EPA/ROD/R04-96/263
1996

EPA Superfund
Record of Decision:

CHEVRON CHEMICAL CO. (ORTHO DIVISION)
EPA ID: FLD004064242
OU 01
ORLANDO, FL
05/22/1996

RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Chevron Chemical Company Orlando, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Site noted above. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this Site.

The State of Florida, as represented by the Florida Department of Environmental Protection (FDEP), has been the support agency during the Remedial Investigation (RI) and Feasibility Study (FS) process for the Chevron Chemical Company Site. In accordance with 40 CFR 300.430, FDEP, as the support agency, has provided input during the RI/FS process. FDEP agrees with the groundwater remedy, but does not agree with no further action for soil. FDEP is unwilling to concur with the ROD because the State would prefer a risk level no greater than 1 x 10-6. The potential risk associated with future residential exposure at the adjacent trailer park is 9.0 x 10-6. The potential risk associated with future commercial exposure at the Site is 2.0 x 10-6.

ASSESSMENT OF THE SITE

Unacceptable risk associated with this Site is due to the potential future consumption of groundwater containing contaminants above either federal or State of Florida groundwater standards. Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare of the environment.

DESCRIPTION OF THE SELECTED REMEDY

This remedy addresses the principal threats posed by the environmental conditions at this Site.

The major components of the remedy include:

- Natural attenuation
- Groundwater monitoring to document achievement of the groundwater cleanup levels.
- A contingency plan that includes the installation of a subsurface filter wall if natural attenuation does not continue as expected. Additional enhancements, such as limited air sparing, hydraulic gradient control, or source removal will be implemented if necessary.
- Institutional controls

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 to the remedial action, and is cost- effective. This remedy utilizes extent practicable for this Site. This remedy does not satisfy the statutory preference for treatment as a principal element. However, the contaminants in groundwater are expected to naturally attenuate within 8-10 years. In addition, given that there is no current exposure to groundwater, there is no need for immediate active treatment measures.

Because the remedy will result in hazardous substances remaining on- site, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The reviews will be conducted every five years thereafter until health based levels are achieved. Groundwater monitoring data will also be reviewed annually to gauge the effectiveness of natural attenuation and to determine if the contingency remedy should be implemented.

<IMG SRC 0496263>

THE DECISION SUMMARY

1.0 SITE LOCATION AND DESCRIPTION

The Chevron Orlando site is located at 3100 North Orange Blossom Trail (Highway 441) in Orlando, Orange County, Florida (see Figure 1). The site is in Township 22 S, Range 29 E, Section 15. As shown on Figure 2, the site is bordered on the east by Orange Blossom Trail and to the south by active railroad tracks. The land use in the areas to the south and west of the site is light industrial. The Armstrong Trailer Park, which is a residential mobile home park, borders the site to the north. The 441 Trailer Park is north of the Armstrong Trailer Park, and across Orange Blossom Trail to the east of the site. The Lake Fairview Commerce Center is directly across Orange Blossom Trail to the east of the site.

The site is 4.39 acres in size and is currently cleared, vegetated with grass, fenced, and unoccupied. Lake Fairview is approximately 700 feet northeast of the site. Lake Fairview is a remnant karst lake, which is approximately 400 acres in size.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Chevron Chemical Company facility was in operation between 1950 and 1976 as a pesticide formulation plant. The facility received unblended products in bulk liquid and powder form, and blended the products to make pesticides and nutritional sprays for bulk wholesale distribution. The unblended products were shipped in primarily by rail, formulated, packaged in drums, and shipped out by truck. The historic site features included several above ground storage tanks, a drum storage area, a drum rinse area, two pesticide rinsate ponds, three septic tank drain fields, and an underground petroleum storage tank. The above ground tanks were used to store the petroleum distillates which were used as blending agents (e.g., xylene, ethylbenzene, and mineral spirits). As shown on Figure 3, the rinsate ponds were located in the northwestern portion of the site. The ponds were used for the collection and disposal of storm water, pesticide formulating rinse water, drum rinse water, and floor wash-down water. The underground storage tank was used to store vehicle fuel. A floor drain was located in the formulating warehouse in a liquid pesticide formulation area. The floor drain discharged onto the ground surface near an abandoned rail spur located along the southern property boundary.

Parathion, chlordane, phaltan, captan, malathion, and paraquat were formulated at the site. DDT, difolatan, BHC-lindane, dieldrin, aldrin, bromamine, and nutritional sprays (aqueous solution of copper, zinc, manganese, sulfur, and boron) were also formulated during this period of operation. Chemicals used in pesticide formulation included xylene, kerosene, mineral oil, mineral spirits, ethylbenzene, and aromatic naphtha.

Chevron discontinued the formulation of pesticides in 1976. According to Chevron sources, Chevron removed the chemical inventory from the site, drained the equipment lines and backfilled the rinsate ponds with soil.

In 1978, the property was sold and Central Florida Mack Trucks, a truck sales and service company, began operations at the Site. Central Florida Mack Trucks repaired and serviced diesel engine trucks. Body work and painting were also conducted at the site. The facility generated waste oil and waste degreasing solvent (from engine and parts cleaning operation). A waste oil through was located along the railroad spur on the southwestern side of the site. Used oil filters, waste oil, diesel fuel, paint, and partially filled drums of powdered pesticides were later discovered in the rinsate pond area during the first Removal Action, along with discarded truck parts and debris.

In March 1984, during the operation of Central Florida Mack Trucks, a tanker truck (owned by Waste Management, Inc.) filled with 3% hydrochloric acid and an unknown amount of nitric acid, was stored on-site for repair. The tanker leaked an estimated 3,000 to 6,000 gallons of acid, which resulted in an explosion in the spill area and disposed of the contaminated soils.

Central Florida Mack Trucks discontinued its operation at the Site in November 1986. On March 1, 1991, the pesticide formulating/warehouse building on site burned down. The building debris was cleared from the rail spur area and the south side of the site was fenced. Chevron purchased the property in foreclosure from First Union Bank and the Resolution Trust Company in 1993 and 1994, respectively.

During the period from 1982 to 1989, several investigations were conducted to assess the conditions at the site. The results of these studies indicated the presence of some pesticides, VOCs, and metals in soil and/or groundwater samples.

In May 1989, an EPA contractor conducted a field investigation under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Samples from the surface and subsurface soils and the groundwater were collected at the site. The results of the sampling activities identified the presence of pesticides, benzene, toluene, xylene, naphthalene compounds, and metals in soil samples collected along the rail spur adjacent to the former outfall from the floor drain. Chlordane was detected in soil samples collected in the southwest corner of the site. Pesticides, metal, benzene, toluene, xylene, and naphthalene compounds were detected in soil samples collected in the vicinity of the former rinsate ponds.

<IMG SRC 0496263A>
<IMG SRC 0496263B>
<IMG SRC 0496263C>

Analysis of the groundwater samples identified metals, benzene, toluene, and xylene in the samples collected near the floor drain outfall. Metals, pesticides, xylene, benzene, trichloroethylene, and chlorobenzene were detected in the groundwater samples collected in the vicinity of the rinsate ponds.

During 1990, as a result of these studies, EPA and Chevron signed an Administrative Order on Consent (AOC) for a removal action at the Site. Site contamination was further assessed in accordance with the requirements of the AOC.

The results of the assessment activities were used to define general areas of soil contamination, and to identify the presence of groundwater contamination. The primary contaminants of interest identified through the assessment were chlordane, DDT (and its daughter products), parathion, and a variety of petroleum hydrocarbons.

The assessment results were also used to plan the Removal Action activities. The Removal Action activities focused on removal of material which could be a source of groundwater contamination or a risk to human health, and included the soil in the rinsate pond area, along the railroad spur, and adjacent to the historic aboveground storage tank area. The EPA authorized Chevron to proceed with the Removal Action in August 1991.

The Agency for Toxic Substances and Disease Registry (ATSDR) defined the removal action goals and cleanup levels for the soils on site, to be protective of human health via the inhalation and dermal contract routes of exposure. The ATSDR goals were removal of shallow soils (0- to 1-foot below land surface) with chlorinated pesticide concentrations in excess of 50 milligrams per kilogram (mg/kg), and removal of deeper soils (1-foot to the water table) with chlorinated pesticide concentrations in excess of 100mg/kg. ATSDR recommended the use of chlordane as an

indicator chemical because chlordane was considered the most prevalent and most toxic compound to humans and was found in the highest concentrations.

Prior to the removal action, additional sampling was conducted to evaluate the potential for off-site migration of contaminants in the groundwater and to evaluate the magnitude and extent of soil contamination. Soil samples were collected using a 50-foot by 50-foot grid established across the site. Samples were collected from 2 to 4 feet below land surface (BLS), 4 to 6 feet BLS, and 8 to 10 feet BLS. Groundwater samples were collected via a Hydropunch and the installation of four additional clusters of wells. Petroleum hydrocarbons such as benzene, ethylbenzene, and xylene were the predominant groundwater contaminants. Chlorinated pesticides were detected sporadically; a-BHC and b-BHC were the most frequently detected pesticides.

The removal action was conducted during the period from December 1991 through September 1992. All site structures were demolished and removed. Approximately 17,780 tons of pesticide contaminated soil were excavated and disposed of; 4,900 tons of petroleum contaminated soil were excavated and treated; and 126,000 gallons of recovered stormwater and groundwater were treated and discharged into an on site infiltration trench. All of the excavated areas were backfilled with clean soil and the site was graded and seeded. Figure 4 shows the areas that were excavated, and the depths of each excavation.

In April 1993, Chevron and EPA entered into a separate AOC to conduct an RI/FS pursuant to the EPA policy known as the Superfund Accelerated Cleanup Model (SACM). The purpose of the RI/FS was to evaluate groundwater contamination at the Site and to evaluate potential soil contamination in an adjacent trailer park and areas of off-site drainage.

Soil sampling was conducted in two phases at the adjacent Armstrong Trailer Park. Based on the results of the sampling, a removal action was conducted at the trailer park during March and April 1994. The soil cleanup level was 4.9 ppm of chlordane. Approximately 230 tons of contaminated soil was excavated from the trailer park. Most of the contaminated soil was removed from an area adjacent to the northwest corner of the Site, a probable location for surface water runoff (see Figure 5).

Groundwater sampling was also conducted in phases during the RI. Nine existing monitoring wells were sampled in April 1993. Seventeen additional wells were installed and subsequently sampled during September and October 1993.

The site was finalized on the NPL during May 1994. The RI/FS documents were finalized during March 1995.

3.0 HISTORY OF COMMUNITY RELATIONS

A public meeting was held on November 20, 1991, prior to the on-site removal action. In addition, an administrative record and public comment period were also established for the removal action.

A public meeting was held on July 29, 1993 to explain the upcoming RI/FS activities at the Site. The meeting was held at the Fire Fighters Council Hall in Orlando. Another public meeting was held on March 17, 1994 prior to the removal action at the Armstrong Trailer Park. The meeting was conducted at the trailer park.

A fact sheet describing the status of Superfund activities was mailed to the community during July 1994.

<IMG SRC 0496263D>

<IMG SRC 0496263E>

The Florida Department of Health and Rehabilitative Services (HRS) held a meeting on March 9, 1995 at the Armstrong Trailer Park. HRS held the meeting to discuss their health assessment of the Site. EPA staff were present to discuss Superfund activities.

The Proposed Plan fact sheet was mailed to the community on July 18, 1995. The administrative record was updated and relocated to the Edgewater Branch Public Library, which is closer to the Site. A public meeting was held on July 26, 1995 at the Edgewater Branch Public Library. The public comment period was held from July 21, 1995 to August 18, 1995.

4.0 SCOPE AND ROLE OF ACTION

The planned actions for this Site address groundwater contamination. The ROD further describes this remedy and is the only ROD anticipated for this Site.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Geology

The Chevron Orlando site is located in north-central Orange County, on the Florida Peninsula. The topography of Orange County includes a highland region which extends across the western part of the county, and a lowland region in the eastern portion of the county along the St. Johns River. The Orlando Ridge, Mount Dora Ridge, and part of the Lake Wales Ridge make up the highland region, which is mostly sand hills of remnants of fossil beach ridges that parallel the Atlantic coast.

The site lies within the Osceola Plain, in a small area between the Orlando and Mount Dora Ridges. The ridges are differentiated from surrounding plains by the profusion of mature karst lakes. The drainage in the vicinity of the site is controlled by the topography, with the drainage basins for groups of lakes defined by relic beach ridges.

The main drainage features in Orange County include small seasonal streams, lakes and sinkholes. Drainage in Orange County, specifically in the Orlando area, also occurs through drainage wells. Between 1906 to 1961, approximately 300 drainage wells were drilled in Orange County to control the county have no natural drainage outlets, except for infiltration into the surficial aquifer. The maximum water level elevation in a lake is controlled by a fixed-elevation weir. As the water level in the lake rises in response to rainfall and overtops the weir, the overflow is channeled into the drainage wells. The drainage wells are constructed into the Floridan aquifer. Lake Fairview is the closest lake to the Site. The southernmost edge of the lake is located approximately 700 feet northwest of the Site.

The land surface elevation of the site ranges between 97 and 102 feet above mean sea level. The elevation decreases to the north and east. Historically, stormwater runoff flowed across the site to the north into a drainage ditch, which discharged into a small pond in the northwest comer of the site. The site topography was modified during the first Removal Action to promote on-site infiltration of stormwater. Prior to the Removal Action, the eastern portion of the site (which was covered with asphalt) drained to the east into the storm drain system along Orange Blossom Trail.

5.2 Area Hydrogeology

Orange County is underlain by a wedge of marine limestone, dolomite, shale, sand and anhydrite that is approximately 6,500 feet thick. Overlying the crystalline basement in succession are

the Eocene age Lake City limestone (over 700 feet thick), the Avon Park limestone (400 to 600 feet thick), and the Ocala limestone (0 to 125 feet thick) which may be highly eroded or missing in some parts of the county. These formations, and permeable portions of the Hawthorn formation, comprise the Floridan aquifer.

The Floridan aquifer is divided into two major producing zones, the upper zone (between 150 and 600 feet BLS) and the lower zone (between 1,100 feet and 1,500 feet BLS). The producing zones are composed of dolomitic limestone and are separated by less permeable layers of soft limestones. The lower producing zone is a main source of municipal water supply for much of Orlando and Winter Park.

The Miocene age Hawthorn formation (50 to 300 feet thick) overlies the Ocala limestone. The upper Hawthorn is made up of gray-green, clayey, quartz sand and silt, and acts as a confining unit between the surficial aquifer and the Floridan aquifer. The lower part of the Hawthorn formation is comprised of limestone with phosphorite and quartz sand. In areas where the lower part of the formation produce water, it is considered to be part of the Floridan aquifer. However, this water producing unit of the Hawthorn formation may not be present in all parts of the county.

Discharge from the surficial aquifer occurs through domestic water supplies throughout Orange County. Most of the wells constructed in the unconfined aquifer are small in diameter and produce approximately 5 to 10 gallons per minute. Additional discharge from the surficial aquifer occurs through seepage into lakes and streams during periods of low flow and drought, as well as downward leakage to the Floridan aquifer. The majority of recharge to the surficial aquifer comes from rainfall, and infiltration from surface water bodies. However, upward leakage from the Floridan aquifer may recharge the surificial aquifer in areas where the potentiometric surface of the Floridan aquifer is above the water table. The direction of groundwater flow in the surficial aquifer is controlled by topography.

Some recharge to the Floridan aquifer occurs through infiltration of rainfall through semi-permeable confining layers, but most occurs through the drainage wells in the county. The groundwater flow direction in the Floridan aquifer is generally easterly and northeasterly. The regional flow in influenced locally by the effects of pumping wells, seasonal fluctuations, and drainage wells.

The climate in the area is semi-tropical with an average annual temperature of 71.8 degrees Fahrenheit (°F) with minor seasonal fluctuations. The average temperature in the winter is 61.1 °F and 81.1 °F in the summer.

Rainfall is approximately 48 inches per year, with the most precipitation occurring between June and September. November is the driest month with an average rainfall of 1.78 inches. July is the wettest month with an average rainfall of 7.78 inches. The wind flow in the area is predominantly from the north and east. However, the wind does not blow in a single direction more than 10 percent of the time.

5.3 Site Hydrogeology

The shallow lithology underlying the site was defined during construction of monitor wells and soil borings. Quartz sand, with varying amounts of silt and organic material was encountered from 0 to 27 feet below land surface (BLS). The sand is fine to medium grained, and ranges in color from brown to light tan. Organic material was observed in the upper 10 to 15 feet of the sand unit, along with stringers of clay. The lower portion of the unit grades from sand in an organic matrix to sand in a light tan calcareous mud matrix.

The contract with the Hawthorne formation appears to be an erosional surface, represented by a decreasing percentage of sand an increasing percentage of calcareous clay. In MW-14, a distinctive clay horizon was encountered at 40-feet below land surface. The gray silty clay layer is approximately 20 feet thick. Olive green clay with phosphorite nodules, which is characteristic of the upper Hawthorn formation, was encountered in MW-14 at approximately 65-feet BLS. The first limestone unit of the Hawthorn formation was encountered at 78-feet BLS. The limestone is light grey, with distinctive phosphorite nodules.

The saturated thickness of the surficial aquifer at the site is 17 to 20 feet. The depth to groundwater at the site is usually within 10 feet of the land surface. The groundwater flow across the site is to the northeast toward Lake Fairview with a gradient of approximately .006 feet/feet. The potentiometric surface elevation in the upper Floridan aquifer, as measured in MW-14, is approximately 20 feet lower than the water table elevation measured on the site.

An aquifer performance test was conducted at the site to determine the characteristics of the surficial aquifer. The data produced by the pumping test were evaluated using various methods to best address the anticipated delayed yield and partial penetration. The static water level was measured in two monitor wells to identify potential areal influences on the water table elevation for a period of 24-hours before the pumping test began. The pumping test data interpretation provided a range of transmissivity values from 700 to 1000 feet^2/day. A hydraulic conductivity value of 52 feet/day was selected for use in the groundwater flow model, as most representative of the areawide surficial aquifer.

The water level in MW-14 (the Hawthorn formation monitor well) was also measured during the pumping test, to determine whether a connection between the surficial aquifer and the first water level was measured in MW-14 that could be related to the test.

A well survey was conducted within a radius of one mile around the site. The files at the Florida Department of Environmental Regulation (now the Department of Environmental Protection), the St. Johns Water Management District, and the U.S. Geological Survey were reviewed to complete the survey. Eight wells were identified within a one mile radius of the site, but none of these wells are down gradient of the site. The closest well is located approximately 3800 feet northwest of the Site.

5.4 Soil Contamination

The previous on-site removal addressed much of the soil contaminated with chlorinated pesticides (including chlordane) and petroleum at the Site. The soil cleanup level was a chlordane concentration of 50 ppm in the upper one foot of soil 100 ppm for the deeper soils. Excavation depths varied from 0 - 10 feet and, as a result, 50 percent of the surface area and 17 percent of the deeper soil was excavated and replaced by clean fill.

The contaminants of concern in on-site soil are summarized in Tables 1 and 2. Other organic compounds and pesticides were detected but are not evaluated further due to low detection frequencies of low concentrations relative to screening values. The contaminants of concern in off-site soil are summarized in Table 3. The exposure point concentration listed in the following tables is the statistical 95% UCL for the average value unless it exceeds the maximum value detected or is below the minimum value detected. In those cases, the maximum detected value is used.

The removal at the adjacent trailer park addressed soil contaminated by surface water runoff from the Site. The soil cleanup level for the trailer park was a chlordane concentration of 4.9 ppm and was based on protecting human health in a residential setting.

TABLE 1: CONTAMINANTS OF CONCERN IN ON-SITE SURFACE SOIL

Contaminant	Frequency of Point Detection (mg/kg)	Range of Detected Concentrations (mg/kg)	Exposure Concentration
4,4'-DDD	25/81	.04-21	2.5
4,4'-DDE	12/79	.147-3.1	1.1
4,4'-DDT	27/81	.053-58	1.4
Aldrin	5/82	.019-13	1.2
b-BHC	7/82	.005-21	1.1
Chlordane	54/82	.088-79	8.6
Dieldrin	12/79	.029-11	1.2
Heptachlor Epoxide	4/80	.0058-0.6	0.6

TABLE 2: CONTAMINANTS OF CONCERN IN ON-SITE SURFACE SOIL

Contaminant	Frequency of Point Detection (mg/kg)	Range of Detected Concentrations (mg/kg)	Exposure Concentration
4,4'-DDD	126/271	.01-210	17
4,4'-DDE	49/215	.007-21	2.1
4,4'-DDT	50/271	.053-58	2.7
Aldrin	19/225	.019-23	1.5
a-BHC	13/225	.5-130	1.4
b-BHC	15/225	.005-21	1.2
Chlordane	187/273	.048-350	46
Dieldrin	56/222	.029-16	2
g-BHC (lindane)	12/225	.3-19	1.4
Endrin	14/216	.014-6.7	6.7

TABLE 3: CONTAMINANTS OF CONCERN IN ON-SITE SURFACE SOIL

Contaminant	Frequency of Point Detection (mg/kg)	Range of Detected Concentrations (mg/kg)	Exposure Concentration
Chlordane	50/53	.004-5.3	3.9
Lead	7/7	15-130	79
Dieldrin	16/53	.079-1.1	0.066

5.5 Groundwater Contamination

Certain VOCs, pesticides, and metals have been detected in some monitoring wells at the Site. The groundwater contaminants vary in concentration, location and depth underneath and adjacent to the Site. Groundwater contamination has been found at depths ranging from approximately 5 to 30 feet BLS. Low level groundwater contamination extends in a northeast direction under the Site and the eastern portion of the upgradient trailer park. Site contaminants have not been detected in the monitoring well located upgradient of Lake Fairview. The contaminants of concern in groundwater at the Site are summarized in Table 4. Other organic compounds and pesticides were detected but are not evaluated further due to low detection frequencies or low concentrations relative to screening values. The locations of the groundwater monitoring wells are shown in Figure 6. One well, MW-14, was installed and screened at a depth of 82-94 feet. Trace amounts of chromium and lead were detected along with bis(2-ethyl hexyl) phthlate and di-n-octyl phthlate.

6.0 SUMMARY OF SITE 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 taking action and indicates the exposure pathways that need to be addressed by the remedial action. This section of the ROD reports the results of the baseline risk assessment conducted for this Site.

GROUNDWATER CONTAMINANT	FREQUENCY OF DETECTION (April 1995)	RANGE OF DETECTED CONCENTRATIONS(ug/l)	CLEANUP STANDARD (ug/l)
Benzene	9/25	1.1-23	1
Ethylbenzene	12/25	.9-380	30
Xylenes	13/25	4-1,100	20
Total Napthalenes	3/25	25-26	100
4,4'-DDD	4/25	.12-2.2	0.1
a-BHC	10/25	.16-19	0.05
b-BHC	12/25	.15-47	0.1
g-BHC (Lindane)	3/25	.87-2.4	0.2
Chlordane	3/25	1.1-17	2
Arsenic	2/25	10-34	50
Chromium	2/25	70-3,200	100
Lead	8/25	5-66	15

<IMG SRC 0496263F>

6.1 Contaminants of Concern

The chemicals measured in the various environmental media during the RI were included in this discussion of the site risks if the results of the risk assessment indicated that a contaminant might pose a significant current or future risk of contribute to a cumulative risk which is significant. The criteria for a significant risk was a carcinogenic risk level above the acceptable risk range, i.e., 1x10-4 to 1x10-6, or a hazard quotient (HQ) greater than 1.0 (unity). See tables 1-4 for the contaminants of concern in each medium.

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 baseline risk assessment is based on the reasonable maximum exposure (RME) that may be encountered during the various Site use scenarios. The RME concentrations are either the calculated 95% Upper Confidence Limit of the aritmetic mean or the maximum concentration detected during sampling. The intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures. If the calculated UCL exceeded the maximum level measured at the Site, then the maximum concentration detected was used to represent the reasonable maximum concentration. The chronic daily intakes were then used in conjunction with cancer slope factors and noncarcinogenic reference doses to evaluate risk.

The exposure point concentrations for on-site soil are based on analytical data collected prior to and as part of the on-site removal action conducted in 1992. The data can be found in the July 1991 Removal Action Plan (see Figure 4-1 and Appendix C) and the December 1992 Removal Action Report (see Appendices E and F). Table 3-5 of the Baselins Risk Assessment, dated March 1995 lists the particular sample points used in the exposure point concentrations. The Baseline Risk Assessment used only those samples collected from areas after excavation was completed or from the remaining areas where no removal excavation was necessary.

The exposure point concentrations for off-site (Armstrong Trailer Park) and the current groundwater conditions are presented in the RI Report dated November 1994. There was a removal of some surface soil conducted at the Armstrong Trailer Park during March 1994. Again, the Baseline Risk Assessment used only those samples collected from areas after excavation was completed or from the remaining areas where no removal excavation was necessary.

6.2 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, 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 absorption).

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 the above 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 5: POTENTIAL EXPOSURE PATHWAYS

Media	Scenario	Receptor	Exposure Pathways
Groundwater	Future	Adult & Child	Ingestion & Resident Inhalation
On-site Surface Dermal Contact	Current	Trespasser	Ingestion & Soil
	Future	Trespasser & Worker	Ingestion & Adult Dermal Contact
On-site Subsurface Soil Worker	Future	Adult Construction	Ingestion & Dermal Contact
Off-site Soil	Current	Child & Adult	Ingestion & Resident Dermal Contact

Vegetation and ground cover present at the Site will impede wind erosion of soil at the Site. Therefore, exposure to constituents in air, either as vapor or adsorbed to dust, is not considered significant at the Site under current land use conditions. The presence of vegetation also reduces direct contact with surface soils by Site visitors.

The baseline risk assessment considered commercial and residential land use. There is a mobile home park located just north of the Site and industrial/commercial operations on the all other sides of the Site. Future residential use of the Site is not likely. The current zoning and future land use planning both designate commercial use for the Site and the surrounding area.

6.3 Toxicity Assessment

Toxicity values are used in conjunction with the results of the exposure assessment to characterize Site risk. EPA has developed critical toxicity values for carcinogens and noncarcinogens. Cancer slope factors (CSFs) have been developed for estimating excess lifetime cancer risk associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in units of (mg/kg/day)-1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at the intake level. The term "upper bound" reflects the conservative estimated of the risks calculated from the CSF. Use of this conservative approach makes underestimation of the actual cancer risk highly unlikely. CSRs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainly factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict efforts on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

6.4 Risk Characterization

Human health risks are characterized for potential carcinogenic and noncarcinogenic effects by combing exposure and toxicity information. Excessive lifetime cancer risks are determined by multiplying the estimated daily intake level with the CSF. These risk are probabilities that are generally expressed in scientific notation (e.g., 1x10-6). An excess lifetime cancer risk of 1x10-6 indicates that, as a plausible upper boundary, an individual has a one in one million additional (above their normal risk) chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the assumed specific exposure conditions at a Site.

EPA considers individual excess cancer risks in the range of 1x10-4 to 1x10-6 as protective; however the 1x10-6 risk level is generally used as the point of departure for setting cleanup levels at Superfund sites. The point of departure risk level of 1x10-6 express EPA's preference for remedial actions that result in risk at the more protective end of the risk range. The health-based risk levels for the Site are shown in Table 6. The health-based risk levels for off-site soil are shown in Table 7.

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 contaminants's reference dose). A HQ which

exceeds unity (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 form the cumulative exposure to multiple contaminants within a single medium or across media. The HI for the Site are shown in Table 6. The HIs for the off-site soil are shown in Table 7.

Exposure to on-site soil under existing conditions and land use does not present an unacceptable carcinogenic risk. Exposure to on-site subsurface soil by a future construction worker yields a hazard index slightly above unity. However, given the conservative assumptions used in the risk assessment, the actual exposure and associated risk is expected to be acceptable. EPA's definition of acceptable risk is found in 40 CFR 300.430 (e)(2).

Future residential use of the site poses an unacceptable risk, primarily due to ingestion of contaminated groundwater. Currently, no drinking water wells are located within the area of the groundwater plume. Exposure to on-site surface soil by a future residential child yields a hazard index slightly above unity. However, given the conservative assumptions used in the risk assessment the actual exposure and associated risk is expected to be acceptable.

Current and future exposure to soil at the adjacent Armstrong Trailer Park does not pose an unacceptable risk. Ingestion of contaminated groundwater would pose an unacceptable risk, but no private wells are used at the trailer park. Area residences and business are currently supplied by municipal water supply systems; therefore, the groundwater in the surficial aquifer is not consumed and poses no foreseeable risk.

Unacceptable risk associated with this Site is due to the potential future consumption of groundwater containing contaminants above either federal or State of Florida groundwater standards. 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, of the environment.

6.5 Environment Risk

A qualitative and quantitative risk assessment was conducted to determine if contaminants present in site soils and groundwater have impacted or can potentially impact flora and fauna in the area.

The site is now a vacant lot and much of the surface soil has been removed and backfilled with clean soil. Grasses and weeds have revegetated most of the Site and birds and insects have been observed on site. No endangered or threatened species have been identified in the immediate vicinity of the Site.

The risk assessment considered potential on-site ecological impacts by calculating HIs for exposure of surrogate species to on-site soil. The calculations were produced in a manner similar to the HIi calculated for human exposure. Calculated potential intakes were compared to No-Observed-Adverse-Effects-Levels, Lowest-Observed-Adverse-Effects, or other toxicological data. Given the conservative assumptions used to calculate potential exposure and associated risk, the ecological risk for on-site species is not considered significant.

TABLE 6: RISK SUMMARY FOR CURRENT AND FUTURE USE: ON-SITE SOIL AND GROUNDWATER

Land Use/Receptor	Pathway	Noncarcinogenic (Hazard Index) Risk	Carcinogenic Risk
			Current Use/Adolescent Ingestion of Soil 0.2 5x10-6 Trespasser
	Dermal Contact	0.1 5x10-6 with Soil	
	TOTAL:	0.3 1x10-5	
Future Use/Adolescent	Ingestion of Soil	0.2 5x10-6 Trespasser	
	Dermal Contact	0.1 5x10-6 with Soil	
	TOTAL:	0.3 1x10-5	
Future Use/Adult Construction	Ingestion of Soil	2.0 4x10-6 Worker	
	Dermal Contact with Soil	0.3 8x10-7	
	TOTAL:	2.3 5x10-6	
Future Use/Adult Worker	Ingestion of Soil	0.1 9x10-6	
	Dermal Contact with Soil	0.08 8x10-6	
	TOTAL:	0.18 2x10-5	
Future Use/Child Resident	Ingestion of soil	3.0 6x10-5	
	Dermal contact with soil	0.8 2x10-5	
	Ingestion of groundwater	10 2x10-3	
	Inhalation of groundwater	0.9 4x10-6	
	TOTAL:	15 2x10-3	
Future Use/Adult Resident	Ingestion of soil	0.4 3x10-5	
	Dermal Contact	0.3 3x10-5 with Soil	
	Ingestion of groundwater	5.0 3x10-3	
	Inhalation of groundwater	0.4 7x10-6	
	TOTAL:	6.1 3x10-3	

TABLE 7: RISK SUMMARY FOR CURRENT AND FUTURE USE: ON-SITE SOIL AND GROUNDWATER

Land Use/Receptor	Pathway	Noncarcinogenic (Hazard Index) Risk	Carcinogenic Risk
Child Resident	Ingestion of soil	0.8	7x10-6
	Dermal contact with soil	0.3	2x10-6
	TOTAL:	1.1	9x10-6
Adult Resident	Ingestion of soil	0.09	3x10-6
	Dermal contact with soil	0.1	3x10-6
	TOTAL:	0.19	6x10-6

6.6 Uncertainties

At all stages of the risk assessment, conservative estimates and assumption were made so as not to underestimate potential risk. Nevertheless, uncertainties and limitations are inherent in the risk assessment process.

The estimates of exposure point concentrations of the chemicals of concern probably overstate actual concentrations to which individuals would hypothetically be exposed and therefore, the health risk estimates are very conservative. In addition, no attenuation of the chemicals was considered; however, this may reduce concentrations of chemicals over time.

The assumed exposure pathways evaluated in the risk assessment are conservative in nature and may overstate the actual risk by this Site.

Summing risks or hazard indices for multiple contaminants ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants.

7.0 DESCRIPTION OF ALTERNATIVES FOR GROUNDWATER

The following Site specific alternatives represent a range of distinct actions addressing human health and environmental concerns. The analysis presented below reflects the fundamental components of the various alternatives considered feasible for this Site.

The various alternatives were based on achieving groundwater cleanup levels. Most of these cleanup levels are based in the primary Maximum Contaminant Levels (MCLs) for drinking water. However, the cleanup levels for ethylbenzene and xylene are based on their respective secondary MCLs. It is apparent that these two contaminants may contribute to increased mobilization of the BHC isomers. Thus, the secondary standards were considered appropriate for the protection of groundwater.

MCLs were not available for alpha-BHC, and 4,4-DDD'. Therefore, groundwater cleanup levels for these contaminants were based on the State's preferred risk levels for carcinogens.

Seven alternatives were selected for detailed analysis and are listed below:

Alternative No. 1 No future action
Alternative No. 2 Natural attenuation and monitoring
Alternative No. 3 Removal, treatment, and disposal of groundwater
Alternative No. 4 Bioactive filter
Alternative No. 5 Hydrologic flow barrier
Alternative No. 6 Combined alternative
Alternative No. 7 Source removal

Alternative No. 1 - No future action: This alternative serves as a baseline with which other alternatives can be compared and includes maintenance of the existing fence and warning signs, and mowing of the grass at the site for a 30-year period. Conservative estimates of biodegradation rates indicate that ARARs for mobile contaminants will be met in approximately 10 years. However, this alternative does not include monitoring to verify the rate of degradation.

Under this alternative, no further cleanup would occur at the site. A removal action was completed on-site during 1992 and a removal action was completed at the adjacent trailer park during 1994. Groundwater at the Site is not presently consumed and poses no current risk. However, no controls would be placed on future groundwater use. Area residences and businesses are currently supplied by municipal water supply systems.

Alternative No. 2 - Natural attenuation and monitoring: Alternative No. 2 includes the implementation of regulatory or institutional controls to limit the future use of the site, and the initiation of a long-term groundwater monitoring program. This alternative relies on the natural attenuation processes and continued natural degradation to reduce contaminant concentrations. Conservative estimates of biodegradation rates indicate that ARARS for mobile contaminants will be met in approximately 10 years.

Institutional controls utilize regulatory agency procedures or deed restrictions to restrict access to or usage of contaminated groundwater. Although the surficial aquifer is not used for water supply in the vicinity of the site, deed restrictions would be placed on the site to specify that groundwater withdrawals from the site (other than sampling to determine water quality) are restricted until the ARARs are achieved. Institutional controls would be used, as necessary, to control access to contaminated groundwater outside the Chevron property boundary. Since all residences and businesses in the vicinity of the site are supplied by the city and county municipal water supply systems, it is unlikely that the surficial aquifer will be used for water supply in the near future.

This alternative also includes a long-term monitoring program to monitor contaminant concentrations in the groundwater beneath and downgradient of the site.

Alternative No. 3 - Removal, treatment, and disposal of groundwater: This alternative consists of the installation of extraction wells (or a combination of extraction wells and horizontal wells) to remove contaminated groundwater. The contaminated groundwater would then be treated by air stripping and carbon adsorption. The treated groundwater will be discharged into on-site infiltration trenches. Numerical simulations indicate that this alternative will achieve the ARARs for all of the mobile COCs at the property boundary within 3 years. Existing information is insufficient to accurately predict the time required for groundwater to comply with ARARs at all locations across the site, but may be similar to that required for the no-action alternative (i.e., 8-10 years). Natural attenuation may be necessary to completely satisfy the cleanup levels. Contaminant concentrations may reach asymptotic levels slightly above the cleanup the cleanup levels in a typical pump and treat system.

The purpose of air stripping is to bring the groundwater into contact with air so that the volatile compounds migrate from the water to air. Although the pesticides of concern generally have low Henry's law constants (i.e., are not very volatile), stripping can be enhanced by using a high air-to-water ratio to create an environment in which each compounds concentration in air is always low. Under these conditions, the system will tend toward an equilibrium condition where the concentration in the water is lowered. Vapor emission controls are required to capture the volatilized pesticides by passing the emissions through activated carbon cylinders.

Granular activated carbon (GAC) adsorption is a physical adsorption process that has been shown to be successful in reducing the concentrations of pesticides in wastewater. The groundwater is brought into direct contact with the GAC filter beds, usually two columns in series and/or parallel, to facilitate continuous operation and to allow for replacement of exhausted beds. Although disposal of spent carbon is a major expense, GAC beds designed for low pesticide concentrations can often last about 3 months before replacement is needed.

Alternative No. 4 - Bioactive filter: The bioactive filter alternative is an innovative technology that involves installation of a permeable, biologically active wall to intercept groundwater contaminants migrating off-site. The filter extends vertically from land surface to approximately 30 ft below the surface, and horizontally to encomposed of native sand mixed with a carbon material that will selectively adsorb dissolved organic species migrating in the groundwater. The filter is designed such that COC concentrations in groundwater exiting the downgradient edge of the filter material will meet ARARs. In addition, if a natural material

like peat is used for the filter, the organic compounds collected by the filter may biodegrade more rapidly when adsorbed to this more biologically active material. COC concentrations upgradient of the filter will be reduced by ongoing natural biodegradation. ARARs for organic contaminants are expected to be met downgradient of the Site within 3 years. Cleanup levels are expected to be met on-site within 10 year, similar to the timeframe associated with the natural attenuation alternatives.

Alternative No. 5 - Hydrologic flow barrier: The hydrologic flow barrier considered for this alternative is a slurry wall, which is a low-permeabilty barrier that will be constructed along the downgradient edges of the site. The slurry wall will decrease the flow of contaminated groundwater from the site to downgradient areas. The portion of the plume that is currently downgradient of the site will continue to degrade. Contaminant migration will be eliminated. Cleanup levels for mobile contaminants are expected to be met downgradient of the Site within 3 years. The downgradient concentrations will decrease because the flow of upgradient, on-site contaminant will be greatly reduced and thus will no longer contribute to the downgradient contamination. Cleanup levels are expected to be met on-site within 10 years, similar to the timeframe associated with the natural attenuation alternatives.

Alternative No. 6 - Combined alternative: This alternative includes quarterly groundwater sampling and additional groundwater assessment. After one year, the groundwater data would be reviewed to determine if natural attenuation has reduced the levels of contaminants such as xylene and alpha- BHC by 10 to 15 percent. If those levels are achieved, then the natural attenuation and groundwater sampling would continue. If not, then the permeable filter wall (alternative 4) would be implemented along with other measures such as limited air sparging of hydraulic gradient control, or source removal, if necessary. The contingency may also be required if contaminant concentrations do not decrease as predicted during subsequent years or if contaminants are detected in monitoring well MW-11D. This alternative also includes deed restrictions to prohibit the residential use of the Chevron Site and institutional controls to prohibit the potential consumption of groundwater from the area of the contaminant plume until groundwater standards have been achieved. Cleanup levels are expected to be achieved within 8-10 years and groundwater monitoring will continue until those levels are achieved.

Alternative No. 7 - Source Removal: Under this alternative, contaminated soil that may as a source of COCs to groundwater would be located, excavated, and transported to an approved TSD facility. Once the sources have been removed, groundwater concentrations of COCs would be expected to decrease rapidly due to natural attenuation mechanisms (i.e., biodegradation). Cleanup levels would be expected to be met within 3 years after the source has been removed. However, the locations of potential limited sources to groundwater are not known with certainty, despite extensive site investigations and soil removal actions. As a result, this remedy may still rely on natural attenuation to ultimately achieve cleanup levels and may require approximately 10 years to achieve cleanup levels.

This alternative would likely be combined with any of the alternatives 2-6, if necessary, to achieve an effective cleanup.

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The alternatives are evaluated against on another by using the following nine criteria:

- Overall protection of human health and the environment.
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).
- Long term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Short term effectiveness.

- Implementability.
- Costs.
- Community Acceptance.
- State Acceptance.

The NCP categorized the nine criteria into three groups:

(1) Threshold criteria: the first two criteria, overall protection of human health and the environment and compliance with ARARs (or invoking a waiver), are the minimum criteria that must be met in order for an alternative to be eligible for selection

(2) Primary balancing criteria: the next five criteria are considered primary balancing criteria and are used to weigh major trade-offs among alternative cleanup methods

(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. Community acceptance is addressed in the responsiveness summary of the ROD.

The comparative analysis of the seven alternatives proposed for this Site are presented in the following section.

8.1 Comparative Analysis of Remedial Alternatives

1. Overall Protection of Human Health and the Environment

Each alternative, except for the no-action alternative, would provide protection of human health and the environment given the current conditions at the Site. Removal actions to address contaminated soil have been completed at the Site and the adjacent trailer park. The groundwater within the surficial aquifer beneath and downgradient of the site is not currently used as a potable, irrigation, or industrial supply. Potable water is provided to surrounding residents and businesses by the City of Orlando and Orange County municipal water supply systems. The groundwater in the surficial aquifer is not currently being used, and the plume is at steady state. Therefore, there is no risk to human health of the environment associated with the groundwater in its current condition. There is potential future risk if a private drinking water well was installed in the area of the plume before the contaminants had degraded.

2. Compliance with ARARs

Each alternative is expected to comply with federal and state ARARs for groundwater contaminants. It is expected that the various alternatives will achieve compliance with groundwater ARARs within 8-10 years. However, alternative 1, would not provide the necessary monitoring to verify the expected degradation of contaminants. The ARARs include federal and state MCLs for drinking water. State guidance concentrations or federal action levels are used for contaminants that do not have MCLs.

3. Long-Term Effectiveness and Permanence

The long-term effectiveness of all of the alternatives, except the no-action alternative, is similar. All alternatives will eventually result in reduction of contaminant concentrations to achieve cleanup levels. Alternatives 3,4 and 6 reduce the toxicity, mobility, and volume of contaminants through treatment. Continued groundwater monitoring will provide the additional data to refine the predictions of the time required for the selected alternative to achieve the cleanup levels.

4. Reduction of Toxicity, Mobility, or Volume

Alternatives 3 and 4 (and possibly 6) reduce the toxicity, mobility, and volume of contaminants through treatment. Alternative 5, which involves a physical barrier, will reduce the mobility of contaminants and also indirectly reduce the toxicity and volume. Alternatives 1 and 2 will reduce the toxicity, mobility, and volume of contaminants by natural attenuation.

5. Short-Term Effectiveness

Those alternatives that require disruption of on-site soils (Alternatives 3, 4, 5, 7, and possibly 6) pose a greater short-term risk to site workers and adjacent residents than the no action and natural attenuation alternatives. The trench construction alternatives also pose a greater risk to site workers due to the use of heavy equipment and high-pressure hydraulic systems.

Alternatives 1, 2, and 6 may result in satisfaction of cleanup levels within 8- 10 years. Alternatives 3, 4, 5, and 7 may result in satisfaction of cleanup levels for the organic contaminants within 2 to 3 years at the north boundary and downgradient of the site. However, it may still take 8-10 years for cleanup levels to be met at the Site.

6. Implementability

All alternatives ate technically implementable. Alternative No. 3-groundwater extraction, treatment, and disposal-requires pilot testing and long-term operation and maintenance and is therefore more difficult to implement. The Soil Saw, which may be used for Alternatives 4, 5, and possibly 6, is an innovative technology, and is currently available only through Brown and Root. However, conventional trenching technology can be used to implement these alternatives.

7. Cost

The net present value (NPV) cost estimates for the alternatives range from $92,200 for the no action alternative, to $3,553,800 for groundwater recovery and treatment. The cost estimates are approximate.

TABLE 8: COST COMPARISON OF CLEANUP ALTERNATIVES

Groundwater Alternative	Capital Costs	Annual Operation & Maintenance (O&M) (based Present Worth)	Total Cost
1 - No Action	$ 0	$ 6,000	$ 92,000
2 - Natural Attenuation	$ 10,000	$ 17,160	$247,700 and Monitoring
3 - Pump and Treat	$ 583,800	$ 193,200	$3,553,800
4 - Bioactive Filter Wall	$ 1,053,100	$ 17,510	$ 1,316,900
5 - Hydrologic Flow Barrier	$1,610,000	$ 17,610	$1,873,800
6 - Alternative 2 with Alternative 4 as contingency*	$ 10,000	$ 17,160	$247,000
	$ 1,053,000	$ 17,160	$ 1,316,900
7 - Excavation of source	$ 1,035,000	$ 17,200	$ 1,558,200 material

*Cost are shown here both without the contingency and with the contingency.

8. Community Acceptance

Based on the responses received during the public comment period, the community accepts the selected remedy.

9. State Acceptance

The State of Florida, as represented by the Florida Department of Environmental Protection (FDEP), has been the support agency during the Remedial Investigation (RI) and Feasibility Study (FS) process for the Chevron Chemical Company Site. In accordance with 40 CFR 300.430, FDEP, as the support agency, has provided input during the RI/FS process. FDEP agrees with the groundwater remedy, but does not agree with no further action for soil. FDEP is unwilling to concur with the ROD because the State would prefer a risk level no greater than 1x10-6. The potential risk associated with future residential exposure at the adjacent trailer park is 9.0 x 10-6. The potential risk associated with future commercial exposure at the Site 2.0 x 10-5.

9.0 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 groundwater at this Site. At the conclusion of the remedy, the potential rise associated with exposure to groundwater at the Site will be in the range 10-5 to 10-6. EPA considers these risks levels to be protective of human health and the environment as they fall within EPA' risk range and are based on an EPA approved site specific risk assessment. The total present worth cost of the selected remedy, Alternative No. 6,is estimated at $247,000. The cost will increase to approximately $1.3 million if the contingency plan is implemented.

EPA has determined that no further action is necessary for soil at the Site. The potential risk associated with current or future commercial exposure at the Site is 2.0 x 10-5. The potential risk associated with future residential exposure at the adjacent trailer park is 9.0 x 10-6. EPA considers these risk levels to be protective of human health and the environment as they fall within EPA' risk range and are based on an EPA approved site specific risk assessment. However, on September 29, 1995, FDEP issued guidance suggesting soil cleanup goals which are based on a risk level of 1 x 10-6. Attainment of the more stringent risk level may be necessary to obtain FDEP's concurrence with deletion of this Site from the National Priorities List in the future.

The remedy for groundwater is summarized in the following items:

1. Deed restrictions/notices or institutional controls to prohibit consumption of contaminated groundwater until the cleanup standards have been met.

2. routine maintenance of the Site including fence maintenance, grass mowing, etc.

3. natural attenuation of contaminants in groundwater and quarterly groundwater monitoring.

4. a contingency plan which includes the installation of a subsurface filter wall. Events that would trigger the contingency are detailed below.

A. Deed Restrictions of Institutional Controls and Site Maintenance

Deed restrictions or institutional controls are intended to prohibit consumption of contaminated

groundwater until the cleanup standards have been achieved.

Site maintenance includes those routine tasks such as fence maintenance, grass mowing, etc. Site maintenance shall be conducted for up to 30 years or until cleanup levels are achieved, whichever comes first.

B. Groundwater Remediation

B.1. The major components of groundwater remediation to be implemented include:

- Natural degradation and/or attenuation of groundwater contaminants

- Groundwater monitoring to document the expected reduction in contaminant concentrations and to evaluate potential contaminant migration.

- A contingency plan which includes the installation of a subsurface filter wall. Other measures such as limited air sparging, hydraulic gradient control, or source removal, would be implemented as necessary. The contingency would be invoked if one of the following conditions is met:

    - contaminant concentrations do not decrease by 10-15% within one year.

    - contaminant concentrations in subsequent years do not decrease as expected.

    - organic contaminants are detected in monitoring well MW-11 or MW- 15.

The groundwater monitoring program will initially consist of quarterly monitoring during the first year. The monitoring program will also include additional groundwater assessment. This assessment will include installation of additional monitoring wells as necessary to further define the extent of the groundwater contamination.

If, after one year, there is a 10 to 15% reduction in contaminant concentrations, then a new model for natural attenuation will be developed based upon the available groundwater sampling data. Future contaminant reduction by natural attenuation will be evaluated relative to the predicted reductions of the new natural attenuation model.

If contaminant concentrations are not reduced by 10-15% within one year, then the surface filter wall will be installed. Additional enhancements, such as limited air sparging, hydraulic gradient control, or source removal will be implemented as necessary. The contingency may also be required if future monitoring data does not continue to demonstrate contaminant reduction as predicted by the attenuation model.

The degree of contaminant attenuation will be measured relative to the concentrations in groundwater samples collected in April 1995. The initial one year sampling period will begin with the first sampling event conducted subsequent to the April 1995 sampling event.

The focus of this groundwater remedy is upon the BETX compounds (benzene, ethylbenzene, and xylene) and the pesticides. Therefore, it may not be necessary to analyze for total naphthalenes and metals as frequently as the other contaminants. Total naphthalenes and arsenic were detected below their associated above its cleanup level in one well, located off-site. Lead was detected sporadically on site around the Site.

In addition, it is possible there may be other, off-site sources of some groundwater contaminants. The groundwater sampling data should be reviewed for evidence of contaminant

migration to the Site from off-site sources.

The groundwater monitoring will continue until groundwater cleanup standards have been achieved for two consecutive monitoring periods. EPA, in consultation with FDEP, will conduct an annual review the groundwater monitoring data to evaluate the effectiveness of this remedy. Others actions may be implemented, if necessary.

C. Compliance Testing

Groundwater samples will be collected and analyzed for the parameters listed in the table below.

TABLE 9: COMPLIANCE MONITORING

GROUNDWATER	CLEANUP STANDARD (ug/1)	CLEANUP CONTAMINANT	STANDARD (ug/1)
Benzene	1-1	b-BHC	0.1-4
Ethylbenzene	30-2	g- bhc	.2-1 (Lindane)
Xylenes	20-2	Chlordane	2-1
Total naphthalenes	100-3	Arsenic	50-1
4,4-DDD	0.4	Chromium	100-1
a-BHC	0.05-4	Lead	15-5

1 Primary MCL
2 Secondary MCL
3 State target level
4 State Guidance Concentration
5 Federal action level

10.0 STATUTORY DETERMINATIONS

EPA has determined that the selected remedy will satisfy statutory determinations of Section 121 of CERCLA. The remedy will be protective of human health and the environment, will comply with ARARs, will be cost effective, and will use permanent solutions and alternative treatment technologies to the maximum extent practicable.

10.1 Protection of Human Health and The Environment

This remedy is protective of human health and the environment due to several factors. First, removal actions have reduced soil contaminants to levels that will not contribute to an unacceptable risk given future commercial use of the Site or continued residential use of the trailer park. Secondly, groundwater contaminants will naturally degrade and/or attenuate to levels that comply with groundwater cleanup levels. Finally, there are no private wells located in the area of groundwater contamination and State law restricts installation of new wells in areas of known contamination.

10.2 Compliance with ARARs

Implementation of this remedy will comply with all federal and State ARARs and will not require a waiver. This remedy will comply with the ARARs that are listed Table 10.

TABLE 10: ARARS

LOCATION SPECIFIC

Citation Location/Description

- Florida Administrative Code 62-524 and Florida Statute Areas of known contamination. Regulatory clearance A 373.309 required to use potable water wells in area of known contamination.

- Florida Administrative Code 62-736 Hazardous waste sites. Requires use of warning signs to A Inform public of potentially harmful conditions at sites.

CHEMICAL-SPECIFIC AND ACTION-SPECIFIC

SAFE DRINKING WATER ACT-40 USC Section 300

40 CFR Part 141 - National Primary Drinking Water Establishes maximum contaminant levels (MCLs) which are A Standards health-based standards for public water systems.

STATE ARARS

R & A FAC 62-550 State of Florida Primary Drinking Water Standards

TO BE CONSIDERED (TBC)

FAC 62-550 State of Florida Secondary Drinking Water Standards

FAC 62-770.730 State of Florida Petroleum Contamination Site Cleanup Criteria.

June 21, 1990 Memorandum from U.S. EPA Action level for lead in drinking water. Established by U.S. EPA OERR/OWPE

1994 Florida Groundwater Guidance Concentrations State of Florida minimum criteria that consider potential carcinogenic of toxic effects for contaminants in groundwater

A= APPLICABLE REQUIREMENTS WHICH WERE PROMULGATED UNDER FEDERAL LAW TO SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION LOCATION OR OTHER CIRCUMSTANCE AT THE SITE.

R & A= RELEVANT AND APPROPRIATE REQUIREMENTS WHICH WHILE THEY ARE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION OR OTHER CIRCUMSTANCE AT THE SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE SITE THAT THEIR USE IS WELL SUITED TO THE SITE.

1 = CHEMICAL-SPECIFIC REQUIREMENT 2 = ACTION-SPECIFIC REQUIREMENT

10.3 Cost-Effectiveness

The selected remedy, Alternative 6, is a cost effective remedy. The selected remedy includes natural attenuation and monitoring and a contingency remedy which includes a subsurface filter wall. The total estimated present worth cost of this alternative is approximately $247,00 which includes capital costs and annual operation and maintenance costs. The cost increase to approximately $1.3 million if the contingency is implemented. EPA has determined that the cost of implementing the remedy is proportionate to the overall effectiveness of the remedy and is a reasonable value.

10.4 Use of Permanent Solutions and Treatment Technologies

The selected remedy uses permanent solutions and treatment technologies to the maximum extent practicable. Natural attenuation is expected to permanently achieve the groundwater cleanup standards within a reasonable timeframe of 8-10 years.

10.5 Preference for Treatment as a Principal Element

This remedy does not satisfy the statutory preference for treatment as a principal element. However, the groundwater contaminants are expected to naturally degrade and/or attenuate within 8-10 years.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The remedy described in this Record of Decision is the preferred alternative described in the Proposed Plan for this Sit. There have been no significant changes in the selected remedy.

APPENDIX A: RESPONSIVENESS SUMMARY CHEVRON NPL SITE

1. One person was concerned that contaminants may have been carried by surface water drainage along paths that have not been investigated. The drainage paths includes a portion of the Armstrong Trailer Park plus an area that starts near the railroad track to the west of the Chevron property.

RESPONSE: The transport of contaminants via surface water drainage from the Chevron property across the Armstrong Trailer Park has been addressed. The Removal Action Report, dated July 1994, summarizes the soil sampling conducted across the trailer park and the subsequent soil removal. Figure 1-2 shows the location of soil samples collected throughout the trailer park. Figure 2-2 shows the extent of contaminated soil which required removal from the trailer park.

The sampling results indicate that the extent of contamination was well defined and that no further soil removal is necessary in the trailer park.

Concerns about other drainage paths are addressed by various drainage studies conducted at the Site. A surface and groundwater hydrology evaluation was prepared in March 1995 and is part of the administrative record for this Site. The evaluation confirmed that surface water drainage across the Site is predominantly to the northwest corner of the Site. An earlier drainage evaluation was conducted at the Site during 1991. Surface elevations measured at various locations across the Site indicate that the surface water would have drained to northwest corner of the Site.

Some localized surface water may have drained along the railroad tracks located south and west of the Site. This surface water drainage would have been limited to the immediate area around the railroad tracks. The drainage is not likely to have included surface water from most of the Site, as explained above.

2. One person asked if dust generated during the 1992 removal could have affected him at his workplace across North Orange Blossom Trail.

RESPONSE: No. Air sampling was conducted during the removal and no excessive levels were detected. The cleanup workers wore protective equipment, including respirators, because they were so close to the disturbed soil. In addition, the cleanup workers wear protective equipment because they are subject to frequent exposures from working at many different sites.

3. One person recommended alternative one, no further action. The person noted that if no one is drinking the water and the contaminants are expected to degrade naturally, then the government should not spend more money at the Site.

RESPONSE: It is correct that no one is drinking the groundwater and that the contaminants are expected to degrade naturally. However, it is necessary to spend some money to collect groundwater samples to confirm that degradation occurs as expected. The government will not pay for the sampling. Chevron will conduct the sampling and will be supervised by EPA.

4. One person was concerned that no baseline was established to measure the required 10-15% reduction during the first year. The person also questioned what would happen if some contaminants decline as required, but others do not decline.

RESPONSE: The first year of additional monitoring data will be compared to result for samples collected during April 1995.

The focus of this groundwater remedy is upon benzene, ethylbenzene, xylene and the pesticides.

These contaminants were the most frequently detected (and apparently mobile) contaminants in the groundwater. Statistical analyses of all available groundwater data may be useful to evaluate the degradation of contaminants.

5. FDEP stated that the potential risk levels associated with current or future use of the Site exceed FDEP's target risk of 10-6.

RESPONSE: EPA is aware of FDEP's long standing preference for attaining risk no greater than 10-6 for carcinogens. However, at this Site, the risk assessment does not support further action for soil to achieve a target risk remediation goals which attain risk between 10-4 to 10-6. Use of a risk range is a necessary process to account foot factors such as toxicological uncertainty and/or confidence. FDEP's preference was also factored into the risk management process prior to the determination that no further action was necessary for soil. The potential risk associated with exposure to soil at the Site is already within EPA's risk range. Therefore, no further action for soil is necessary.

6. One person stated that ethylbenzene and xylene have minimal co- solvency effects, particularly at the current concentrations, and do not contribute to the migration of pesticides in groundwater. Therefore, the issue of co-solvency is not relevant in the decision to use the lower secondary groundwater standards for ethlbenzene and xylene as cleanup standards.

RESPONSE: There is site specific evidence that suggests the synchronous movement of solvents and pesticides in groundwater. The sampling data show that generally, the concentrations of Bhc pesticides are elevated in the same wells where the organic solvents are elevated.

7. One person stated that the secondary groundwater standards for ethylbenzene and xylene are based on odor. These standards are much lower than the primary groundwater standards which are based on protection of human health. Therefore, if EPA intends to use odor based standards, then it must establish background odor standards and adjust the cleanup standards accordingly.

   The person also stated that the cleanup standards for 4,4'-DDD. a-BHC, and b-BHC are state guidance concentrations, not groundwater or drinking water standards. Therefore, these standards are to be considered by EPA, but are not ARARs.

   Finally, the person noted that language in Florida code 62-520.520 exempts a facility from compliance with secondary standards. The exemption may be applied if the installation discharged to groundwater prior to July 1982 and if the installation operated consistently with regulations related to the discharge at the time of the operation.

RESPONSE: Secondary standards are based on aesthetic qualities relating to the public acceptance of drinking water. In addition, the State of Florida encourages the use of secondary standards to prevent the impairment of potential drinking water supplies.

The Florida secondary standard for odor from groundwater is 3, the odor threshold number. This specific secondary standard for odor is not used as a basis to evaluate the groundwater alternatives at this Site.

The cleanup standards for 4,4'-DDD, a-BHC, and b-BHC are defined as "To Be Considered" (TBC) in Section 10 of this ROD. These standards are based on carcinogenic health based data. The secondary standards for ethylbenzene and xylene are also defined as TBC. Guidelines defined as TBC may be used in the remedy selection process.

Finally, given the available data, it is apparent that the use of secondary groundwater standards will not increase the timeframe required to achieve groundwater cleanup. The timeframe for overall groundwater cleanup was estimated at 8-10 years due to the time necessary to achieve compliance with the primary standard for benzene. EPA has recalculated selected individual contaminant degradation rates using the secondary standards for ethylbenzene and xylene and the state guidance concentrations for the BHC compounds. These standards were coupled with the April 1995 groundwater contaminant concentrations in the biodegradation model. The results indicate that the timeframes required to comply with these secondary standards should still be less than the expected overall cleanup timeframe.

8. One person noted that metals detected in groundwater at the site are not site related. In addition , there are off-site sources of metals that are not addressed, then the concentrations found at the Site may not decline with time. Therefore, metals should not be included as cleanup levels that must be met at the Site. In addition, upgradient, off-site sources of petroleum should be addressed because they are impacting groundwater at the Site.

RESPONSE: There was a documented case of an acid spill in the vicinity of the western rinstat pond. Soil from the affected area was excavated and disposed offsite. However, it is possible that the low pH of the acid did temporarily increase the mobility of metals from soil to groundwater. Therefore, it is possible that the presence of metals in groundwater is related to site activities.

EPA agrees that the groundwater sampling data should be reviewed for indications of off-site contamination migrating to the Site. Also, see the response to comment #8 below.

9. One person noted that the estimated costs for groundwater monitoring presented in the FS were based on purgeable aromatic compounds and chlorinated pesticides only. The addition of naphthalenes, arsenic, chromium, and lead will triple the testing costs for each sample, thus impacting the cost effectiveness of the remedy.

RESPONSE: The monitoring costs in the FS considered a worst case scenario of sampling for thirty years. A more realistic monitoring period is ten years, given that cleanup levels should be achieved within that timeframe. Thus, the additional costs associated with analyzing several additional contaminants will be more than offset by the expected shorter duration of sampling.

Nevertheless, the focus of this groundwater remedy is upon the BETX compounds (benzene, ethylbenzene, and xylene) and the pesticides. Therefore, it may not be necessary to analyze for total naphthalenes and metals as frequently as the other contaminants. Total naphthalenes and arsenic were detected below their associated cleanup levels during the last sampling event. Chromium was detected above its cleanup level in one well, located off-site. Lead was detected sporadically on site and around the Site.