ROD dated 29 September 2000. As part of this five-year review, ARARs identified in the ROD (EPA 2000a) were reviewed to determine if any newly promulgated or modified requirements of federal and state environmental laws have significantly changed the protectiveness of the remedies implemented at the Site since the ROD was issued.

No changes to ARARs were identified and no newly-promulgated ARARs were found during this review. The ROD divided ARARs pertaining to remedial activities at the Site into chemical-, location- and action-specific categories. These ARARs are discussed below.

6.4.1 Chemical-specific ARARs

Chemical-specific ARARs are usually health or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment. The chemical-specific ARARs identified in the ROD for the Site are discussed below:

- **Federal Safe Drinking Water Act (SDWA), Maximum Contaminant Levels, Maximum Contaminant Level Goals, and Action Levels (40 CFR Part 141):** These requirements are relevant and appropriate to ground water used for drinking water by residences with private water supply wells at the Site. These MCLs are the established remedial goals for the COCs in ground water at the Site as follows: chromium at 0.1 mg/L and 1,1-DCE at 0.007 mg/L. As described in the Final Design Report (Tetra Tech 2002), 1,1 DCE (1) has only been detected in the NCC plume, (2) has historically been detected infrequently at very low levels, and (3) is not expected to be present in concentrations exceeding the MCL at the treatment plant due to the volume of influent water and attendant dilution. Therefore, in accordance with EPA direction, the RD and RA did not consider treatment or monitoring of 1,1-DCE. The ground water has been monitored and the data have been analyzed. The analysis indicates that the chromium concentrations at all three facilities appear to be decreasing compared to the concentrations during system startup; therefore, the remedial action is progressing towards meeting the chemical-specific remedial goals for the Site.

- **Federal RCRA, Identification and Listing of Hazardous Waste (40 CFR Part 261):** The ROD identified these requirements as applicable to solid wastes generated during the treatment of contaminated ground water which may be classified as a hazardous waste, if they exhibit any RCRA characteristics. Ion resin exchange is not a hazardous waste as it is regenerated by Siemens; therefore, this requirement does not apply to the management and handling of the regenerated resin. Used bag filters, a waste generated from the treatment process, have been analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) and determined to be non-hazardous.

- **Federal RCRA, Land Disposal Restrictions (40 CFR Part 268):** These requirements were identified as applicable to hazardous wastes generated from the treatment of the contaminated ground water. Ion resin exchange is not a hazardous waste as it is regenerated by Siemens; therefore, this requirement does not apply. Used bag filters, a waste generated from the treatment process, have been analyzed using TCLP and determined to be non-hazardous.

No other chemical-specific ARARs for the Site were identified during the five-year review process, and no new chemical-specific requirements pertaining to the Site have been promulgated since 2000.

6.4.2 Location-specific ARARs

Location-specific ARARs are restrictions on remedial activities solely based on the location of the remedial activity. The location-specific ARARs identified in the ROD for the Site are discussed below:

- **Ground Water Restoration:** The ROD identified the State of Texas Rules, Ground Water Protection Act (Texas Water Code, Chapter 26, Subchapter J, 401- 406) as a location-specific ARAR. This statute was identified as applicable because the Site's underlying ground water is

impacted, and the statute requires ground water to be restored, if feasible. This ARAR continues to be met through the implementation of this remedial action under the 2000 ROD to address impacted ground water and restore state ground water, as feasible.

- **Construction Permits:** The ROD identified the Ector County Pipeline/Utility Agreement Order which requires permits for construction in right-of-ways and agreements for roadway crossings. This ARAR was identified as applicable for the construction of all pipelines in roadways and alleys and the installation of borings requiring crossing beneath paved streets after approval of special variance requests. This ARAR was met during construction of the treatment system (Tetra Tech 2002).

No other location-specific ARARs for the Site were identified during the five-year review process, and no new location-specific requirements pertaining to the Site have been promulgated since 2000.

6.4.3 Action-specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions or conditions taken with respect to specific substances. These requirements are triggered by the particular remedial activities that are selected to accomplish the remedy. The action-specific ARARs specified in ROD are discussed below:

- **Federal RCRA, Section 3020(b):** The ROD identified this requirement which provides exemption from the ban on underground injection of treated contaminated ground water into or above an underground source of drinking water if the following three conditions are met: (1) the injection is a CERCLA response action or a RCRA corrective action; (2) contaminated ground water must be treated to substantially reduce hazardous constituents prior to such injection; and (3) the response action or corrective action must be sufficient to protect human health and the environment upon completion. The injection wells installed and operated as part of the RA are meeting all three requirements of this ARAR as the action is being conducted under CERCLA; ground water is being treated to substantially reduce hazardous constituents as demonstrated in the influent and effluent analysis, and the RA is operating in such a manner to protect human health and the environment.

- **Federal SDWA, Underground Injection Control Regulations (40 CFR § 141.13):** The ROD identified these regulations which provide exemptions from Underground Injection Control (UIC) permitting process to wells used to re-inject treated ground water into the same formation from which it was withdrawn. The injection wells installed and operated during the RA were exempt from UIC permitting under these provisions of the SDWA. Based upon review of existing site documentation, this ARAR appears to have been met.

- **Federal RCRA, Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262):** The ROD identified these requirements for management and manifesting hazardous waste for off-site transportation and disposal as being applicable to potential hazardous wastes generated from the treatment of the contaminated ground water. Ion resin exchange is not a hazardous waste as it is regenerated by Siemens; therefore, this requirement does not apply.

Used bag filters, a waste generated from the treatment process, has been analyzed using TCLP and determined to be non-hazardous.

No other action-specific ARARs for the Site were identified during the five-year review process, and no new action-specific requirements pertaining to the Site have been promulgated since 2000.

6.5 SITE INSPECTION

A Site inspection was conducted on 14 May 2008, to assess the condition of the Site and the effectiveness of measures employed to protect human health and the environment from the contaminants still present at the Site. Attendees included: Vince Malott (EPA), Kim Wallace-Wymore (EA), and Curtis Shupp (Etech Environmental and Safety Solutions, Inc.). The inspection team visited the LM, M&C, and NCC facilities. The Site inspection checklist is provided in Attachment 3. The Site inspection photographs are provided in Attachment 4.

Tank T-1A was observed to be leaking contaminated ground water at the time of the Site inspection (Photographs 1 and 2). The leaking water is contained within secondary containment, but the presence of water in the building is a potential slip hazard. The leaking tank was repaired on 29 May 2008.

Two of the electrical pull boxes at the M&C facility were flooded at the time of the Site inspection as a result of rainfall earlier in the week (Photograph 4). The Site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem (Photograph 3). Drilling was completed on 19 May 2008. Flooding of electrical components in electrical pull boxes have been a persistent problem at the Site, particularly in 2007 when the Site received 33.5 inches of rainfall.

The Site inspection team observed that the well pads, skirts, and lids were generally in good condition. However, the expansion plugs on some monitor wells are worn and may not provide an effective long-term seal against surface water intrusion into the monitor wells, and the well vaults on some monitor wells need new O-rings to prevent surface water intrusion into the well vaults.

In addition, the Site inspection team inspected the wiring in several recovery wells. The electrical components in the recovery wells are susceptible to corrosion as a result of rain water accumulating in the vaults. Three of the recovery wells (NRW-13, NRW-14, and NRW-17) have Coyote Pump Protectors installed (Photographs 7 and 8), which makes the electrical components less vulnerable to flooding

compared to those recovery wells without controllers (Photograph 5). Etech personnel will install pump protectors on 20 additional recovery wells.

6.6 SITE INTERVIEWS

In accordance with the community involvement requirements of the five-year review process, EPA identified key individuals to be interviewed. Table 5 lists the individuals that completed interview records for the first five-year review.

TABLE 5
LIST OF INTERVIEWEES

Name	Title/Position	Organization	Date Survey Completed
Danny Barlau	Adjacent Property Owner	Fabco Industrial	15 May 2008
Virgie V. Martin	Homeowner	--	31 May 2008
Keith Westberry	Project Manager	Etech Environmental & Safety Solutions, Inc.	5 June 2008

Responses received by two of the interviewees were generally favorable. However, the response received by a neighboring homeowner was not favorable. The main concerns that were brought up through the interview process are highlighted as follows:

- Danny Barlau (Adjacent Property Owner)—Mr. Barlau owns property adjacent to the M&C facility. His overall impression of the remedial action is favorable. He stated that once all equipment and lines were installed, the Site has been well maintained. He said that he feels well-informed about the site activities and progress and any questions he had were addressed by the EPA. He is interested in purchasing the M&C property.

- Virgie V. Martin (Homeowner)—She stated that the remedial action has had a negative effect on the surrounding community. She stated construction contractors caused surface damage to her property and that she was never reimbursed for the cost of repairs to her property by the EPA as promised. She said additional surface damage was caused to her property by contractors in 2007 when rain water was pumped out of the well vaults. She would like to receive (1) copies of the water results after each sampling event instead of once per year, and (2) any information regarding health concerns or studies related to the ground water contamination.

- Keith Westberry (Etech Project Manager)—He stated that the local electricity service provider is not very reliable, and Etech frequently encounters problems with power outages and surges at the Site. He also stated system components have been stressed as a result of the excessive rainfall in the past year, and the installation of Coyote controllers in the recovery wells has

proven to be effective because it leaves fewer components in the well vaults vulnerable to flooding. He would like to receive information on the recent sampling events and the overall effect of the remedy.

To review complete answers to all the interview questions, please refer to Attachment 5.

7.0 TECHNICAL ASSESSMENT

In accordance with EPA Five-Year Review Guidance (EPA 2001), a determination of protectiveness of the selected remedy for a site will be determined by a technical assessment examining the following three questions:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the assumptions used at the time of the remedy selection still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The technical assessment was conducted by reviewing the ROD, O&M Plan, Annual and Semi-annual System Operating Reports, Ground Water Monitoring Reports; interviewing the Site project manager and operations team; and by conducting a site visit. The technical assessment is presented in the following sections.

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

- **Remedial Action Performance**—Based on the review of documents, ARARs, and the results of the Site inspection, it has been determined that the selected remedy for the Site was designed and installed as required by the ROD. The selected remedy included the following elements: a ground water extraction and treatment system, a treated ground water re-infiltration system, an infiltration gallery for flushing hexavalent chromium through vadose zone soils, and a long term ground water monitoring program.

  The system was completed in 2003. Currently, the ground water extraction, treatment, and reinjection systems are operating as intended by the decision documents, as is the long term monitoring program. The use of the infiltration gallery was discontinued due to ground water mounding issues.

  The cleanup goals have not yet been achieved; however, as of August 2007, the following trends in concentrations of chromium in ground water have been observed:

- **Leigh Metal:** The overall footprint of the ground water plume remains similar to the footprint of the plume at startup, and it appears that the ground water extraction and treatment system is maintaining capture at this facility. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing. However, the maximum concentrations of chromium detected within the plume has decreased over time, from 14,000 µg/L prior to system startup to 3,440 µg/L in March 2008.

- **Machine and Casting:** The overall footprint of the ground water plume remains similar to the footprint of the plume at startup, and it appears that the ground water extraction and treatment system is maintaining capture at this facility. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing. However, the maximum concentrations of chromium detected within the plume have decreased over time, from 9,870 µg/L prior to system startup to 1,680 µg/L in March 2008.

- **National Chromium Corporation:** The overall footprint of the ground water plume remains similar to the footprint of the plume at startup. Ground water concentration trends vary across the plume, with some exhibiting increasing concentrations, others decreasing. However, the maximum concentrations of chromium detected within the plume has decreased over time, from 13,200 µg/L just after system startup (January 2004) to 7,630 µg/L in March 2008. Concentrations in the southeastern corner of the plume have increased, which could be due to an issue with plume capture or with the excessive rainfall in 2007.

- **System Operations/operation and maintenance—**Due to high rainfall events in May and August of 2007, parts of the ground water extraction system were submerged for a prolonged period. The components were not designed to withstand submersion in water, and significant time and effort has been spent replacing and/or repairing equipment damaged due to the rain.

- **Cost of System Operation/O&M—**System operation began in September 2003. Operation costs provided by EA for August 2006 through April 2008 are listed below.

August – December 2006	$277,000
January – December 2007	$900,000 (includes $75,000 in repairs and upgrades)
January – April 2008	$293,000

  The average monthly cost during this time period was approximately $67,800, which equates to an average annual cost of $813,600. These costs include but are not limited to routine O&M of the Site, ground water sampling and analysis, repairs and upgrades to the system, and consulting and reporting activities. The O&M cost records prior to August 2006 have been archived and were not available for review at the time of this report. The average annual O&M cost compares favorably to the O&M costs estimated in the ROD of approximately $1,200,000.

- **Implementation of Institutional Controls and Other Measures—**Institutional controls (legal restrictions that protect a remedy and prevent human exposure) are an issue that is being evaluated at Superfund sites. In 2000 when the ROD was issued for the Site, institutional controls were not considered to be a necessary remedy component. As a result, the remedy described in the ROD did not include institutional controls. In order to address this issue,

institutional controls may need to be evaluated and implemented if unacceptable risks are determined to be present during the long-term ground water cleanup.

- **Monitoring Activities—Ground water monitoring is currently** conducted three times a year, which is less than the originally quarterly ground water monitoring. This should be sufficient monitoring (if the same wells are monitored during each event) to continue monitoring plume locations and extraction system performance.

- **Opportunities for Optimization**—An evaluation of the existing ground water model was conducted in June 2008 (DBS&A 2008). The evaluation indicated the existing model should be replaced by two separate ground water models (one for the M&C facility and a combined model for the LM and NCC facilities). The models should:

    - simulate transient flow rather than steady-state conditions;
    - contain fewer layers than the original model; and
    - assess plume capture using particle tracking methods.

- **Ground Water Recovery Rates—**Ground water recovery rates are much lower than initially planned (from an estimated 528 gallons per minute (gpm) in the final design report (Tetra Tech 2002) to an actual average recovery rate of 132 gpm. The lower recovery rate will significantly increase remediation timeframe over initial estimates. Using an updated ground water model, it may be feasible to increase total flow rates or to optimize contaminant extraction.

- **Ground Water Monitoring—**Ground water monitoring could be optimized using the revised ground water models and/or optimization software to reduce costs associated with sampling.

- **Early Indicators of Potential Remedy Problems—**The increases in ground water concentrations of chromium measured during the August 2007 ground water monitoring event may be due to insufficient plume capture or flushing of chromium from the vadose zone into the saturated soil and should be investigated.

7.2 QUESTION B: ARE THE ASSUMPTIONS USED AT THE TIME OF REMEDY SELECTION STILL VALID?

This section addresses changes in environmental standards, newly promulgated standards, and "to-be-considereds" (TBCs), changes in exposure pathways, and changes in toxicity and other contaminant characteristics during the five-year review period, and progress toward meeting RAOs.

- **Changes in Environmental Standards, Newly Promulgated Standards, and TBCs**—Environmental standards (referred to as Applicable or Relevant and Appropriate Requirements [ARARs]) for this Site were identified in the ROD signed on 29 September 2000. The five-year review for this Site included identification of and evaluation of changes in the ROD-specified ARARs and TBCs to determine whether such changes may affect the protectiveness of the selected remedy. The ARARs and TBCs identified by the ROD for the Site include chemical- and action-specific requirements for the remedy.

  The TCEQ and Federal regulations have not been revised so that the effectiveness of the remedy at the Site would be called into question. The MCLs applicable to the ground water

contamination at the Site have not been revised since the ROD was signed. No new regulations have been issued by the State of Texas or the Federal government that would call into question the effectiveness of the remedy. The remedy selected for the Site followed EPA's presumptive remedy guidance.

- **Changes in Exposure Pathways—**There have been no changes in existing human health exposure pathways for the Site since the commencement of the LTRA. The previous extension of water supply lines to residences in the area as well as the operation of the P&T system has eliminated or reduced the existing human health exposure pathways present at the Site. Monitoring of private residential wells that are used for water supply is conducted as part of the overall ground water monitoring program. Land use within the Site remains a mix of residential and industrial operations. No new source areas have been identified as part of this five-year review.

- **Changes in Toxicity and Other Contaminant Characteristics—**No changes to the toxicity of identified contaminants have been identified for the Site as part of this five-year review.

- **Progress Toward Meeting the RAOs—**In general, it appears that the remedy is progressing as expected for long-term restoration of the contaminated ground water.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

The type of information that might call into question the protectiveness of the remedy includes potential future land use changes in the vicinity of the Site or other unexpected changes in site conditions or exposure pathways. Institutional controls (legal restrictions that protect a remedy and prevent human exposure) are an issue that is being evaluated at Superfund sites. In 2000 when the ROD was issued for the Site, institutional controls were not considered to be a necessary remedy component. As a result, the remedy described in the ROD did not include institutional controls. In order to address this issue, institutional controls may need to be evaluated and implemented if unacceptable risks are determined to be present during the long-term ground water cleanup. No other information has come to light as part of this review that would call into question the protectiveness of this remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

After documents and data were reviewed, and the Site inspection and interviews were completed, it appears that the remedy is functioning as intended by the ROD; however cleanup times may be longer than expected due to continued contamination of aquifer from soil sources of chromium and lower than expected removal rates.

Use of the infiltration gallery for flushing hexavalent chromium through vadose zone soils was discontinued due to ground water mounding issues. Other remedial methods for soil treatment should be considered.

Since implementation of the remedy, it is apparent that the ground water extraction rate is much lower than assumed in the design documents. It is suggested that the ground water model be updated and run to optimize ground water extraction rates, and that other remedies be considered that may accelerate the saturated soil and ground water remediation time frame.

No other information has come to light as part of this review that would call into question the protectiveness of this remedy.

8.0 ISSUES

This section describes issues associated with the Site identified during the First Five-Year Review:

- **Corrosion of electrical components in the well vaults**—Electrical pull boxes at the M&C facility were flooded at the time of Site inspection as a result of rainfall earlier in the week. The Site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem and prevent water migrating along the conduit and flooding the well vaults. Corroded electrical components were replaced in numerous recovery and injection well vaults in 2007, and Coyote Pump Protectors were installed on select recovery wells in order to make the wells less vulnerable to flooding.

- **Increasing trend of chromium concentrations at select recovery wells in the NCC extraction system**—The chromium concentrations in the southeastern (downgradient) portion of the NCC plume increased in August 2007 at recovery wells NRW-14, NMW-17, NRW-23, and NRW-24. Concentrations in NRW-23 and NRW-24 declined in November 2007 and March 2008.

- **Improve the capture zone evaluation for the ground water extraction system**—Evaluation of the existing ground water model revealed that the model should be replaced to better simulate transient conditions rather than steady-state conditions and to create two models by separating the M&C model from the LM and NCC model. These updated models can be utilized to propose modifications to the flow rates and more accurately predict the capture zone for the ground water recovery system.

- **The ROD did not include the use of institutional controls to protect the remedy effectiveness because the remedy was anticipated to achieve the cleanup goals throughout the aquifer**—The use of institutional controls may be necessary to alert potential property purchasers concerning the presence of ground water contamination at the Site. While the presence of operation and maintenance personnel, along with the periodic presence of remediation personnel, make it unlikely that the installation of ground water wells for drinking

or irrigation would go undetected, such institutional controls may be necessary for the long-term protection of public health.

- **During the Site inspection, several monitor wells were found to be in need of minor repairs**—The expansion plugs on some monitor wells are worn and may not provide an effective long-term seal against surface water intrusion into the monitor wells, and the well vaults on some monitor wells need new O-rings to prevent surface water intrusion into the well vaults. The well pads, skirts, and lids were generally in good condition.

- **Improve Public Outreach**—Local residents contacted during the Site interviews requested that the sampling results and the remedy progress be reported on a more frequent basis.

Table 6 provides a summary table of issues identified, and if they currently affect the remedy protectiveness.

TABLE 6
ISSUES IDENTIFIED

Issue	Affects Remedy Protectiveness	
	Current	**Future**
Corrosion of electrical components in the well vaults.	No	Yes
Increasing trend of chromium concentrations at select recovery wells in the NCC extraction system.	No	Yes
Improve the capture zone evaluation for the ground water extraction system.	No	Yes
The use of institutional controls to protect the remedy effectiveness.	No	Yes
Minor repairs to monitor wells.	No	Yes
Improve Public Outreach	No	No

9.0 RECOMMENDATIONS AND FOLLOW UP ACTIONS

To address these issues, the following recommendations and follow-up actions have been identified.

- Complete maintenance and repair work on the electrical components for the ground water extraction and injection network. The installation of Coyote Pump Protectors, drainage holes in electrical pull boxes, and replacement of corroded electrical components should be completed as planned.

- Expand the ground water monitoring network near the leading edge of the NCC chromium plume. Additional data is needed to assist in evaluating the changes in chromium concentrations

recorded in select recovery wells.

- Complete the development of a replacement ground water model to improve the capture zone evaluation for the ground water recovery system. Development of the new models is currently underway and is expected to be completed in time for the 2008 Annual Operation and Maintenance Report.

- Identify available institutional controls to protect the remedy effectiveness and prevent accidental exposure via private wells installed through the contaminated portion of the aquifer.

- Perform maintenance and repair work on the Site monitor wells. The locks should be replaced on all conventional monitor wells in order to prevent unauthorized access to the wells. The expansion plugs and PVC well caps should be replaced where necessary to prevent surface water infiltration into the monitor wells. The O-rings on the well vault lids should be replaced where necessary to prevent surface water infiltration into the well vaults.

- Increase the frequency of public updates concerning the sampling results and the progress of the remedy.

Table 7 summarizes the recommendations and follow up actions for the Site.

TABLE 7
RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue	Recommendations and Follow Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow Up Actions: Affects Remedy Protectiveness (Yes/No)	
					Current	Future
Corrosion of electrical components in the well vaults.	Complete maintenance and repair work on the electrical components for the ground water extraction and injection network. The installation of Coyote Pump Protectors, drainage holes in electrical pull boxes, and replacement of corroded electrical components should be completed as planned.	EPA	EPA	In progress	No	Yes
Increasing trend of chromium concentrations at select recovery wells in the NCC extraction system	Expand the ground water monitoring network near the leading edge of the NCC chromium plume. Additional data is needed to assist in evaluating the changes in chromium concentrations recorded in select recovery wells.	EPA	EPA	2010	No	Yes
Improve the capture zone evaluation for the ground water extraction system.	Complete the development of a replacement ground water model to improve the capture zone evaluation for the ground water recovery system. Development of the new models is currently underway and is expected to be completed in time for the 2008 Annual Operation and Maintenance Report.	EPA	EPA	2008 Annual O&M Report	No	Yes

TABLE 7 (CONTINUED)
RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue	Recommendations and Follow Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow Up Actions: Affects Remedy Protectiveness (Yes/No)	
					Current	Future
The use of institutional controls to protect the remedy effectiveness	Identify available institutional controls to protect the remedy effectiveness and prevent accidental exposure via private wells installed through the contaminated portion of the aquifer.	EPA	EPA	2010	No	Yes
Minor repairs to monitor wells	Perform maintenance and repair work on the Site monitor wells. The locks should be replaced on all conventional monitor wells in order to prevent unauthorized access to the wells. The expansion plugs and PVC well caps should be replaced where necessary to prevent surface water infiltration into the monitor wells. The O-rings on the well vault lids should be replaced where necessary to prevent surface water infiltration into the well vaults.	EPA	EPA	2009	No	Yes
Improve Public Outreach	Increase the frequency of public updates concerning the sampling results and the progress of the remedy.	EPA	EPA	Ongoing	No	No

Notes:

EPA U.S. Environmental Protection Agency
NCC National Chromium Corporation

10.0 PROTECTIVENESS STATEMENT

The remedy implemented at the Sprague Road Ground Water Plume Superfund Site currently protects human health and the environment. The ground water extraction system has been constructed in accordance with the requirements of the ROD, and extraction, treatment and monitoring of the ground water is being conducted as required. Long-term protectiveness of the remedy will be verified by continued monitoring of the ground water recovery and treatment system; sampling and analysis of the ground water; and, by implementing the necessary actions to address the issues discussed in this Five-Year Review Report. The remedy is expected to be fully protective when the ground water performance goals are achieved through continued operation of the ground water extraction and treatment system.

11.0 NEXT REVIEW

The next five-year review for the Site is required by September 2013, five years from the date of this review.

Attachment 1

Figure 1: Well Location Map
Figure 2: Potentiometric Surface Map (March 2008)
Figure 3: Chromium Concentrations Map (March 2008)

HILLMONT ROAD

83RD STREET

81ST STREET

NOLAN STREET

AIRWAY DRIVE

AVENUE

MACHINE AND CASTING

LEIGH METAL

GAS PIPES

TREATMENT BUILDING

SPRAGUE ROAD

MARY FRANCIS AVENUE

BEESON AVENUE

OREGON STREET

STEVEN ROAD

NATIONAL CHROMIUM

STONER

ALICE

AIRWAY ACRES

ODESSA INDUSTRIAL PARK

GREENFIELD ACRES

LEGEND

- EXTRACTION WELL LOCATION
- INJECTION WELL LOCATION
- MONITOR WELL LOCATION

0 100 200

SCALE IN FEET

SPRAGUE ROAD SUPERFUND SITE
ODESSA, TEXAS

FIGURE 1
WELL LOCATION MAP

PREPARED FOR: EPA

BY: EA ENGINEERING, SCIENCE, AND TECHNOLOGY

P:\Federal\EPA\Vac A\0007-Sprague Rd\0400\Sprague\Rd_Fig2_extW Contours October2006 5th.dwg 04/23/2007 thoma TX

DRAWING NAME: F:\Federal\Non Dod\EPA\projects\1434207\figures\March 2008 figures\FIG2 eaGW Contours March 2008 5ft.dwg
DATE:04/02/2008 TIME:17:09 DRAWN BY: jmikkleson

160 80 0 160 320
GRAPHIC SCALE IN FEET

LEGEND

- EXTRACTION WELL LOCATION
- INJECTION WELL LOCATION
- MONITOR WELL LOCATION

NOTE:
1. WATER LEVEL MEASUREMENTS COLLECTED 9-13 MARCH 2008.

SPRAGUE ROAD
ODESSA, TEXAS

FIGURE 2
POTENTIOMETRIC SURFACE MAP
MARCH 2008

PREPARED FOR: EPA

BY: EA ENGINEERING, SCIENCE, AND TECHNOLOGY

N

160 80 0 160 320

Feet

LEGEND

- MONITOR WELL LOCATION
- >100 µg/L
- >500 µg/L
- >1,000 µg/L

NOTE:

1. GROUND WATER SAMPLES COLLECTED 9-12 MARCH 2008.
2. CONCENTRATIONS IN MICROGRAMS PER LITER

SPRAGUE ROAD SUPERFUND SITE
ODESSA, TEXAS

FIGURE 3
CHROMIUM CONCENTRATIONS MAP
MARCH 2008

PREPARED FOR: EPA

BY: EA ENGINEERING, SCIENCE, AND TECHNOLOGY

Attachment 2

Documents Reviewed

DOCUMENTS REVIEWED

Daniel B. Stephens and Associates, Inc. (DBS&A). 2008. Letter Correspondence between Doug Reaber, DBS&A, and Stan Wallace, EA Engineering, Science, and Technology, Inc. (EA), Regarding Evaluation of the Ground Water Model for the Sprague Road Superfund Site. June 11.

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EA. 2007d. "Quarterly Ground Water Monitoring Report, May 2007, Sprague Road Ground Water Plume Superfund Site." July.

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Attachment 3

Site Inspection Checklist

FIVE-YEAR REVIEW SITE VISIT CHECKLIST

I. SITE INFORMATION

Site Name: Sprague Road Ground Water Plume	**Date of Inspection:** 14 May 2008
Location and Region: Ector County, Texas	**EPA ID:** TX0001407444
Agency, office, or company leading the five-year review: EPA Region 6	**Weather/temperature:** Sunny, windy /80°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other (Monitored natural attenuation)

Attachments: ☒ Inspection team roster attached ☒ Site map attached (Figure 2 in Attachment 1)

II. INTERVIEWS (Check all that apply)

O&M Site Manager Keith Westberry (Name) Program Manager, Etech Environmental and Safety Solutions, Inc. (Title)

Interviewed: ☒ by mail ☐ at office ☐ by phone Phone no. (469) 371-0990

Problems, suggestions: ☒ Report attached (Attachment 5)

2. O&M Staff Curtis Shupp (Name) Technician, Etech Environmental and Safety Solutions, Inc. (Title)

Interviewed: ☐ by mail ☐ at office ☐ by phone Phone no. (432) 638-7155

Problems, suggestions: ☐ Report attached

Mr. Shupp was an inspection team member on 14 May 2008.

3. Local regulatory authorities and response agencies (i.e.; State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Texas Commission on Environmental Quality

(Interview form was sent to the TCEQ, but no response was received.)

Contact Subhash Pal (Name) (Title)

Interviewed: ☒ by mail ☐ at office ☐ by phone Phone no.

Problems, suggestions: ☐ Report attached

4. Other interviews (optional): ☒ Reports attached

Interview forms were delivered to two adjacent residents by mail. Interview forms were hand delivered to one resident and one business owner during the site inspection. One homeowner, located south of the NCC facility, and one business owner, located adjacent to the M&C facility, returned the interview form.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M manual (O&M Work Plan)	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

2. Site-Specific Health and Safety Plan ☒ Readily available ☒ Up to date ☐ N/A

☒ Contingency plan/emergency response plan ☒ Readily available ☒ Up to date ☐ N/A

Remarks: _____

3. O&M and OSHA Training Records ☒ Readily available ☒ Up to date ☐ N/A

Remarks: OSHA training records are kept at the E-tech office.

4. Permits and Service Agreements

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. Gas Generation Records ☐ Readily available ☐ Up to date ☒ N/A

6. Settlement Monument Records ☐ Readily available ☐ Up to date ☒ N/A

7. Groundwater Monitoring Records ☒ Readily available ☒ Up to date ☐ N/A

8. Leachate Extraction Records ☐ Readily available ☐ Up to date ☒ N/A

9. Discharge Compliance Records

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☒ Water (effluent)	☒ Readily available	☒ Up to date	☐ N/A

Remarks: Water effluent is tested daily for hexavalent chromium using the Hach® Pocket Colorimeter™ field test kit. Test results are recorded in the daily reports.

10. Daily Access/Security Logs ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Site contractors and visitors are documented in the daily reports.

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State ☐ PRP in-house

☐ Contractor for PRP ☒ Other: Contractor for EPA Region 6

2. O&M Cost Records

☐ Readily available ☒ Up to date ☐ Funding mechanism/agreement in place

☐ Original O&M cost estimate ☐ Breakdown attached

O&M costs prior to August 2006 have been archived and were not available for review.

	Date		Date	Total Cost		
From	Aug 2006	to	Dec 2006	$ 277,000	-	☐ Breakdown attached
From	Jan 2007	to	Dec 2007	$ 900,000	-	☐ Breakdown attached
From	Jan 2008	to	April 2008	$ 293,000	-	☐ Breakdown attached
From		to			-	☐ Breakdown attached
From		to			-	☐ Breakdown attached
From		to			-	☐ Breakdown attached
From		to			-	☐ Breakdown attached
From		to			-	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period

Numerous unanticipated repairs were required to flooded and corroded electrical components in 2007 and 2008 as a result of the unusually high amount of rainfall at the Site.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Gates at the LM treatment facility are locked when unattended.

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A

Remarks: Signs designating the properties as a Superfund site are posted at the LM, M&C, and NCC facilities with EPA contact information.

C. Institutional Controls

The ROD does not specify any institutional controls at the Site. During the emergency response action in 1998, EPA supplied bottled water to residents whose water wells were affected by the chromium contamination. EPA has since provided for the installation of city water supply lines to the affected residents as an alternative water supply. The industrial properties adjacent to the LM, NCC, and M&C facilities use private wells to supply water for their industrial operations only and use bottled water for drinking water.

1. Implementation and enforcement

Site conditions imply ICs not properly implemented	☐ Yes	☐ No	☒ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☐ No	☒ N/A

Type of monitoring (e.g., self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____

Name Title Phone no.

Reporting is up-to-date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☐ No	☒ N/A
Violations have been reported	☐ Yes	☐ No	☒ N/A

Other problems or suggestions: ☐ Report attached

_____

_____

2. Adequacy ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: _____

_____

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

_____

2. Land use changes onsite ☒ N/A

Remarks: _____

_____

3. Land use changes offsite ☒ N/A

Remarks: _____

_____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. Roads damaged ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks: _____

B. Other Site Conditions

Remarks: Site is maintained daily by Etech personnel. Many electrical components have been damaged as a result of excessive rainfall. Repairs are currently being completed to address the electrical issues and to help prevent future problems.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. Settlement (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent _____ Depth _____
Remarks: _____

2. Cracks ☐ Location shown on site map ☐ Cracking not evident
Lengths _____ Widths _____ Depths _____
Remarks: _____

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent _____ Depth _____
Remarks: _____

4. Holes ☐ Location shown on site map ☐ Holes not evident
Areal extent _____ Depth _____
Remarks: _____

5. Vegetative Cover ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: _____

6. Alternative Cover (armored rock, concrete, etc.) ☐ N/A
Remarks: _____

7. Bulges ☐ Location shown on site map ☐ Bulges not evident
Areal extent _____ Depth _____
Remarks: _____

8. Wet Areas/Water Damage ☐ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	☐ Areal extent _____
☐ Ponding	☐ Location shown on site map	☐ Areal extent _____
☐ Seeps	☐ Location shown on site map	☐ Areal extent _____

☐ Soft subgrade ☐ Location shown on site map ☐ Areal extent _____

Remarks: _____

9. Slope Instability ☐ Slides ☐ Location shown on site map

☐ No evidence of slope instability Areal extent _____

Remarks: _____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. Flows Bypass Bench ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

2. Bench Breached ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

3. Bench Overtopped ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, rip rap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. Settlement ☐ Location shown on site map ☐ No evidence of settlement

Areal extent _____ Depth _____

Remarks: _____

2. Material Degradation ☐ Location shown on site map ☐ No evidence of degradation

Material type _____ Areal extent _____

Remarks: _____

3. Erosion ☐ Location shown on site map ☐ No evidence of erosion

Areal extent _____ Depth _____

Remarks: _____

4. Undercutting ☐ Location shown on site map ☐ No evidence of undercutting

Areal extent _____ Depth _____

Remarks: _____

5. Obstructions Type _____

☐ No obstructions ☐ Location shown on site map

Areal extent _____ Size _____

Remarks: _____

6. Excessive Vegetative Growth Type _____

☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent _____
Remarks: _____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. Gas Vents ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks: _____

2. Gas Monitoring Probes
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks: _____

3. Monitoring Wells (within surface area of landfill)
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks: _____

4. Leachate Extraction Wells
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks: _____

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. Gas Treatment Facilities
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O&M
Remarks: _____

2. Gas Collection Wells, Manifolds, and Piping ☐ Good condition ☐ Needs O&M
Remarks: _____

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs O&M ☐ N/A
Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A
Remarks: _____

2. Outlet Rock Inspected ☐ Functioning ☐ N/A
Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. Siltation Areal extent _____ Size _____
☐ N/A ☐ Siltation not evident
Remarks: _____

2. Erosion Areal extent _____ Depth _____
☐ N/A ☐ Erosion not evident
Remarks: _____

3. Outlet Works ☐ Functioning ☐ N/A
Remarks: _____

4. Dam ☐ Functioning ☐ N/A
Remarks: _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. Deformations ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement _____
Rotational displacement _____
Remarks: _____

2. Degradation ☐ Location shown on site map ☐ Degradation not evident
Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. Siltation ☐ Location shown on site map ☐ Siltation not evident
Areal extent _____ Depth _____
Remarks: _____

2. Vegetative Growth ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent _____ Type _____
Remarks: _____

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent _____ Depth _____
Remarks: _____

4. Discharge Structure ☐ Functioning ☐ N/A
Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. Settlement ☐ Location shown on site map ☐ Settlement not evident
Areal extent _____ Depth _____
Remarks: _____

2. Performance Monitoring Type of monitoring _____
☐ Performance not monitored Frequency _____ ☐ Evidence of breaching
Head differential _____
Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. Pumps, Wellhead Plumbing, and Electrical
☐ Good condition ☒ All required wells located ☒ Needs O&M ☐ N/A
Remarks: Electrical pull boxes and well vaults accumulate rain water, resulting in damage to electrical components. Repair contractors were onsite to drill holes in electrical boxes to allow the rain water to drain. Etech personnel are installing Coyote pump protectors on selected recovery wells in order to reduce the downtime due to flooded well vaults.

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances
☒ Good condition ☐ Needs O&M
Remarks: _____

3. Spare Parts and Equipment
☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: _____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical
☐ Good condition ☐ Needs O&M
Remarks: _____

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances
☐ Good condition ☐ Needs O&M
Remarks: _____

3. Spare Parts and Equipment
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. Treatment Train (Check components that apply)
☒ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon absorbers
☒ Filters Bag filters remove solids >10 microns in size
☐ Additive (e.g., chelation agent, flocculent) _____
☒ Others Ion exchange system
☒ Good condition ☐ Needs O&M
☒ Sampling ports properly marked and functional
☒ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually 100 million gallons (average)
☐ Quantity of surface water treated annually _____
Remarks: _____

2. Electrical Enclosures and Panels (Properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs O&M
Remarks: _____

3. Tanks, Vaults, Storage Vessels
☐ N/A ☐ Good condition ☒ Proper secondary containment ☒ Needs O&M
Remarks: Tank T-1A was leaking at the time of inspection, but was repaired on 29 May 2008.

4. Discharge Structure and Appurtenances
☐ N/A ☐ Good condition ☒ Needs O&M
Remarks: Several injection wells have corroded electrical components that need to be replaced. Repairs were in progress at the time of this report.

5. Treatment Building(s)
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☒ Chemicals and equipment properly stored
Remarks: Roof leaks at the LM facility have been repaired and gutters have been cleared.

6. Monitoring Wells (Pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☐ Good condition
☒ All required wells located ☒ Needs O&M ☐ N/A
Remarks: Electrical components have been corroded to due to excessive rainfall. Coyote pump protectors will be installed on selected recovery wells; corroded solenoid valves are being replaced in injection wells. Well caps on selected monitor wells need to be replaced including monitor wells M-2 and MMW-10 at M&C.

D. Monitored Natural Attenuation ☐ Applicable ☒ N/A

1. Monitoring Wells (Natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled (quarterly) ☐ Good condition
☐ All required wells located ☐ Needs O&M ☐ N/A
Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site that are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedial objectives were to (1) prevent exposure to contaminated ground water, above acceptable risk levels, (2) prevent or minimize further migration of the ground water contaminant plume, (3) prevent or minimize further migration of contaminants from source materials to ground water, and (4) return ground waters to their expected beneficial uses wherever practicable. The selected remedy included the following elements: a ground water extraction and treatment system, a treated ground water re-infiltration system, an infiltration gallery for flushing hexavalent chromium through vadose zone soils, and a long term ground water monitoring program. Currently, the ground water extraction, treatment and reinjection systems are operating as intended by the decision documents, as is the long term monitoring program. The use of the infiltration gallery was discontinued due to ground water mounding issues. The cleanup goals have not yet been achieved. However, the chromium concentrations in the LM, M&C, and NCC plumes have decreased since system startup.

B. Adequacy of O&M

Tank T-1A was observed to be leaking contaminated ground water at the time of the site inspection. The leaking water is contained within secondary containment, but the presence of water in the building is a potential slip hazard. The leaking tank was repaired on 29 May 2008.

Two of the electrical pull boxes at the M&C facility were flooded at the time of site inspection as a result of rainfall earlier in the week. The site inspection team observed contractors drilling drainage holes in the electrical pull boxes in order to alleviate the problem. Drilling was completed on 19 May 2008. Flooding of electrical components in electrical pull boxes have been a persistent problem at the Site, particularly in 2007, when the Site received 33.5 inches of rainfall.

During June 2008, the O &M contractor will be installing Coyote pump protectors in selected recovery wells, leaving the recovery well electrical components less vulnerable to flooding.

C. Early Indicators of Potential Remedy Failure

Although chromium concentrations are generally declining, the August 2007 concentrations in the southeast (downgradient) portion of the NCC plume appear to show an increasing trend. This increase may be due to flushing of chromium from the vadose zone into the saturated soil and should be investigated.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy

Ground water recovery rates are much lower than initially planned (from an estimated 511 gallons per minute (gpm) in the Final Design Report to an actual average recovery rate of 144 gpm. The lower recovery rate will significantly increase remediation timeframe over initial estimates. Using an updated ground water model, it may be feasible to increase total flow rates, or to optimize contaminant extraction. Ground water monitoring could be optimized using the revised ground water model and/or optimization software to reduce costs associated with sampling.

Attachment 4

Site Inspection Photographs

Photograph No. 1 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of leaking Tank T-1A inside the LM treatment facility.
Date: 14 May 2008

Photograph No. 2 Site: Sprague Road Ground Water Plume Superfund Site
Description: Additional view of leaking Tank T-1A.
Date: 14 May 2008

Photograph No. 3 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of contractor drilling drainage holes in flooded electrical pull boxes at the M&C facility.
Date: 14 May 2008

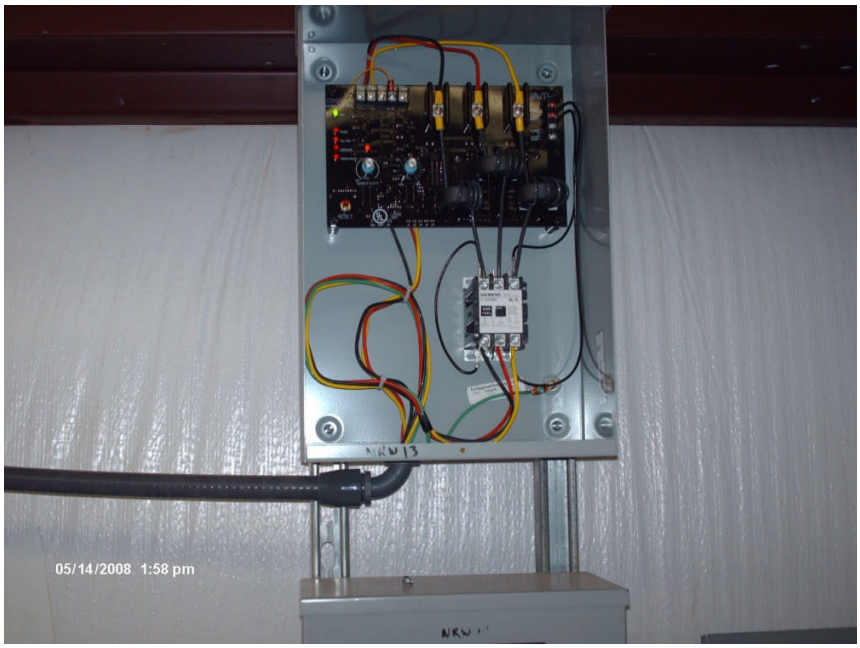
Photograph No. 4 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of flooded electrical pull box at the M&C facility.
Date: 14 May 2008

Photograph No. 5 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of wiring in extraction well MRW-2.
Date: 14 May 2008

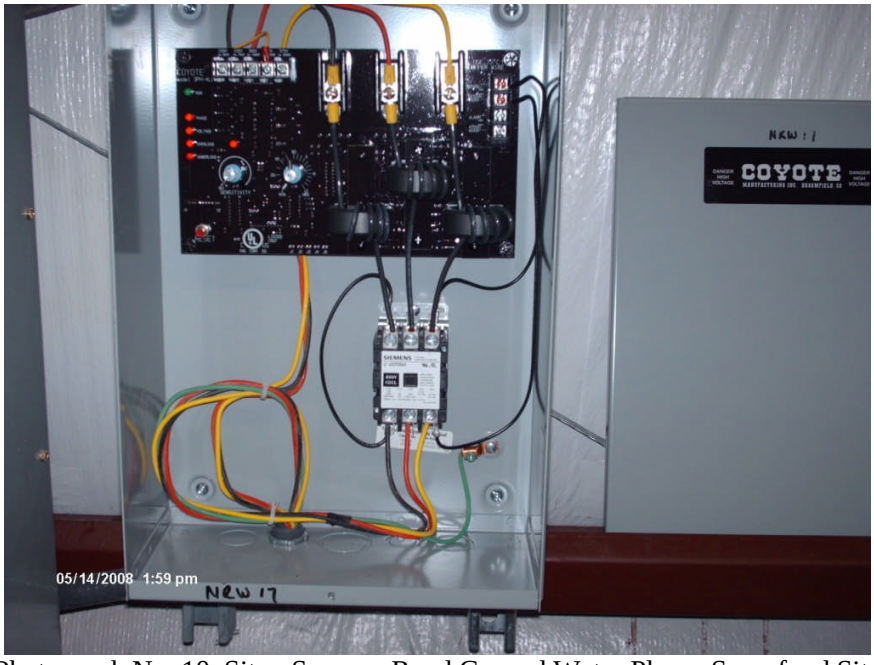
Photograph No. 6 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of flooded well vault in extraction well MRW-1.
Date: 14 May 2008

Photograph No. 7 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of wiring in extraction well NRW-17. The Coyote controller eliminates the need for relays in the vaults.
Date: 14 May 2008

Photograph No. 8 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of wiring in extraction well NRW-13. The Coyote controller eliminates the need for relays in the vaults.
Date: 14 May 2008



Photograph No. 9 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of Coyote control box for NRW-13 inside the NCC control building.
Date: 14 May 2008



Photograph No. 10 Site: Sprague Road Ground Water Plume Superfund Site
Description: View of Coyote control box for NRW-17 inside the NCC control building.
Date: 14 May 2008

Attachment 5

Interview Records

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Sprague Road Ground Water Plume Superfund Site	**EPA ID No.:** TX0001407444	
Location: Ector County, Texas	**Date:** June 5, 2008	
Contact Made By:		
Name: Vincent Malott	**Title:** Task Order Monitor	**Organization:** U.S. EPA
Telephone No.: (214) 665-8313 **E-Mail:** malott.vincent@epa.gov	**Street Address:** 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Kim Wallace-Wymore	**Title:** Project Manager	**Organization:** EA
Telephone No.: (972) 315-3922 **E-Mail:** kwymore@eaest.com	**Street Address:** 405 S. Highway 121, Building C, Suite 100 **City, State, Zip:** Lewisville, Texas 75067	
Individual Contacted:		
Name: Keith Westberry	**Title:** Project Manager	**Organization:** Etech Environmental & Safety Solutions, Inc.
Telephone No.: (903) 881-8390 **E-Mail Address:** keith@etechenv.com	**Street Address:** 12800 W. Hwy 80 East **City, State, Zip:** Midland, Texas 79765	

Survey Questions

The purpose of the Five-Year Review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environment continue to be protected by the remedial actions that have been performed at the site. This interview is being conducted as a part of the first Five-Year Review for the Sprague Road Ground Water Plume Superfund Site. The period covered by this Five-Year Review is from September 2003 to the current completion of this review. Should you choose to respond, please return your interview form to Kim Wallace-Wymore at EA Engineering via e-mail or postal service by 10 June 2008.

1. What is your overall impression of the work conducted at the site since initiation of the Remedial Action in 2003?

Response: I think the site has recently, last two years, received a great amount of rainfall. Considering that the system was designed for an average annual rainfall of 9 inches, the system has done pretty well. The system components have been stressed with wet conditions in the pull boxes that have contributed to a lot of degradation of the system components recently. Electrical repairs have been performed on several occasions over this time period to improve system performance. In addition, we are on a more frequent basis pumping out the pull boxes, which should result in longer runtime between repairs. The installation of the Coyote Controllers in the recovery wells has also proven to be a good idea and should dramatically effect overall operation and runtime hours of the recovery system. With less components in the vaults, there is less chance for degradation and repairs.

Overall, since O&M started, there has been a steady effort to improve the functionality and efficiency of the system. Within the last 2 years, these efforts have visibly increased. Continued and sustained efforts with these objectives as part of the focus should ultimately result in reaching the goals of USEPA for this site in a timely manner.

2. From your perspective, what effect has the Remedial Action at the site had on the surrounding community?

Response: The community really has had very little comment to us on this topic. We still get complaints from what seems like the same people. Complaints have been quickly and adequately responded to by EPA and site contractors since they have started to occur. I would say that over time the complaints have tended to lessen as the community has gotten more and more comfortable with the system and O&M personnel working near them. As for the effect of the RA on the site, the influent chromium concentrations have continued to drop. Although not a lot of data has been shared on the overall affect of contaminant reduction in the last couple of years throughout the plume area. Its hard to say but it seems to be reducing contaminants. It's possible the lack of community interaction is due to the consistent presence of personnel and the continued operation of the system.

3. Are you aware of any ongoing community health concerns regarding the site or its operation and maintenance?

Response:
I am not aware of any.

4. Do you have any other concerns, comments, or issues that you would like to mention at this time pertaining to the Remedial Action activities at the site?

Response: I believe that EA is doing a great job of trying to reduce costs and improve the function of the system their responsiveness to things that have come up has been great.

5. Are you aware of any events, incidents, or activities at the site, such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

Response: Three Issues:
1) About a year ago out on Sprague Road an automobile accident involving occurred where and the outer fence was temporarily damaged.
2) Recently in wet conditions we have had some damage to well vaults caused by some of the local community driving their vehicles in the ditches where these vaults are located, primarily in the area of NCC.
3) We are constantly enduring power outages and surges as the local electricity supplier is not very reliable.

6. Do you feel well-informed about the site's activities and progress?

Response:
Yes – I hear daily from my site Technician. We don't hear a lot about the sampling results and information about the overall effect on reducing contamination.

7. Do you have any other comments, suggestions, or recommendations regarding the site?

Response: Not at this time. All of our recommendations have been quickly reviewed and evaluated by the EA staff. They are very good at listening to recommendations and responding to them very quickly and effectively.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY

Site Name: Sprague Road Ground Water Plume Superfund Site	**EPA ID No.:** TX0001407444
Location: Ector County, Texas	**Date:** 5-15-08

Contact Made By:

Name: Vincent Malott	**Title:** Task Order Monitor	**Organization:** U.S. EPA
Telephone No.: (214) 665-8313 **E-Mail:** malott.vincent@epa.gov	**Street Address:** 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Kim Wallace-Wymore	**Title:** Project Manager	**Organization:** EA
Telephone No.: (972) 315-3922 **E-Mail:** kwymore@eaest.com	**Street Address:** 405 S. Highway 121, Building C, Suite 100 **City, State, Zip:** Lewisville, Texas 75067	

Individual Contacted:

Name: Danny Barlow	**Title:** Pres	**Organization:** Fabco Ind Inc
Telephone No.: **E-Mail Address:** 432-367-4488	**Street Address:** **City, State, Zip:** Box 1551 Odessa Tx 79761	

Survey Questions

The purpose of the Five-Year Review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environment continue to be protected by the remedial actions that have been performed at the site. This interview is being conducted as a part of the first Five-Year Review for the Sprague Road Ground Water Plume Superfund Site. The period covered by this Five-Year Review is from September 2003 to the current completion of this review. Should you choose to respond, please return your interview form to Kim Wallace-Wymore at EA Engineering via e-mail or postal service by 10 June 2008.

1. What is your overall impression of the work conducted at the site since initiation of the Remedial Action in 2003?

Response: Very Good

2. From your perspective, what effect has the Remedial Action at the site had on the surrounding community?

Response: Once All Eqpt + hoses were in place Things at Site are Neat + orderly

3. Are you aware of any ongoing community health concerns regarding the site or its operation and maintenance?

Response: NO

4. Do you have any other concerns, comments, or issues that you would like to mention at this time pertaining to the Remedial Action activities at the site?

Response: None

5. Are you aware of any events, incidents, or activities at the site, such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

Response: None I AM AWARE OF.

6. Do you feel well-informed about the site's activities and progress?

Response: Yes IF I had questions, I was always able to contact Mr Malott or local Person for Answers

7. Do you have any other comments, suggestions, or recommendations regarding the site?

Response: None at this time. I am interested in buying this property if I can get local Taxing entity's to Sell property

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Sprague Road Ground Water Plume Superfund Site	**EPA ID No.:** TX0001407444	
Location: Ector County, Texas	**Date:** May 31, 2008	
Contact Made By:		
Name: Vincent Malott	**Title:** Task Order Monitor	**Organization:** U.S. EPA
Telephone No.: (214) 665-8313 **E-Mail:** malott.vincent@epa.gov	**Street Address:** 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Kim Wallace-Wymore	**Title:** Project Manager	**Organization:** EA
Telephone No.: (972) 315-3922 **E-Mail:** kwymore@eaest.com	**Street Address:** 405 S. Highway 121, Building C, Suite 100 **City, State, Zip:** Lewisville, Texas 75067	
Individual Contacted:		
Name: Larry Martin	**Title:**	**Organization:**
Telephone No.: 432-366-3833 **E-Mail Address:** VVM@Rwhell.net	**Street Address:** 2627 Steven Road **City, State, Zip:** Odessa TX 79764	

Survey Questions

The purpose of the Five-Year Review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environment continue to be protected by the remedial actions that have been performed at the site. This interview is being conducted as a part of the first Five-Year Review for the Sprague Road Ground Water Plume Superfund Site. The period covered by this Five-Year Review is from September 2003 to the current completion of this review. Should you choose to respond, please return your interview form to Kim Wallace-Wymore at EA Engineering via e-mail or postal service by 10 June 2008.

1. What is your overall impression of the work conducted at the site since initiation of the Remedial Action in 2003?

Response: See attached response

2. From your perspective, what effect has the Remedial Action at the site had on the surrounding community?

Response: See attached response

3. Are you aware of any ongoing community health concerns regarding the site or its operation and maintenance?

Response: See attached response

4. Do you have any other concerns, comments, or issues that you would like to mention at this time pertaining to the Remedial Action activities at the site?

Response: See attached response

5. Are you aware of any events, incidents, or activities at the site, such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

Response: See attached response

6. Do you feel well-informed about the site's activities and progress?

Response: See attached response

7. Do you have any other comments, suggestions, or recommendations regarding the site?

Response: See attached respons

SURVEY QUESTIONS: Submitted by: Virgie V. Martin

1. Overall impression is poor.

2. Remedial Action is invasive and has a sustaining negative effect on the surrounding community. Construction of the remedial equipment was not full disclosed and will have a permanent effect on our property.

3. No. EPA has never inquired about our health. Information regarding ongoing health concerns or studies has never been sent to us. I am a breast cancer patient and my husband died with Lymphoma. I am very interested in any health report.

4. EPA action at this site has not been forthcoming with the residents. EPA broke their contract with us regarding the reseeding and cleanup of our land. It was never reseeded and the contractors pushed up large mounds of dirt and left piles of brush and dirt on the locations. My husband worked for months to level, clean and reseed most of the surface damage. When we inquired about the cleanup and reseeding process, Vince Mallott instructed us to send him the costs we incurred. The original contract would expire soon and he would invoice the current contractor for the cleanup project cost. Invoices and labor costs were sent to Mr. Mallott but they were never honored. When he was questioned about payment of the cleanup at a later date, he said it was outside of his current job scope and the request for reimbursement would have to be resubmitted to the legal department or they could possibly reciprocate with work in like kind. I have not talked to Mr. Mallott since that time.

Water sample results have been received only once each year. All water sample results should be sent to the effected residents.

Trash is thrown out by contractors.

5. In 2007, we had above normal rainfall and monitoring boxes were filled with rain water. Even though my husband instructed tanker truck drivers how to get to the boxes without doing additional surface damage they chose to drive wherever they pleased. Only one contractor has called in advance to inform me that they would be in the area to check the system or take water samples.

This site has continuous trespassing because the fence has not been closed. We have kept our commitment to EPA for ingress and egress. Privacy of our property must be monitored by the residents in this area.

6. No.

7. Yes. EPA investigated this site during the 1980's. EPA continued to allow the chromium business to contaminate the ground water table that furnished this entire community with potable water. Remedial actions did not begin until 2003. Why does EPA procrastinate about the enforcement of their laws?

The chromium business owners who contaminated this community, and continue to do so, are now attempting to sell their property and building. I am inquiring if the EPA code allows this company to keep any monies received from a sale of their property and building? This building and property was occupied by a junk car dealer for several years and possibly received lease or rent monies during that time. If so, what codes allows them to receive this money and why are they not required to refund money to the superfund cost? If the chromium business owners are allowed to keep any monies received from income or property sale, I am requesting information or contact names and numbers to officially protest such action.

The Larry Martin Family has been very cooperative with the EPA remediation process as the records will show. We feel as if the guilty party who created this entire situation is receiving preferential treatment if they are allowed to keep any funds received from rent/lease or sale of the chromium property that continues to contaminate our community water source.

I recommend that potable water supplies be made available at sites such as this as soon as possible and that sanctions for your codes/laws be enforced on the contaminating company.

Attachment 6

Legal Descriptions of Site Properties

2253

593

Prepared by the State Bar of Texas for use by lawyers only.
Revised 10-85.

89-27,298

WARRANTY DEED WITH VENDOR'S LIEN

8167

Date: June 15, 1989

Grantor: **JOHN R. LEIGH and wife, DOROTHY J. LEIGH**

Grantor's Mailing Address (including county): Rt. 2, Box 1698, Odessa, Texas 79764

Grantee: **LEIGH METAL COATING & MACHINING, INC., a Texas Corporation**

Grantee's Mailing Address (including county):
P.O. Box 69709
Odessa, Texas 79769
Ector County

Consideration: For the sum of $10.00 and other valuable consideration and a note of even date that is in the principal amount of $270,000.00 and is executed by Grantee, payable to the order of Grantor. It is secured by a vendor's lien retained in this deed and by a deed of trust of even date from Grantee to **JAY DURELL**, Trustee.

Property (including any improvements):

Being the West 100' of Lot 2, Block 3, AIRWAY ACRES, a subdivision of Ector County, Texas, according to the map or plat thereof of record in Volume 3, Page 91, PRECT.

Reservations from and Exceptions to Conveyance and Warranty:

1. Any prior mineral reservations of record;
2. Present restrictions, if any, existing against said property;
3. Existing Building and Zoning Ordinances, if any;
4. Easements and Leases that appear of record and any easements visible upon inspection of property; and
5. Ad Valorem property taxes not yet due and payable.

Grantor, for the consideration and subject to the reservations from and exceptions to conveyance and warranty, grants, sells, and conveys to Grantee the property, together with all and singular the rights and appurtenances thereto in any wise belonging, to have and hold it to Grantee, Grantee's heirs, executors, administrators, successors, or assigns forever. Grantor hereby binds Grantor and Grantor's heirs, executors, administrators, and successors to warrant and forever defend all and singular the property to Grantee and Grantee's heirs, executors, administrators, successors, and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the reservations from and exceptions to warranty.

The vendor's lien against and superior title to the property are retained until each note described is fully paid according to its terms, at which time this deed shall become absolute.

When the context requires, singular nouns and pronouns include the plural.

John R. Leigh

JOHN R. LEIGH

Dorothy J. Leigh

DOROTHY J. LEIGH

(Acknowledgment)

STATE OF TEXAS
COUNTY OF ECTOR

This instrument was acknowledged before me on the 15th day of June, 19 89 by JOHN R. LEIGH and wife, DOROTHY J. LEIGH

DAVID L. YARBROUGH
Notary Public, State of Texas
My Comm. Expires June 5, 1992

David Yarbrough

Notary Public, State of Texas
Notary's name (printed):

Notary's commission expires:

FILED FOR RECORD THE 15th DAY OF June A.D., 19 89 AT 4 O'CLOCK P. M.

DULY RECORDED THE 16th DAY OF June A.D., 19 89 AT 10 O'CLOCK A. M.

INSTRUMENT NO: 8167
RETURN TO:

Lawyers Title Agency
Will Call For

BARBARA BEDFORD, COUNTY CLERK
ECTOR COUNTY, TEXAS

BY Angela Dickerson DEPUTY

2253

89-27,298

591

WARRANTY DEED WITH VENDOR'S LIEN

8166

Date: June 15, 1989

Grantor: **JOHN R. LEIGH a/k/a JOHN LEIGH and wife, DOROTHY J. LEIGH**

Grantor's Mailing Address (including county): Rt. 2, Box 1698, Odessa, Texas 79764

Grantee: **LEIGH METAL COATING & MACHINING, INC., a Texas Corporation**

Grantee's Mailing Address (including county):

P.O. Box 69709
Odessa, Texas 79769
Ector County

Consideration: For the sum of $10.00 and other valuable consideration and a note of even date that is in the principal amount of $270,000.00 and is executed by Grantee, payable to the order of Grantor. It is secured by a vendor's lien retained in this deed and by a deed of trust of even date from Grantee to **JAY DURELL**, Trustee.

Property (including any improvements):

The surface only of a 1.43 acre parcel of land out of Lot 1, Block 3, AIRWAY ACRES, a subdivision in Sections 40 and 41, Block 42, T-1-S, T&P RR. Co. Survey, Ector County, Texas, said parcel being more particularly described as follows:

Beginning at the Northeast corner of said Lot 1, Block 3, AIRWAY ACRES. Thence S. 14° 32' E. 300 feet to a point; Thence S. 75° 32' W. 205.44 feet to a point; Thence N. 15° 07' W. 300 feet to a point; Thence N. 75° 32' E. 208.59 feet to the point of beginning.

Reservations from and Exceptions to Conveyance and Warranty:

1. Any prior mineral reservations of record;
2. Present restrictions, if any, existing against said property;
3. Existing Building and Zoning Ordinances, if any;
4. Easements and Leases that appear of record and any easements visible upon inspection of property; and
5. Ad Valorem property taxes not yet due and payable.

Grantor, for the consideration and subject to the reservations from and exceptions to conveyance and warranty, grants, sells, and conveys to Grantee the property, together with all and singular the rights and appurtenances thereto in any wise belonging, to have and hold it to Grantee, Grantee's heirs, executors, administrators, successors, or assigns forever. Grantor hereby binds Grantor and Grantor's heirs, executors, administrators, and successors to warrant and forever defend all and singular the property to Grantee and Grantee's heirs, executors, administrators, successors, and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the reservations from and exceptions to warranty.

The vendor's lien against and superior title to the property are retained until each note described is fully paid according to its terms, at which time this deed shall become absolute.

When the context requires, singular nouns and pronouns include the plural.

John R. Leigh

JOHN R. LEIGH a/k/a JOHN LEIGH

Dorothy J. Leigh

DOROTHY J. LEIGH

(Acknowledgment)

STATE OF TEXAS
COUNTY OF ECTOR

This instrument was acknowledged before me on the 15th day of June, 1989
by JOHN R. LEIGH a/k/a JOHN LEIGH and wife, DOROTHY J. LEIGH

DAVID L. YARBROUGH
Notary Public, State of Texas
My Comm. Expires June 5, 1992

David Yarbrough

Notary Public, State of Texas
Notary's name (printed):

Notary's commission expires:

FILED FOR RECORD THE 15th DAY OF June A.D., 1989 AT 4 O'CLOCK P. M.

DULY RECORDED THE 16th DAY OF June A.D., 1989 AT 10 O'CLOCK A. M.

INSTRUMENT NO: 8166
RETURN TO:

Lawyers Title Agency
Will Call For

BARBARA BEDFORD, COUNTY CLERK
ECTOR COUNTY, TEXAS

BY: Brenda Nickerson DEPUTY

2253
Prepared by the State Bar of Texas for use by lawyers only.
Revised 10-85.

89-27,298 595

WARRANTY DEED WITH VENDOR'S LIEN

8168

Date: June 15, 1989

Grantor: JOHN R. LEIGH and wife, DOROTHY J. LEIGH

Grantor's Mailing Address (including county): Rt. 2, Box 1698, Odessa, Texas 79764

Grantee: LEIGH METAL COATING & MACHINING, INC., a Texas Corporation

Grantee's Mailing Address (including county):
P.O. Box 69709
Odessa, Texas 79769
Ector County

Consideration: For the sum of $10.00 and other valuable consideration and a note of even date that is in the principal amount of $270,000.00 and is executed by Grantee, payable to the order of Grantor. It is secured by a vendor's lien retained in this deed and by a deed of trust of even date from Grantee to JAY DURELL, Trustee.

Property (including any improvements):

Being the East 100 feet of the West 200 feet of Lot 2, Block 3, AIRWAY ACRES, a subdivision of Ector County, Texas, according to the map of plat thereof of record in Volume 3, Page 91, PRECT.

Reservations from and Exceptions to Conveyance and Warranty:

1. Any prior mineral reservations of record;
2. Present restrictions, if any, existing against said property;
3. Existing Building and Zoning Ordinances, if any;
4. Easements and Leases that appear of record and any easements visible upon inspection of property; and
5. Ad Valorem property taxes not yet due and payable.

Grantor, for the consideration and subject to the reservations from and exceptions to conveyance and warranty, grants, sells, and conveys to Grantee the property, together with all and singular the rights and appurtenances thereto in any wise belonging, to have and hold it to Grantee, Grantee's heirs, executors, administrators, successors, or assigns forever. Grantor hereby binds Grantor and Grantor's heirs, executors, administrators, and successors to warrant and forever defend all and singular the property to Grantee and Grantee's heirs, executors, administrators, successors, and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the reservations from and exceptions to warranty.

The vendor's lien against and superior title to the property are retained until each note described is fully paid according to its terms, at which time this deed shall become absolute.

When the context requires, singular nouns and pronouns include the plural.

John R. Leigh

JOHN R. LEIGH

Dorothy J. Leigh

DOROTHY J. LEIGH

(Acknowledgment)

STATE OF TEXAS
COUNTY OF ECTOR

This instrument was acknowledged before me on the 15th day of June, 1989 by JOHN R. LEIGH and wife, DOROTHY J. LEIGH

DAVID L. YARBROUGH
Notary Public, State of Texas
My Comm. Expires June 5, 1992

David Lugo

Notary Public, State of Texas
Notary's name (printed):

Notary's commission expires:

FILED FOR RECORD THE 15th DAY OF June A.D., 1989 AT 4 O'CLOCK P. M.

DULY RECORDED THE 16th DAY OF June A.D., 1989 AT 10 O'CLOCK A. M.

INSTRUMENT NO: 8168
RETURN TO:

Lawyers Title Agency
Will Call For

BARBARA BEDFORD, COUNTY CLERK
ECTOR COUNTY, TEXAS

BY: Phyllis Anderson DEPUTY

000000-01-MRP-AM

The State of Texas

Secretary of State

18887

CERTIFICATE OF MERGER

FOR

NATIONAL CHROMIUM CORPORATION

THE UNDERSIGNED, AS SECRETARY OF STATE OF THE STATE OF TEXAS, HEREBY CERTIFIES THAT ARTICLES OF MERGER OF

M & B PROPERTIES, INC.

INTO
NATIONAL CHROMIUM CORPORATION

DULY SIGNED AND VERIFIED, HAVE BEEN RECEIVED IN THIS OFFICE AND ARE FOUND TO CONFORM TO LAW.

ACCORDINGLY THE UNDERSIGNED, AS SUCH SECRETARY OF STATE, AND BY VIRTUE OF THE AUTHORITY VESTED IN HIM BY LAW, ISSUES THIS CERTIFICATE AND ATTACHES HERETO A COPY OF THE ARTICLES.

DATED AUG. 16, 1982

David A. Dean
Secretary of State

ARTICLES OF MERGER

OF DOMESTIC CORPORATIONS

Pursuant to the provisions of Article 5.04 of the Texas Business Corporation Act, the undersigned corporations adopt the following Articles of Merger for the purpose of merging M & B PROPERTIES, INC., into NATIONAL CHROMIUM CORPORATION.

1. The following Plan of Merger was approved by the shareholders of each of the undersigned corporations in the manner prescribed by the Texas Business Corporation Act:

M & B PROPERTIES, INC., a Texas corporation, and NATIONAL CHROMIUM CORPORATION, a Texas corporation, sometimes hereinafter referred to as the "surviving corporation," agree as follows:

ARTICLE 1

PLAN OF REORGANIZATION

Plan Adopted

1.01. A plan of reorganization of M & B PROPERTIES, INC., and NATIONAL CHROMIUM CORPORATION, pursuant to the provisions of Articles 5.01 through 5.13 of the Texas Business Corporation Act and Section 368(a)(1)(A) of the Internal Revenue Code, is adopted as follows:

(1) M & B PROPERTIES, INC., shall be merged with and into NATIONAL CHROMIUM CORPORATION, to exist and be governed by the laws of the State of Texas.

(2) The name of the surviving corporation shall be: NATIONAL CHROMIUM CORPORATION.

(3) When this agreement shall become effective, the separate existence of M & B PROPERTIES, INC., shall cease and the surviving corporation shall succeed, without other transfer, to all the rights and property of M & B PROPERTIES, INC., and shall be subject to all the debts and liabilities of such corporation in the same manner as if the surviving corporation had itself incurred them. All rights of creditors and all liens upon the property of each constituent corporation shall be preserved unimpaired, limited in lien to the property affected by such liens immediately prior to the merger.

(4) The surviving corporation will carry on business with the assets of M & B PROPERTIES, INC., as well as with the assets of NATIONAL CHROMIUM CORPORATION.

(5) The shareholders of M & B PROPERTIES, INC., will surrender all of their shares in the manner hereinafter set forth.

(6) In exchange for the shares of M & B PROPERTIES, INC., surrendered by its shareholders, the surviving corporation will issue and transfer to such shareholders on the basis hereinafter set forth, shares of its common stock.

(7) The shareholders of NATIONAL CHROMIUM CORPORATION will retain their shares as shares of the surviving corporation.

ARTICLE 2

PLAN OF MERGER

2.01. The Articles of Incorporation of NATIONAL CHROMIUM CORPORATION as in effect on the effective date of Merger, shall continue in full force and effect as the Articles of Incorporation of NATIONAL CHROMIUM CORPORATION and shall not be changed or amended by the Merger.

2.02. NATIONAL CHROMIUM CORPORATION reserves the right and power, after the effective date of the Merger, to alter, amend, change or repeal any of the provisions contained in its Articles of Incorporation in the manner now or hereafter prescribed by statute, and all rights conferred on officers, directors or stockholders herein are subject to this reservation.

2.03. The Bylaws of NATIONAL CHROMIUM CORPORATION, as such Bylaws exist on the effective date of the Merger, shall remain and be the Bylaws of NATIONAL CHROMIUM CORPORATION until altered, amended or repealed, or until new Bylaws shall be adopted in accordance with the provisions thereof, the Articles of Incorporation, or in the manner permitted by the applicable provisions of law.

2.04. The Directors of NATIONAL CHROMIUM CORPORATION as of the effective date of the Merger shall continue in office until the next Annual Meeting of the Stockholders of NATIONAL

CHROMIUM CORPORATION. The number of Directors of NATIONAL CHROMIUM CORPORATION shall continue to be five and shall be the following persons: William R. Masterson, William H. Masterson, Norvell Harris, Delbert Leewayne Holloman and Larry Christensen.

The following officers of NATIONAL CHROMIUM CORPORATION immediately prior to the effective date of the Merger shall continue in office after the effective date of the Merger and until the next Annual Meeting of the Board of Directors of NATIONAL CHROMIUM CORPORATION:

Chairman of the Board	William H. Masterson
Chief Executive Officer	William H. Masterson
President	William R. Masterson
Executive Vice-President	Delbert Leewayne Holloman
Secretary/Treasurer	Bernice Page

2.05. Each share of issued and outstanding Common Stock ($1.00 par value) of M & B PROPERTIES, INC., shall be converted into one share of Common Stock ($1.00 par value) of NATIONAL CHROMIUM CORPORATION. Upon the surrender of certificates representing shares of M & B PROPERTIES, INC., stock by holders thereof, certificates for an equal number of NATIONAL CHROMIUM CORPORATION stock shall be issued in exchange by NATIONAL CHROMIUM CORPORATION. Shares of NATIONAL CHROMIUM CORPORATION Common Stock ($1.00 par value) outstanding at the date of this Merger shall not be converted or exchanged but shall remain outstanding as shares of Common Stock ($1.00 par value) of the surviving corporation.

2.06. The effective date of the Merger shall be the date when these Articles and the Plan of Merger are accepted for record by the Secretary of State of Texas.

2. As to each of the undersigned corporations, the number of shares outstanding and the designation and number of outstanding shares of each class entitled to vote as a class on such Plan, are as follows:

Name of Corporation	Number of Shares Outstanding	Entitled to Vote as a Class Designation of Class	Number of Shares
M & B Properties, Inc.	1200	None	None
National Chromium Corporation	6000	None	None

Name of Corporation	Total Voted For	Total Voted Against	Number of Shares Entitled to Vote as a Class	Voted For	Voted Against
M & B Properties, Inc.	1200	-0-	None	None	None
National Chromium Corporation	6000	-0-	None	None	None

DATED: August 12, 1982.

M & B PROPERTIES, INC.

By: Wm. R. Masterson
Secretary

By: H. H. Hardeman
President

NATIONAL CHROMIUM CORPORATION

By: William R. Masterson
President

By: L. Page
Secretary

STATE OF TEXAS

COUNTY OF ECTOR

The undersigned notary public does hereby certify that on this 12th day of August, 1982, personally appeared before me Henry F. Baldwin who, being by me first duly sworn, declared that he is the President of M & B PROPERTIES, INC., that he signed the foregoing document as President of the corporation, and that the statements therein contained are true.

MY COMMISSION EXPIRES
1-4-86
DEANNA ELLIS

Deanna Ellis
Notary Public in and for
Ector County, Texas

STATE OF TEXAS

COUNTY OF ECTOR

The undersigned notary public does hereby certify that on this 12th day of August, 1982, personally appeared before me William R. Masterson who, being by me first duly sworn, declared that he is the President of NATIONAL CHROMIUM CORPORATION, that he signed the foregoing document as President of the corporation, and that the statements therein contained are true.

MY COMMISSION EXPIRES
1-4-86
DEANNA ELLIS

Deanna Ellis
Notary Public in and for
Ector County, Texas

FILED FOR RECORD THE 14 DAY OF Oct. A.D., 1982 AT 4 O'CLOCK P M.

DULY RECORDED THE 15 DAY OF Oct. A.D., 1982 AT 11 O'CLOCK A M.

INSTRUMENT NO: 18887

RETURN TO: Hollmann & Lyon
1205 W. University
Odessa, Texas

LUCILLE WOLZ, COUNTY CLERK
ECTOR COUNTY, TEXAS
BY Hilda Munoz DEPUTY

WARRANTY DEED
(General)

THE STATE OF TEXAS {
{ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF ECTOR {

That I, DON LINDLEY, of the County of Harris, State of Texas for and in consideration of the sum of TEN AND NO/100 ($10.00) DOLLARS and other good and valuable consideration to the undersigned paid by the grantee herein named, the receipt of which is hereby acknowledged, have GRANTED, SOLD AND CONVEYED, and by these presents do GRANT, SELL AND CONVEY unto JERRY BARNES, 1709 Avenue F, Del Rio, Texas 78840, of the County of Val Verde and State of Texas, all of the following described real property in Ector County, Texas, to-wit:

Being the North 100 feet (N/100') of lot 2, Block 44, AIRWAY ACRES, THIRD FILING, a Subdivision of Ector County, Texas, according to the map or plat thereof of record in Volume 4, Page 21, Plat Records, Ector County, Texas; SAVE AND EXCEPT all oil, gas, and other minerals in, on, and under said land.

TO HAVE AND TO HOLD the above described premises, together with all and singular the rights and appurtenances thereto in anywise belonging, unto the said grantee, his, heirs and assigns forever; and do hereby bind my heirs, executors and administrators to WARRANT AND FOREVER DEFEND all and singular the said premises unto the said grantee, his heirs and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof.

EXECUTED this 12 day of January A.D. 1990.

Don Lindley
DON LINDLEY

THE STATE OF TEXAS {
{
COUNTY OF Harris {

Before me, the undersigned authority, on this day personally appeared DON LINDLEY, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office on this the 12 day of January, A.D. 1990.

Geneva Smith
NOTARY PUBLIC IN AND FOR THE STATE OF TEXAS
MY COMMISSION EXPIRES: 8/17/93

FILED FOR RECORD THE 25th DAY OF January A.D., 1990 AT 3 O'CLOCK P. M.

DULY RECORDED THE 26th DAY OF January A.D., 1990 AT 10 O'CLOCK A.M.

INSTRUMENT NO: 1258
RETURN TO:
John SMITH , Atty,
323 North Grant
Odessa, Texas 79761

BARBARA BEDFORD, COUNTY CLERK
ECTOR COUNTY, TEXAS
BY: Brenda Moore
DEPUTY