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# EPA Superfund
# Record of Decision:

## Marzone Inc/Chevron Chemical Co. Site OU2
## Tifton, GA
## 7/1/1999

# RECORD OF DECISION

## SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

## MARZONE INC./CHEVRON CHEMICAL COMPANY SUPERFUND SITE

## OPERABLE UNIT TWO

## TIFT COUNTY, GEORGIA

PREPARED BY

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION 4

ATLANTA, GEORGIA

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The major components of the selected remedy for operable unit two include:

- Excavation and disposal of surface soils which exceed the surface soil performance standards.
- 
- Excavation and disposal of sediments from the railroad drainage ditch and from the non-wooded wetland area south of the railroad spur which exceed the sediment performance standards.
- Transportation by truck of contaminated soil and sediment to a permitted Subtitle C or D landfill.
- Restoration of surface soil and wetland areas.
- Confirmation sampling to verify that remaining soil and sediment is below performance standards.
- Monitoring of wetland and creek area for at least five years to determine if remaining contamination is naturally attenuating. Levels of contamination in these areas do not pose an immediate or acute threat; therefore, access restriction is not necessary.
- Installation of at least two additional groundwater monitoring wells.
- Annual groundwater monitoring for at least five years for the contaminants of concern, as well as potential transformation products and geochemical parameters to determine if comtaminanation is naturally attenuating.
- Review of groundwater data after five years to determine if natural attenuation is effective. A contingency remedy of an in-situ treatment wall system may be implemented at EPA's sole discretion, if results do not confirm that natural attenuation is effective.
- Institutional controls to restrict use of contaminated groundwater.

The selected remedy will address the principal threat wastes of toxaphene and DDT and its breakdown products, as well as secondary threat wastes of chlordane, BHCs, endrin, dinoseb, and metals. Toxaphene, DDT, chlordane and metals are found in surface soils and sediments, posing an unacceptable risk to human health and the environment. BHCs, endrin, dinoseb, and metals are found in groundwater and pose an unacceptable risk to future users of groundwater as a drinking water source.

## STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate, and is cost-effective.

Although this remedy does not utilize treatment that reduces toxicity, mobility, or volume as a principal element, this negative aspect is outweighed by the cost-effectiveness, long term effectiveness and ease of implementing the selected remedy. Finally, it is determined that this remedy utilizes a permanent solution and alternative treatment technology to the maximum extent practicable.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern (COCs) and their respective concentrations
- Baseline risk represented by the COCs
- Cleanup levels established for COCs and the basis for the levels
- Current and future land and groundwater use assumptions used in the baseline risk assessment and ROD
- Land and groundwater use for which the site will be available as a result of the Selected Remedy
- Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected
- Decisive factors that led to selecting the remedy

Because this remedy will result in hazardous substances remaining onsite above health-based levels that would allow for unlimited use and unrestricted exposure, a review will be conducted every five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

RICHARD D. GREEN, DIRECTOR
WASTE MANAGEMENT DIVISION

1 JULY 99
DATE

**Decision Summary**
**Record of Decision**
**Operable Unit Two**

**Marzone Inc./Chevron Chemical Company**
**Tifton, Georgia**

## 1.0 SITE LOCATION AND DESCRIPTION

The Marzone Inc./Chevron Chemical Company Site (hereinafter, "Marzone" or "the Site") is located in south-central Georgia in the city of Tifton, at the intersection of Golden Road and the Norfolk-Southern Railroad tracks (EPA ID# GAD991275686). The Site consists of two former facilities where various liquid and dry formulations of pesticides and/or fertilizers were handled for approximately thirty years. The current owner of the two properties is Milan, Incorporated. This Record of Decision (ROD) addresses all environmental media (soil, surface water, sediment, and groundwater) associated with Operable Unit 2 (OU2), roughly defined as the Golden Seed property, Gum Creek and the associated wetlands, and a segment of the railroad drainage ditch (see
Figure 1).

During the Remedial Investigation for OU1, pesticides and metals were discovered in the soils and sediments in and around the Golden Seed facility, which is located approximately 1,000 feet southeast of the former formulation facility at OU1. Because the Golden Seed facility served as a separate source area, the Site was divided into two operable units. EPA conducted the Remedial Investigation/Feasibility Study for OU2 of the Site.

## 2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Marzone OU2 Property may have been used as a formulation and packaging plant for pesticides and fertilizers chemicals from the 1967 until 1992. It appears that the handling of agricultural chemicals commenced at the Marzone OU2 property as early as 1967. Pesticide formulation and/or fertilizer operations may have been conducted by a succession of owners until 1992 when business operations at the Marzone OU2 Property apparently ceased.

The Site was listed on the National Priorities List (NPL) in August 1989. Chevron Chemical Company, Kova Fertilizer, Inc., and Billy Mitchell, three of the Potentially Responsible Parties (PRPs), agreed to conduct the Remedial Investigation/Feasibility Study (RI/FS) at what later became OU1 pursuant to an Administrative Order By Consent dated September 1990. In the course of the Remedial Investigation, sampling on the Golden Seed Property established that significant source contamination existed on the Golden Seed Property.

EPA conducted a removal action at OU2 in 1993 to remove raw chemicals, contaminated debris, and heavily contaminated surface soils. Containers of chemicals, including pesticides and

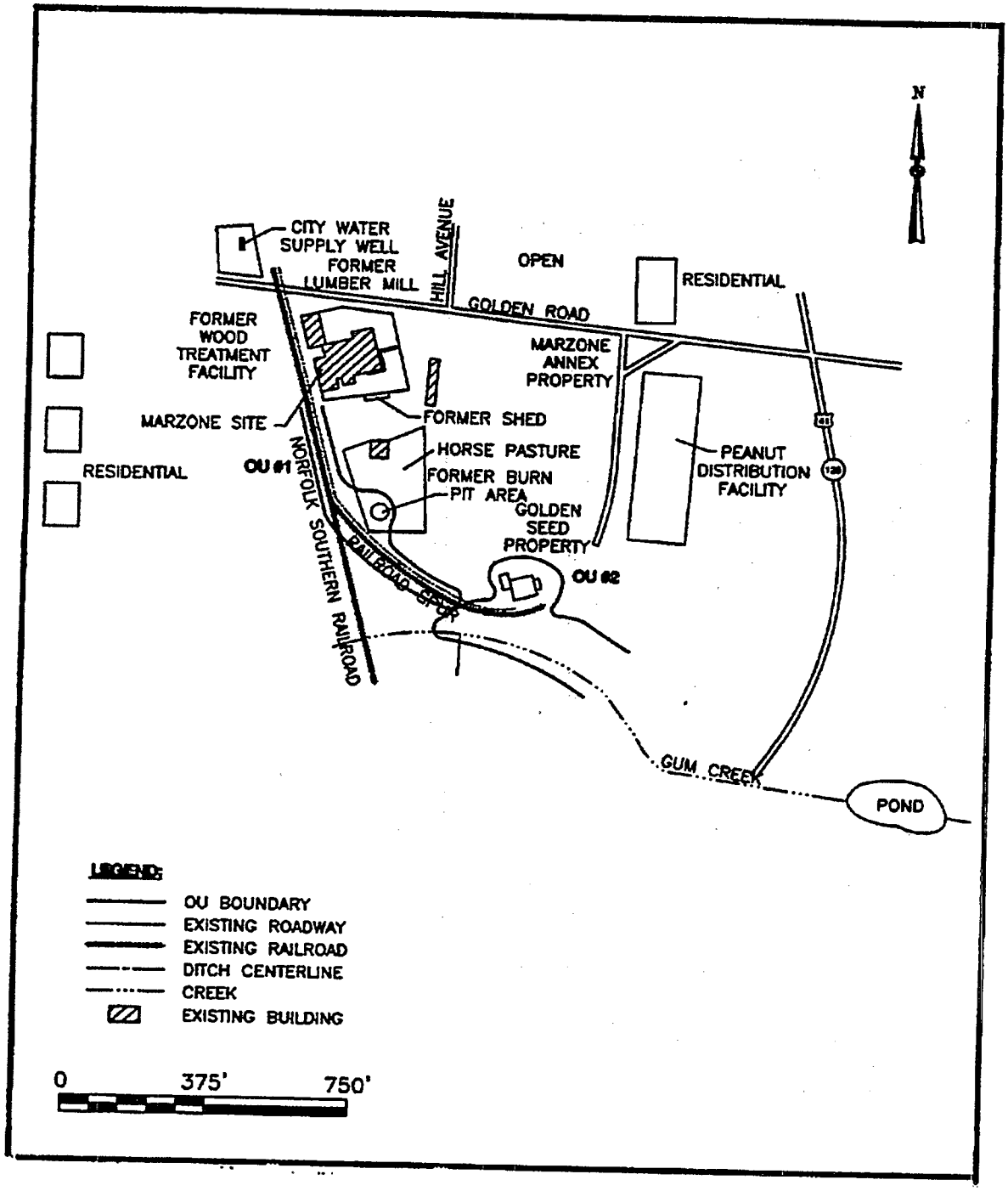


Figure 1-1: Site Map

herbicides were found at the site. EPA demolished and removed several on-site structures, excavated and removed the first foot of soil in areas of contamination, and excavated and removed contaminated subsurface soil and debris to an action level for subsurface soils of 10 ppm for total pesticides. Over 6,000 tons of soil and debris were removed and shipped to a permitted landfill.

EPA issued a ROD for Operable Unit 1 on September 30, 1994, which called for (1) low temperature thermal desorption of contaminated soils and (2) pumping and treating of contaminated groundwater. Chevron Chemical Company and Kova Fertilizer are conducting the remedial design/remedial action (RD/RA) pursuant to a Unilateral Administrative Order (UAO). The soil remedy was changed by a ROD amendment in July 1997 to off-site landfill disposal. EPA has approved the installation of a full-scale pilot project for the groundwater remedy utilizing an in-situ treatment wall. The in-situ treatment wall was installed in August 1998. EPA will review the performance of the pilot project before evaluating whether a ROD amendment is appropriate for the OU1 groundwater remedy.

EPA initiated the Remedial Investigation/Feasibility Study (RI/FS) for the Marzone OU2 property in November 1995. Field work was conducted by EPA's contractor, CDM Federal Program Corporation, and EPA's Environmental Response Team. A Remedial Investigation/Feasibility report was issued by EPA in June 1998.

## 3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Tifton and Tift County Public Library at 1 Library Lane was chosen as the local information repository for the Site. Since the NPL listing of the Marzone Site in 1989, numerous public meetings and open houses have been held regarding OU1. The public comment period for the original OU1 ROD was from July 15, 1994 to September 14, 1994. A public meeting was held on July 26, 1994. A public comment period for the first proposed plan for a ROD amendment, which covers the former burn pit area, was held from September 16, 1996 to November 16, 1996 A public meeting was held on September 26, 1996. A second public comment period for the former burn pit ROD amendment was from August 25, 1998 to September 25, 1998. A public meeting was held on September 3, 1998. The former burn pit ROD amendment was issued on November 10, 1998. In addition, a 30-day public comment period was provided on an Explanation of Significant Differences which was issued in September 1996. A public comment period for the second proposed plan for a ROD amendment was held from April 1, 1997 to May 1, 1997. A public meeting was held on April 17, 1997. The ROD amendment for OU1 was signed on June 18, 1997. An Explanation of Significant Differences was issued in July 1998.

EPA met with members of the community in February 1998 to discuss the progress of the RI/FS for OU2. The public comment period on the proposed plan for the OU2 ROD was July 31, 1998 through October 10, 1998. A public meeting was held on September 3, 1998 where representatives for EPA answered questions regarding the Site and the proposed plan under consideration. The administrative record was available to the public at both the information

repository maintained at the Tifton/Tift County Public Library and at the EPA Region IV Library at 61 Forsyth Street in Atlanta, Georgia. The notice of availability of these documents and of the public comment period was published in the Tifton Gazette on July 31, 1998. Notice of an extension to the comment period and rescheduled public meeting was published in the Tifton Gazette on August 25, 1998. Notice of an additional extension to the public comment period was published on September 15, 1998. These notices were also published in the Tift Area Today Calendar. Responses to the significant comments received during the public comment period and at the public meeting are included in the Responsiveness Summary, which is part of this ROD.

EPA awarded a Technical Assistance Grant (TAG) to the community group, People Working for People, Inc. (PWP), in April 1995. PWP utilized the grant through approximately May 1997 to hire a technical advisor to provide technical expertise to the community. PWP is now using technical services through EPA's Technical Outreach Services for Communities to provide technical expertise to the community.

This decision document presents the selected remedial action for operable unit two of the Marzone site, chosen in accordance with CERCLA, as amended, and the NCP. The decision for this Site is based on the administrative record. The requirements under Section 117 of CERCLA for public and state participation have been met for this operable unit.

## 4.0 SCOPE AND ROLE OF OPERABLE UNITS

The Marzone Site was divided into two operable units (OUs) after the RI field work discovered an additional source area at the Golden Seed facility. Additional Potentially Responsible Parties (PRPs) may be involved on OU2, since that property was, at times, owned and operated separately from OU1. These units are generally as:

- OU One: Contamination of the soils and groundwater at the former Marzone facility, a portion of the Slack property, and a segment of the railroad drainage ditch from Golden Road to the mid-point between the culverts located at the southern portion of the railroad spur. EPA signed a ROD for this operable unit on September 30, 1994. OU1 addresses surface and subsurface soil contamination from pesticides and other organic chemicals, as well as groundwater contamination resulting from the soil contamination. The purpose of operable unit one is to prevent current or future exposure to the contaminated soils by removing surface contamination, to reduce contaminant migration into the groundwater by removing subsurface contamination which served as a source to the groundwater, and to initiate groundwater restoration. This operable unit for soils is in the remedial action phase. Soil excavation and disposal is complete. For groundwater, this operable unit is in the remedial design phase. A full-scale pilot groundwater treatment system has been constructed and is operating. EPA will review the performance of the pilot project before evaluating whether a ROD amendment is appropriate for the groundwater remedy.

- OU Two: Contamination of the soils and groundwater at the Golden Seed facility and adjacent property to the west and north of the Golden Seed facility, as well as sediments and surface water in Gum Creek, the associated wetlands, and the railroad drainage ditch from the mid-point between the culverts located at the southern portion of the railroad spur to the northeastern corner of the Golden Seed facility. Operable unit two addresses the source of contamination at the Golden Seed facility and resulting soil, groundwater, surface water and sediment contamination. The purpose of operable unit two is to reduce the principal threats from pesticides, other organic chemicals, and metals which have contaminated surface and subsurface soil and have migrated into the groundwater and sediments.

## 5.0 SUMMARY OF SITE CHARACTERISTICS

The conceptual model for Operable Unit Two involves drums and disposal pits as the primary sources. Leaching from the pits and spills from the drums served as the primary release mechanism into the soil. Secondary release mechanisms from the soil include dust and/or volatile emissions which could be carried by wind to human and ecological receptors, infiltration/percolation into the groundwater which could carry contaminants to human and ecological receptors (Gum Creek and associated wetlands), and storm water runoff which could carry contaminants by surface water or sediments to human or ecological receptors.

### 5.1 PHYSIOGRAPHY/TOPOGRAPHY

The city of Tifton is located in the south-central portion of the Tifton Upland subdivision of the Coastal Plain Physiographic Province. The Tifton Upland is a topographically high section of the Coastal Plain where ground surface elevations range upward to approximately 500 feet, National Geodetic Vertical Datum of 1929 (NGVD). The regional land surface slopes downward toward the southeastern border of the upland to approximately 100 feet NGVD.

Tift County consists of uplands, river terraces, and flood plains with moderately wide interstream divides separating relatively broad valleys. The surface expression of the divides is generally level, very gently sloping or undulating, while the valley walls have modest slopes and nearly level valley floors.

### 5.2 GEOLOGY/SOILS

The Coastal Plain is composed of a wedge of clastic and carbonate sediments ranging in age from Jurassic/Cretaceous to recent. The depth of the Coastal Plain sediments varies from a feather-edge thickness at the Fall Line to more than 7,000 feet in southwestern Georgia. The sediments represent both non-marine and marine sources. The Coastal Plain sediments lie unconformably on a basement complex of Piedmont crystalline rocks, Triassic red beds and volcanics, and metamorphosed Paleozoic sedimentary rocks.

Extensive sedimentary deposition has occurred in the Site area. The two primary geologic units of interest are the Hawthorne Group and the underlying Floridan Aquifer System, represented in this area by the Suwannee Formation.

The uppermost geologic unit occurring in the study area is the Miocene-age Hawthorne Group. The Hawthorne has two major facies: a non-marine facies composed of the Coosawhatchiue Formation, the Marks Head Formation and the Parachuchla Formation, and a marginal marine/non-marine facies composed of the Altamaha Formation. The Hawthorne Group occurs at ground surface in the study area and extends to an approximate depth of 300 feet below grade at Tifton Well TW-7, 300 feet northwest of the former Marzone facility (OU1). The Hawthorne is composed of interbedded clay and clay with limestone, with minor beds of sand, sandy clay, sand-silt and clay, and limestone.

The Hawthorne is reported to be continuous throughout the study area. In the Site area, the thickness is approximately 300 feet. The Hawthorne Group is significant to the Site because it is considered to be a confining unit, overlying the Floridan Aquifer System, a major water producing zone, at greater depth.

The Hawthorne Group is underlain by the Oligocene-age Suwannee Formation. The Suwannee occurs at a depth of 300 or more feet below grade in the study area. It is composed of monolithic limestone, which is locally cavernous. The Suwannee represents the Floridan Aquifer System in this area of Georgia and is important to the Site as the regionally significant source of potable water supplies in the Site area.

## 5.3 SURFACE WATER AND SEDIMENTS

The Site area is situated within the drainage basin of the southeast-flowing Alapaha River. Local drainage moves by overland flow to Gum Creek. Gum Creek forms a small (less than one acre) pond approximately 2,000 feet east of the site. Gum Creek drains this unnamed pond and discharges to the New River, approximately five miles downstream of the Site. In the Site area, Gum Creek is primarily a wet-weather stream consisting of a series of pools and small riffle areas. Drainage at the Golden Seed property is to the south, toward the railroad drainage ditch that follows the rail spur. The railroad drainage ditch drains into a marshy area adjacent to Gum Creek via two culverts that pass beneath the railroad tracks. Following periods of rain, this area contains a series of stagnant pools of water which overflow toward Gum Creek.

## 5.4 HYDROGEOLOGY

Groundwater is a significant natural resource in the Site area and has been the subject of many previous studies. Several aquifers of regional significance may be present in this area of the southeast U.S. These aquifers include the Surficial Aquifer System (not present in the Site area), the Intermediate Aquifer System (IAS), and the Floridan Aquifer System (FAS). The IAS consists of various Hawthorne Group members composed largely of sand, clay, shell zones, and limestone,

occurring within a 13-county area of southwest Florida. In Georgia, the Hawthorne consists chiefly of interbedded clay, sand, and silt and is described as a confining unit in the Site area. Discontinuous Hawthorne water-bearing zones are present in several areas within Georgia and Florida. Shallow water-bearing units of the Hawthorne Group are recharged primarily by precipitation. Discharge from water-bearing zones within the Hawthorne Group appears primarily to be to local surface waters, although vertical flow to underlying strata is possible.

The FAS is one of the most extensive and prolific water-producing sources in the southeastern U.S. At the Site, the FAS is overlain by a 300-foot thickness of predominantly fine-grained, cohesive, plastic sediments of the Hawthorne Group. The system is recharged principally by rainfall and stream flow in its outcrop area some 25 miles northwest of the Site. The Site and surrounding area is not a significant recharge area.

## 5.5 SAMPLING STRATEGY

The original work plan for Marzone OU2 specified the following samples:

- 63 surface soil and 24 subsurface soil samples for onsite analysis using immunoassay analytical techniques for toxaphene, DDT and gamma-BHC;
- 24 surface soil and 12 subsurface soil samples to be analyzed for volatiles, semivolatiles, pesticides, and metals by a Contract Laboratory Program lab;
- 4 surface water samples from the railroad drainage ditch, 8 surface water samples from the wetlands, and 7 surface water samples from Gum Creek to be analyzed for volatiles, semivolatiles, pesticides, and metals, as well as water quality parameters;
- 4 sediment samples from the railroad drainage ditch, 16 sediment samples from the wetlands, and 7 sediment samples from Gum Creek to be analyzed for volatiles, semivolatiles, pesticides, and metals; and
- 7 groundwater samples to be analyzed for volatiles, semivolatiles, pesticides, and metals, as well as water quality parameters.

Because of various technical problems, the following samples were collected and analyzed:

- 63 surface soil and 24 subsurface soil samples for onsite analysis using immunoassay analytical techniques for toxaphene, DDT and gamma-BHC;
- 24 surface soil and 12 subsurface soil samples to be analyzed by a Contract Laboratory Program lab;

| TABLE 5-1:ORGANIC CONTAMINANTS IN SURFACE SOIL | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/KG OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Heptachlor | 4.8J | 120N | 5/29 |
| Heptachlor epoxide | 8.7J | 146 | 4/29 |
| Gamma-BHC | 4J | 4J | 1/29 |
| Delta-BHC | 6.8J | 21 | 2/29 |
| DDT | 15N | 23,000 | 23/29 |
| DDE | 0.61J | 2,500 | 22/29 |
| DDD | 6.8 | 150,000 | 17/29 |
| Dieldrin | 55.8 | 55.8 | 1/29 |
| Endrin | 12J | 19,000 | 8/29 |
| Endosulfan sulfate | 8.8J | 8.8J | 1/29 |
| Toxaphene | 320 | 100,000 | 22/29 |
| Endrin aldehyde | 79 | 450.5 | 3/29 |
| Gamma-chlordane | 11 | 3,300 | 14/29 |
| Alpha-chlordane | 35 | 1,300 | 11/29 |
| Endrin ketone | 41 | 5,900N | 5/29 |
| Atrazine | 38 | 85 | 2/13 |
| Dalapon | 22 | 22 | 1/13 |
| Dinoseb | 74 | 74 | 1/13 |
| Dioxin (TEQ) | 0.00022 | 0.0091 | 6/6 |
| Di-N-Butylphthalate | 370 | 1,200 | 16/24 |
| Fluoranthene | 44J | 92J | 2/24 |
| Pyrene | 54J | 54J | 1/24 |
| Benzyl Butyl Phthalate | 450 | 2,000 | 7/24 |
| Bis(2-ethylhexy) phthalate | 950 | 2,200 | 5/24 |
| Chrysene | 80J | 80J | 1/24 |
| Di-N-Octylphthalate | 690 | 690 | 1/24 |
| Benzo(b &/or k)fluoranthene | 51J | 160J | 2/24 |
| Benzo-a-pyrene | 82J | 82J | 1/24 |
| (3- &/or 4-) Methylphenol | 63J | 63J | 1/24 |

J - Estimated value
N - Presumptively identified
PPB - Parts per billion or micrograms per kilogram
Minimum concentration is that detected above the detection limit.

- 3 surface water samples from the railroad drainage ditch, 8 surface water samples from the wetlands, and 7 surface water samples from Gum Creek;
- 4 sediment samples from the railroad drainage ditch, 8 sediment samples from the wetlands, and 7 sediment samples from Gum Creek; and
- 7 groundwater samples.

| TABLE 5-2:INORGANIC CONTAMINANTS IN SURFACE SOIL | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (MG/KG OR PPM) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 1.0 | 18 | 21/29 |
| Barium | 8.9 | 229.5 | 21/29 |
| Beryllium | 0.16J | 0.6 | 6/29 |
| Cadmium | 1.1 | 5.9 | 4/29 |
| Chromium | 2.6J | 26 | 26/29 |
| Cobalt | 0.6 | 17.9 | 5/5 |
| Copper | 5.4 | 1785 | 21/29 |
| Lead | 1.9J | 280.5 | 28/29 |
| Antimony | 3.1J | 4.2 | 2/29 |
| Nickel | 1.3 | 195.5 | 18/29 |
| Selenium | 1.2J | 1.7 | 3/29 |
| Vanadium | 6.3 | 60 | 19/29 |
| Zinc | 35 | 20,400 | 20/29 |
| Mercury | 0.1 | 0.14 | 8/29 |
| Aluminum | 630 | 14,000J | 29/29 |
| Manganese | 6.2J | 13,600 | 28/29 |
| Calcium | 251 | 12,000J | 15/29 |
| Iron | 1,100 | 27,000 | 29/29 |
| Magnesium | 65.1 | 1020 | 13/29 |

PPM - Parts per million or milligrams per kilogram
ND - Not detected
J - Estimated value
Minimum concentration is that detected above the detection limit.

An additional sampling event was conducted in June 1997 for the ecological risk assessment. This event involved soil sampling in five locations, surface water and sediment sampling in nine locations ( one railroad drainage ditch, two wetlands and six Gum Creek), and tissue sampling. In addition, sampling events were conducted in May 1998 and December 1998 to further delineate groundwater and subsurface soil contamination. The May 1998 event involved groundwater sampling at the seven permanent monitoring wells. The December 1998 event involved groundwater sampling at six of the seven permanent wells (one well was damaged), groundwater sampling at eight temporary monitoring wells, and subsurface soil sampling around the concrete pad.

## 5.5 NATURE AND EXTENT OF CONTAMINATION

Surface and subsurface soils were sampled and analyzed for pesticides, herbicides, metals, volatile organic compounds, and semivolatile organic compounds. Summaries of the results are presented in Tables 5-1 through 5-4.

TABLE 5-3: ORGANIC CONTAMINANTS IN SUBSURFACE SOIL

| CHEMICAL | CONCENTRATION DETECTED (UG/KG OR PPB) | | FREQUENCY OF DETECTIONS |
|---|---|---|---|
| | MINIMUM | MAXIMUM | |
| DDT | 0.97J | 1000 | 12/17 |
| DDE | 0.65JN | 35 | 6/17 |
| DDD | 0.85J | 120 | 4/17 |
| Endrin | 0.5J | 140 | 5/17 |
| Toxaphene | 660 | 660 | 1/17 |
| Gamma-chlordane | 0.32J | 33 | 8/17 |
| Alpha-chlordane | 0.54J | 35 | 5/17 |
| Endrin ketone | 4.3N | 53 | 2/17 |
| Parathion | 31J | 31J | 1/17 |
| Di-N-butylphthalate | 490 | 960 | 9/12 |
| Benzyl butyl phthalate | 400 | 580 | 4/12 |
| Bis(2-ethylhexyl)phthalate | 650 | 1,100 | 8/12 |

J - Estimated value
N - Presumptively identified
PPB - Parts per billion or micrograms per kilogram
Minimum concentration is that detected above the detection limit.

The primary pesticides detected in surface soil at OU2 include: toxaphene, 4,4'-DDT and its metabolites and chlordane isomers (gamma-chlordane and alpha-chlordane). Other pesticides include heptachlor, heptachlor epoxide, gamma-BHC (lindane), delta-BHC, dieldrin, endrin, endrin aldehyde, and endrin ketone. DDT and its metabolites (DDX) ranged from below detection limit (BDL) to 175.5 parts per million (ppm). Toxaphene ranged from BDL to 100 ppm. Chlordane ranged from BDL to 4.6 ppm. Three herbicides, atrazine, dalapon, and dinoseb, were detected in surface soil samples, but were not widespread.

Surface soil was also tested for dioxins. The background surface soil sample had a dioxin toxic equivalent (TEQ) of 0.0076 parts per billion (ppb). TEQs on-site ranged from 0.00022 to 0.0091 ppb.

Eight pesticides were detected in subsurface soil samples. These include DDX and the two chlordane isomers found in surface soil. Others included endrin, toxaphene, and endrin ketone. Parathion was detected in one subsurface soil sample.

| TABLE 5-4: INORGANIC CONTAMINANTS IN SUBSURFACE SOIL | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (MG/KG OR PPM) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 2.1J | 5.1 | 8/17 |
| Beryllium | 0.29J | 0.29J | 1/17 |
| Cadmium | 0.2J | 0.2J | 2/17 |
| Nickel | 0.81J | 25 | 10/17 |
| Selenium | 1.1 | 2J | 6/17 |
| Thallium | 0.74J | 0.74J | 1/17 |
| Vanadium | 6.8 | 64 | 17/17 |
| Zinc | 13 | 220 | 7/17 |
| Aluminum | 4,000 | 17,000 | 17/17 |
| Manganese | 5 | 66 | 13/17 |
| Magnesium | 50J | 420 | 7/17 |

PPM - Parts per million or milligrams per kilogram
ND - Not detected
J - Estimated value
Minimum concentration is that detected above the detection limit.

| TABLE 5-5: CONTAMINANTS IN DITCH SURFACE WATERS | | | |
|---|---|---|---|
| CHEMICALS | CONCENTRATION DETECTED (UG/L OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Delta-BHC | 0.16 | 0.16 | 1/4 |
| Gamma-BHC (Lindane) | 0.08 | 0.08 | 1/4 |
| DDE | 0.29 | 0.29 | 1/4 |
| Endrin | 0.22 | 0.22 | 1/4 |
| Endrin ketone | 0.44 | 0.85 | 3/4 |
| Atrazine | 0.29 | 0.94 | 2/3 |
| Dinoseb | 0.12JN | 1.1 | 2/3 |
| Arsenic | 7J | 14.3 | 2/4 |
| Barium | 11 | 90 | 4/4 |
| Cadmium | 1J | 2J | 2/4 |
| Cobalt | 3J | 3J | 1/4 |
| Chromium | 3J | 3J | 1/4 |
| Copper | 30.8 | 47 | 2/4 |
| Nickel | 4J | 12J | 4/4 |
| Lead | 3 | 3.8 | 2/4 |
| Vanadium | 6J | 8J | 1/4 |
| Zinc | 64 | 1,300 | 4/4 |
| Aluminum | 268 | 5,200 | 3/4 |
| Manganese | 35 | 1,400 | 4/4 |
| Iron | 750 | 4,720 | 4/4 |
| Magnesium | 2,940 | 7,900 | 4/4 |
| Sodium | 3,400 | 8,400 | 4/4 |
| Potassium | 4,200 | 11,000 | 4/4 |

PPB - Parts per billion
J - Estimated value
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

| TABLE 5-6: CONTAMINANTS IN WETLAND SURFACE WATER | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Alpha-BHC | 0.09 | 0.09 | 1/10 |
| Beta-BHC | 0.17 | 0.17 | 1/10 |
| Gamma-BHC(Lindane) | 0.036J | 0.2 | 8/10 |
| DDT | 4.6 | 4.6 | 1/10 |
| DDD | 11 | 11 | 1/10 |
| Endrin | 0.15 | 0.15 | 1/10 |
| Toxaphene | 7.5 | 13N | 2/10 |
| Alpha-chlordane | 0.061J | 0.062 | 2/10 |
| Endrin ketone | 0.59 | 1.6 | 6/10 |
| Atrazine | 0.31N | 0.83 | 8/8 |
| 2,4-D | 0.14J | 0.29J | 2/8 |
| Dinoseb | 0.54J | 2.6 | 3/8 |
| Arsenic | 9.7 | 20.3 | 2/10 |
| Barium | 15 | 130 | 10/10 |
| Cobalt | 1J | 6J | 4/10 |
| Chromium | 3J | 19 | 6/10 |
| Copper | 14.7 | 83 | 8/10 |
| Lead | 3.5 | 8.6 | 2/10 |
| Nickel | 8.3 | 8.3 | 1/10 |
| Thallium | 5 | 5 | 1/10 |
| Vanadium | 7.5 | 7.5 | 1/10 |
| Zinc | 96 | 1,400 | 10/10 |
| Aluminum | 145 | 14,000 | 9/10 |
| Manganese | 49 | 2,500 | 10/10 |
| Calcium | 4,700 | 48,000 | 10/10 |
| Iron | 670 | 19,000 | 10/10 |
| Magnesium | 1,500 | 7,400 | 10/10 |
| Potassium | 3,200 | 17,000 | 10/10 |

ND - Not detected
N - Presumptive evidence of presence of material
J - Estimated value
Minimum concentration is that detected above the detection limit.

Elevated levels of metals were found throughout OU2. Sixteen metals were found at concentrations greater than two times average background concentration in surface soil samples. Metals exceeding background concentrations include arsenic, barium, beryllium, chromium, copper, nickel, vanadium, zinc, manganese, and mercury. Zinc and copper are prevalent on the Golden Seed property. Arsenic, mercury, and chromium exceeded background concentrations on the area west and north of the Golden Seed facility. Eleven metals were detected in subsurface soils at concentrations greater than two times average background concentration in subsurface soil samples. These included arsenic, beryllium, cadmium, nickel, zinc, and manganese.

| TABLE 5-7: CONTAMINANTS IN GUM CREEK SURFACE WATER | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Beta-BHC | 0.03J | 0.03J | 1/13 |
| Gamma-BHC(Lindane) | 0.014J | 0.07 | 7/13 |
| DDD | 0.05 | 0.05 | 1/13 |
| Dieldrin | 0.08 | 0.08 | 1/13 |
| Endosulfan sulfate | 0.18 | 0.18 | 1/13 |
| Endrin | 0.013J | 0.043J | 5/13 |
| Endrin ketone | 0.52 | 0.8 | 2/13 |
| Toxaphene | 3.6JN | 6.1N | 2/13 |
| Atrazine | 0.6N | 0.89N | 6/7 |
| Arsenic | 7.6 | 7.6 | 1/13 |
| Barium | 26 | 96 | 13/13 |
| Chromium | 1J | 11 | 4/13 |
| Copper | 6.3 | 51.6 | 5/13 |
| Lead | 2J | 24 | 9/13 |
| Vanadium | 2J | 26J | 7/13 |
| Zinc | 50 | 420 | 10/13 |
| Aluminum | 147 | 9,500 | 10/13 |
| Manganese | 58 | 3,180 | 13/13 |
| Iron | 950 | 12,000 | 13/13 |
| Sulfate | 2,100 | 14,000 | 7/13 |

ND - Not detected
J - Estimated value
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

| TABLE 5-8: CONTAMINANTS IN DITCH SEDIMENTS | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/KG OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| DDT | 37 | 20,000 | 5/5 |
| DDE | 9N | 1,190 | 5/5 |
| DDD | 24 | 13,000 | 5/5 |
| Endrin | 180 | 240 | 2/5 |
| Heptachlor epoxide | 154 | 154 | 1/5 |
| Toxaphene | 8,500 | 83,000 | 2/5 |
| Endrin aldehyde | 55J | 55J | 1/5 |
| Gamma-chlordane | 71C | 980* | 3/5 |
| Alpha-chlordane | 170C | 980* | 3/5 |
| Atrazine | 63 | 63 | 1/2 |
| Fluoranthene | 170J | 170J | 1/4 |
| Pyrene | 200J | 200J | 1/4 |
| Benzo(a)anthracene | 170J | 170J | 1/4 |
| Chrysene | 260J | 260J | 1/4 |
| Benzo(b &/or k)fluoranthene | 580J | 580J | 1/4 |
| Benzo-a-pyrene | 220J | 220J | 1/4 |
| (3- &/or 4-)methylphenol | 61J | 61J | 1/4 |
| CHEMICAL | CONCENTRATION DETECTED (MG/KG OR PPM) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 1.3J | 14 | 4/5 |
| Barium | 9.1 | 79 | 5/5 |
| Beryllium | 0.3 | 0.3 | 1/5 |
| Cadmium | 0.090J | 1.9J | 5/5 |
| Chromium | 3.8 | 45 | 5/5 |
| Copper | 8.7 | 300 | 5/5 |
| Nickel | 3.5 | 21 | 5/5 |
| Lead | 12 | 75 | 5/5 |
| Vanadium | 7.6J | 79 | 5/5 |
| Zinc | 46 | 1,500 | 5/5 |
| Aluminum | 2,500 | 33,000 | 5/5 |
| Manganese | 84 | 770 | 5/5 |
| Iron | 3,000 | 37,000 | 5/5 |
| Sodium | 210 | 210 | 1/5 |

* Measured as total chlordane
ND - Not detected
J - Estimated value
N - Presumptive evidence of presence of material
C - Confirmed by GC/MS
Minimum concentration is that detected above the detection limit.

Volatile organic compounds were not detected in surface or subsurface soils. Ten semivolatile organic compounds (SVOCs) were detected in surface soil. Five were polycyclic aromatic hydrocarbons, four were phthalates, and one was a phenol. Three phthalate compounds were detected in subsurface soil samples.

Surface water and sediments were also sampled and analyzed for pesticides, herbicides, metals, volatile organic compounds, and semivolatile organic compounds. Summaries of the results are presented in Tables 5-5 through 5-10.

Eighteen surface water samples were collected for OU2 in the original sampling event: three from the ditch, eight from the wetland, and seven from the creek. Nine additional samples were taken in the June 1997 event: one from the ditch, two from the wetland, and six from the creek. Seven pesticide/herbicide compounds, beta-BHC, gamma-BHC, DDE, endrin, endrin ketone, atrazine, and dinoseb, were detected in the surface water samples collected from the ditch. Twelve pesticide and herbicide compounds including toxaphene, endrin ketone, and gamma-BHC (lindane) were detected in the surface water samples from the wetland. Of the pesticides/ herbicide detected in Gum Creek surface water samples, endrin, toxaphene, lindane and atrazine were detected most frequently.

In the ditch surface water, fifteen metals were detected at concentrations which were greater than two times background including chromium, nickel, and lead. Twelve metals were detected in the wetlands surface water at concentrations exceeding two times background. These metals included copper, zinc, and manganese. In Gum Creek surface water, eleven metals were found at concentrations which were greater than two times background including chromium, lead, and manganese.

One volatile organic compound (VOC) was detected in the ditch surface water samples. Toluene was found at 7 ppb in the background ditch surface water sample. Xylene was detected in the background surface water sample for the wetland. VOCs were not detected in the surface water samples for Gum Creek. SVOCs were not detected in surface water samples for the ditch or wetland. Bis(2-ethylhexyl)phthalate was present in the background surface water sample for Gum Creek.

Ten pesticide/herbicide compounds were detected in sediment samples obtained from the drainage ditch. Eleven pesticide/herbicide compounds including DDX, toxaphene, and chlordane isomers were detected in shallow (0 - 2 inch) sediment samples from the wetland. Ten pesticide compounds were detected in the deep (6 - 12 inch) sediment samples from the wetland. In Gum

| TABLE 5-9: CONTAMINANTS IN WETLAND SEDIMENTS | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/KG OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Heptachlor | 160N | 160N | 1/23 |
| Heptachlor epoxide | 54 | 193 | 2/23 |
| Alpha-BHC | 3.8J | 91 | 3/23 |
| Beta-BHC | 20 | 270 | 3/23 |
| Gamma-BHC (Lindane) | 14 | 99 | 4/23 |
| DDT | 147.4 | 14,000 | 15/23 |
| DDE | 17 | 1,100 | 18/23 |
| DDD | 30 | 9,020 | 16/23 |
| Dieldrin | 156 | 156 | 1/23 |
| Toxaphene | 2,700 | 170,000 | 16/23 |
| Gamma-chlordane | 15 | 5,500 | 14/23 |
| Alpha-chlordane | 33 | 2,500 | 11/23 |
| Endrin ketone | 2,300 | 3,200 | 2/23 |
| Dinoseb | 29 | 29 | 1/5 |
| CHEMICAL | CONCENTRATION DETECTED (MG/KG OR PPM) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 2.1J | 37 | 17/23 |
| Barium | 3.7 | 580 | 19/23 |
| Berylllium | 0.3 | 0.3 | 1/23 |
| Cadmium | 0.15J | 7 | 14/23 |
| Cobalt | 0.250J | 17J | 19/23 |
| Copper | 5.4 | 850 | 22/23 |
| Nickel | 0.770J | 480 | 23/23 |
| Lead | 3.9 | 180 | 23/23 |
| Selenium | 0.98J | 3.6J | 6/23 |
| Vanadium | 12.5 | 15.4 | 2/23 |
| Zinc | 9.8 | 4,620 | 23/23 |
| Manganese | 3.6 | 3,300 | 23/23 |
| Calcium | 73 | 8,300 | 23/23 |
| Iron | 2,100 | 30,000 | 21/21 |
| Magnesium | 64 | 1,600 | 21/21 |
| Sodium | 38 | 520 | 14/21 |
| Potassium | 61 | 1,700 | 18/21 |

ND - Not detected J - Estimated value

Minimum concentration is that detected above the detection limit.

| TABLE 5-10: CONTAMINANTS IN GUM CREEK SEDIMENTS | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/KG OR PPB) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| DDT | 42N | 93,000 | 6/13 |
| DDE | 11 | 7,900 | 8/13 |
| DDD | 10 | 18,000 | 8/13 |
| Toxaphene | 10,000 | 22,000 | 2/13 |
| Gamma-chlordane | 21 | 29,000 | 6/13 |
| Alpha-chlordane | 16 | 11,000 | 4/13 |
| CHEMICAL | CONCENTRATION DETECTED (MG/KG OR PPM) | | FREQUENCY OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 0.6 | 40 | 11/13 |
| Barium | 9.2 | 330 | 13/13 |
| Beryllium | 0.5 | 0.5 | 1/13 |
| Cadmium | 0.11J | 2.9J | 8/13 |
| Cobalt | 0.75J | 17J | 9/13 |
| Chromium | 3.3 | 41 | 13/13 |
| Copper | 2.7 | 1,000 | 12/13 |
| Nickel | 1.1J | 26 | 13/13 |
| Lead | 7.3 | 290 | 13/13 |
| Vanadium | 7.1 | 81 | 13/13 |
| Zinc | 21 | 1,500 | 13/13 |
| Mercury | 0.59 | 0.59 | 1/13 |
| Aluminum | 2,623 | 42,000 | 13/13 |
| Manganese | 10 | 2,400 | 13/13 |
| Calcium | 429 | 4,400 | 13/13 |
| Iron | 1,800 | 37,000 | 13/13 |
| Magnesium | 57.6 | 1,000 | 13/13 |
| Sodium | 190 | 190 | 1/13 |
| Potassium | 187 | 1,100 | 7/13 |

J - Estimated value
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

| TABLE 5-11: ORGANIC CONTAMINANTS IN GROUNDWATER - MARCH 1996 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Alpha-BHC | 0.067 | 0.083 | 2/7 |
| Gamma-BHC | 0.019 | 0.39J | 3/7 |
| Endrin | 0.17 | 3.9 | 2/7 |
| Endosulfan II (Beta) | 0.039 | 0.64 | 2/7 |
| Endrin ketone | 1.2 | 5.1 | 2/7 |
| Atrazine | 0.35 | 0.71 | 2/7 |
| 2,4-D | 0.82 | 0.82 | 1/7 |
| 2,4,5-T | 2.1 | 2.1 | 1/7 |
| Dinoseb | 0.64 | 3,400 | 3/7 |
| Chloroform | 2J | 2J | 1/7 |
| 1,1,2-Trichloroethane | 1J | 1J | 1/7 |

J - Estimated
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

| TABLE 5-12: ORGANIC CONTAMINANTS IN GROUNDWATER - MAY 1998 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Alpha-BHC | 0.062 | 0.085 | 3/7 |
| Beta-BHC | 0.078JNA | 0.097JN | 2/7 |
| Gamma-BHC | 0.065A | 0.12 | 3/7 |
| Endrin | 0.16JNA | 0.44N | 3/7 |
| Endrin ketone | 0.068J | 5.2 | 4/7 |
| Dinoseb | 0.092J | 4,300 | 3/7 |
| 1,2-Dichloroethane | 0.61J | 1.0 | 4/7 |
| 1,1,2-Trichloroethane | 1 | 1.2 | 2/7 |

J - Estimated
N - Presumptive evidence of presence of material
A - Average value
Minimum concentration is that detected above the detection limit.

| TABLE 5-13: ORGANIC CONTAMINANTS IN GROUNDWATER - DECEMBER 1998 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Alpha-BHC | 0.048J | 0.17 | 4/12 |
| Gamma-BHC | 0.028J | 0.5 | 5/12 |
| Endrin ketone | 0.094 | 4.1 | 9/12 |
| Atrazine | 0.012 | 1.8 | 8/12 |
| Dinoseb | 0.0073 | 1,100 | 9/12 |

J - Estimated
N - Presumptive evidence of presence of material
A - Average value
Minimum concentration is that detected above the detection limit.

Creek six pesticide compounds were detected in sediment samples. Two pesticides (heptachlor and 4-chloro-2-methyl phenoxy acetic acid (MCPA)) were detected in background samples, but not in others.

Fourteen metals were detected at concentrations greater than two times background in ditch sediments. These metals include arsenic, chromium, cadmium, nickel, and lead. In the wetland sediments, fifteen metals were detected at concentrations greater than two times background. Gum Creek sediment samples contained seventeen metals at concentrations greater than two times background.

Three VOCs were detected in the background sediment samples collected from the ditch, but were not detected in other samples. These VOCs were toluene, ethyl benzene, and methyl ethyl ketone. VOCs were not detected in shallow or deep sediment samples from the wetland or the sediment samples from Gum Creek. Seven SVOCs were detected in one sediment sample from the ditch. Twelve SVOCs were detected in shallow sediment samples and five SVOCs were detected in deep sediment samples. In Gum Creek, eight SVOCs were detected in the duplicate background sediment sample.

Seven groundwater monitoring wells were installed and developed for the remedial investigation at OU2. Eight temporary wells were installed for the December 1998 sampling event. Groundwater samples were analyzed for pesticides and herbicides, volatiles, and semivolatiles (Tables 5-11 through 5-16). Nine pesticides and herbicides were detected in groundwater samples. These included endrin ketone, atrazine, dinoseb, endrin, alpha-BHC, gamma-BHC (lindane) and endosulfan II. Eighteen metals were detected in groundwater samples at concentrations which were greater than two times background. Chloroform, 1,2-dichloroethane, and 1,1,2-trichloroethane were the only VOCs detected in the groundwater samples. SVOCs were not detected in groundwater samples.

| TABLE 5-14: INORGANIC CONTAMINANTS IN GROUNDWATER - MARCH 1996 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 11 | 34 | 2/7 |
| Barium | 9 | 160 | 7/7 |
| Beryllium | 1J | 18JN | 4/7 |
| Cadmium | 17 | 17 | 1/7 |
| Cobalt | 130 | 130 | 1/7 |
| Chromium | 12 | 230 | 4/7 |
| Copper | 29 | 1,400 | 7/7 |
| Nickel | 12J | 720 | 7/7 |
| Lead | 5 | 50 | 7/7 |
| Selenium | 7J | 16J | 2/7 |
| Zinc | 62 | 2,100J | 7/7 |
| Aluminum | 2,400 | 970,000 | 3/7 |
| Manganese | 16J | 8,800 | 7/7 |
| Calcium | 3,400 | 180,000 | 7/7 |
| Iron | 460 | 19,000 | 7/7 |
| Magnesium | 1,700 | 49,000 | 7/7 |
| Sodium | 2,200J | 220,000J | 7/7 |
| Potassium | 1,700J | 80,000J | 7/7 |
| Sulfate | 9,900 | 6,300,000 | 6/7 |
| Ammonia | 260 | 260,000 | 7/7 |
| Total Phosphorus | 50 | 240,000 | 5/7 |
| Nitrate/Nitrite | 110 | 70,000 | 5/7 |
| Chloride | 6,800 | 48,000 | 6/7 |

J - Estimated
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

| TABLE 5-15: INORGANIC CONTAMINANTS IN GROUNDWATER - MAY 1998 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Arsenic | 4.4 | 4.4 | 1/7 |
| Barium | 4.4 | 350 | 7/7 |
| Beryllium | 2 | 12 | 3/7 |
| Cadmium | 3.6 | 12 | 2/7 |
| Cobalt | 3.4 | 89 | 4/7 |
| Chromium | 36 | 89 | 3/7 |
| Copper | 3.4 | 650 | 7/7 |
| Nickel | 2.9 | 400 | 4/7 |
| Lead | 22 | 22 | 1/7 |
| Selenium | 2.5 | 20 | 3/7 |
| Zinc | 17 | 1,500 | 7/7 |
| Aluminum | 160 | 580,000 | 7/7 |
| Manganese | 33 | 5,800 | 7/7 |
| Calcium | 4,400 | 150,000 | 7/7 |
| Iron | 180 | 28,000 | 6/7 |
| Magnesium | 1,100 | 30,000 | 7/7 |
| Sodium | 4,500 | 140,000 | 7/7 |
| Potassium | 4,000 | 74,000 | 7/7 |
| Nitrate/Nitrite | 240 | 38,000 | 6/7 |

J - Estimated
N - Presumptive evidence of presence of material
Minimum concentration is that detected above the detection limit.

Principal threat wastes at the site include pesticides (toxaphene, DDT and its metabolites, and chlordane) and metals in surface soil which may migrate by wind or surface runoff to other surface soils, surface waters, and sediments. Additional principal threat wastes are pesticides (BHCs), herbicides (dinoseb) and metals which may migrate by infiltration into the groundwater. Low-level threat wastes are other pesticides, organics, and metals which were found in low frequency or are relatively non-mobile.

| TABLE 5-16: INORGANIC CONTAMINANTS IN GROUNDWATER -DECEMBER 1998 | | | |
|---|---|---|---|
| CHEMICAL | CONCENTRATION DETECTED (UG/L OR PPB) | | NUMBER OF DETECTIONS |
| | MINIMUM | MAXIMUM | |
| Barium | 23 | 1,200 | 9/11 |
| Cobalt | 20 | 120 | 2/11 |
| Chromium | 9.5 | 140 | 3/11 |
| Copper | 8.1 | 850 | 3/11 |
| Nickel | 18 | 570 | 2/11 |
| Zinc | 9.9 | 1,700 | 9/11 |
| Aluminum | 410 | 730,000 | 11/11 |
| Manganese | 5.9 | 7,500 | 10/11 |
| Calcium | 1,300 | 150,000 | 11/11 |
| Iron | 140 | 11,000 | 11/11 |
| Magnesium | 400 | 49,000 | 11/11 |
| Sodium | 3,700 | 170,000 | 11/11 |
| Potassium | 1,000 | 67,000 | 8/11 |
| Sulfate | 1,700 | 5,800,000 | 6/6 |
| Nitrate | 260 | 66,000 | 6/6 |
| Nitrite | ND | ND | 0/6 |

J - Estimated
N - Presumptive evidence of presence of material
ND - Not detected
Minimum concentration is that detected above the detection limit.

## 6.0 SUMMARY OF OPERABLE UNIT TWO RISKS

CERCLA directs EPA to conduct a baseline risk assessment to determine whether a Superfund Site poses a current or potential threat to human health and the environment in the absence of any remedial action. The baseline risk assessment provides the basis for determining whether or not remedial action is necessary and the justification for performing remedial action. Based upon this analysis it was determined that the surface soil, sediments, and groundwater pose current or potential risks.

The major human health risks currently associated with OU2 of the Marzone Site are the ingestion and dermal contact of contaminated soil by actual on-site visitors. For potential future residents, the

| TABLE 6-1: CHEMICALS OF POTENTIAL CONCERN FOR HUMAN HEALTH | | | |
|---|---|---|---|
| CHEMICAL | SURFACE SOIL | SURFACE WATER | GROUNDWATER |
| Alpha-BHC | | | Yes |
| Gamma-BHC (Lindane) | | Yes | Yes |
| DDT | Yes | | |
| DDE | Yes | | |
| DDD | Yes | | |
| Endrin | Yes | | Yes |
| Toxaphene | Yes | Yes | |
| Gamma-chlordane | Yes | | |
| Alpha-chlordane | Yes | | |
| Endrin ketone | Yes | | Yes |
| Atrazine | | Yes | Yes |
| Dinoseb | | | Yes |
| Chloroform | | | Yes |
| 1,1,2-Trichloroethane | | | Yes |
| Arsenic | Yes | | Yes |
| Beryllium | Yes | | Yes |
| Cadmium | | | Yes |
| Chromium | | | Yes |
| Copper | Yes | | Yes |
| Nickel | | | Yes |
| Lead | | | Yes |
| Vanadium | Yes | | |
| Zinc | | Yes | Yes |
| Aluminum | Yes | Yes | Yes |
| Manganese | Yes | Yes | Yes |
| Iron | Yes | Yes | Yes |
| Ammonia | | | Yes |
| Nitrate/Nitrite | | | Yes |

major risks associated with OU2 are ingestion and dermal contact of contaminated soil and ingestion of groundwater. Sediment contamination poses a current and future unacceptable ecological risk. Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

## 6.1 HUMAN HEALTH RISK ASSESSMENT

### 6.1.1 CONTAMINANTS OF CONCERN

The chemicals measured in the various environmental media during the RI were evaluated for inclusion as chemicals of potential concern (COPCs) in the risk assessment by application of screening criteria. The criteria which resulted in elimination of chemicals included: inorganics whose maximum concentration did not exceed two times the average background concentration, inorganics that are essential nutrients or are normal components of human diets, inorganic and organic chemicals whose maximum concentration in soil or groundwater was lower than a risk-based concentration corresponding to an excess cancer risk of 1x10-6 or a hazard quotient level of 0.1, as specified by the EPA Region 3 Risk-Based Concentration Table, and inorganic or organic chemicals whose maximum detected concentrations in surface water was lower that the Ambient Water Quality Criteria. Table 6-1 lists the chemicals of potential concern for human health for the Site. These chemicals wre then further evaluated in the baseline risk assessment to determine the chemicals of concern (COCs) that would require remediation.

Data from the Remedial Investigation indicate that the transfer of contamination from subsurface soil to groundwater is not a concern. This conclusion is based on two factors. First, few contaminants detected in subsurface soil were detected in groundwater. Only two organic constituents, endrin and endrin ketone, were detected in both subsurface soil and groundwater. Second, a comparison of the highest concentrations of constituents found in subsurface soil with EPA's Soil Screening Levels for migration to groundwater indicates that additional investigation is not warranted. None of the compounds exceeds its corresponding soil screening level, indicating that the levels found are not a concern. Parathion has no soil screening level; however, it was not detected in any of the groundwater samples and its maximum detection is considerably less than the cleanup value for methyl parathion of 4,550 ug/kg established in the Record of Decision for Operable Unit 1 of the Site. This indicates that parathion is not likely to migrate to groundwater at levels of concern. Therefore, subsurface soil is not included in the remedial objectives specified in Section 6.3.

### 6.1.2 EXPOSURE ASSESSMENT

Whether a chemical is actually a concern to human health and the environment depends upon the likelihood of exposure, i.e. whether the exposure pathway is currently complete or could be complete in the future. A complete exposure pathway (a sequence of events leading to contact with a chemical) is defined by the following four elements:

- A source and mechanism of release from the source,
- A transport medium (e.g., surface water, groundwater, air) and mechanisms of migration through the medium,
- The presence or potential presence of a receptor at the exposure point, and
- A route of exposure (ingestion, inhalation, dermal adsorption).

If all four elements are present, the pathway is considered complete.

An evaluation was undertaken of all potential exposure pathways which could connect chemical sources at the Site with potential receptors. All possible pathways were first hypothesized and evaluated for completeness using EPA's criteria. The current pathways represent exposure pathways which could exist under current Site conditions while the future pathways represent exposure pathways which could exist, in the future, if the current exposure conditions change. Exposure by each of these pathways was mathematically modeled using generally conservative assumptions.

TABLE 6-2: SURFACE SOIL EXPOSURE POINT CONCENTRATIONS SUMMARY

| CHEMICAL OF POTENTIAL CONCERN | EXPOSURE POINT CONCENTRATION (MG/KG) | STATISTICAL MEASURE |
|---|---|---|
| DDT | 23 | Maximum |
| DDE | 2.5 | Maximum |
| DDD | 31 | 95% UCL |
| Endrin | 2.5 | 95% UCL |
| Toxaphene | 100 | Maximum |
| Gamma-chlordane | 1.9 | 95% UCL |
| Alpha-chlordane | 0.29 | 95% UCL |
| Endrin ketone | 0.9 | 95% UCL |
| Arsenic | 11 | 95% UCL |
| Beryllium | 0.16 | 95% UCL |
| Copper | 286 | 95% UCL |
| Vanadium | 38 | 95% UCL |
| Aluminum | 9,883 | 95% UCL |
| Manganese | 450 | 95% UCL |
| Iron | 13,862 | 95% UCL |

95% UCL - 95 per cent upper confidence limit on the arithmetic mean soil concentration
Maximum - Maximum concentration detected of a chemical. Used as a default in place of the 95% UCL, when the 95% UCL exceeds the maximum.

The current pathways are:

- potential ingestion of surface soils and drainage ditch and wetland sediments by visitors,
- potential ingestion of surface water by visitors,
- potential dermal exposure by visitors to surface soils and drainage ditch and wetland sediments,
- potential dermal exposure by visitors to surface water, and
- potential inhalation exposure by visitors to dust.

The future pathways are:

- potential dermal exposure by visitors or residents to surface soil and drainage ditch and wetland sediments,
- potential dermal exposure by residents or visitors to surface water,
- potential ingestion of surface soil by visitors or residents,
- potential ingestion of surface water by visitors or residents,
- potential inhalation exposure by residents to dust, and
- potential ingestion of groundwater from a future drinking water well or inhalation of VOCs released from the groundwater.

TABLE 6-3: SURFACE WATER EXPOSURE POINT CONCENTRATION SUMMARY

| CHEMICAL OF POTENTIAL CONCERN | EXPOSURE POINT CONCENTRATION (UG/L) | STATISTICAL MEASURE |
|---|---|---|
| Gamma-BHC (Lindane) | 0.03 | 95% UCL |
| Toxaphene | 4.8 | 95% UCL |
| Atrazine | 0.8 | 95% UCL |
| Zinc | 365 | 95% UCL |
| Aluminum | 9,500 | Maximum |
| Manganese | 279 | 95% UCL |
| Iron | 12,000 | Maximum |

95% UCL - 95 per cent upper confidence limit on the arithmetic mean soil concentration
Maximum - Maximum concentration detected of a chemical. Used as a default in place of the 95% UCL, when the 95% UCL exceeds the maximum.

The exposure point concentrations for each of the chemicals of concern and the exposure assumptions for each pathway were used to estimate the chronic daily intakes for the potentially complete pathways. The chronic daily intakes were then used in conjunction with cancer potency factors and noncarcinogenic reference doses to evaluate risk. Exposure-point concentrations for contaminants in surface soil, surface water, and groundwater are provided in Tables 6-2, 6-3, and 6-4.

The major assumptions about exposure frequency and duration that were included in the exposure assessment were:

| TABLE 6-4: GROUNDWATER EXPOSURE POINT CONCENTRATION SUMMARY | | |
|---|---|---|
| CHEMICAL OF POTENTIAL CONCERN | EXPOSURE POINT CONCENTRATION (UG/L) | STATISTICAL MEASURE |
| Alpha-BHC | 0.042 | Mean |
| Gamma-BHC (Lindane) | 0.09 | Mean |
| Endrin | 0.7 | Mean |
| Endrin ketone | 1.1 | Mean |
| Atrazine | 0.2 | Mean |
| Dinoseb | 572 | Mean |
| Chloroform | 2 | Mean |
| 1,1,2-Trichloroethane | 1 | Mean |
| Arsenic | 9 | Mean |
| Beryllium | 4 | Mean |
| Cadmium | 3 | Mean |
| Chromium | 46 | Mean |
| Copper | 335 | Mean |
| Nickel | 143 | Mean |
| Lead | 22 | Mean |
| Zinc | 553 | Mean |
| Aluminum | 163,409 | Mean |
| Manganese | 1,822 | Mean |
| Iron | 6,207 | Mean |
| Ammonia | 73,192 | Mean |
| Nitrate/Nitrite | 17,688 | Mean |

Mean - Mean concentration, using one-half the sample quantitation limit for non-detects.

| TABLE 6-5: CANCER SLOPE FACTORS FOR CHEMICALS OF POTENTIAL CONCERN | | | |
|---|---|---|---|
| CHEMICAL | CSF(oral) | CSF(dermal) | CSF(inhalation) |
| Alpha-BHC | 6.3E+00 | 1E+01 | 6.3E+00 |
| Gamma-BHC (Lindane) | 1.3E+00 | 3E+00 | NA |
| DDT | 3.4E-01 | 7E-01 | 3.4E-01 |
| DDE | 3.4E-01 | 7E-01 | NA |
| DDD | 2.4E-01 | 5E-01 | NA |
| Toxaphene | 1.1E+00 | 2E+00 | 1.1E+00 |
| Gamma-chlordane | 1.3E+00 | 3E+00 | 1.3E+00 |
| Alpha-chlordane | 1.3E+00 | 3E+00 | 1.3E+00 |
| Atrazine | 2.2E-01 | 4E-01 | NA |
| Chloroform | 6.1E-03 | 8E-03 | 8.1E-02 |
| 1,1,2-Trichloroethane | 5.7E-02 | 7E-02 | 5.6E-02 |
| Arsenic | 1.5E+00 | 8E+00 | 1.5E+01 |
| Beryllium | 4.3E+00 | 2E+01 | 8.4E+00 |
| Cadmium | NA | NA | 6.3E+00 |
| Chromium VI | NA | NA | 4.2E+01 |
| Lead* | NA | NA | NA |

Table only includes COPCs for which cancer slope factors are available.
* Lead is considered a probable human carcinogen; however, no data on cancer slope factors are available.
NA - Not applicable (no data)
CSF - Cancer slope factor $(mg/kg/day)^{-1}$

1) Future onsite residents were assumed to have an exposure frequency of 350 days per year for 30 years. A site visitor who would enter the Site is assumed to have an exposure frequency to soil and dust of 80 days per year for 10 years. The juvenile visitor is assumed to visit the wetland and creek area 12 times per year for 10 years.

2) Soil ingestion rates for future onsite residents include a rate of 200 mg/day for children and 100 mg/day for adults. The soil ingestion rate for current use is 100 mg/visit for the site

visitor. The surface water ingestion rate is 10 ml/hour for 4 hours/visit for a visitor wading in the wetland and creek area for a total rate of 40 ml/visit.

3) Dermal contact exposure parameters for surface water for a visitor assume contact 4 times/month for 3 months/year or 12 visits/year for 10 years.

4) In all scenarios a standard body weight of 70 kg for adults, 15 kg for children, and 45 kg for juveniles was used.

### 6.1.3 TOXICITY ASSESSMENT

Toxicity assessment is a two-step process whereby the potential hazards associated with route-specific exposure to a given chemical are (1) identified by reviewing relevant human and animal studies; and (2) quantified through analysis of dose-response relationships. EPA has conducted numerous toxicity assessments that have undergone extensive review within the scientific community. EPA toxicity assessments and the resultant toxicity values were used in the baseline risk assessment to determine both carcinogenic and non-carcinogenic risks associated with each chemical of concern and route of exposure. EPA toxicity values that are used in this assessment include:

- cancer slope factors (CSFs) for carcinogenic effects, and
- reference dose values (RfDs) for non-carcinogenic effects.

Cancer slope factors are route-specific values derived only for compounds that have been shown to cause an increased incidence of tumors in either human or animal studies. The slope factor is an upper bound estimate of the probability of a response per unit intake of a chemical over a lifetime and is determined by low-dose extrapolation from human or animal studies. When an animal study is used, the final slope factor has been adjusted to account for extrapolation of animal data to humans. If the studies used to derive the slope factor were conducted for less than the life span of the test organism, the final slope factor has been adjusted to reflect risk associated with lifetime exposure. Table 6-5 presents cancer slope factors for the chemicals of potential concern (COPCs).

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. Reference doses are ideally based on studies where either animal or human populations were exposed to a given compound by a given route of exposure for the major portion of the life span (referred to as a chronic study). The RfD is derived by determining dose-specific effect levels from all the available quantitative studies, and applying uncertainty factors to the most appropriate effect level to determine a RfD for humans. The RfD represents a threshold for toxicity. RfDs are derived such that human lifetime exposure to a given chemical via a given route at a dose at or below the RfD should not result in adverse health effects, even for the most sensitive members of the population. Table 6-6 presents reference doses for the chemicals of potential concern.

| TABLE 6-6: REFERENCE DOSES FOR CHEMICALS OF POTENTIAL CONCERN | | | |
|---|---|---|---|
| CHEMICAL | RfD (oral) | RfD(dermal) | RfD(inhalation) |
| Gamma-BHC (Lindane) | 3E-04 | 2E-04 | NA |
| DDT | 5E-04 | 3E-04 | NA |
| Endrin | 3E-04 | 2E-04 | NA |
| Gamma-chlordane | 6E-05 | 3E-05 | 2E-04 |
| Alpha-chlordane | 6E-05 | 3E-05 | 2E-04 |
| Endrin ketone | 3E-04 | 2E-04 | NA |
| Atrazine | 3.5E-02 | 2E-02 | NA |
| Dinoseb | 1E-03 | 5E-04 | NA |
| Chloroform | 1E-02 | 8E-03 | NA |
| 1,1,2-Trichloroethane | 4E-03 | 3E-03 | NA |
| Arsenic | 3E-04 | 6E-05 | NA |
| Beryllium | 5E-03 | 1E-03 | 6E-06 |
| Cadmium | 5E-04 | 1E-04 | NA |
| Chromium VI | 5E-03 | 1E-03 | 3E-05 |
| Copper | 4E-02 | 4E-03 | NA |
| Nickel | 2E-02 | 4E-03 | NA |
| Lead* | NA | NA | NA |
| Vanadium | 7E-03 | 1E-03 | NA |
| Zinc | 3E-01 | 6E-02 | NA |
| Aluminum | 1E+00 | 2E-01 | NA |
| Manganese | 2.3E-02 | 5E-03 | 1.43E-05 |
| Iron | 3E-01 | 6E-02 | NA |
| Nitrate/Nitrite | 1E-01 | 2E-02 | NA |

Table only includes COPCs for which reference doses are available.
* Lead produces non-cancer effects; however, no data on reference doses are available.
NA - Not applicable (no data)
RfD - Reference Dose (mg/kg/day)

### 6.1.4 RISK CHARACTERIZATION

Human health risks are characterized for potential carcinogenic and non-carcinogenic effects by combining exposure and toxicity information. For carcinogens, risks area generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

where: risk = a unitless probability (e.g., $2 \times 10^{-5}$) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that are generally expressed in scientific notation (e.g., $1 \times 10^{-6}$). An excess lifetime cancer risk of $1 \times 10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is $10^{-4}$ to $10^{-6}$.

EPA considers individual excess cancer risks in the range of $10^{-4}$ to $10^{-6}$ as protective; however the $1 \times 10^{-6}$ risk level is generally used as the point of departure for setting cleanup levels at Superfund sites. The point of departure risk level of $1 \times 10^{-6}$ expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). A HQ which exceeds one (1) indicates that the daily intake from a scenario exceeds the chemical's reference dose. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium

or across media. An HI which exceeds unity indicates that there may be a concern for potential health effects resulting from the cumulative exposure to multiple contaminants within a single medium or across media.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

CDI = Chronic daily intake
RfD = Reference dose

CDI and RfD are expressed in the same units and represent the same exposure period ( i.e., chronic, subchronic, or short-term).

Throughout the risk assessment process, uncertainties associated with evaluation of chemical toxicity and potential exposures arise. For example uncertainties arise in derivation of toxicity values for reference doses (RfDs) and carcinogenic slope factors (CSFs), estimation of exposure point concentrations, fate and transport modeling, exposure assumptions and ecological toxicity data. Because of the conservative nature of the risk assessment process, risk estimated in this assessment are likely to be overestimates of the true risk associated with potential exposure at OU #2 of the Marzone Site. The estimated human health risks for OU #2 are shown in Tables 6-7 through 6-13.

Neither a cancer slope factor nor reference dose value is available for lead. Instead, blood lead concentrations have been accepted as the best measure of exposure. EPA has developed an integrated exposure uptake biokinetic model to assess chronic exposures of children to lead. This model was used to evaluate exposures of future child residents to lead. EPA uses a blood lead level of 10 ug/dl as the benchmark to evaluate lead exposure. The projected blood lead levels for this site are below 10 ug/dl for all age groups.

## 6.2 ECOLOGICAL RISK

### 6.2.1 ECOLOGICAL SETTING

The Marzone Site is located in a rural area with a combination of light industrial/agriculture and residential land use. The ecological setting of the Site consists of areas of open fields, scrub/shrub, drainage, wetlands, and woodlands, with an intermittent stream named Gum Creek. The various habitats are large and diverse enough, including the riparian corridor, to support a variety of small wildlife species.

The open fields are located on the northern portion of OU2 of the Site. These grassy areas are kept mowed or bush-hogged for maintenance. The area surrounding the former facility is considered a highly disturbed ruderal area dominated by opportunistic grasses and forbes. North of this highly disturbed area, the habitat consists of ruderal grasslands.

Scrub/shrub habitats are located west of the highly disturbed grassy area and in the central portion of OU2 of the Site south of the railroad spur. These habitats are relatively small in size and consist of shrub and sapling layers. Both areas appear to have been previously disturbed either by mowing, dumping of agriculture remnants (e.g., peanuts), or possibly due to previous contamination (south of the railroad spur). Vegetative stresses are evident in a 1979 aerial photograph that includes this disturbed area south of the railroad spur. The vegetation in this photograph is dead. The area appears to have recovered somewhat, however, evidence of chlorotic conditions are still present.

Gum Creek flows southeast approximately 5 miles where it joins the New River. Gum Creek is an intermittent stream where it flows through the site. Approximately 1.5 miles downstream, several

| TABLE 6-7: RISK CHARACTERIZATION SUMMARY - CARCINOGENS - CURRENT USE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Scenario Timeframe: Current<br>Receptor Population: Visitor<br>Receptor Age: Juvenile | | | | | | | |
| Media | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | Exposure Route Total |
| Soil | Soil | Soil On-Site, Direct Contact | DDT | 5x10-7 | N/A | 6x10-7 | 1.1x10-6 |
| | Soil | Soil On-Site, Direct Contact | DDD | 5x10-7 | N/A | 6x10-7 | 1.1x10-6 |
| | Soil | Soil On-Site, Direct Contact | Toxaphene | 8x10-6 | N/A | 9x10-6 | 1.7x10-5 |
| | Soil | Soil On-Site, Direct Contact | Arsenic | 1x10-6 | N/A | 3x10-7 | 1.3x10-6 |
| Soil Risk Total | | | | | | | 2x10-5 |
| Surface Water | Surface Water | Direct Contact | Toxaphene | 2x10-8 | | 3x10-7 | 3x10-7 |
| Surface Water Risk Total | | | | | | | 3x10-7 |
| Total Risk | | | | | | | 2x10-5 |

| TABLE 6-8: RISK CHARACTERIZATION SUMMARY - NON-CARCINOGENS - CURRENT USE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Scenario Timeframe: Current<br>Receptor Population: Visitor<br>Receptor Age: Child | | | | | | | |
| Media | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | Exposure Route Total |
| Soil | Soil | Soil On-Site, Direct Contact | DDT | 0.02 | N/A | 0.03 | 0.05 |
| | Soil | Soil On-Site, Direct Contact | Gamma-chlordane | 0.02 | N/A | 0.02 | 0.05 |
| | Soil | Soil On-Site, Direct Contact | Arsenic | 0.02 | N/A | 0.005 | 0.025 |
| | Soil | Soil On-Site, Direct Contact | Iron | 0.02 | N/A | 0.01 | 0.03 |
| | Soil | Soil On-Site, Direct Contact | All other COCs | 0.028 | N/A | 0.021 | 0.049 |
| Soil Risk Total | | | | | | | 0.2 |
| Total Risk | | | | | | | 0.2 |

| TABLE 6-9: RISK CHARACTERIZATION SUMMARY - CARCINOGENS - FUTURE USE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Scenario Timeframe: Future<br>Receptor Population: Resident<br>Receptor Age: Child | | | | | | | |
| Media | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | Exposure Route Total |
| Soil | Soil | Soil On-Site, Direct Contact | DDT | 9x10-6 | N/A | 2x10-6 | 1.1x10-5 |
| | Soil | Soil On-Site, Direct Contact | DDD | 8x10-6 | N/A | 2x10-6 | 1x10-5 |
| | Soil | Soil On-Site, Direct Contact | Toxaphene | 1x10-4 | N/A | 3x10-5 | 1.3x10-4 |
| | Soil | Soil On-Site, Direct Contact | Arsenic | 2x10-5 | N/A | 5x10-8 | 2x10-5 |
| Soil Risk Total | | | | | | | 1.7x10-4 |
| Ground Water | Ground Water | Ingestion | Alpha-BHC | 1x10-6 | N/A | N/A | 1x10-6 |
| | | | Arsenic | 8x10-5 | N/A | N/A | 8x10-5 |
| | | | Beryllium | 9x10-5 | N/A | N/A | 9x10-5 |
| Groundwater Risk Total | | | | | | | 1.7x10-4 |
| Total Risk | | | | | | | 3.4x10-4 |

| TABLE 6-10: RISK CHARACTERIZATION SUMMARY - NON-CARCINOGENS - FUTURE USE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Scenario Timeframe: Future<br>Receptor Population: Resident<br>Receptor Age: Child | | | | | | | |
| Media | Exposure Medium | Exposure Point | Chemical of Potential Concern | Ingestion | Inhalation | Dermal | Exposure Route Total |
| Soil | Soil | Soil On-Site, Direct Contact | DDT | 0.6 | N/A | 0.2 | 0.8 |
| | Soil | Soil On-Site, Direct Contact | Gamma-chlordane | 0.4 | N/A | 0.1 | 0.5 |
| | Soil | Soil On-Site, Direct Contact | Arsenic | 0.5 | N/A | 0.03 | 0.53 |
| | Soil | Soil On-Site, Direct Contact | Iron | 0.6 | N/A | 0.04 | 0.64 |
| | Soil | Soil On-Site, Direct Contact | All other COCs | 0.9 | N/A | 0.03 | 0.93 |
| Soil Risk Total | | | | | | | 3.4 |
| Ground Water | Ground Water | Ingestion | Dinoseb | 37 | N/A | N/A | 37 |
| | Ground Water | Ingestion | Aluminum | 10 | N/A | N/A | 10 |
| | Ground Water | Ingestion | Manganese | 5 | N/A | N/A | 5 |
| | Ground Water | Ingestion | Nitrate/ Nitrite | 11 | N/A | N/A | 11 |
| | Ground Water | Ingestion | All other COCs | 6 | N/A | N/A | 6 |
| Groundwater Risk Total | | | | | | | 69 |
| Total Risk | | | | | | | 73 |

| TABLE 6-11: SUMMARY OF CANCER AND NON-CANCER RISKS BY EXPOSURE ROUTE - CURRENT USE SCENARIO | | |
|---|---|---|
| Exposure Route | Site Visitor | |
| | Cancer | HI |
| Inadvertent Ingestion of Soil | 1E-05 | 0.1 |
| Dermal Contact with Soil | 1E-05 | 0.1 |
| Inhalation of Dust | 3E-09 | 0.002 |
| Inadvertent Ingestion Surface Water | 2E-08 | 0.002 |
| Dermal Contact Surface Water | 3E-07 | 0.005 |
| **TOTAL RISK** | **2E-05** | **0.2** |

| TABLE 6-12: SUMMARY OF CANCER RISKS BY EXPOSURE ROUTE - FUTURE USE SCENARIO | | | | |
|---|---|---|---|---|
| Exposure Route | Site Visitor | Child Resident | Adult Resident | Lifetime Resident |
| Inadvertent Ingestion of Soil | 1E-05 | 2E-04 | 7E-05 | 2E-04 |
| Dermal Contact with Soil | 1E-05 | 4E-05 | 7E-05 | 1E-04 |
| Inhalation of Dust | 3E-09 | 2E-08 | 2E-08 | 3E-08 |
| Inadvertent Ingestion of Surface Water | 2E-08 | NA | NA | NA |
| Dermal Contact with Surface Water | 3E-07 | NA | NA | NA |
| Ingestion of Groundwater | NA | 2E-04 | 3E-04 | 5E-04 |
| Inhalation of VOCs while Showering | NA | NA | 2E-06 | 2E-06 |
| **TOTAL RISK** | **2E-05** | **4E-04** | **4E-04** | **8E-04** |

| TABLE 6-13: SUMMARY OF NON-CANCER RISKS BY EXPOSURE ROUTE - FUTURE USE SCENARIO | | | | |
|---|---|---|---|---|
| Exposure Route | Site Visitor | Child Resident | Adult Resident | Lifetime Resident |
| Inadvertent Ingestion of Soil | 0.1 | 3 | 0.3 | 0.8 |
| Dermal Contact with Soil | 0.1 | 0.4 | 0.2 | 0.2 |
| Inhalation of Dust | 0.002 | 0.02 | 0.005 | 0.01 |
| Inadvertent Ingestion of Surface Water | 0.002 | NA | NA | NA |
| Dermal Contact with Surface Water | 0.005 | NA | NA | NA |
| Ingestion of Groundwater | NA | 69 | 25 | 32 |
| **TOTAL RISK** | **0.2** | **73** | **25** | **33** |

tributaries flow into the creek forming a perennial stream. During periods of heavy rainfall, the stream within the site consists of a series of flowing pools and small riffle areas. The banks of the stream overflow creating a marshy area. The stream flows through a wooded area consisting of little to no ground cover or understory. The overstory consists of a 90 to 100% canopy cover. This canopy is consistent along the stream as it flows south of the site.

The wetlands at OU2 of the site are classified as palustrine emergent, palustrine scrub/shrub, and palustrine forested. These wetlands are located on the southern portion of OU2, most being south of the railroad spur. Emergent and scrub/shrub wetlands are located along the railroad spur and in one central area south of the spur. The forested wetlands are located along the flood plain edges of Gum Creek. Hydrophytic vegetation and evidence of hydric conditions are evident (buttressed trunks, hypertrophied lenticils, shallow root systems, etc.).

### 6.2.2 EXPOSURE ASSESSMENT

A complete exposure pathway must exist for a receptor species to be exposed to a contaminant of concern (COC). The exposure pathway consists of the following elements: a source and mechanism of COC release to the environment, an environmental transport medium for the released COC, a point of contact with the contaminated medium, and a route of entry of the COC into the receptor at the exposure point. An examination of sources, releases, fate and transport mechanisms, exposure points, and exposure routes is conducted in order to determine the complete exposure pathways that exist at this site. If any of these elements are missing, the pathway is incomplete and is not considered further.

An evaluation was undertaken of all potential exposure pathways which could connect chemical sources at the Site with potential receptors. All possible pathways were first hypothesized and evaluated for completeness using EPA's criteria. The following exposure pathways were developed:

- Potential ingestion, dermal contact, or plant uptake of soil contaminants by terrestrial receptors,
- Potential ingestion of contaminated surface water by terrestrial receptors,
- Potential dermal exposure to contaminated surface water by aquatic, semi-aquatic, or terrestrial receptors,
- Potential ingestion of or dermal exposure to contaminated sediments by aquatic, semi-aquatic, or terrestrial receptors,
- Potential plant uptake of sediment contaminants by aquatic or semi-aquatic receptors, and
- Potential inhalation of contaminants in fugitive dust by terrestrial receptors.

Determining potential exposure routes is key to evaluating the toxic mechanisms associated with the COCs. Chemical contact can occur through dermal absorption, inhalation, ingestion, and biotransfer. This evaluation emphasizes the most likely routes of exposure by surfaces soil, surface water, and sediments. The primary pathways proposed for ecological receptors are related to the drainage ditch, wetland, Gum Creek, and the surface soils.

### 6.2.3 THREATENED AND ENDANGERED SPECIES REVIEW

A threatened and endangered and rare (T&E) species review and survey were conducted for OU2 of the Site. Prior to initiation of the T&E field survey, a list of T&E species potentially present in Tift County was obtained from the Georgia Department of Natural Resources (GA DNR), Wildlife Resource Division. According to a database search conducted by the GA DNR, there are no known occurrences of T&E species with the potential to occur on within 3 miles of the site. However, based on habitat present at the site, a list of T&E species with the potential to occur at the site was developed. A field survey was conducted to identify the presence of these species. No T&E species were observed during the survey.

### 6.2.4 TOXICITY ASSESSMENT

An ecological risk assessment was conducted for OU2 of the Site by the EPA Environmental Response Team (ERT). The contaminants of potential concern (COPC) were identified using results from the Remedial Investigation (RI) Report and the ERT sampling event. The primary organic COPC identified in the RI were chlordane, DDT, DDE, DDD, and toxaphene. These same compounds were the most frequently detected chemicals in site specific tissue samples, soil, sediment, and water samples, and were also detected in earthworm tissue from toxicity tests from the ERT sampling event. The pesticide data from the ERT sampling event were screened using a risk

characterization process that relates exposure concentrations to concentrations that potentially cause adverse effects (benchmark values). The exposure concentrations were the highest concentration detected for each contaminant in the surface water, surface sediment and surface soil samples collected on site.. The benchmark values are based on the lowest concentration considered to be protective of the most sensitive organism in a medium, and were derived from peer reviewed literature and the EPA criteria.

A hazard quotient (HQ) for each COPC is calculated by comparing the exposure concentration to the benchmark value. An elevated hazard quotient (greater than one) signifies that exposure to the contaminant may present a risk. Additional data and analysis is necessary to determine if risk actually exists, as conservative assumptions were used throughout the screening-level risk assessment. Compounds with HQs of less than one were eliminated from further consideration as a contaminant of concern (COC). Contaminants for which maximum concentrations of compounds exceeded benchmarks for water, sediment, and soil are presented in Table 6-7.

Contaminants that were above the benchmark, but detected infrequently, (such as heptachlor epoxide) were analyzed further. Statistical analysis showed that these contaminants were strongly collocated with contaminants which were detected more frequently. Additionally, the mechanisms of toxicity for the chlorinated pesticides at the Site are similar, so that the potential effects to biota would be comparable for most compounds. Based on these factors, the ecological risk assessment for organics focused on chlordane, DDT, DDD, DDE, and toxaphene.

Inorganic contaminants were also analyzed in the RI and the ERT study. Several metals (aluminum, arsenic, cadmium, chromium, copper, iron, lead, magnesium, manganese, and zinc) were significantly elevated. While other metals were detected at the site and still may pose potential risk to biota, they are typically collocated with the commonly occurring metals.

The organic contaminants were evaluated using four methods: 1) a food chain model, 2) a comparison between contaminant concentrations measured in surface water and literature-based values on toxicity of water concentrations to amphibians; 3) the use of soil and water toxicity tests; and 4) analysis of receptor body tissue. The method used was dependent upon the specific toxicity mechanism of the COC. Iron was not evaluated in the food chain model because it is considered to be a direct-acting acute toxicant and does not biomagnify.

Body tissue from earthworms, crayfish, mosquitoes, frogs and small mammals were analyzed to provide direct measurements of body burdens. The results from these analyses were used in food chain models to determine the acute and sub-lethal toxicity of site contaminants to birds and mammals. Soil and water toxicity tests were performed using earthworms and aquatic invertebrates.

| TABLE 6-14: ECOLOGICAL EXPOSURE PATHWAYS OF CONCERN | | | | |
|---|---|---|---|---|
| EXPOSURE MEDIUM | RECEPTOR | EXPOSURE ROUTES | ASSESSMENT ENDPOINT | MEASUREMENT ENDPOINT |
| Wetland (Surface water and sediment) | Aquatic invertebrates | Direct contact with water and sediment; ingestion of sediment | Structure and function of wetland community and aquatic invertebrate community | Toxicity of water and sediment to *Hyallela* and *Ceriodaphnia* and crayfish tissue analysis |
| Wetland (Surface water and sediment) | Amphibians | Direct contact with water and sediment; ingestion of sediment and water | Structure and function of wetland community and amphibian community | Green tree frog and green frog tissue concentration; comparison of water data with LOECS |
| Soil | Terrestrial invertebrates | Direct contact with soil | Structure and function of upland soil communities | Earthworm toxicity test |
| Soil and water | Worm-eating, insect-eating and carnivorous birds | Ingestion of terrestrial invertebrates, insects, or vertebrates; ingestion of aquatic vertebrates; ingestion of water or soil | Acute and sub-lethal toxicity to worm-eating, insect-eating and carnivorous birds | Analysis of insect , earthworm, small mammal and frog tissue and use of analytical results in food chain model |
| Soil and water | Carnivorous and omnivorous mammals | Ingestion of terrestrial vertebrates or aquatic vertebrates and invertebrates; Ingestion of soil or water | Acute and sub-lethal toxicity to carnivorous and omnivorous mammals | Analysis of small mammal, crayfish, and frog tissue and use of analytical results in food chain model |

| TABLE 6-15: ECOLOGICAL ORGANIC CONTAMINANTS OF CONCERN | | | | |
|---|---|---|---|---|
| CHEMICAL | MEDIA/UNITS | MAXIMUM CONCENTRATION | BENCHMARK | HAZARD QUOTIENT |
| DDD | Water - ug/L | 0.05 | 0.0064[1] | 7.8 |
| Gamma-BHC | Water - ug/L | 0.2 | 0.08[1] | 2.5 |
| DDD | Soil - ug/kg | 5,800 | 500[2] | 11.60 |
| DDE | Soil - ug/kg | 1,500 | 500[2] | 3.00 |
| DDT | Soil - ug/kg | 8,744 | 500[2] | 17.49 |
| Dieldrin | Soil - ug/kg | 720 | 500[2] | 1.44 |
| Endrin | Soil - ug/kg | 650 | 500[2] | 1.30 |
| Endrin ketone | Soil - ug/kg | 680 | 500[2] | 1.36 |
| Toxaphene | Soil - ug/kg | 21,000 | 500[2] | 42.00 |
| DDD | Sediment - ug/kg | 5,600 | 3.3[1] | 1696.97 |
| DDE | Sediment - ug/kg | 1,200 | 3.3[1] | 363.64 |
| Alpha-chlordane | Sediment - ug/kg | 1,100 | 1.7[1] | 647.06 |
| Heptachlor epoxide | Sediment - ug/kg | 190 | 5[3] | 38.00 |

[1] Region 4 Waste Management Division Screening Values for Hazardous Waste Sites
[2] Dutch Soil Cleanup (Interim) Act, criteria for moderate soil contamination that requires further study
[3] Persuad et al. 1992 (LEL)

### 6.2.5 RISK ASSESSMENT

The ERT study made the following conclusions regarding ecological risk at the Marzone OU2 Site.

- Based on the results of the RI toxicity tests, the pesticide and metals present in crayfish tissue, and the potential risk to amphibians posed by DDT and some metals, there appears to be a potential threat to the overall functioning of the wetland community as well as individual receptors.

- Based on the presence of pesticides and metals in earthworm tissue and the mortality results from earthworm toxicity tests, there is potential risk to soil communities.

- The results of the hazard quotient calculations for worm-eating birds (using American Robin as a measurement endpoint) suggest that there is a potential risk associated with pesticides and aluminum, cadmium, chromium, copper, lead and zinc at the Marzone OU2 Site.

- The results of the hazard quotient calculations for insectivorous birds (using Red Winged Blackbird as a measurement endpoint) suggest that there is no potential risk associated with pesticides at the Marzone OU2 Site. The risk associated with metals to insectivorous birds could not be assessed.

- The results of the hazard quotient calculations for carnivorous birds (using Red-Tailed Hawk and Green Heron as a measurement endpoints) suggest that there is potential risk associated with pesticides and metals at the Marzone OU2 Site.

- The results of the hazard quotient calculations for carnivorous mammals (using Red Fox as a measurement endpoint) suggest that there is no potential risk associated with pesticides, but there is risk from aluminum at the Marzone OU2 Site.

- The results of the hazard quotient calculations for omnivorous mammals (using Raccoon as a measurement endpoint) suggest that there is no potential risk associated with pesticides, but there is risk from aluminum and manganese at the Marzone OU2 Site.

- The following contaminants were retained as ecological COCs: chlordane, DDT, DDE, DDD, toxaphene, aluminum, arsenic, cadmium, chromium, copper, iron, lead, magnesium, manganese, and zinc.

## 6.3 REMEDIATION OBJECTIVES

The remedial action objectives for Marzone OU2 are:

1) containment or treatment of all contaminated surface soils above health-based or ecological action levels,

2) containment or treatment of contaminated sediment above ecological action levels, and

3) restoration of groundwater to drinking water levels.

The cleanup of surface soil and groundwater to residential use or drinking water action levels is based on the anticipated use of the Marzone OU2 site as residential property. Although the site has been used as commercial/industrial property in the past, residential neighborhoods are located near the Site. The selected response action will address current human health risks to on-site visitors and ecological risks and will address future human health risks to residents, by removing or treating

contaminated soil and sediment and by treating or containing contaminated groundwater. Subsurface soil is not included in the remedial objectives for the reasons specified in Section 6.1.1.

| TABLE 6-16: SUMMARY OF SOIL AND SEDIMENT REMEDIATION PERFORMANCE STANDARDS FOR CONTAMINANTS OF CONCERN | | |
|---|---|---|
| COMPOUND | MEDIUM | |
| | SURFACE SOIL (MG/KG) | SEDIMENT (MG/KG)** |
| DDT | 1.0* | 5.0 |
| DDE | 1.0* | 5.0 |
| DDD | 2.0* | 5.0 |
| Toxaphene | 0.4* | 3.0 |
| alpha - chlordane | 0.1** | 0.1 |
| gamma-chlordane | 0.1** | 0.1 |
| Copper | 20** | 20 |
| Lead | 330** | 330 |
| Zinc | 100** | 100 |

* Surface soil performance standards based on protection of future residents at a $10^{-6}$ calculated cancer risk level for direct contact

** Surface soil or sediment performance standards based on ecological risk; surface soil standards also protective of future residents at a $10^{-6}$ calculated cancer risk level for direct contact and a Hazard Index of less than 1.0 for non-carcinogens

The establishment of health-based cleanup goals serves as an important means of guiding remedial activities. A health-based approach is warranted when cleanup standards promulgated by state or federal agencies are not available for contaminants in soil, as well as for certain groundwater contaminants. The approach to developing health-based goals is derived from the risk assessment process. The risk assessment is essentially a process by which the magnitude of potential cancer risks and other health effects at a site can be evaluated quantitatively. A cleanup goal is established by back-calculating a health protective contaminant concentration, given a target cancer risk or hazard index which is deemed acceptable and realistic. The concept of the cleanup goal inherently incorporates the concept of exposure reduction which allows remedial alternatives to be flexible.

The soils at the Marzone OU2 site currently contain concentrations of Site-related contaminants at levels which would pose an unacceptable risk (cumulative risk in excess of $10^{-6}$ for cancer risks and/or hazard indices in excess of 1 for non-cancer risks) to human health for future on-site residents exposed to the soil and groundwater and for ecological receptors exposed to soil, sediments, and

surface water. Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

| TABLE 6-17: SUMMARY OF GROUNDWATER REMEDIATION PERFORMANCE STANDARDS FOR CONTAMINANTS OF CONCERN | |
|---|---|
| COMPOUND | PERFORMANCE STANDARD (UG/L) |
| Aluminum | 28,702* |
| Beryllium | 4** |
| Cadmium | 5** |
| Manganese | 660* |
| Nickel | 100** |
| Lead | 15 *** |
| Iron | 8,611 * |
| Nitrate/Nitrite | 1,000 (MCL for nitrite) |
| alpha - BHC | 0.03 *** |
| gamma- BHC | 0.2 ** |
| Endrin | 2 ** |
| Dinoseb | 7 ** |

* Calculated value for Hazard Quotient = 1
** EPA Maximum Contaminant Level
*** EPA Action Level

The cleanup levels for contaminants of concern for OU2 of the Site are contained in Tables 6-15 and 6-16. The soil cleanup levels have been generated to ensure treatment of contaminated soil which exceeds the health-based cleanup levels established at the $10^{-6}$ risk level for carcinogenic contaminants and a hazard quotient level of 1 for non-carcinogenic contaminants or exceeds ecological action levels. The cleanup levels will be applied at the Site to ensure that future on-site residents will not be exposed to unacceptable concentrations of site-related chemicals and that groundwater and the ecological community will be protected.

## 7.0 DESCRIPTION OF ALTERNATIVES

Two alternatives for the remediation of contaminated soil and sediment at OU#2 of the Marzone site were evaluated in depth in the Feasibility Study Report and listed in the Proposed Plan for the Site, along with the No Action alternative. Two alternatives for the remediation of contaminated groundwater also were evaluated in depth, along with the No Action alternative. These alternatives are complete and address the remediation of all the media. Tables 7-1 and 7-2 summarize the alternatives and their costs. For the soil and sediment alternatives, sub-alternative A includes complete excavation of surface soils, drainage ditch sediments, and wetland sediments which exceed performance standards. Sub-alternative B is a modification which includes complete excavation of surface soils and

*drainage ditch sediments.* In addition, wetland sediments which exceed performance standards in the non-wooded portion(s) of the wetland area (i.e., "hot-spot" areas) will also be removed. For the wetlands, EPA initially only considered excavation of all areas which exceeded performance standards (sub-alternative A). However, after consideration of the adverse impacts of remediation in the wooded areas of the wetlands, EPA added sub-alternative B to allow excavation of the "hot-spot" areas while preserving the wooded wetland areas.

The site-specific alternatives analyzed in the Feasibility Study represented a range of distinct waste-management strategies addressing the human health and environmental concerns. Eight remedial technologies for containment or treatment of soil or groundwater were analyzed. Two technologies for soil and sediment and two technologies for groundwater were retained as the most effective for this site. Although the selected remedial alternative will be further refined as necessary during the predesign phase, the analysis presented below reflects the fundamental components of the various alternatives considered feasible for this Site.

## 7.1 SOIL AND SEDIMENT ALTERNATIVES

Table 7-1: Operable Unit #2 Soil Alternatives

| Alternative Number | Remedial Action | Present Worth |
|---|---|---|
| 1 | No Action | $0 |
| 2 A/B | Excavation & Onsite Treatment with Solidification/Stabilization; Onsite Disposal | A - $2,952,850<br>B - $1,431,560 |
| 3 A/B | Excavation & Offsite Disposal | A - $2,988,840<br>B - $1,596,900 |

### 7.1.1 ALTERNATIVE NO. 1 - NO FURTHER ACTION

The no action alternative is carried through the screening process as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This alternative is used as a baseline for comparison with other alternatives that are developed. Under this alternative, EPA would take no further action to minimize the impact soil contamination has on the area. Soil contamination would remain and possibly migrate due to surface runoff. There is no cost for this alternative.

### 7.1.2 ALTERNATIVE NO. 2 A/B - EXCAVATION AND SOLIDIFICATION/ STABILIZATION WITH ONSITE DISPOSAL

This alternative involves excavating contaminated surface soil and sediments necessary to meet the performance standards. Onsite treatment would be solidification/stabilization which uses cement or other pozzolanic material to bind the contaminants to the soil. The treated

soil would be backfilled onsite and covered with a layer of vegetated topsoil. The final treatment system would depend on the outcome of treatability testing and would be determined during the remedial design phase. Treated soil would be subject to the Toxicity Characteristic Leaching Procedure (TCLP) and other tests to determine if treatment was effective. If the soil mixture failed the tests, it would be retreated until the test was passed. Excavation and treatment of contaminated soils and sediments will remove source material which is causing contamination of Gum Creek surface water and sediment. Removal of this source contamination will result in a reduction in surface water and sediment contamination in Gum Creek. Restoration and/or mitigation of destroyed wetlands would be required.

Alternative 2 has been divided into two sub-alternatives which vary in scope. Alternative 2A would consist of excavating all contaminated soil and sediments necessary to meet the remedial action objectives, which involves an estimated 14,300 cubic yards. Under Alternative 2B, surface soils and drainage ditch soils would be excavated and treated. Wetland sediment in the "hot-spot" areas also would be excavated and treated. Contaminated wetland sediment in the wooded area would remain in place, but would be monitored for at least five years until an acceptable level of ecological risk is achieved. Monitoring stations could include the area immediately south of the Golden Seed facility (Area 1), an area halfway between U.S. Highway 41 and Area 1 (Area 2), an area near the intersection of Gum Creek and U.S. Highway 41 (Area 3), and an area at the pond located southeast of U.S. Highway 41 (Area 4). This sub-alternative is included because the destruction of wetland caused by remediating the less accessible wetland sediment could outweigh the benefit of removing the contamination. The estimated volume of soil for Alternative 2B is 6,300 cubic yards. The cost of this alternative is estimated to be $2,952,850, if all contaminated soil and sediment is excavated and treated and $1,432,560, if surface soil, drainage ditch, and "hot-spot" areas are excavated and treated. For alternatives 2A and 2B, the expected outcome is that residential use of the non-wetland area would be available when the surface soil remedy was completed (approximately two years after initiation).

### 7.1.3 ALTERNATIVE NO. 3 A/B - EXCAVATION AND OFFSITE DISPOSAL

This alternative involves excavating contaminated surface soil and sediment necessary to meet the remedial action objectives and transporting it offsite for disposal. The excavated area would be backfilled with clean topsoil. If the soil is characterized as a RCRA hazardous waste, it would be transported to a RCRA Subtitle C disposal facility and pretreated, if necessary, at the facility before disposal. If the soil is characterized as a RCRA non-hazardous waste (as expected based on Marzone OU1 characteristics), it would be transported to a RCRA Subtitle D disposal facility. Excavation and disposal of contaminated soils and sediments will remove source material which is causing contamination of Gum Creek surface water and sediment. Removal of this source contamination will result in a reduction in surface water and sediment contamination in Gum Creek. Restoration and/or mitigation of destroyed wetlands would be required.

Alternative 3 has been divided into two alternatives which vary in scope. Alternative 3A would consist of excavating all contaminated soil and sediments necessary to immediately meet the remedial action objectives, which involves an estimated 14,300 cubic yards. Under Alternative 3B, surface soils and drainage ditch soils would be excavated and treated. Wetland sediment in the "hot-spot" areas also would be excavated and treated. Contaminated wetland sediment in the wooded area would remain in place, but would be monitored for at least five years until an acceptable level of ecological risk is achieved. Monitoring stations could include the area immediately south of the

Golden Seed facility (Area 1), an area halfway between U.S. Highway 41 and Area 1 (Area 2), an area near the intersection of Gum Creek and U.S. Highway 41 (Area 3), and an area at the pond located southeast of U.S. Highway 41 (Area 4). This sub-alternative is included because the destruction of wetland caused by remediating the less accessible wetland sediment could outweigh the benefit of removing the contamination. The estimated volume of soil for Alternative 3B is 6,300 cubic yards. If the soil is not characterized as a RCRA hazardous waste (based on Marzone OU1 soil characteristics), it would be transported to a Subtitle D landfill. The estimated cost of this alternative would be $2,988,840 for all contaminated soil and sediment and $1,596,900 if surface soil, drainage ditch, and "hot-spot" areas are excavated. For this alternative, the expected outcome is that residential use at the non-wetland area would be available when the remedy was completed (less than one year after initiation).

## 7.2 GROUNDWATER ALTERNATIVES

### 7.2.1 ALTERNATIVE NO. 1 - NO ACTION ALTERNATIVE

The no action alternative is carried through the screening process as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This alternative is used as a baseline for comparison with other alternatives that are developed. Under this alternative, EPA would take no further action to minimize the impact groundwater contamination has on the area. Groundwater contamination would remain and possibly migrate off-site. There is no cost for this alternative.

Table 7-2: Operable Unit #2 Groundwater Alternatives

| Alternative Number | Remedial Action | Present Worth |
|---|---|---|
| 1 | No Action | $0 |
| 2 | Monitored Natural Attenuation | $477,676 |
| 3 | Funnel and Gate | $2,696,966 |

### 7.2.2 ALTERNATIVE NO. 2 - MONITORED NATURAL ATTENUATION

This alternative is based on groundwater data which has indicated that groundwater contamination may be naturally attenuating as it moves across the site, based on three sampling events conducted since 1996. Multiple sampling events over an extended period of time will be necessary to confirm that natural attenuation is effective at this site. Natural attenuation is a combination of processes which act to reduce the level of contamination in groundwater. These processes include biodegradation, adsorption, dilution, and dispersion. Under this alternative, EPA would monitor groundwater for a period of at least five years to ensure that natural attenuation was effectively reducing groundwater contamination. At least two additional groundwater monitoring wells, one located to the west of the Golden Seed facility and another located to the southeast of MW-02, would be installed to provide better coverage of the groundwater contamination and its movement. After five years, a contingency remedy of a passive in-situ treatment system would be implemented at EPA's sole discretion, if monitoring results did not confirm that natural attenuation was effective. The cost for this alternative, without the treatment contingency, is estimated to be $477,676. For this

alternative, the expected outcome is the availability of groundwater for drinking water uses when cleanup levels are achieved (time unknown, but assumed to be at least 30 years).

The contingency for a passive in-situ treatment system is included in this alternative because of uncertainties with the natural attenuation process. Groundwater monitoring data indicate that most contaminants are decreasing in concentration, especially for dinoseb and the more toxic metals. In contrast, for BHCs and the less toxic metals evidence of natural attenuation is inconclusive. Temporary monitoring wells located between the formulation area in OU1 and the Golden Seed area in OU2 demonstrate the presence of BHCs in this area, suggesting that releases in Marzone OU1 may have contributed to the BHC contamination in OU2. The remedial action at OU1 has removed the source of contamination to the groundwater (contaminated soil). Treatment of contaminated groundwater at OU1 is ongoing in a remedial design pilot study. The OU1 remedial action and the outcome of the remedial design pilot study may therefore result in a decrease in BHC concentrations at OU2 over time. However, the effects of OU1 actions on OU2 groundwater quality are uncertain.

EPA's Directive Number 9200.4-17 entitled Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites states that "monitored natural attenuation is appropriate as a remedial approach only where it can be demonstrated capable of achieving a site's remedial objectives within a time frame that is reasonable compared to that offered by other methods and where it meets the applicable remedy selection criteria for the particular OSWER program. EPA expects that monitored natural attenuation will be most appropriate when used in conjunction with active remediation measures (*e.g.*, source control), or as a follow-up to active remediation measures that have already been implemented." Such conditions exist at the Marzone OU2 site.

### 7.2.3 ALTERNATIVE NO. 3 - FUNNEL AND GATE

A funnel-and-gate system uses natural groundwater gradients to drive the water through the treatment media. A funnel-and-gate system has two primary components: a "funnel" which directs the contaminated groundwater, and a "gate" where treatment occurs. The funnel portion of the system is typically an impermeable barrier inserted into the aquifer to direct flow toward the gate. Funnels are most effective in directing groundwater flow if they penetrate the entire thickness of the contaminated aquifer and can be "keyed in" to an impermeable unit at the aquifer base. Because such a base exists at the Marzone site, the use of a funnel system appears hydraulically viable.

Conceptually, a reactive media or combination of media, such as a granular activated carbon (GAC) or zero-valent iron (ZVI), are installed within the gate portion of the system. Groundwater passing through the gate is treated by the reactive media. Laboratory treatability studies conducted on groundwater at the neighboring OU1 site indicate GAC alone would be capable of ensuring that performance standards for OU1 contaminants of concern (COCs). A full-scale pilot project was constructed at OU1 to further test this system. Since OU2 has metals as additional COCs, more treatability studies may be required at OU2.

A conceptual variant of the funnel-and-gate system uses a slurry wall for the funnel portion of the system. With this approach, the gate is provided by constructing groundwater collection galleries that collect contaminated groundwater and route it through a treatment gate. The treated groundwater is then discharged through the slurry wall via piping and flows into the downgradient aquifer via distribution galleries. This approach can be less expensive to construct than other funnel-and-gate methods. This approach has been used in a full-scale pilot project at the Marzone OU1 site. The cost

for this alternative is estimated to be $2,696,966. For this alternative, the expected outcome is the availability of groundwater for drinking water uses when cleanup levels are achieved (at least 30 years).

## 8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This section of the ROD provides the basis for determining which alternative provides the best balance with respect to the statutory balancing criteria in Section 121 of CERCLA and in Section 300.430 of the NCP. The major objective of the FS was to develop, screen, and evaluate alternatives for the remediation of Operable Unit Two at the Marzone site. The remedial alternatives selected from the screening process were evaluated using the following nine evaluation criteria:

- Overall protection of human health and the environment.
- Compliance with applicable and/or relevant and appropriate Federal or State public health or environmental standards.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume of hazardous substances or contaminants.
- Short-term effectiveness, or the impacts a remedy might have on the community, workers, or the environment during the course of implementing it.
- Implementability, that is, the administrative or technical capacity to carry out the alternative.
- Cost-effectiveness considering costs for construction, operation, and maintenance of the alternative over the life of the project.
- Acceptance by the State.
- Acceptance by the Community.

The NCP categorizes the nine criteria into three groups:

(1) Threshold Criteria - overall protection of human health and the environment and compliance with ARARs (or invoking a waiver) are threshold criteria that must be satisfied in order for an alternative to be eligible for selection;

(2) Primary Balancing Criteria - long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability, and cost are primary balancing factors used to weigh major trade-offs among alternative hazardous waste management strategies; and

(3) Modifying Criteria - state and community acceptance are modifying criteria that are formally taken into account after public comment is received on the proposed plan and incorporated in the ROD.

The selected alternative must meet the requirement for overall protection of human health and the environment and comply with all ARARs or be granted a waiver for compliance with ARARs. Any alternative that does not satisfy both of these requirements is not eligible for selection. The Primary Balancing Criteria are the technical criteria upon which the detailed analysis is primarily based. The final two criteria, known as Modifying Criteria, assess the public's and the state agency's acceptance of the alternative. Based on these final two criteria, EPA may modify aspects of a specific alternative.

The following analysis is a summary of the evaluation of alternatives for remediating OU2 of the Marzone Superfund Site under each of the criteria. A comparison is made between each of the alternatives for achievement of a specific criterion.

**Threshold Criteria**

## 8.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Soil alternative 1 would not contain or remediate the soil or sediment contamination. Neither would surface water contamination be reduced. Cleanup levels for soil would not be achieved with alternative 1, and alternative 1 therefore would not provide adequate protection of human health and the environment. Since alternative 1 does not meet a threshold criteria, it will not be discussed further in the document. Soil alternative 2 would remediate contaminated soil and sediment with onsite treatment to reduced risk levels. Soil alternative 3 would remove the contaminated soil from the site to reduce risks. Both alternatives would provide protection from exposure due to direct contact or soil ingestion. Sub-alternative B for both alternatives would be less effective than sub-alternative A, since some contaminated sediment would remain in place, but each sub-alternative B is still protective of human health and the environment and is balanced by a reduced overall destruction of the wetlands. For soil alternatives 2 and 3, cleanup would reduce human health risks to a $10^{-6}$ additional cancer risk for direct contact with soils by future residents, which is within EPA's acceptable risk range. Excavation and treatment or disposal of contaminated soils and sediments will remove source material which is causing contamination of Gum Creek surface water and sediment. Removal of this source contamination under soil alternatives 2 or 3 will result in a reduction in surface water and sediment contamination in Gum Creek.

Groundwater alternative 1 would not contain, remediate, or adequately monitor groundwater contamination. EPA would not know if cleanup levels for groundwater were achieved with alternative 1, and alternative 1, therefore, would not have a basis for taking additional action, if necessary, to provide adequate protection of human health and the environment. Since alternative 1 does not meet a threshold criteria, it will not be discussed further in the document. Groundwater alternative 2 would provide performance monitoring to verify that natural attenuation was reducing contamination in the groundwater to cleanup levels. A contingency treatment alternative would be implemented if groundwater monitoring did not demonstrate that natural attenuation was effective. Groundwater alternative 3 would provide treatment of contaminated groundwater to meet cleanup levels. Both alternatives would provide long-term protection from exposure due to ingestion of groundwater, since cleanup would reduce contamination to EPA Safe Drinking Water Act Maximum Contaminant Levels.

## 8.2 COMPLIANCE WITH ARARS

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4). Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address hazardous substances, the remedial actions to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the site. Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

Soil alternatives 2 and 3 would comply with all Federal or State ARARs. Contaminant-specific ARARs would be met through excavation and treatment or disposal of contaminated soil. All excavation, storage, handling, treatment and disposal of contaminated soil would be conducted in accordance with applicable RCRA requirements. Off-site disposal of contaminated soil under Soil alternative 3 would be at a permitted RCRA Subtitle C, or Subtitle D landfill, as appropriate. During treatment, air emissions from the site would be monitored to ensure compliance with the Clean Air Act. Air monitoring would be conducted to ensure that contaminant concentrations do not exceed levels considered to be safe for human health. If levels are exceeded, mitigative procedures would be employed to prevent harmful levels of air emissions from impacting on-site workers or from leaving the Site. RCRA design standards would be incorporated into the remedial design of all remedial activities.

Drinking water standards would be met by both groundwater alternatives 2 and 3. However, the time period for alternative 2 may be longer than that for alternative 3 (estimated at 30 years).

**Primary Balancing Criteria**

## 8.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

Soil alternatives 2 and 3 would provide long-term effectiveness through removal and treatment or disposal of contaminated soils. If contaminated soil remains on site above levels which allow for unrestricted use, a review at least every five years would be required to ensure that the remediation continued to protect human health and the environment. Sub-alternative B for both alternatives would be less effective, since some contaminated sediment would remain in place, but these sub-alternatives are still protective of human health and the environment and are balanced by reduced overall destruction of the wetlands. Groundwater alternatives 2 and 3 would provide long-term effectiveness through reduction of contamination by natural attenuation or active treatment.

The alternatives increase in long-term effectiveness and permanence as more treatment options are included. Therefore, soil alternative 2 and groundwater alternative 3 provide greater long-term effectiveness and permanence than soil alternative 3 and groundwater alternative 2.

## 8.4 REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of the remedy. Soil alternative 2 would reduce mobility and toxicity through treatment; however, volume would increase. Soil alternative 3 would reduce mobility of contamination by removing contaminated soil off-site and placing the soil in a landfill. Toxicity and volume would remain the same if pretreatment was not required. Toxicity would be reduced if pretreatment was required before disposal at a RCRA Subtitle C facility. Sub-alternative B for alternatives 2 and 3 would reduce toxicity and mobility less than sub-alternative A, since some contaminated sediment would remain in place.

Groundwater alternative 2 would not utilize treatment to reduce toxicity, mobility, or volume, unless the contingency is implemented. However, this alternative takes advantage of natural processes to reduce toxicity and mobility of contaminants. Groundwater alternative 3 would utilize treatment to reduce toxicity of contaminants.

## 8.5 SHORT-TERM EFFECTIVENESS

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers and the community during construction and operation of the remedy until clean-up goals are achieved. Soil alternative 2 (A or B) would require approximately 2 years and soil alternative 3 (A or B) would require approximately 1 year to implement. Appropriate monitoring and engineering controls would be applied to reduce fugitive dust, noise and risks to on-site remedial workers and nearby workers and residents for soil alternatives 2 or 3.

Groundwater alternative 2 would require approximately 15 months to implement (including 12 months for treatability studies and modeling). Groundwater alternative 3 would require approximately 14 months to implement. For administrative purposes EPA is assuming that the time to reach cleanup levels for alternatives 2 and 3 will be at least 30 years.

## 8.6 IMPLEMENTABILITY

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Technological expertise, services, equipment and materials are adequately available for the implementation of soil alternatives 2 and 3. Soil alternative 2 would require a longer period than alternative 3 to implement due to the on-site treatment of the contaminated soil. Technological expertise, services, equipment and materials are also adequately available for the implementation of groundwater alternatives 2 and 3. Groundwater alternatives 2 and 3 would require approximately the same time to implement.

## 8.7 COST

The total present worth cost of soil alternative 2 is approximately $2,952,851 ($2,756,851 for capital cost and $196,000 for operations and maintenance (O&M) costs) if all contaminated soil and sediment is excavated and treated (sub-alternative A) and $1,432,563 ($1,255,271 for capital costs and $177,292 for O&M costs) if some wetland sediments are not excavated (sub-alternative B). For disposal at a non-hazardous waste landfill, the total present worth cost for soil alternative 3 is approximately $2,988,838 ($2,948,838 for capital costs and $40,000 for O&M costs) if all contaminated soil and sediment is removed (sub-alternative A) and approximately $1,596,874 ($1,493,082 for capital costs and $103,792 for O&M costs) if some wetland sediments are not excavated (sub-alternative B).

For groundwater alternative 2, the total present cost is estimated to be $461,426. The estimated capital cost for additional wells and treatability studies is $181,838 and the estimated O&M cost is $279,589. The cost for the contingency would be the same as for groundwater alternative 3. The cost for groundwater alternative 3 is approximately $2,696,966. . The estimated capital cost is $2,501,181 and the estimated O&M cost is $195,785.

**Modifying Criteria**

## 8.8 STATE ACCEPTANCE

The State of Georgia, as represented by the Georgia Environmental Protection Division (GaEPD), has been the support agency during the Remedial Investigation and Feasibility Study process for Marzone site. In accordance with 40 CFR 300.430, as the support agency, GaEPD has provided input during this process. The State of Georgia, as represented by GaEPD, has concurred with the selected remedy.

## 8.9 COMMUNITY ACCEPTANCE

During the public comment period, comments were received on the proposed plan. See Appendix A - Responsiveness Summary for EPA's responses to the comments.

## 9.0 SUMMARY OF SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, EPA has selected a remedy for Operable Unit 2 of the Site. The selected remedy is Alternative 3B for soils and sediments and Alternative 2 for groundwater. The soil and sediment remedy provides for the following:

1. Excavation and off-site disposal of surface soils which exceed the surface soil performance standards.

2. Excavation and off-site disposal of sediments, from the railroad drainage ditch beginning at the culverts at the southernmost point of the railroad spur continuing in a northeasternly direction, which exceed the sediment performance standards.

3. Excavation and off-site disposal of sediments, in the non-wooded wetland area south of the railroad spur, which exceed the sediment performance standards.

4. Transportation of contaminated soil and sediment to a permitted Subtitle C or D landfill.

5. Restoration (backfilling, grading, and seeding or replanting vegetation) of surface soil and wetland areas.

6. Confirmation sampling of soil and sediment to verify that remaining soil and sediment is below performance standards.

7. Monitoring of wetland and creek area in the wooded area for at least five years to determine if remaining contamination is naturally attenuating. EPA would consider additional remedial actions, if contamination does not appear to be naturally attenuating.

This alternative was selected because the destruction of wetland caused by remediating the inaccessible wetland sediment would outweigh the benefit of removing the contamination. If the soil is not characterized as a RCRA hazardous waste (as anticipated based on Marzone OU1 soil characteristics), it may be transported to a Subtitle D landfill. Excavation and disposal of contaminated soils and sediments will remove source material which is causing contamination of Gum Creek surface water and sediment. Removal of this source contamination will result in a reduction in surface water and sediment contamination in Gum Creek.

The selected groundwater remedy is Alternative 2 - monitored natural attenuation. This selected remedy is based on groundwater data which have indicated that groundwater contamination may be naturally attenuating as it moves across the site. Natural attenuation is a combination of processes which act to reduce the level of contamination in groundwater. These processes include biodegradation, adsorption, dilution, and volatilization. The major components of the groundwater remedy are as follows:

1. Installation of at least two additional groundwater monitoring wells, one located to the west of the Golden Seed facility and another located to the southeast of MW-02 to provide better coverage of the groundwater contamination and its movement.

2. Annual groundwater monitoring for at least five years for the contaminants of concern, as well as potential transformation products and geochemical parameters.

3. Review of groundwater data after five years to determine if natural attenuation is effective. A contingency remedy of an in-situ treatment wall may be implemented at EPA's sole discretion, if results did not confirm that natural attenuation was effective.

4. Institutional controls to restrict use of contaminated groundwater.

The contingency for a funnel-and-gate system is included in this alternative, because of uncertainties with the natural attenuation process. Groundwater monitoring data indicate that most contaminants are decreasing in concentration, especially for dinoseb and the more toxic metals. For BHCs and other metals, evidence of natural attenuation is inconclusive. Temporary monitoring wells located between the facility at Marzone OU1 and the Golden Seed portion of Marzone OU2 demonstrate the presence of BHCs in this area, suggesting that Marzone OU1 may have contributed to the BHC

contamination in OU2. The remedial action at OU1 has removed the source of contamination to the groundwater (contaminated soil). Treatment of contaminated groundwater at OU1 is ongoing in a remedial design pilot study. The OU1 remedial action and remedial design pilot study and its outcome may therefore result in a decrease in BHC concentrations at OU2 over time, since source material at OU1 has been removed. However, the effects of OU1 actions on OU2 groundwater quality are uncertain, because the contribution of OU1 contamination to OU2 groundwater is not fully understood at this time.

EPA will review and analyze data from the OU2 monitoring wells after five years. If the data does not demonstrate a sufficient decline in concentration, EPA may, at its sole discretion, implement the contingency remedy of an in-situ treatment wall. In addition, if the data demonstrates to EPA that OU1 activities have contributed to BHC groundwater contamination at OU2, but that the OU1 remedial action and natural attenuation are not effective in reducing BHC concentrations, EPA would consider additional remedial actions at OU1.

At the completion of this remedy, the additional cancer risk associated with this Site has been calculated at $10^{-6}$ for surface soils and sediments or more protective levels necessary for ecological protection. Groundwater performance standards are established to meet EPA's Maximum Contaminant Levels (MCLs) for drinking water or to meet a $10^{-6}$ additional cancer risk level, if MCLs are not available. The combined total present worth cost of the selected remedy, Alternatives 3B for soil/sediment and 2 for groundwater, is estimated to be $1,910,298.

## 9.1 SOIL AND SEDIMENT REMEDY

### 9.1.1 DESCRIPTION OF REMEDY

The selected remedy for contaminated soils is excavation and off-site disposal (Alternative 2B). This remedy includes excavation of soils and sediments which exceed the performance standards; dewatering sediments, if necessary; sampling of soils and sediments to determine the appropriate disposal alternative (Subtitle C or D landfill); and transportation by truck to the landfill.

In order to facilitate this remedy, OU2 of the Marzone site is designated as an Area of Concern (AOC) for purposes of this ROD. All waste managed within the AOC must comply with the requirements set out in this ROD for soil remediation. OU2 and the designated AOC consists of the former Golden Seed facility, a portion of the railroad spur drainage ditch, Gum Creek and associated wetlands, and a portion of the Banner Grain property and Newton property adjacent to the former Golden Seed facility. The AOC also includes suitable areas in close proximity to the contamination necessary for implementation of the remedy selected in this ROD. Since soil contamination at OU2 will be cleaned to the risk-based performance standards, no closure standards apply for this AOC.

Major components of the soil and sediment remedy include:

1. Excavation of contaminated surface soils (0 to 1 feet) on and around the Golden Seed area which exceed performance standards. The volume of surface soil is estimated to be 4,300 cubic yards.

2. On-site stockpiling surface soil for sampling to determine the appropriate disposal alternative (Subtitle C or D landfill).

3. Backfilling of surface soil area with sampled, clean fill and restoration of area. Restoration will include grading and seeding.

4. Excavation of sediments, from the railroad drainage ditch beginning at the culverts at the southernmost point of the railroad spur continuing in a northeasternly direction, which exceed the sediment performance standards.

5. Additional sampling of non-wooded wetland area to better delineate the areas of contamination.

6. Excavation of sediments in the non-wooded wetland area south of the railroad spur (approximately 1,000 cubic yards) which exceed the sediment performance standards.

7. Dewatering, if necessary, and sampling of sediments to determine the appropriate disposal alternative (Subtitle C or D landfill).

8. Restoration of excavated wetland areas. Restoration will consist of backfilling sediments, grading, and replanting shrubs and grasses.

9. Transportation of contaminated soil and sediment to a permitted Subtitle C or D landfill.

10. Confirmation sampling to verify that remaining soil and sediment is below performance standards.

11. Monitoring of wetland and creek area for at least five years to determine if remaining contamination is naturally attenuating. EPA would consider additional remedial actions, if contamination does not appear to be naturally attenuating.

12. Air monitoring to ensure safety of nearby residents and workers.

### 9.1.2 PERFORMANCE STANDARDS

Performance standards for surface soil and sediments are presented in Table 9-1. The performance standards for surface soil are based upon a $10^{-6}$ additional cancer risk level for a cleanup associated with future residential land use or more stringent ecological risk levels. Excavation of contaminated soils within OU2 shall continue until the remaining soil achieves the performance standards. All excavation shall comply with ARARs, OSHA, and state standards. Pertinent testing methods will be selected or approved by EPA and used to determine that performance standards have been achieved.

The performance standards for sediments are based on ecological models which calculate a potential risk to ecological receptors. Contaminated sediments within the non-wooded wetland area south of the railroad spur (Figure 9-1) will be excavated, dewatered and disposed of in a Subtitle C or D landfill. The wetland will be restored by replacing sediment and replanting shrubs and grasses.

### 9.1.3 SOIL TESTING

Soil testing shall be conducted on the site to determine the effectiveness of meeting the soil and sediment performance standards outlined in Table 9-1. Performance will be met when the confirmatory sampling effort shows surface soil (0 to 1 feet) and sediment samples from the drainage

ditch and non-wooded wetland area south of the railroad spur have been remediated to a level at or below the performance standards.

| TABLE 9-1: SUMMARY OF SOIL AND SEDIMENT REMEDIATION PERFORMANCE STANDARDS FOR CHEMICALS OF CONCERN | | |
|---|---|---|
| COMPOUND | MEDIUM | |
| | SURFACE SOIL (MG/KG) | SEDIMENT (MG/KG) ** |
| DDT | 1.0* | 5.0 |
| DDE | 1.0* | 5.0 |
| DDD | 2.0* | 5.0 |
| Toxaphene | 0.4* | 3.0 |
| alpha - chlordane | 0.1** | 0.1 |
| gamma-chlordane | 0.1** | 0.1 |
| Copper | 20** | 20 |
| Lead | 330** | 330 |
| Zinc | 100** | 100 |

* Surface soil performance standards based on protection of future residents at a $10^{-6}$ calculated cancer risk level for direct contact

** Surface soil or sediment performance standards based on ecological risk; surface soil standards also protective of future residents at a $10^{-6}$ calculated cancer risk level for direct contact and a Hazard Index of less than 1.0 for non-carcinogens

### 9.1.4 COST

For excavation and off-site disposal (Alternative 2B), the estimated present worth cost of the remedy is approximately $1,596,874. These costs include planning and design fees, as well as mobilization and implementation. The capital cost is approximately $1,493,082; the operation and maintenance cost is approximately $103,792. A breakdown of estimated costs is in Table 9-3.

## 9.2 GROUNDWATER REMEDY

### 9.2.1 DESCRIPTION OF REMEDY

The selected groundwater remedy is Alternative 2 - monitored natural attenuation with a contingency for an in-situ passive treatment system such as funnel-and-gate. This selected remedy is based on groundwater data which have indicated that groundwater contamination may be naturally attenuating as it moves across the site. Natural attenuation is a combination of processes which act to reduce the level of contamination in groundwater. These processes include biodegradation, adsorption, dilution, and volatilization. The components of the groundwater remedy are as follows:

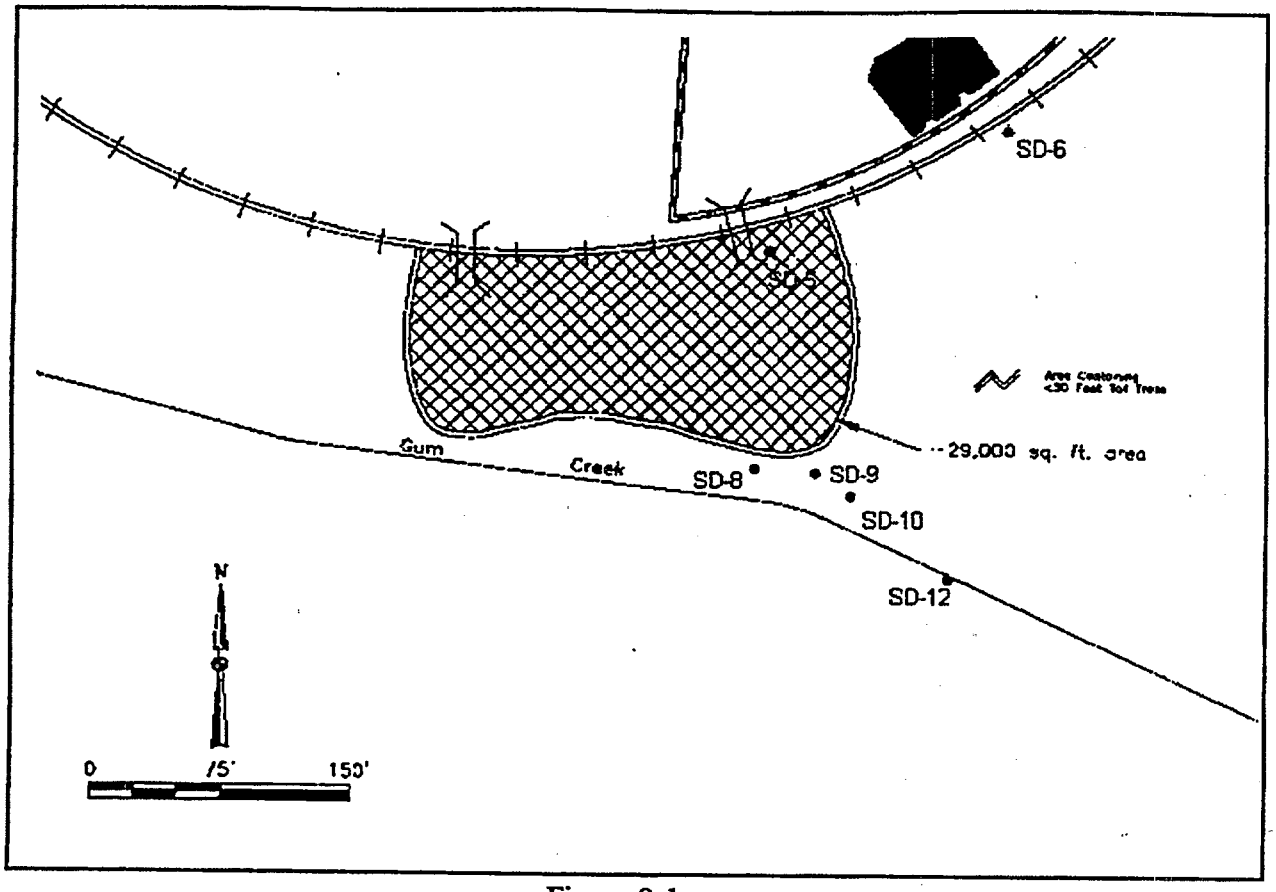


Figure 9-1
Approximate Non-wooded Wetland Area of Contamination

1. Installation of at least two additional groundwater monitoring wells, one located to the west of the Golden Seed facility and another located to the southeast of MW-02 to provide better coverage of the groundwater contamination and its movement.

2. Annual groundwater monitoring for at least five years for the contaminants of concern, as well as potential transformation products and geochemical parameters. Monitoring results will be used to determine the effectiveness of natural attenuation processes such as biodegradation, dispersion, dilution, chemical or biological stabilization, or transformation.

3. Review of groundwater data after five years to determine if natural attenuation is effective in reaching performance standards. A contingency remedy of an in-situ treatment wall may be implemented at EPA's sole discretion, if results do not confirm that natural attenuation was effective. However, before implementing the contingency remedy, EPA may determine that additional groundwater monitoring is necessary.

4. Institutional controls to restrict use of contaminated groundwater.

### 9.2.2 PERFORMANCE STANDARDS

The performance standards for groundwater are based upon Maximum Contaminant Levels (MCLs) established by the EPA Safe Drinking Water Act, if available. If MCLs are not available for a contaminant of concern, performance standards are based on a $10^{-6}$ additional cancer risk level for carcinogens or a hazard quotient of 1 or less for non-carcinogens. Pertinent testing methods will be selected or approved by EPA and used to determine that performance standards have been achieved.

### 9.2.3 GROUNDWATER TESTING

Groundwater will be monitored until groundwater concentrations have met the appropriate performance standards. After five years of monitoring, the data will be analyzed to determine if natural attenuation processes are effective. A contingency remedy of an in-situ treatment wall may be implemented at EPA's sole discretion, if results did not confirm that natural attenuation was effective. Instead of implementing the contingency remedy, EPA may determine that additional groundwater monitoring is necessary.

TABLE 9-2: SUMMARY OF GROUNDWATER REMEDIATION PERFORMANCE STANDARDS

| COMPOUND | PERFORMANCE STANDARD (UG/L) |
|---|---|
| Aluminum | 28,702* |
| Beryllium | 4** |
| Cadmium | 5** |
| Manganese | 660* |
| Nickel | 100** |
| Lead | 15 *** |
| Iron | 8,611 * |
| Nitrate/Nitrite | 1,000 (MCL for nitrite) |
| alpha - BHC | 0.03 *** |
| gamma- BHC | 0.2 ** |
| Endrin | 2 ** |
| Dinoseb | 7 ** |

* Calculated value for Hazard Quotient = 1
** EPA Maximum Contaminant Level
*** EPA Action Level

### 9.2.4 COST

For monitored natural attenuation, the estimated present worth cost of the remedy is approximately $477,676. These costs include planning and design fees, as well as mobilization and implementation. The capital cost is approximately $198,087; the operation and maintenance cost is approximately $279,589. A breakdown of estimated costs is in Table 9-3.

## 10.0 STATUTORY DETERMINATION

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedial action for this Site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

### 10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through treating and monitoring threats at Operable Unit 2 of the Site. The selected remedy provides protection of human health and the environment by eliminating, reducing, and controlling risk through removal of contaminated surface soils and sediments, monitoring of groundwater, and institutional controls. Contaminated surface soils and sediment "hot spots" will be excavated and transported to a RCRA permitted landfill. Groundwater and remaining contaminated sediments will be monitored to determine if contaminant concentrations are naturally attenuating. A contingency remedy of an in-situ treatment wall may be implemented at EPA's sole discretion, if results did not confirm that natural attenuation was effective. Instead of implementing the contingency remedy, EPA may determine that additional groundwater monitoring is necessary. Institutional controls will restrict the use of groundwater until it meets groundwater performance standards.

### 10.2 ATTAINMENT OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Remedial actions performed under CERCLA must comply with all applicable or relevant and appropriate requirements (ARARs). All alternatives considered for the Marzone OU2 site were evaluated on the basis of the degree to which they complied with these requirements. The selected remedy was found to meet or exceed all ARARs, including those listed in Tables 10-1, 10-2, 10-3, and 10-4.

Waivers

Section 121 (d)(4)(C) of CERCLA provides that an ARAR may be waived when compliance with an ARAR is technically impracticable from an engineering perspective. No waivers are necessary with respect to the selected remedy.

| TABLE 9-3 - SUMMARY OF SELECTED REMEDY COSTS | | | | |
|---|---|---|---|---|
| **Capital Costs** | Quantity | Unit | Unit Cost | Estimated Installed Cost |
| **Soil Remedy - Capital Costs** | | | | |
| Mobilization/demobilization | 1 | LS | $50,000 | $ 50,000.00 |
| Excavation | 6,300 | Cubic yard | $10 | $ 63,000.00 |
| Shipping costs | 358 | Load | $175 | $ 62,650.00 |
| Disposal | 5,250 | Ton | $50 | $ 262,500.00 |
| Backfill of clean soil | 6,300 | Cubic yard | $60 | $ 378,000.00 |
| Grading | 20,100 | Square yard | $0.16 | $ 3,216.00 |
| Landscaping | 4.15 | Acre | $1,413 | $ 5,863.95 |
| Sheet piling for wetlands | 7,500 | Square feet | $12 | $ 90,000.00 |
| Water removal in wetlands | 5 | Day | $200 | $ 1,000.00 |
| Clearing, grubbing, and chipping | 0.7 | Acre | $500 | $ 350.00 |
| Wetland restoration | 0.7 | Acre | $3,200 | $ 2,240.00 |
| Subtotal - Capital costs | | | | $ 918,819.95 |
| Fees (Contractor, Legal, Administrative) | | | | $ 275,645.99 |
| Total Capital Costs | | | | $ 1,194,465.94 |
| Contingency (25%) | | | | $ 298,616.48 |
| Total Construction Costs | | | | $ 1,493,082.42 |
| **Soil Remedy - O&M Costs** | | | | |
| Biennial Surface Water/Sediment Sampling | 2/year | 5 years | $4,500 | $ 45,000.00 |
| Annual Surface Water/Sediment Sampling | 1/year | 25 years | $4,500 | $ 112,500.00 |
| Confimatory sampling | 50 | Samples | $500 | $ 25,000.00 |
| Total Annual O&M Cost | | | | $ 182,500.00 |
| Present Worth Cost | | | | $ 103,792.00 |
| **SOIL REMEDY - TOTAL COST** | | | | **$1,596,874.42** |

| TABLE 9-3 - SUMMARY OF SELECTED REMEDY COSTS (CONTINUED) | | | | |
|---|---|---|---|---|
| | Quantity | Unit | Unit Cost | Estimated Installed Cost |
| **Groundwater - Capital Costs** | | | | |
| Field Sampling and Analysis | 1 | Event | $29,000 | $ 29,000.00 |
| Natural Attenuation Modeling | 1 | Event | $20,000 | $ 20,000.00 |
| Micorcosm Study | 1 | Event | $62,900 | $ 62,900.00 |
| Installation of Additional Wells | 2 | Wells | $5,000 | $ 10,000.00 |
| Subtotal - Capital costs | | | | $ 121,900.00 |
| Fees (Contractor, Legal, Administrative) | | | | $ 36,570.00 |
| Total Capital Costs | | | | $ 158,470.00 |
| Contingency (25%) | | | | $ 39,617.50 |
| Total Construction Costs | | | | $ 198,087.50 |
| **Groundwater - O&M Costs** | | | | |
| Quarterly Groundwater Sampling | 1/year | 5 years | $30,000 | $ 150,000.00 |
| Annual Groundwater Sampling | 1/year | 25 years | $7,500 | $ 187,500.00 |
| Biennial Surface Water Sampling | 2/year | 5 years | $4,500 | $ 45,000.00 |
| Annual Surface Water Sampling | 1/year | 25 years | $4,500 | $ 112,500.00 |
| Total Annual O&M Cost | | | | $ 495,000.00 |
| Present Worth Cost | | | | $ 279,589.00 |
| **GROUNDWATER - TOTAL COST** | | | | **$ 477,676.50** |
| **TOTAL REMEDIATION COST** | | | | **$ 2,074,550.00** |

LS - Lump sum

Notes:

1) Estimated costs are based on conceptual evaluation of the potential remedy and are subject to change based on preliminary and final design

2) Assume that all excavated material shipped to Subtitle D landfill

3) Unit costs based on experience at OU1

4) Load assumed to be 22 cubic yards; number of loads includes 25% expansion factor; tonnage based on 1.5 cubic yard (expanded) per ton.

Other Guidance To Be Considered

Other Guidance To Be Considered (TBCs) include health based advisories and guidance. TBCs have been utilized in estimating incremental cancer risk numbers for remedial activities at the sites. The risk numbers are evaluated relative to the normally accepted point of departure risk range of $10^{-4}$ to $10^{-6}$.

## 10.3 COST EFFECTIVENESS

Cost effectiveness is determined by comparing the cost of all alternatives being considered with their overall effectiveness to determine whether the costs are proportional to the effectiveness achieved. Overall effectiveness is defined by three of the five balancing criteria: long-term effectiveness, short-term effectiveness, and reduction of toxicity, mobility, or volume through treatment. EPA evaluates the incremental cost of each alternative as compared to the increased effectiveness of the remedy. The selected remedy provides long-term effectiveness and reduction of toxicity, mobility, or volume through treatment.

The estimated cost of EPA's selected remedy is $1,910,298. The selected remedy, Alternative 3B for soils and Alternative 2 for groundwater, is the most cost effective alternative.

## 10.4 UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy utilizes permanent solutions to the maximum extent practicable. Excavation and landfill disposal of contaminated soils and sediments will provide a permanent solution for surface soils and sediments. Monitored natural attenuation will allow natural processes to reduce contaminant levels in the groundwater. A contingency remedy of an in-situ treatment wall may be implemented at EPA's sole discretion, if results did not confirm that natural attenuation was effective. Instead of implementing the contingency remedy, EPA may determine that additional groundwater monitoring is necessary.

Alternative 2 for soils would provide long-term effectiveness and reduction of toxicity, mobility, or volume through treatment; however, this alternative is more costly and has less short-term effectiveness. Alternative A for each of the soil alternatives would provide greater long-term effectiveness in removing contaminant mass, but would cause greater destruction to the ecological habitat. Alternative 3 for groundwater would provide long-term effectiveness and reduction of toxicity, mobility, or volume through treatment; however, this alternative is more costly.

## 10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The statutory preference for treatment will not be met, since contaminated soil and sediment will be placed in a landfill and groundwater will be allowed to naturally attenuate. However, mobility of contaminants in the soil and sediment will be reduced by placement in a permitted landfill. Natural attenuation will reduce groundwater concentrations and associated risks through naturally occurring treatment processes.

## 11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

There are no significant changes from the proposed plan.

| TABLE 10-1: CONTAMINANT-SPECIFIC ARARS | | | |
|---|---|---|---|
| **Federal** | | | |
| **Safe Drinking Water Act** | | 40 USC Section 300 | |
| National Primary Drinking Water Standards | A | 40 CFR Part 141 | Establishes maximum contaminant levels (MCLs) which are health-based standards for public water systems. |
| National Secondary Drinking Water Standards | R&A | 40 CFR Part 143 | Establishes secondary maximum contaminant levels (SMCLs) which are non-enforceable guidelines for public water systems to ensure the aesthetic quality of the water. |
| Maximum Contaminant Level Goals (MCLGs) | A | 40 CFR Part 141 | Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects with an adequate margin of safety. |
| **Clean Water Act** | | 33 USC Section 1251 et. seq | |
| Ambient Water Quality Criteria | A | 40 CFR Part 131 Quality Criteria for Water, 1976, 1980, 1986 | Requires the states to set ambient water quality criteria (AWQC) for water quality based on use classifications and the criteria developed under Section 304(a) of the Clean Water Act. |
| **Resource Conservation and Recovery Act (RCRA), as amended** | | 42 USC Section 6905, 6912, 6924, 6925 | |
| RCRA Groundwater Protection | R&A | 40 CFR Part 264 | Provides for groundwater protection standards, general monitoring requirements, and technical requirements. |
| **Clean Air Act** | | 42 USC Section 7401 et. | |

| | | | |
|---|---|---|---|
| | | seq. | |
| National Primary and Secondary Ambient Air Quality Standards | R&A | 40 CFR Part 50 | Establishes standards for ambient air quality to protect public health and welfare. |
| National Emissions Standards for Hazardous Air Pollutants (NESHAPs) | R&A | 40 CFR Part 61 | Provides emissions standards for hazardous air pollutants for which no ambient air quality standards exist. |
| **Solid Waste Disposal Act (SWDA)** | | 42 USC Section 6901 et.seq. | |
| Land Disposal Restrictions | A | 40 CFR Part 268.10-12; 40 CFR Part 268 (Subpart D) | Disposal of contaminated soil and debris resulting from CERCLA response actions are subject to Federal land disposal restrictions. |
| **State** | | | |
| Georgia Department of Natural Resources Environmental Protection Division; Water Quality Control | A | Chapter 391-3-6 | Establishes groundwater classifications and water quality standards. |
| Georgia Drinking Water Regulations | A | Chapter 391-3-5 | Regulates water systems within the state that supply drinking water that may affect the public health. |
| Georgia Department of Natural Resources Environmental Protection Division; Air Quality Control | R&A | Chapter 391-3-1 Section 02 | Establishes air quality standards. |

A - Applicable

R & A - Relevant and appropriate

| TABLE 10-2: LOCATION-SPECIFIC ARARS | | | |
|---|---|---|---|
| **Standard, Requirement, Criteria, or Limitation** | **Citation** | | **Description** |
| **Federal** | | | |
| **Solid Waste Disposal Act (SWDA)** | | 42 USC Section 6901 et. seq. | |
| RCRA Location Standards | R&A | 40 CFR Part 264.18(b) | Establishes design, construction, operation and maintenance standards for treatment/storage/disposal (TCD) facilities constructed in a 100-year floodplain. |
| **Fish and Wildlife Conservation Act** | R&A | 16 USC Part 2901 et. seq. | Requires states to identify significant habitats and develop conservation plans for these areas. |
| **Floodplain Management Executive Order** | R&A | Executive Order 11988; 40 CFR Part 6.302 | Actions that are to occur in floodplain should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial value. |
| **Protection of Wetlands Executive Order No. 11990** | R&A | 40 CFR 6.302(a) and Appendix A | Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands. Alternatives that involve the alteration of a wetland may not be selected unless a determination is made that no practicable alternative exists. |
| **Clean Water Act** - Guidelines for Specifications of Disposal Sites for Dredged or Fill Material | R&A | 40 CFR Part 230 | Regulates the discharge of dredged or fill material into U.S. waters, including wetlands to ensure that discharges are evaluated with respect to impact on aquatic ecosystems. |
| **Endangered Species Act** | R&A | 16 USC Section 1531 | Requires action to conserve endangered species or threatened species, including consultation with the Department of Interior. |

| State | | | |
|---|---|---|---|
| **Georgia Erosion and Sedimentation Control** | R&A | Chapter 391-3-7 | Establishes requirements for obtaining a permit before any land disturbing activities is undertaken. |
| **Rules for Environmental Planning Criteria** | R&A | Chapter 391-3-16 | Establishes criteria for the protection of groundwater recharge areas and wetlands. |
| **Game and Fish** | R&A | OCGA Section 27 | Protects endangered and threatened species. Prohibits any activity which disturbs, mutilates, or destroys wildlife homes. |

A - Applicable
R & A - Relevant and appropriate

| TABLE 10-3: POTENTIAL ACTION-SPECIFIC ARARS | | | |
|---|---|---|---|
| **Standard, Requirement, Criteria, or Limitation** | **Citation** | | **Description** |
| **Federal** | | | |
| **Solid Waste Disposal Act (SWDA)** | | 42 USC Section 6901-6987 | |
| Identification and Listing of Hazardous Wastes | A | 40 CFR Part 261 | Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 263-265 and Parts 124, 270, and 271. |
| Standards Applicable to Generators of Hazardous Waste | R&A | 40 CFR Part 262 | Establishes standards for generators of hazardous waste. |
| Standards Applicable to Transporters of Hazardous Waste | A | 40 CFR Part 263 | Establishes standards which apply to persons transporting hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR part 262. |
| Standards Applicable to Hazardous Waste Generation, Storage, Transportation, and Disposal Facilities | R&A | 40 CFR 264 | Established standards for hazardous waste treatment, storage, and disposal facilities. |
| Land Disposal Restrictions | R&A | 40 CFR Part 268.10-12; 40 CFR 268 (Subpart D) | Disposal of contaminated soil and debris resulting from CERCLA response actions are subject to Federal land disposal restrictions. |
| Hazardous Waste Permit Program | R&A | 40 CFR 270 | Establishes provisions covering basic EPA permitting requirements. |
| **Occupational Safety and Health Act** | A | 20 USC Section 651-678 | Regulates worker health and safety. |

| TABLE 10-3: POTENTIAL ACTION-SPECIFIC ARARS | | | |
|---|---|---|---|
| **Standard, Requirement, Criteria, or Limitation** | **Citation** | | **Description** |
| **Clean Air Act** | | 42 USC Section 7401-7642 | |
| National Ambient Air Quality Standards | A | 40 CFR Part 50 | Treatment technology standard for emissions to air from incinerators, surface impoundments, waste piles, landfills, and fugitive emissions. |
| **Hazardous Materials Transportation Act** | | 49 USC Section 1801-1813 | |
| Hazardous Materials Transportation Regulations | A | 49 CFR Parts 107, 171-177 | Regulates transportation of hazardous materials. |
| **State** | | | |
| Georgia Hazardous Waste Management Act | A | Code of Georgia, Title 12, Article 3, Chapter 8 | Institution and maintenance of a state-wide program for the management of hazardous wastes through the regulation of the generation, transportation, storage, treatment, and disposal of hazardous wastes. |
| Georgia Solid Waste Management Rules | R&A | Chapter 391-3-4 | Siting and design requirements for disposal sites. |
| Georgia Air Quality Control Law | A | Title 12, Chapter 9 | Air pollution control, air quality, and emissions control standards. |
| Georgia Hazardous Waste Management Rules | A | Rules and Regulations of the State of Georgia, Chapter 391-3-11 | Establishes the policies, procedures, requirements, and standards to implement the Georgia Hazardous Waste Management Act. |

A - Applicable

R & A - Relevant and appropriate

| TABLE 10-4: TO-BE-CONSIDERED (TBCs) DOCUMENTS[1] | | |
|---|---|---|
| **Document** | **Citation** | **Description** |
| Georgia Hazardous Site Response Act (HSRA) and associated rules | OCGA Title 12, Chapter 8, Article 3, Part 2 and Chapter 391-3-19 | Establishes State hazardous substance cleanup activities and requirements |

[1] TBCs - To-be-considered criteria are documents which are not legally binding, but should be considered in determining the necessary level of cleanup for protection of human health or the environment.

# ATTACHMENT 1
# RESPONSIVENESS SUMMARY

# RESPONSIVENESS SUMMARY
# RECORD OF DECISION AMENDMENT
# MARZONE INC./CHEVRON CHEMICAL COMPANY SITE
# OPERABLE UNIT TWO
# TIFTON, TIFT COUNTY, GEORGIA

The U.S. Environmental Protection Agency (EPA) held a public comment period from July 31, 1998 through October 10 1998 for interested parties to give input on EPA's Amended Proposed Plan for Remedial Action at Operable Unit Two (OU 2) of the Marzone Inc./Chevron Chemical Company (Marzone) Superfund Site in Tifton, Tift County, Georgia. EPA conducted a public meeting on September 3, 1998, at the J.T. Reddick Middle School in Tifton, Georgia. The meeting presented the results of the Remedial Investigation, the Feasibility Study, and Risk Assessment, as well as the proposed plan for remediation. The public comment period was extended an additional 30 days, from September 10, 1998 to October 10 1998 after EPA received a request for an extension.

A responsiveness summary is required to document how EPA addressed citizen comments and concerns about the Site, as raised during the public comment period. All comments summarized in this document have been factored into the amended final decision of the remedial action for OU 2of the Marzone Site.

This responsiveness summary for the Marzone Site is divided into the following sections.

I. Overview - This section discusses the recommended alternative for remedial action and the public reaction to this alternative.

II. Background on Community Involvement and Concerns - This section provides a brief history of community interest and concerns regarding the Marzone Site.

III. Summary of Major Questions and Comments Received During the Public Comment Period and EPA's Responses - This section presents comments submitted during the public comment period and provides the responses to these comments.

IV. Concerns to be Addressed in the Future- This section discusses community concerns of which EPA should be aware during remedial design.

## I. Overview

The remedial alternatives for Operable Unit Two were presented to the public in an Amended Proposed Plan released on July 31, 1998 and in public notices in the Tifton Gazette on July 31, 1998; August 25, 1998; and September 15, 1998. A public meeting was held on September 3, 1998.

## II. Background on Community Involvement and Concerns

EPA has taken the following actions to insure that interested parties have been kept informed and given an opportunity to provide input on activities at the Marzone Site. Through a Technical Assistance Grant (TAG) to the community group, People Working for People, Inc., EPA has provided information on site activities and investigation results. The TAG expended all grant funds in May 1997. A TAG advisor has not been available since that time.

The public comment period for this amended ROD was initially announced as July 31, 1998 through August 30, 1998. EPA extended the comment period until September 10, 1998, because information was not available in the Administrative Record until that date. EPA extended the comment period an additional 30 days upon request. A public meeting was held on September 3, 1998 where representatives from EPA answered questions regarding the Site and the amended proposed plan under consideration. The administrative record was available to the public at both the information repository maintained at the Tifton and Tift County Library and at the EPA Region 4 Library in Atlanta, Georgia. The notice of availability of the proposed plan and the administrative record was published in the Tifton Gazette on July 31, 1998 and August 25, 1998.

Community concerns included the groundwater contamination, air monitoring, and traffic. A summary of the concerns and EPA's responses follow.

## III. Summary of Major Questions and Comments Received During the Public Comment Period and EPA's Responses

1. Comment: One commenter asked about the location of air monitors during the remedial action.

   EPA Response: An air monitoring system will be installed and utilized during the remedial activities at the Site. The specific locations of air monitors will be determined during the remedial design phase and will depend on local wind patterns.

2. Comment: One commenter was concerned about the possibility of trucks not following the proposed route which does not pass through the residential area.

   EPA Response: The truck traffic will be carefully monitored to ensure that all trucks are following the approved route. Truckers who do not follow the approved route will not be allowed to continue working at the site. A toll-free number will be available for residents to use, if they have concerns about the truck traffic.

3. Comment: One commenter asked if EPA had determined where dinoseb in the groundwater is coming from and will EPA be doing more testing. The Commenter also wondered if the dinoseb is part of Operable Unit 1 (OU1) or OU2.

EPA Response: EPA conducted additional testing in the area where dinoseb was discovered. The source of the dinoseb is still unknown; however, the concentrations of dinoseb are decreasing apparently due to natural attenuation. The dinoseb is a part of OU2; it was not found on OU1.

4. Comment: One commenter asked about the location of the groundwater plume discussed in the Remedial Investigation Report. The commenter also asked if dinoseb was in the groundwater plume and what other contaminants were in the plume.

EPA Response: The Remedial Investigation Report and Feasibility (RI/FS) Study Report were amended with an errata sheet to remove the statements regarding a groundwater plume between OU1 and OU2. Since EPA issued the RI/FS report, EPA has gathered additional groundwater data. This data indicate that some of the groundwater contamination may originate in OU1. Additional groundwater contamination may originate in the area of the Golden Seed buildings and move toward the south. The contaminants which appear consistently in the groundwater around the buildings are metals, alpha-BHC, gamma-BHC, and endrin. Dinoseb was not found in any groundwater samples at OU1. High concentrations of dinoseb were found in a well (MW-2) in the northeast portion of OU2. The dinoseb contamination at OU2 is probably moving to the south or southeast. Wells to the southwest of MW-2 do not show high levels of dinoseb contamination. The dinoseb movement will be better defined during the Remedial Design phase.

5. Comment: One commenter asked if testing had been conducted upstream from the creek which flows south of the Golden Seed facility.

EPA Response: EPA has conducted extensive testing of this area with the South Tift Area Initiative and the Remedial Investigations for the Marzone site. Available data do not indicate that unacceptable levels of contamination exist upstream of the Site (west of Whiddon Road).

6. Comment: One commenter asked who would be checking the monitored natural attenuation system for groundwater.

EPA Response: EPA will be responsible for the accuracy of the monitored attenuation data, whether collected by EPA or some other party under EPA oversight.

7. Comment: One commenter supported the remedy selection for the railroad drainage ditch, but stated that the aerial extent to be remediated should be validated with current sampling analysis.

EPA Response: Sampling and analysis of the drainage ditch from the southwest corner of the Slack property to the culverts at the southern point of the railroad spur was conducted

in fall of 1998. Results indicated that remediation of this portion of the ditch was required. This remediation was conducted in 1998.

Sampling of the ditch from the culverts to the northeastern corner of the Golden Seed property was conducted during the OU2 remedial investigation. This portion of the drainage ditch will be remediated during the OU2 remedial action.

8. Comment: One commenter supported the selected remedy for surface soils, but stated that subsurface soils adjacent to the Golden Seed concrete pad should be sampled. The commenter also criticized the use of immunoassays at this Site.

EPA Response: Additional subsurface soil sampling was conducted in December 1998. The results from this sampling indicate that contamination was not present above levels of concern.

Sampling around the concrete pad was not conducted during the March 1996 field work because of flooding in that area. Other subsurface samples upslope from the concrete pad were not collected because of extremely shallow groundwater levels (1 foot below land surface).

Additional soil and subsurface sampling was not conducted prior to December 1998 for the following reasons:

1) The EPA removal program conducted soil sampling after excavating each grid to ensure compliance with the performance standard of 100 ppm (total pesticides). The average of the results from this sampling is 18.6 ppm (total pesticides). Data from the removal report indicates that the majority constituents in these samples were toxaphene, DDT, DDE, and DDD which are not contaminants of concern (COCs) in the groundwater.

2) In comparing the groundwater COCs with surface and subsurface soil COCs, only two organic contaminants correlate. The contaminants, endrin and endrin ketone, are not drivers in the groundwater remediation. The second round of sampling found concentrations of endrin below the Safe Drinking Water Act Maximum Contaminant Level (MCL). A performance standard is not available for endrin ketone, but EPA does not believe that the concentration of endrin ketone is of concern, based on comparison with the endrin MCL.

3) The highest metals concentrations were only found in well MW-2 which is most likely not influenced by activities around the concrete pad, since groundwater flow would not proceed from the pad area to well MW-2.

Immunoassays were used as a screening tool for toxaphene, DDT, and gamma-BHC to define the boundary of contamination. The technique has been used successfully at other Superfund sites and was a useful tool at this site.

9. Comment: One commenter stated that the Kd's for subsurface contaminants of concern (COCs) are badly overstated, which may understate COC mobility.

EPA Response: Values for Kd's may be overstated when compared to literature values. However, this issue is not considered to be significant since the only organic contaminants found in both soils and groundwater are endrin and endrin ketone which for endrin was not detected above the performance standard (MCL) in the second round of sampling. There is no MCL or other performance standards for endrin ketone; however, the highest level of endrin ketone in groundwater was found in well MW-2 which is upgradient from the highest soil concentration.

10. Comment: One commenter concurred with the selected remedy of monitored natural attenuation, but disagrees with the selection of a contingency remedy at this time. The commenter stated that analytical results for metals may not be accurate, possibly due to suspended solids in water samples. The commenter also stated that the groundwater is not a useable water supply because of low yield and proximity to an animal enclosure.

EPA Response: A contingency remedy is necessary for this site, since the application of monitored natural attenuation is unproven for the Marzone OU2 contaminants of concern. The in-situ treatment wall is considered to be the best contingency remedy given the hydrogeology of the area. This contingency remedy is being pilot-tested at OU1 of the Marzone site and has been successful to date at that operable unit.

Suspended solids may have been a problem for some of the groundwater samples. However, analysis of the data shows no correlation between high turbidity (which correlates with high suspended solids) and high metal concentrations. In fact, well MW-02SH, which showed the highest concentrations of most inorganics cited in the Comment, had a turbidity of 3 NTU. Such a turbidity would be associated with a low suspended solids concentration. The spatial variability in sample concentrations is not considered to necessarily be evidence of a suspended solids problem, since organic contaminant concentrations showed similar variability.

The comment regarding the groundwater not being a useable water supply is not supported by a quantitative analysis of the aquifer at OU2 which compares the potential well yield to the well yield criterion established by the EPA to define a potential source of drinking water (150 gallons per day or approximately 0.1 gallon per minute yield per U.S.EPA, Guidelines for Ground-Water Classification under the EPA Ground-Water Protection Strategy, 1986). The more critical concern may be the potential for metals or

pesticide-contaminated groundwater to discharge to nearby surface water or wetlands. This concern could require that the shallow groundwater contamination be addressed, regardless of the aquifer yield.

11. Comment: One commenter supported the decision to not remediate Gum Creek because of the greater damage which would be done to the ecosystem.

EPA Response: EPA agrees with this comment.

12. Comment: One commenter disagreed with the selected remedy for the non-wooded wetland area between the railroad spur and Gum Creek (the "hot-spot" area). The commenter believes that the remedy should be the same as that for Gum Creek. The commenter stated that the selection of cleanup levels should incorporate bioavailability and biodegradation factors, and that cleanup decisions should be based on clear demonstrations of causal linkage between the presence of contaminants and demonstrated ecological stress. The commenter stated that the available data are inadequate to determine the extent of the proposed remedial action. The commenter further stated that a detailed cost/benefit analysis as required by EPA (1988) should be utilized to justify sediment removal.

EPA Response: The toxicity of the chemicals detected at Marzone is well documented in the literature. Site-specific body burdens in prey species were used to evaluate potential exposures to higher trophic-level organisms who may consume the frogs, etc. Because of the tendency for pesticides such as those detected at Marzone to biomagnify in the food chain, effects are expected in these higher-trophic level organisms. Thus, for conservatism, EPA focused the assessment on the birds and mammals that can consume prey species from the wetland. It is not necessary to demonstrate an effect in the frog or in the populations of the other prey species that EPA collected before reaching the conclusion that a significant ecological risk is present. The readily visible characteristics of the wetland, such as the apparent health of vegetation and the presence of crayfish, insects, and frogs, does not substantiate a claim of no unacceptable risk. The lower trophic-level organisms are not particularly sensitive to the pesticides detected at this site.

The site-specific bioavailability of contaminants detected in site soils has already been assessed through the use of the earthworm toxicity test. The fact that all earthworms died when exposed to Area 2 soils demonstrates the site-specific bioavailability.

A causal relationship between the presence of site COCs and the documented ecological stress has been demonstrated using several lines of evidence, which are the measurement endpoints described in the Ecological Risk Assessment (ERA). A population or community evaluation would be difficult to perform for this site, because of the mobility of higher trophic-level populations.

An adequate number of samples was collected in the wetlands area to meet the stated objectives of the investigation, which were to conduct an overall surface water and sediment investigation and to characterize the area. Samples were collected near the source (at and around the culvert leading from the active portion of the site) and at the ultimate receiver (Gum Creek). Contamination was found in both areas. Therefore, EPA concluded that contamination exists between these areas. A more precise definition of the area of contamination will be provided by additional sampling during the remedial design phase. However, a conservative estimate of the area of contamination has been described in the ROD.

The EPA document referenced by the commenter ("Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA", Interim Final, October 1988) does not require a detailed cost/benefit analysis. The guidance states that the "presentation of differences among alternatives can be measured either qualitatively or quantitatively, as appropriate, and should identify substantive differences (e.g., greater short-term effectiveness concerns, greater cost, etc.). Quantitative information that was used to assess the alternatives (e.g., specific cost estimates, time until response objectives would be obtained, and levels of residual contamination) should be included in these discussions." The proposed plan and Record of Decision present the differences among alternatives in this way and, thus, justified the selected remedy for the wetland area.

13. Comment: One commenter criticized the method for determining remediation goal objectives (RGOs) for the wetland sediments.

EPA Response: The RGOs for the pesticides were calculated be a different approach than those for metals because of the differing mechanisms of toxicity. Pesticides are of concern for food chain exposure to higher trophic-level organisms, while direct toxicity as measured by a toxicity test is a better measure of toxicity for metals (other than mercury). Thus, RGOs for pesticides were based on food chain modeling and site-specific bioaccumulation data, while RGOs for metals were based on toxicity test results. EPA's approach is consistent in that EPA always uses the most sensitive endpoint for a contaminant to develop a RGO for that contaminant.

ATTACHMENT 2
STATE CONCURRENCE

# Georgia Department of Natural Resources

205 Butler Street, Suite 1154, East Tower, Atlanta, Georgia 30334-4910
Lonice C. Barrett, Commissioner
Environmental Protection Division
Harold F. Reheis, Director
Hazardous Waste Management Branch
Phone (404) 656-7802, FAX (404) 651-9425


June 30, 1999

CERTIFIED

Ms. Annie Godfrey
USEPA Region IV (4WDSSRB)
61 Forsyth Street
Atlanta, Georgia 30303

Re: Final Record of Decision
Marzone Inc./Chevron Chemical Company
Superfund Site, Operable Unit 2

Dear Ms. Godfrey:

The Georgia Environmental Protection Division (EPD) has completed its review of the above referenced document. EPD concurs with the Environmental Protection Agency's proposed Final Record of Decision (ROD) as written for the Marzone/Chevron Chemical Site, Operable Unit 2.

If you have any questions, please contact Norman R. Woodburn of my staff at (404) 656-7802.

Sincerely,

Harold F. Reheis

Harold F. Reheis
Director

HFR:nwr

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