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EPA Superfund
Record of Decision Amendment:

DEL NORTE PESTICIDE STORAGE
EPA ID: CAD000626176
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CRESCENT CITY, CA
08/29/2000

AMENDMENT #1

TO THE

RECORD OF DECISION

FOR THE

DEL NORTE COUNTY PESTICIDE STORAGE AREA SUPERFUND SITE
DEL NORTE COUNTY, CA

U.S. Environmental Protection Agency
Region 9
San Francisco, CA

August, 2000

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PART 1: THE DECLARATION

A. Site Name and Location

Del Norte County Pesticide Storage Superfund Site
Del Norte County, CA

B. Statement of Basis and Purpose

This decision document presents the U.S. Environmental Protection Agency's (EPA's) amended selected remedial actions for contaminated groundwater at the Del Norte County Pesticide Storage Site (Site) in Del Norte County, California, which were chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

The State of California concurs with the selected amendments to the remedy.

C. Assessment of Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the Record of Decision (ROD), as modified by this ROD Amendment, may present an imminent and substantial endangerment to public health, welfare, or the environment.

D. Description of Selected Remedy

This ROD Amendment modifies the previously selected remedy for groundwater contaminated with 1,2-Dichloropropane (1,2-DCP) at the Del Norte County Pesticide Storage Site. All other contaminants identified in the original ROD have been remediated through excavation and disposal or are no longer present at levels above the cleanup goals. The revision affects both the cleanup standards and the cleanup technologies selected in the 1985 ROD. The 1985 ROD specified Pump and Treat (P&T) as the groundwater remedy to achieve groundwater restoration for drinking water use.

This ROD Amendment provides for 1) Containment of the groundwater plume through natural attenuation and continued monitoring through semiannual groundwater sampling of selected wells, 2) identification of a new applicable or relevant and appropriate requirement (ARAR) for 1,2-DCP (referred to as the MCL ARAR for 1,2-DCP), 3) a Technical Impracticability (TI) Waiver for the ARAR for 1,2-DCP and 4) Institutional Controls to prevent exposure to contaminated groundwater. The major components of the revised groundwater remedy are as follows:

Containment and Semiannual Groundwater Monitoring

Destructive processes through biodegradation (i.e. natural attenuation) are occurring at a higher rate than plume migration. Without the processes taking place the plume would be expected to migrate downgradient at the same velocity as the regional groundwater, which it is not. It is expected that these processes will continue to stabilize the plume, and slowly shrink its size. It is not expected, however, that the cleanup goals will be reached solely through natural attenuation.

Semiannual Groundwater Monitoring will continue indefinitely under the direction of the State of California Department of Toxic Substances Control (DTSC). Monitoring will ensure that the plume behaves as expected. If after 2 years monitoring demonstrates that the plume remains stable and concentrations continue to decline, the option of an annual monitoring schedule may be considered. If the plume does not remain stable, an appropriate technology will be selected to actively remediate the plume.

Selection of a new ARAR

At the time of the 1985 ROD, an MCL for 1,2-DCP had not been set. A health based standard set at 10ug/L was chosen as the cleanup level. Pursuant to 40 CFR 300.430(f)(ii)(B)(2), components of a remedy that were not described in the original ROD must meet ARARs that exist at the time a ROD amendment is signed. Since the 1985 ROD, a MCL was established for 1,2-DCP and is being identified (but waived) as an ARAR for the site.

Technical Impracticability Waiver

After 7 years of groundwater remediation, monitoring, and evaluations, EPA has concluded that the P&T remedy employed at the Site and/or presently available technology will not restore the groundwater plume to meet groundwater cleanup standards for 1,2-DCP. The factual presentation providing the basis for a TI Waiver is documented in the "Justification for a Technical Impracticability Waiver (TI Waiver) at Del Norte County Pesticide Storage Superfund Site for the Record of Decision" (Attachment A). It is estimated that only 3.75 gallons of 1,2-DCP have been removed, and that 95% of this amount was removed in the first four years of P&T operation. Several augmentations were added to the system to try and accelerate remediation, including air sparging and added extraction wells. No appreciable change in contaminant removal was noted. The system was shut down to determine what effect this would have on contaminant removal and concentrations. After 6-month system shutdowns in 1995,1996,and 1997, no noticeable differences were noted. The system has been off since October 1997 and semiannual monitoring reports show that contaminant concentrations continue to decline only slowly, at the same rate as when the treatment system was operating.

Institutional Controls

The following Institutional Controls, through a combination of agreements, land use covenants and/or local ordinances, will insure that the remaining contaminated groundwater will not be used: restriction of access to the Site; prohibition of disturbing existing wells; prohibition of using the contaminated groundwater; prohibition of well installation in the area of the contamination plume that could cause the plume to move; and prohibition of all residential use of the Site and industrial/commercial use of the Site that would interfere with existing wells. Institutional Controls should not be difficult to implement, monitor, or enforce because Del Norte County owns the Site. EPA and the State of California have reached an agreement in principle with Del Norte County to implement the above-described institutional controls.

E. Statutory Determinations

The selected remedy is protective of human health and the environment, complies with the requirements of CERCLA Section 121 for a waiver of Federal and State requirements that are legally applicable or relevant and appropriate, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. The revised groundwater remedies utilize containment through natural attenuation to reduce toxicity, mobility, or volume of contaminants. However, because treatment of 1,2-DCP was not found to be technically practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy for groundwater.

Because a hazardous substance will remain on-site above health-based levels, the EPA will conduct a review pursuant to Section 121(c) of CERCLA, 42 U.S.C. 9621(c), to be completed in 2000, and every five years after for as long as contaminant levels remain above health-based levels to insure that the remedy continues to provide adequate protection of human health and the environment.

F. Authorizing Signature

_____ _____

Date

Keith Takata
Director, Superfund Division

PART 2: DECISION SUMMARY

A. Site Name, Location, and Description

The Del Norte County Pesticide Storage Area Site (Site), located approximately one mile northwest of Crescent City, California, consists of less than one acre of land contaminated with a variety of herbicides, pesticides, and other compounds. The Site is located in a rural area immediately south of McNamara Field, the airport that serves Del Norte County (See Figure 1). According to the California Department of Finance, approximately 28,100 people presently reside in Del Norte County.

As of January 1999, the population of Crescent City was estimated at 8,200. EPA estimates that 825 persons live within one mile of the Del Norte County Pesticide Storage Area Site.

The operation of the pesticide container storage area ceased in 1981. The Site is fenced, locked, and posted with a public notice stating that hazardous substances may be present. Del Norte County owns the Del Norte Site and the land surrounding it. The entire County-owned parcel (including the Site) covers an area of approximately 480 acres. The County property is bounded on the north by State-owned land, which is intended for use as a natural and recreational area; on the south by Washington Boulevard; on the east by Riverside Drive; and on the west by the Pacific Ocean.

B. Site History of Contamination and Selected Remedy

In December 1969, Del Norte County notified the North Coast Regional Water Quality Control Board (NCRWQCB) of the County's intent to operate a pesticide container storage area. The designated site, 200 feet long and 100 feet wide, was to be located at the southern border of the McNamara Field County Airport, 3/4 of a mile east of the Pacific Ocean. The County requested operating advice and approval from the NCRWQCB, and in January 1970, the NCRWQCB responded with suggested operating procedures and requested additional information about the Site. During 1970, the Site was designated by the NCRWQCB as a Class II-2 disposal site. It was to serve as a County-wide collection point for interim or emergency storage of pesticide containers generated by local agricultural and forestry-related industries. The NCRWQCB approved the Site for this use, provided that all containers were triple rinsed and punctured prior to arrival at the Site.

The pesticide container storage area operated from 1970-1981. In the fall of 1981, the NCRWQCB and California Department of Health Services (DHS) discovered soil and groundwater contamination. This discovery indicated that the pesticide containers had been rinsed on-site, and that the residues and rinseates were improperly disposed of in a bermed, unlined sump area. Preliminary investigations from 1981-1983, by NCRWQCB and DOHS, identified soil and groundwater contamination with herbicides, pesticides and

volatile and semivolatile compounds. Del Norte County's inability to fund further Site investigations initiated the process of listing the Site on the NPL in the fall of 1983.

The U.S. EPA completed Remedial Investigation/ Feasibility Study (RI/FS) activities in 1985. The results of those investigations indicated the contaminants of concern were 1,2-DCP and 2,4-dichlorophenoxyacetic acid (2,4-D). At that time, the contaminant plume was estimated to have extended approximately 170 feet to the southeast of the Site. Investigations also indicated that elevated levels of chromium were also present in soils at the site. The 1985 ROD selected excavation and off-site disposal of contaminated soils and extraction and treatment of the groundwater through pump and treat as the remedy.

In December 1987, EPA performed a Removal Action in which 290 cubic yards of contaminated soils were excavated and disposed of off-site at a licensed hazardous waste disposal facility. That action completed the source removal activities and soil remedy for the site. Continued groundwater monitoring between 1985 and 1987, during the pump and treatment system design phase, indicated the levels of 2,4-D and 1,2-DCP were decreasing significantly in the groundwater. Between 1985 and 1989 (after the source removal but before installation of the pump and treatment system) the levels of 2,4-D in monitoring wells at the Site decreased to less than 2 micrograms/liter (µg/l). The ROD established a 100µg/l cleanup level for 2,4-D, which was met prior to implementation of the treatment system. The levels of 1,2-DCP decreased from approximately 2000µg/l to 600µg/l in the same time period; although the concentrations remained above the 10 µg/l cleanup level. These reductions were likely a result of the source removal and biodegradation and/or volatilization of the contaminants in the groundwater.

Additional investigations to determine chromium levels in soils in the area were performed between 1985 and 1987. Those investigations indicated that the chromium levels were naturally high due to the presence of chromium ore in the bedrock source rock in the area. Based on these findings, an Explanation of Significant Differences (ESD) was prepared in September 1989. The ESD documented that the chromium levels in the soil did not require remediation through removal. The selected groundwater remedy of carbon filtration, coagulation and sand filtration was changed to aeration. Aeration had been considered in the original ROD alternatives but was not chosen due to its ineffective removal of 2,4-D and chromium. The cleanup level for 1,2-DCP was not changed by the ESD.

The pump and treatment system was installed in 1990 and began extracting groundwater from one extraction well at the rate of 15 gallons per minute (gpm). The treatment system operated continuously from April 1990 to December 1994. During that period it was observed that 1,2-DCP concentrations in the groundwater monitoring wells located within the plume had reached asymptotic levels; between approximately 40µg/l and 15µg/l. In 1994, EPA installed an air sparging system to determine if the injection of

air into the aquifer would enhance contaminant removal. Additional sparge points were added in 1995. No discernable changes in the levels of 1,2-DCP in groundwater were noted.

In 1994, EPA also began a program of turning the groundwater treatment system off for extended periods of time to determine what effect it would have on contaminant concentrations. The system was turned off for approximately six months in 1995, and then restarted. It was turned off again for six months in 1996. No discernable differences were noted either time. The system has been off since October 1997 and semiannual monitoring reports show that contaminant concentrations continue to decline slowly, at the same rate as when the treatment system was operating.

C. Community Participation

The major community concerns, at the time the RI/FS was published, were contamination of the groundwater with chromium and the liability of the County for cleanup costs. Sampling revealed the form of chromium present was trivalent, and found to be a naturally occurring source of chromium. EPA and the State assumed the majority of the costs of remediation.

Due to low community interest no formal public meeting was held before the ROD was signed. Rather, two meetings were held with interested County, City and State officials and a local citizens action group (The Friends of Del Norte County). Five Fact Sheets have been prepared and distributed to the community: August 1984, July 1985, August 1987, August 1989, and December 1989. In addition, EPA has provided interviews and tours of the treatment system to the local press and interested community representatives. EPA also regularly informed local agency representatives and City Council members of groundwater treatment progress and analytical results.

On March 9, 2000, a community meeting was held to discuss the Proposed Plan for this ROD Amendment. A small group of local agriculturists and county employees attended. All concurred with the proposed amended remedy.

Documents contained in the administrative record have been made available at the Site repository located in the Del Norte County Library for community members to review and comment upon.

D. Basis for the ROD Amendment

The 1985 ROD specified P&T as the groundwater remedy to restore groundwater to drinking water use. This Amendment revises the selected remedy to containment of the groundwater plume through natural attenuation and continued monitoring through semiannual groundwater sampling of selected wells, selects a new ARAR for 1,2-DCP,

waives the MCL ARAR for 1,2-DCP, and imposes institutional controls to prevent exposure to contaminated groundwater.

The revision to the groundwater remedy is supported by the following information: completed remedial actions have performed appropriately and reasonable upgrades and modifications have been made to enhance contaminant mass removal. The groundwater treatment system has operated efficiently as designed. Based on the believed mechanics of the contaminant in aquifer soils and the rate of contaminant reduction, it is unknown when, or if, cleanup levels could be reached. The same rate of cleanup is expected if the remedial system is removed and levels are allowed to degrade naturally. However, natural attenuation is not a reasonable treatment remedy at the site because it is unknown whether natural processes will ever result in attaining cleanup levels over the entire plume. Further, the same rate of contaminant reduction is observed whether or not the pump and treatment system is in operation. Based on the mechanics of the source term in the groundwater (sorption onto soil clay and fines) no other remedies, either conventional or innovative, could be reasonably expected to remediate the contaminant to cleanup levels.

The 1985 ROD cleanup level of 10µg/l for 1,2-DCP (based on a health advisory) cannot be attained. In 1992, subsequent to the signing of the ROD, EPA promulgated a Maximum Contaminant Level (MCL) under the Safe Drinking Water Act of 5µg/l for 1,2-DCP, which was adopted by the State. Pursuant to 40 CFR 300.430(f)(ii)(B)(2), components of a remedy that were not described in the original ROD must meet ARARs that exist at the time a ROD amendment is signed. The MCL for 1,2-DCP, however, is more stringent than the cleanup level set in the 1985 ROD and therefore even less likely to be attained. For this reason, the MCL for 1,2-DCP will be waived based on the technical impracticability of attaining 5µg/l or less in the groundwater. All other constituents of concern have been remediated to below cleanup levels.

Monitoring of the groundwater conditions at the Site will continue indefinitely under the direction of the State of California DTSC. Semi-annual sampling of six monitoring wells will continue and access and use restrictions (institutional controls) will be imposed. Institutional controls will assure that contaminated groundwater will not be used and that no nearby use of the groundwater affects plume migration as long as contaminant levels remain above cleanup levels. Because Del Norte County owns all of the land surrounding the Site, institutional controls should be easily implemented.

The area over which the TI waiver will apply is the current areal and vertical extent of the contaminant plume for which the concentrations of 1,2-DCP exceed 5µg/l. That area is approximately 5000 square feet in size and is depicted in Figure 2. The plume extends to the depth of the uppermost aquifer (30 feet bgs). The resulting average plume thickness is approximately 20 to 27 feet.

E. Site Characteristics

As discussed, the plume area and contaminant concentrations have remained relatively stable within the last five years (see Table 1). The approximate length of the plume prior to implementation of the groundwater treatment system was 170 feet; it is now approximately 100 feet (see Figure 2). Contaminant concentrations in wells within the plume declined dramatically from 1990 to 1994 (see Table 1), but have not reduced appreciably since 1994.

Well to well comparisons of the four monitoring wells initially found to contain concentrations of 1,2-DCP (MW-25, MW-104, MW-105, and MW-108) have shown this asymptotic response. Concentrations of 1,2-DCP in well MW-104 have been relatively stable for four years but remain above the cleanup level. Well MW-105 has shown decreasing concentrations and will likely continue to do so. However, concentrations in MW-105 are expected to also stabilize above the cleanup level in the same manner as MW-104 due to their location near the center of the plume. Concentrations in wells MW-108 and MW-25 have dropped below the cleanup level, likely due to their location on the edge of the plume. Well MW-108, within the former sump area, has exhibited concentration reductions to non-detect levels. Downgradient wells, including the nearest to the original source area, MW-26, have not exhibited any detectable levels of any contaminant of concern since monitoring began in 1990.

The pesticide 1,2-DCP is a halogenated volatile organic compound with a high vapor pressure and a high Henry's Law constant. This means that the compound, once in water, has a high affinity to go to the vapor phase. However, the compound also has a relatively low Octanol/Water partitioning coefficient (K_{ow}). This results in the compound preferentially sticking to clay and other fine particles in the soil column and only slowly desorbing into the aqueous phase (groundwater). Given the relatively high clay and silt content of the soil at the Site, this process is the likely factor causing the relatively steady-state levels of 1,2-DCP in the groundwater.

Whether the source term of the 1,2-DCP is in a Non Aqueous Phase Liquid (NAPL) form is not known. The compound would not need to exist in the form of a NAPL in order to behave as such once sorbed onto clay and fines. High aqueous concentrations such as those discharged as rinseate into the sump would behave similarly. The location of the affected aquifer soils is likely in the immediate vicinity of the former release areas (i.e. sump). Once the higher concentrations of 1,2-DCP begin to diminish on the clay and fines, the contaminant levels will likely begin to drop relatively rapidly. The timeframe for this cannot be determined because the current mass within the soil and rate of desorption is unknown.

Given the high affinity of 1,2-DCP to go into the vapor phase, once the compound is desorbed into the groundwater, it likely volatilizes relatively quickly into the soil gas. This

process can also be accelerated by the seasonal rise and fall of the water table. This exposes more of the soil to the atmosphere as the water table lowers.

The compound 1,2-DCP is also rated as a relatively biodegradable compound according to EPA technical documents (USEPA, Natural Attenuation Short Course Proceedings, 1997). Therefore, biodegradation could also be affecting contaminant concentrations. This process has not been specifically studied at this site. However, the specific documentation of this process is academic given the historic shrinkage and continued stability of the contaminant plume. Either or both of these processes (biodegradation and volatilization) are likely contributing to the stability of the contaminant plume. With the velocity of the groundwater at approximately 9.5 feet per year and the size of the plume shrinking, destructive processes are obviously occurring at a higher rate than plume migration and contaminant mass flux. Without natural attenuation, the plume would be expected to migrate downgradient at the same velocity as the regional groundwater (9.5 feet/year).

The trend data for well MW-105 support the concept that natural attenuation is successfully reducing contaminant concentrations and stabilizing the plume. However, natural attenuation will not likely allow the plume to reach the cleanup levels. This is supported by the behavior of contaminant concentrations in well MW-104 which have stabilized above the cleanup levels for the past four years. It is unknown when, or if, contaminant levels in these wells could reach cleanup levels.

F. Selected Remedy

The following section describes the modifications to the 1985 ROD.

Containment will be achieved through destructive biodegradation processes (i.e. natural attenuation) occurring at the Site. It is expected that these processes will continue to stabilize the plume, and slowly shrink its size. It is not expected, however, that the cleanup goals will be reached solely through natural attenuation. Contaminants will be monitored inside and down-gradient of the plume until the concentration of 1,2-DCP reaches drinking water standards. Monitoring and the selection of wells to be monitored will continue indefinitely under the direction of the State of California Department of Toxic Substances Control (DTSC). The following six wells will not be abandoned at the site, and will remain functional for monitoring or extraction purposes (See figure 2 for existing well locations): 101 & 201 were previous pumping wells, they will not be decommissioned in case of future need or use, 104 & 105 are the only wells that contain levels of 1,2-DCP above 5µg/l; monitoring of these wells will allow tracking of concentration decrease, 107 & 26 are two downgradient wells that will be used to determine if the plume is migrating. If 2 years of monitoring data demonstrates that the plume remains stable and concentrations continue to decline, the option of an annual monitoring schedule may be considered. Wells to be monitored may be revised based upon the results of the semiannual monitoring plan.

If the plume does not remain stable, an appropriate technology will be selected to actively remediate the plume.

(As described in Section H below, a waiver of the MCL ARAR for 1,2-DCP will be invoked for the plume beneath the Del Norte Storage Area Superfund site.)

Institutional Controls: The following Institutional Controls are selected to prevent exposure to the contaminated groundwater and to insure that the contaminated groundwater plume does not move into areas that are, or could be, used as sources of drinking water: 1) access to the Site will be restricted to protect existing monitoring wells and to prevent use of the contaminated groundwater; 2) disturbing existing wells will be prohibited; 3) use of the contaminated groundwater will be prohibited; 4) installation of wells that could cause the contaminated plume to move or flow different than it does currently will be prohibited; 5) use of the Site for residential purposes will be prohibited and use of the Site for industrial/commercial purposes that will interfere with containment of the plume or with existing wells will be prohibited. These Institutional Controls will be implemented through a settlement agreement with the current owner of the Site (Del Norte County), an enforceable land use covenant with the current or future owner of the Site (pursuant to Cal. Civil Code section 1471), and/or local ordinances. EPA and the State of California have reached an agreement in principle with Del Norte County to implement the above described Institutional Controls .

G. Remedial Action Objectives

The Remedial Action Objectives for groundwater remediation as described in the 1985 ROD were to:

- Prevent contamination of nearby wells
- Clean up contaminated groundwater to drinking water standards or background level

The remedy selected in this ROD Amendment will prevent contamination of nearby wells through containment of the plume. Semiannual groundwater monitoring will provide information on contaminant movement, and concentrations. Analysis of this information will allow the lead agency to determine if the plume continues to behave in the manner expected and in fact continues to be contained. There have been no significant changes in contaminant concentrations or movement for six years regardless of whether a treatment technology is being applied or not, and EPA has concluded this trend will continue. However, the second remedial action objective is unlikely to ever be met. The TI Waiver (see Attachment) states that the MCL ARAR for 1,2-DCP of 5µg/l cannot be achieved by treatment, therefore groundwater will not be remediated to drinking water standards. Although it is believed that natural destructive processes are slowly reducing the concentration of 1,2-DCP in the groundwater, it is unknown if drinking water standards or

background levels can be achieved in this manner. The Remedial Action Objectives have been amended to the following:

- Contain the contaminated groundwater
- Prevent use of groundwater as drinking water for as long as contaminant concentration remains above drinking water levels

H. Nine-Criteria Analysis

EPA promulgated regulations in the NCP which establish a framework of nine evaluation criteria for selecting among remedial alternatives. These nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-term Effectiveness
4. Reduction of Toxicity, Mobility, or Volume through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Table 3 compares the original and amended remedies with regard to the nine criteria**.**

I. Statutory Determinations

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 must comply with applicable or relevant and appropriate environmental standards established under federal and State environmental laws unless a waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following section discusses how the selected remedy addresses these statutory requirements and preferences.

Protection of Human Health and the Environment

The modifications of the 1985 ROD set forth in this ROD Amendment are still protective of human health because: 1) the source of contamination, and contaminated soils have been excavated and/or removed, 2) contamination of 1,2-DCP is contained based on groundwater monitoring data, 3) institutional controls will be implemented to prevent exposure to contaminated groundwater in the area of the plume, 4) groundwater will be sampled and evaluated semiannually, and 5) remedy effectiveness will be reviewed at least every five years.

Because this remedy will result in contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory Five-Year review will be conducted at least every five years until groundwater contamination has reached drinking water standards. Currently a Five-Year Review is in progress and is to be concluded in 2000.

Compliance with ARARs

This ROD amendment modifies the groundwater remedy selected in the 1985 ROD and documents a waiver of the MCL ARAR for 1,2-DCP for the groundwater plume beneath the Del Norte County Pesticide Storage Area. The EPA has waived the ARAR that applies to the plume because it is technically impracticable, from an engineering perspective, to meet the standards. See, CERCLA section 121(d)(4)(c), 42 U.S.C. Section 9621(d)(4)(c).

Remedial actions selected under CERCLA must comply with all ARARs under federal environmental laws or, where more stringent than the federal requirements, State or State subdivision environmental or facility siting laws. Where a State is delegated authority to enforce a federal statute, such as RCRA, the delegated portions of the statute are considered to be a Federal ARAR unless the State law is broader or more stringent than the federal law. Applicable or relevant and appropriate requirements are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific features of the site location. There are three categories of ARARs: (1) chemical-specific requirements; (2) action-specific requirements; and (3) location-specific requirements. Where no ARARs exist for a given chemical, action or location, EPA may consider non-promulgated federal or State advisories and guidance as To Be Considered criteria (TBC). Although consideration of a TBC is not required, if standards are selected based on TBC, those standards are legally enforceable.

Chemical-specific ARARs are risk-based cleanup standards or methodologies which, when applied to site-specific conditions, result in the development of cleanup standards for Contaminants of Concern (COC). Location-specific ARARs are restrictions

placed on concentrations of hazardous substances or the conduct of activities because of the special locations, which have important geographical, biological or cultural features. Examples of special locations include wetlands, flood plains, sensitive ecosystems and seismic areas. Action-specific ARARs are technology-based or activity-based requirements or limitations on actions to be taken to handle hazardous wastes. They are triggered by the particular remedial activities selected to accomplish a remedy.

The ARARs adopted in the 1985 ROD were "frozen" as of the date that EPA signed the ROD. No chemical-specific ARAR for 1,2-DCP was identified in the 1985 ROD. Because in this ROD Amendment EPA is selecting a component of the remedy not described in the 1985 ROD, pursuant to 40 CFR 300.430(f)(ii)(B)(2), EPA is identifying an additional ARAR for the remedy at this Site: the MCL for 1,2-DCP 5 ug/l. (EPA is also waiving the ARAR for the new remedy as discussed below.)

In this ROD Amendment, EPA concludes that it is technically impracticable from an engineering perspective to achieve the MCL for 1,2-DCP for contaminated groundwater beneath the Site. Pursuant to 40 CFR 300.430(f)(ii)(c)(3), the EPA is waiving the MCL ARAR for 1,2-DCP because contaminant and hydrogeologic conditions inhibit restoration. The residual 1,2-DCP in the aquifer is behaving as a NAPL, and makes groundwater restoration of the plume technically impracticable given current technologies. The factual basis for the TI Waiver is set forth in more detail in the TI Evaluation, Attachment A.

Cost-Effectiveness

Cost-effectiveness is determined by evaluation of three of the balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness). Overall effectiveness is then compared to cost to ensure that the remedy is cost-effective.

The remedy proposed in this ROD Amendment does not alter the long-term effectiveness of the original remedy. The P&T technology that was being used was not effective at restoring the aquifer to drinking water levels. However, continued monitoring of plume concentration, size, and movement will provide assurance that human health and the environment are protected for as long as contamination remains above the cleanup level. Though not through treatment, this Amendment does allow for reduction of toxicity, volume and mobility of the contaminant through natural attenuation. Evidence of this has already been noted, and it is believed that it will continue, but not at a rate that would reach remediation goals within a reasonable time frame. No short-term impacts are expected due to the implementation of the alternative remedy. The yearly cost of the original remedy is over 3.5 times the yearly cost of the amended remedy.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The EPA has determined that the remedy described in this ROD Amendment represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner for groundwater at the Del Norte Site.

Preference for Treatment as a Principal Element

As previously stated, the available treatment technologies are not capable of removing and treating all of the 1,2-DCP necessary to attain ARARs/groundwater restoration of the contaminant plume. EPA expects that monitoring inside and downgradient of the plume represents adequate control for migration and will allow continued tracking of reductions in contaminant concentrations. The selected remedy uses containment, monitoring and institutional controls rather than treatment to address the threats posed by the contamination. The available treatment technologies will not achieve the restoration of drinking water standards.

J. Documentation of Significant Changes from the Proposed Plan

No significant changes have been made from the Proposed Plan.

PART 3: RESPONSIVENESS SUMMARY

One verbal comment was given by Glenn Anderson (an employee of the County Department of Agriculture) at the Community Meeting on March 9, 2000.

Glenn Anderson: "I think this amended plan should have been adopted some five years or more ago instead of building up the cost to the County and everyone involved and (sic) mediating this situation. The health risk of very small amounts, parts per billion. A few years ago it couldn't even be determined that you still measure parts per billion. And new techniques came along where you can keep getting it lower and lower. And I know they were getting close to the ten part per billion safety level on a lot of the wells, quite a few years ago. And all of a sudden it got dropped to five. Then the thing kept on going. But I think this is a good idea to stop the pumping and get a closure on it.

Response to Comment: Mr. Anderson, thank you for your comment. We appreciate your concurrence with our remedy. Your comment that EPA should have amended the plan five years ago is understandable. EPA's statutory preference for cleaning up a Superfund site is to reduce the volume, mobility and toxicity of the chemicals of concern at a site through treatment. During the past five years, EPA has tried to achieve this goal by studying various technologies at the site (i.e., air stripping, air sparging, pulsing of the system) to see if the goal of cleanup was technically practicable. Based on these treatability studies, we are now able to conclude that we do not currently have the technology to achieve the cleanup levels at the Del Norte Site. Therefore, we are able to propose this amended remedy which achieves protectiveness of public health and the environment through other means (i.e., containment, monitoring and institutional controls.).

In a letter dated April 17,2000, the State of California through the California Department of Toxic Substances Control (DTSC) concurred with the proposed remedy.

Table 1: 1,2-DCP Concentrations

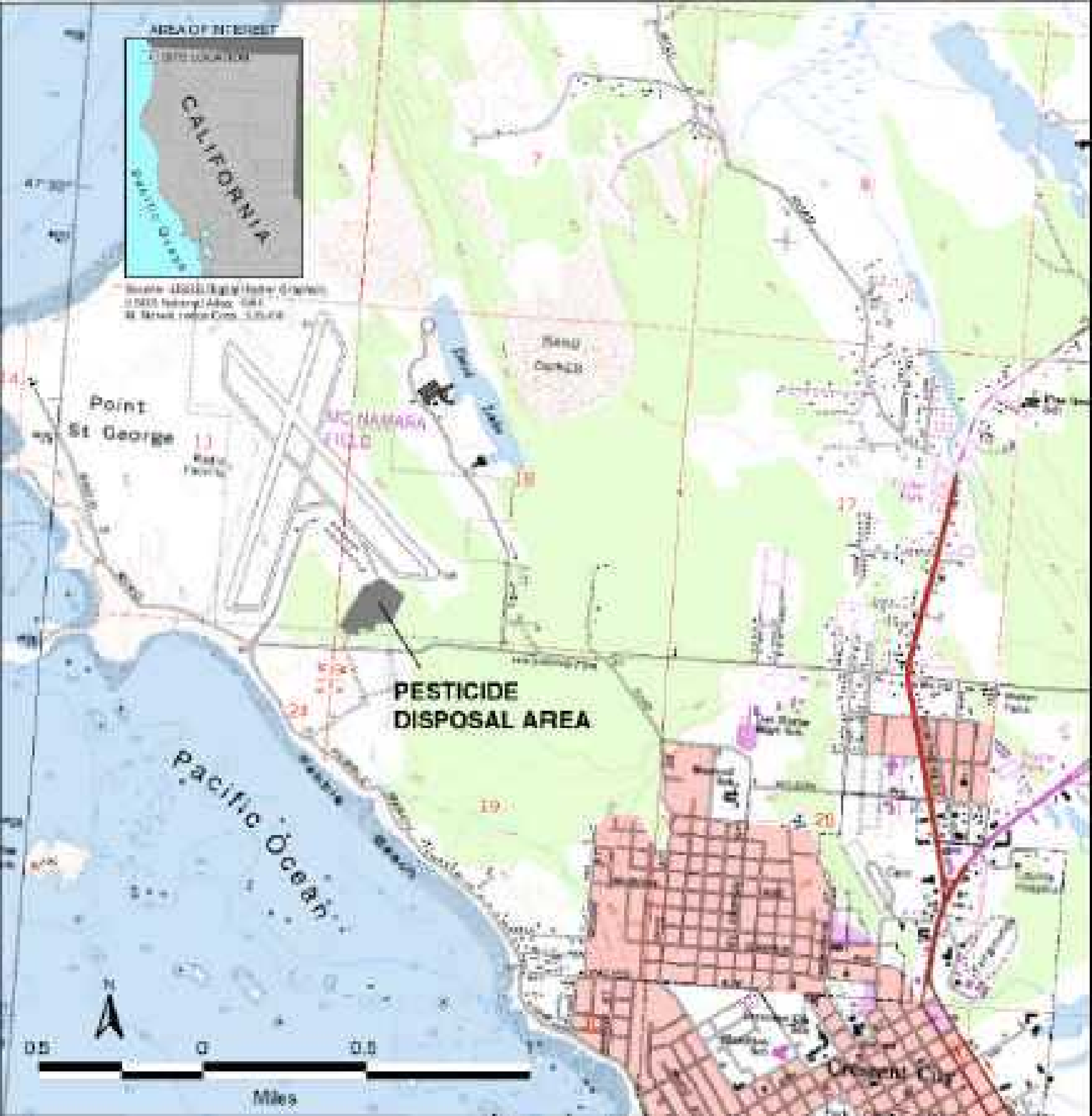
TABLE 1					
SELECTED GROUNDWATER MONITORING WELL SAMPLE RESULTS					
Del Norte County Pesticides Storage Area Site					
MW-104		MW-105		MW-25	
Sampling Date	1,2-DCP (ug/L)	Sampling Date	1,2-DCP (ug/L)	Sampling Date	1,2-DCP (ug/L)
3/24/90	250	3/24/90	220	3/24/90	25
		3/24/90	250		
3/29/90	230				
3/29/90	240				
4/21/90	310	4/21/90	90		
		4/22/90	400		
4/23/90	220	4/23/90	180		
4/23/90	280	4/23/90	230		
4/26/90	430	4/26/90	460		
5/8/90	260	5/8/90	410		
5/22/90	240	5/22/90	330		
		5/22/90	450	5/22/90	23
6/21/90	130	6/21/90	300		
7/26/90	370	7/26/90	260	7/26/90	18
12/6/90	100	12/6/90	73	12/6/90	19
12/6/90	110	12/6/90	73		
		12/6/90	90		
4/18/91	130	4/18/91	91	4/18/91	20
8/28/91	52	8/28/91	57	8/28/91	23
		8/28/91	57		
11/7/91	89	11/7/91	63	11/7/91	23
2/26/92	96	2/26/92	30	2/26/92	11
2/26/92	99				
12/10/92	77	12/10/92	22	12/10/92	11
8/3/93	87	8/3/93	34	8/3/93	13.8
8/3/93	91				
11/17/93	92	11/17/93	72	11/17/93	18
		11/17/93	77		
2/28/94	43	2/28/94	21	2/28/94	8
6/17/94	130	6/17/94	23	6/17/94	6.3

12/14/94	37	12/14/94	12	12/14/94	3.8
MW-104		MW-105		MW-25	
Sampling Date	1 , 2 - D C P (ug/L)	Sampling Date	1 , 2 - D C P (ug/L)	Sampling Date	1 , 2 - D C P (ug/L)
12/14/94	39				
7/26/95	31	7/26/95	17	7/26/95	5.4
		7/26/95	21		
10/25/95	13	10/25/95	73	10/25/95	7
2/7/96	22	2/7/96	48	2/7/96	3.8
		2/7/96	44		
5/14/96	18	5/14/96	48	5/14/96	11
8/21/96	19	8/21/96	39	8/21/96	14
8/21/96	19				
11/13/96	8.4	11/13/96	40	11/14/96	6.9
		11/13/96	29		
5/13/97	19	5/13/97	35	5/13/97	4.5
5/13/97	18				
10/7/97	20	10/7/97	38	10/7/97	10
		10/7/97	37		
6/11/98	13	6/11/98	26	6/11/98	3.8
12/9/98	14	12/9/98	23	6/11/98	3.2
		12/9/98	23	12/9/98	3.7
11/1999	8.2	11/1999	23	11/1999	1.9

= No Sample

Table 2: Applicable or Relevant and Appropriate Requirements for Groundwater
Del Norte County Pesticide Storage Area ROD Amendment

Source	Standard, Requirement, Criterion, or Limitation	Applicable or Relevant and Appropriate	ARAR or Performance Standard Applicability
Porter-Cologne Water Quality Control Act (California Water Code Sections 13140-13147, 13172, 13260, 13262, 13267, 13304.)	Title 27, CCR, Section 20410, Title 23, CCR, Section 2550.6	Applicable	Applies to groundwater remediation and monitoring of sites. Groundwater will be remediated and monitored according to Title 27/Title 23 regulations.
Title 22 CCR Section 64444	5µg/L	Relevant and Appropriate	State MCL for 1,2-Dichloropropane
Safe Drinking Water Act (40 U.S.C. 300et seq.)	National Primary Drinking Water Regulations (40 CFR Part 141)	Relevant and Appropriate	chemical-specific drinking water standards MCLs have been promulgated under the Safe Drinking Water Act.


AREA OF INTEREST
CALIFORNIA
Point
St George
PESTICIDE
DISPOSAL AREA
Pacific Ocean
Crescent City
N
0.5
0
0.5
Miles

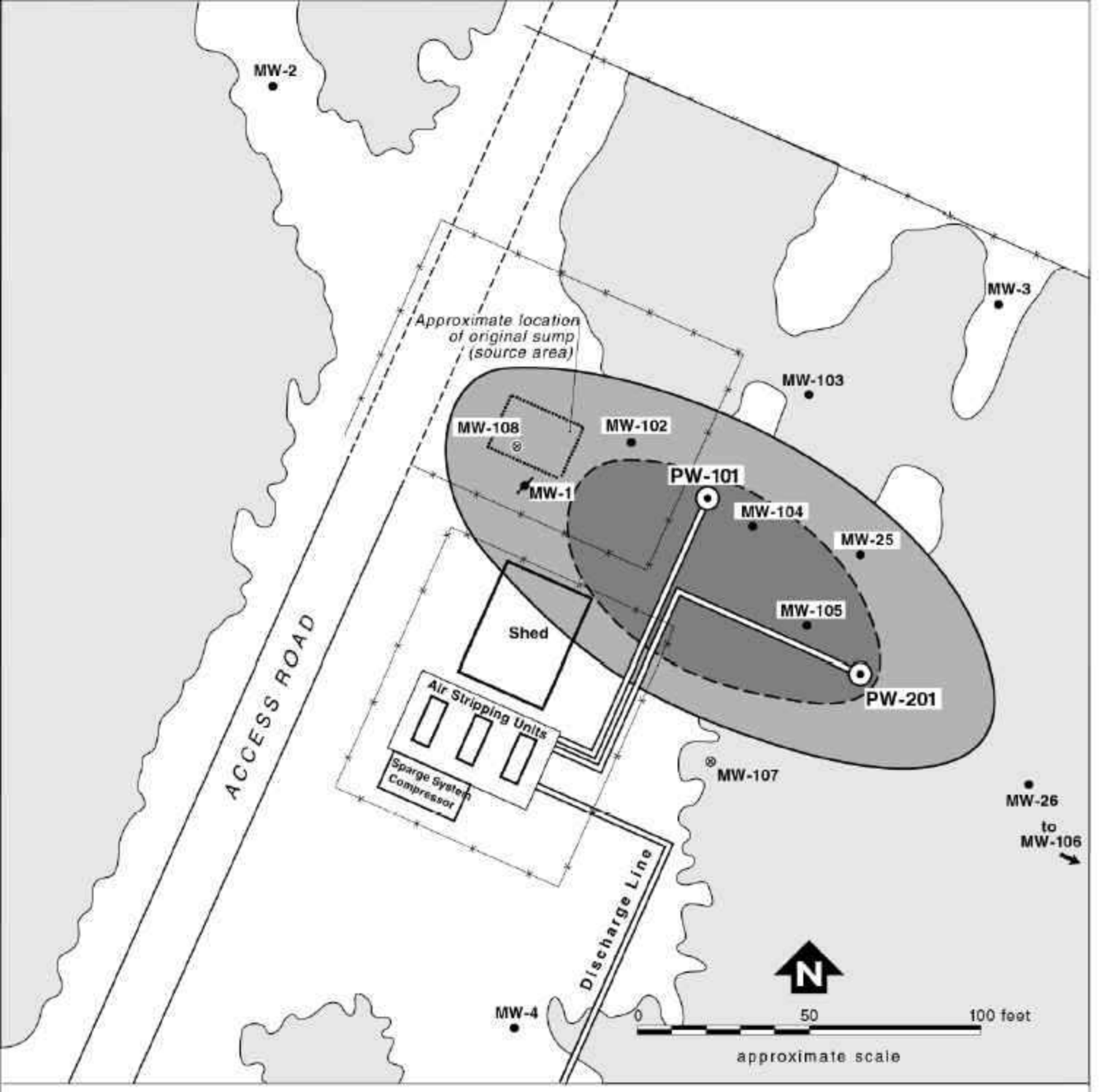


Figure 2
Areal Extent of 1,2 DCP Concentrations > 5 ppb
Del Norte Pesticides NPL Site
Crescent City, California

Justification for a Technical Impracticability Waiver at Del Norte County Pesticide Storage Superfund Site for the Record of Decision

1.0 Introduction

This document presents the background, documentation, and justification for a Technical Impracticability (TI) waiver for the groundwater plume at the Del Norte County Pesticide Storage Superfund Site in Del Norte County, California (Figure 1). The current groundwater contamination plume at the site consists of 1,2-Dichloropropane (1,2-DCP) concentrations up to 38 micrograms per liter (µg/l). The cleanup level stated in the 1985 Record of Decision (ROD) for 1,2-DCP is 10 µg/l and is based on a health advisory. The estimated area of the plume currently above the cleanup level is approximately 5,000 square feet. The original size of the plume was approximately 12,000 square feet in 1990.

Source removal activities were performed at the site in August 1987. Those activities included removal of 290 cubic yards of contaminated soils. The United States Environmental Protection Agency (EPA) has operated a groundwater pump and treatment system at the site since April 1990. The groundwater treatment system consists of two extraction wells feeding an air stripping unit. Once treated, the groundwater is discharged to the local Public Owned Treatment Works. Following initial startup of the treatment system, dramatic reductions of 1,2-DCP were observed in groundwater concentrations. However, these concentrations reached asymptotic levels within the first four years of operations. Subsequent modification to the system through air sparging resulted in only slight reductions in the concentrations. The system was also shut down during several periods over the last four years for comparison of contaminant concentrations and plume behavior; no significant changes were noted. At the current rate of contaminant concentration reduction, it is not possible to determine when, or if, cleanup levels will be reached.

Since source removal and active remediation began, the portion of the plume with 1,2-DCP concentrations greater than 10 µg/l has been reduced by approximately 50%. However, since 1997, little or no reduction has been noticed. It is believed that the 1,2-DCP is being slowly desorbed from clays and silts in the soil to the groundwater. The 1,2-DCP then either volatilizes to the soil gas or biodegrades at a rate slightly greater than or equal to the rate of desorption (i.e. Natural Attenuation). The rate of natural attenuation has been sufficient to contain and shrink the plume, but it is not likely that natural attenuation will be sufficient to allow the plume to reach cleanup levels.

An evaluation of the site conditions, the treatment system, and treatment options as discussed in this document has led to the conclusion that cleanup levels of 1,2-DCP cannot be reached through engineering means or through natural attenuation. Therefore, the ROD will be amended to reflect the fact that the cleanup level for 1,2-DCP of 10 µg/l,

established in the 1985 ROD, cannot be attained and that an alternate remedy will be selected. The Maximum Contaminant Level (MCL) for 1,2-DCP set at 5 µg/l was promulgated subsequent to the signed ROD. The amendment process requires a re-examination of Applicable or Relevant and Appropriate Requirements (ARARs) that may relate to the remedy. The re-examination of ARARs indicates that the MCL for 1,2-DCP is an ARAR for the alternate remedy. Since the MCL for 1,2-DCP is more stringent than the cleanup level specified in the ROD, the MCL will be waived based on technical impracticability. It is the intent of EPA through an existing contractual agreement with the State of California's Department of Toxic Substances Control (DTSC) and/or through an enforcement agreement with Del Norte County to have groundwater monitoring continue and that institutional controls to control site use be established and enforced. A waiver of the MCL for 1,2-DCP will allow for delisting of the site from the NPL while achieving our remedial action objectives.

2.0 Background

The Del Norte County Pesticide Storage Site is located approximately one mile north of Crescent City, California and approximately ½ mile from the Pacific Ocean (Figure 1). The site is located on an undeveloped area of land controlled by the Del Norte County Agricultural Commission near the south end of the county airport. The county operated the site as a county-wide collection point and storage area for pesticide containers from 1970 to 1981. As part of site operations, containers were rinsed and the rinsate disposed in a bermed, unlined sump area. Soil and groundwater contamination were discovered in 1981 by the State of California Regional Water Quality Control Board.

Private domestic water supply wells in the area made contamination of the local groundwater a concern to the regulatory agencies. The nearest private water supply wells are approximately 1/4 mile east of the site. Figure 2 shows the locations of the nearest off-site private domestic wells, east of the site.

State and local cleanup efforts were performed in 1982 which included removal of the stored containers. After State and local funds were expended in initial cleanup efforts at the site, the site was included on the NPL in 1983. The EPA has been the lead agency for the site since its listing on the NPL.

Remedial Investigation/ Feasibility Study (RI/FS) activities were completed by the U.S. EPA in 1985. The results of those investigations indicated the contaminants of concern were 1,2-DCP and 2,4-dichlorophenoxyacetic acid (2,4-D). At that time, the contaminant plume was estimated to have extended approximately 170 feet to the southeast of the site (Figure 3). Investigations also indicated that elevated levels of chromium were also present in soils at the site. The 1985 ROD selected excavation and off-site disposal of contaminated soils and extraction and treatment of the groundwater as the remedy.

In December 1987, EPA performed a Removal Action in which 290 cubic yards of contaminated soils were excavated and disposed of off-site at a licensed hazardous waste disposal facility. That action completed the source removal activities and soil remedy for the site. Continued groundwater monitoring between 1985 and 1987, during the pump and treatment system design phase, indicated the levels of 2,4-D and 1,2-DCP were decreasing significantly in the groundwater. Between 1985 and 1989 (after the source removal but before installation of the pump and treatment system) the levels of 2,4-D in monitoring wells at the site decreased to less than 2 µg/l. The ROD established a 100 µg/l cleanup level for 2,4-D, which was met prior to implementation of the treatment system. The levels of 1,2-DCP decreased from approximately 2000 µg/l to 600 µg/l in the same time period; although the concentrations remained above the 10 µg/l cleanup level. These reductions were likely a result of the source removal and biodegradation and/or volatilization of the contaminants in the groundwater.

Additional investigations into chromium levels in soils in the area were performed between 1985 and 1987. Those investigations indicated that the chromium levels were naturally high due to the presence of chromium ore in the bedrock source rock in the area. Based on these findings, an Explanation of Significant Differences (ESD) was prepared in September 1989. The ESD documented that the chromium levels in the soil did not require remediation through removal. The ESD also changed the groundwater treatment system to a less complex air-stripping technology since 2,4-D and chromium no longer required groundwater remediation. The cleanup level for 1,2-DCP was not changed by the ESD.

The pump and treatment system was installed in 1990 and began extracting groundwater from one extraction well at the rate of 15 gallons per minute (gpm). The treatment system operated continuously from April 1990 to December 1994. During that period it was observed that 1,2-DCP concentrations in the groundwater monitoring wells located within the plume had reached asymptotic levels; between approximately 40 µg/l and 15 µg/l. In 1994, EPA installed an air sparging system to determine if the injection of air into the aquifer would enhance contaminant removal. Additional sparge points were added in 1995. No discernable changes in the levels of 1,2-DCP in groundwater were noted, however.

In 1994, EPA also began a program of turning the groundwater treatment system off for extended periods of time to determine what effect it would have on contaminant concentrations. The system was turned off for approximately six months in 1995, then restarted. It was turned off again for six months in 1996. No discernable differences were noted either time. The system has been off since October 1997 and semiannual monitoring reports show that contaminant concentrations continue to decline only slowly; at the same rate as when the treatment system was operating. The approximate extent of the current 1,2-DCP plume is presented in Figure 4.

3.0 Geologic and Hydrogeologic Setting

Del Norte County is the northern and westernmost county in California. The Del Norte site lies on a marine terrace shelf on the edge of the Pacific ocean (Figure 1). The marine terrace represents an approximately 1 ½ mile wide, relatively flat zone parallel to the Pacific coastline that once lay below sea level near shore. The terrace is bound to the east by the Coast Range mountains. The site, and the aquifer beneath, lie in the Quaternary aged Battery Formation. The Battery Formation consists of moderately well sorted fine sands, silts, and clays with generally moderate groundwater permeability (Figure 5). The presence of clays and fines likely contributes to the continued presence of 1,2-DCP being released into the groundwater.

The ROD states that the water within the Battery Formation is considered a Class II groundwater under EPA's Groundwater Protection Strategy. A Class II groundwater classification indicates that the groundwater is a current or potential source of drinking water or other beneficial uses. Groundwater in the area is being used for agricultural and domestic purposes. Water supply wells in the Battery Formation are capable of producing reasonable quantities of water of acceptable quality for domestic purposes. The nearest domestic water supply wells are located approximately 1/4 mile east of the site (Figure 2). No known agricultural wells are in the immediate vicinity of the site.

The elevation of the site is approximately 50 feet. Groundwater in the area is relatively shallow, ranging between 3 and 10 feet below ground surface seasonally. The thickness of the uppermost aquifer (Battery Formation) is approximately 30 feet in the vicinity of the site. Groundwater flow is consistently to the southeast in the immediate vicinity of both the site and the contaminant plume (Figure 2). Within a mile downgradient of the site, the gradient changes to the south, towards the ocean. The gradient is moderately steep, dropping approximately 10 feet in 1000 linear feet. Hydraulic conductivities of the aquifer have been calculated to be approximately 10^{-3} cm/sec with an average linear pore fluid velocity of approximately 9.5 feet/year. The recharge area for the aquifer is likely the Coast Range mountains to the east as well as direct percolation through on-site soils. A small lake is also present to the east of the site, Dead Lake (Figure 1), and likely affects local groundwater recharge.

The average annual rainfall in the area is approximately 79 inches. Surface water drainage in the vicinity of the site is through a series of drainage channels and ephemeral streams which drain to the southeast and south to the ocean. Most channels are dry during the summer months.

4.0 Summary of Source Control and Remedial Measures

Remedial measures implemented at the site since 1982 included removal of

approximately 1590 drums and containers from the storage yard by the State of California. Subsequent soil removal measures included excavation and off-site disposal of approximately 290 cubic yards (cy) of contaminated soil by the U.S. EPA in 1987. The excavation of the 290 cy of soil from the former sump area represented a near-complete source removal at the site. The location of the former source area (the sump) is shown in Figure 3. Confirmation samples of the surface soil (the source of the contamination) collected following the excavation indicated that concentrations were below any action levels or levels which could continue to contribute to groundwater contamination. The success of this source removal was evidenced by the significant decline in groundwater concentrations of all constituents of concern including 2,4-D and 1,2-DCP. Figure 6 presents the concentrations of 1,2-DCP in the wells within the plume from 1990 to 1994.

Installation of the groundwater pump and treatment system in 1990 was the beginning of active mass removal from the groundwater. Locations of the monitoring wells and the extraction wells (PW-101 and PW-201) are shown on Figure 3. The groundwater treatment system operated for nearly seven years. The system was operated at a continuous pumping rate of 15 gallons per minute. Since its installation, and accounting for shut-down periods, the system has operated a total of 79 months. That represents approximately 51 million gallons of treated groundwater. Initial estimates presented in RI investigation reports (SCS, 1988) anticipated that the groundwater treatment system would need to extract and treat approximately 10 pore volumes from the plume, or 7.5 million gallons, before reaching the cleanup level. This was based on an estimated plume pore volume of 750,000 gallons. The system has now processed 68 pore volumes of the plume and cleanup levels have still not been reached.

The estimated volume of 1,2-DCP removed by the system has been calculated to be approximately 3.75 gallons (14.2 liters or 16.4 kilograms). Approximately 95% of that mass was removed within the first four years of operation (1990 to 1994). Estimates of the total contaminant volume released and the total volume remaining in the environment are not determinable because of several unknown factors. These factors include the unknown volume of contaminant mass that has been naturally attenuated (volatilized or biodegraded), and the unknown amount of contaminant mass still remaining within the soil and clays at the source area.

Several augmentations to the system have been made in order to increase mass removal and attempt to reach cleanup levels. These augmentations included addition of an air sparging system to the plume area and the addition of a second extraction well (PW-201) to determine if additional contaminants would desorb in to the aquifer. Neither resulted in any appreciable change in mass removal or contaminant concentrations in the groundwater. Figure 7 presents the 1,2-DCP concentrations for wells within the plume since 1994 when air sparging began.

The air sparging system consisted of injecting air under pressure into the aquifer. The air

was injected within the plume through a series of injection points. The injection points consisted of ½-inch diameter PVC tubes placed to the bottom of the aquifer at approximately 30 feet below grade. The tubes were then plumbed to an air compressor which forced air through the tubes to the bottom of the aquifer. The air would then bubble to the surface through the entire aquifer thickness. The initial 10 sparging points were installed in March 1994 and operated for one year. Once sparging began, one monitoring well, MW-105 saw a dramatic decrease in 1,2-DCP concentrations within the first six months, but levels returned to near normal within the following six months (Figure 7). When no appreciable differences were noted in contaminant concentrations from the remaining wells, 15 additional sparging points were installed in July 1995. Figure 8 shows the locations of the initial 10 air sparging points and additional 15 points installed in 1995. No significant changes were noted in contaminant concentrations after an additional year, and the air sparging system was shut off in November 1996. The remainder of the groundwater treatment system continued to operate.

The groundwater treatment system operated continuously from April 1990 to December 1994. System shutdowns were then implemented to determine what effect it would have on mass removal and contaminant concentrations. The system was turned off and then on again twice between December 1994 and October 1997. The system was first turned off for approximately six months in 1995, then restarted. It was then turned off again for six months in 1996. The operation cycles are presented in comparison to 1,2-DCP concentrations on Figure 7. No noticeable differences in contaminant concentrations were noted during this time period. The system was shut down for the last time in October 1997 and has not been turned on since, pending results of semiannual sampling of the monitoring wells.

5.0 Contaminant Fate and Transport

As discussed, the plume area and contaminant concentrations have remained relatively stable within the last five years (Figure 7). The approximate length of the plume prior to implementation of the groundwater treatment system was 170 feet; it is now approximately 100 feet (figures 3 and 4, respectively). Contaminant concentrations in wells within the plume declined dramatically from 1990 to 1994 (Figure 6), but have not reduced appreciably since 1994.

Well to well comparisons of the four monitoring wells initially found to contain concentrations of 1,2-DCP (MW-25, MW-104, MW-105, and MW-108) have shown this asymptotic response. Concentrations of 1,2-DCP in well MW-104 have been relatively stable for four years but remain above the cleanup level. Well MW-105 has shown decreasing concentrations and will likely continue to do so. However, concentrations in MW-105 are expected to also stabilize above the cleanup level in the same manner as MW-104 due to their location near the center of the plume. Concentrations in wells MW-108 and MW-25 have dropped below the cleanup level; likely due to their location on the

edge of the plume. Well MW-108, within the former sump area, has exhibited concentration reductions to non-detect levels. Downgradient wells, including the nearest to the original source area, MW-26, have not exhibited any detectable levels of any contaminant of concern since monitoring began in 1990.

The pesticide 1,2-DCP is a halogenated volatile organic compound with a high vapor pressure and a high Henry's Law constant. This means that the compound, once in water, has a high affinity to go to the vapor phase. However, the compound also has a relatively low K_{ow} (Octanol/Water partitioning coefficient). This results in the compound preferentially sticking to clay and other fine particles in the soil column and only slowly desorbing into the aqueous phase (groundwater). Given the relatively high clay and silt content of the soil at the site, this process is the likely factor causing the relatively steady-state levels of 1,2-DCP in the groundwater.

Whether the source term of the 1,2-DCP is in a Non Aqueous Phase Liquid (NAPL) form is not known. The compound would not need to exist in the form of a NAPL in order to behave as such once sorbed onto clay and fines. High aqueous concentrations such as those discharged as rinseate into the sump would behave similarly. The location of the affected aquifer soils is likely in the immediate vicinity of the former release areas (i.e. sump). Once the higher concentrations of 1,2-DCP begin to diminish on the clay and fines, the contaminant levels will likely begin to drop relatively rapidly. The timeframe for this cannot be determined because the current mass within the soil and rate of desorption is unknown.

Given the high affinity of 1,2-DCP to go into the vapor phase, once the compound is desorbed into the groundwater, it likely volatilizes relatively quickly into the soil gas. This process can also be accelerated by the seasonal rise and fall of the water table. This exposes more of the soil to the atmosphere as the water table lowers.

The compound 1,2-DCP is also rated as a relatively biodegradable compound according to EPA technical documents (USEPA, Natural Attenuation Short Course Proceedings, 1997). Therefore, biodegradation could also be affecting contaminant concentrations. This process has not been specifically studied at this site. However, the specific documentation of this process is academic given the historic shrinkage and continued stability of the contaminant plume. Either or both of these processes (biodegradation and volatilization) are likely contributing to the stability of the contaminant plume. With the velocity of the groundwater at approximately 9.5 feet per year and the size of the plume shrinking, destructive processes are obviously occurring at a higher rate than plume migration and contaminant mass flux. Without natural attenuation, the plume would be expected to migrate downgradient at the same velocity as the regional groundwater (9.5 feet/year).

The trend data for well MW-105 support the concept that natural attenuation is successfully reducing contaminant concentrations and stabilizing the plume. However, natural

attenuation will not likely allow the plume to reach the cleanup levels. This is supported by the behavior of contaminant concentrations in well MW-104 which have stabilized above the cleanup levels for the past four years. It is unknown when, or if, contaminant levels in these wells could reach cleanup levels.

6.0 Justification for TI Waiver

The U.S. EPA guidance on Technical Impracticability (Directive 9234.2-25) states that EPA must evaluate whether groundwater restoration is attainable at a Superfund site from an engineering perspective. That evaluation must generally include the following components based on site-specific information and analysis. The following presents a summary of each of the components as it relates to this site.

1) Specific ARAR for which the TI determination is sought.

The EPA plans to amend the ROD and select an alternate remedy because the cleanup level of 10 µg/l for 1,2-DCP (based on a health advisory) cannot be attained. The ROD amendment process requires a re-examination of ARARs. In 1992, subsequent to the signed ROD, the U.S. EPA promulgated an MCL of 5 µg/l for 1,2-DCP which was adopted by the State. The alternate remedy which will replace the original remedy will consist of plume containment, institutional controls, monitoring and a TI waiver of the MCL for 1,2-DCP. The U.S. EPA intends to invoke a technical impracticability waiver for the MCL for 1,2-DCP since it is more stringent than the cleanup level set in the 1985 ROD and therefore even less likely to be attained. For this reason, the MCL for 1,2-DCP will be waived based on the technical impracticability of attaining 5 µg/l or less in the groundwater. All other constituents of concern have been remediated to below cleanup levels.

2) Spatial area over which the TI decision will apply.

The area over which the TI waiver will apply is the current areal and vertical extent of the contaminant plume for which the concentrations of 1,2-DCP exceed 5 µg/l. That area is approximately 5000 square feet in size and is depicted in Figure 4. The thickness of the TI zone extends to the depth of the uppermost aquifer (30 feet bgs). That results in an average plume thickness of approximately 20 to 27 feet. Once the waiver is applied, the site will have met all cleanup criteria and can be delisted.

3) Conceptual model that describes the site geology, hydrogeology, contamination sources, transport, and fate.

The above discussions of the geology, hydrogeology, and source evaluation present the details comprising the site conceptual model. Additional details are provided in the site RI report (1985).

4) Evaluation of the restoration potential of the site.

a) Contaminant sources for the 1,2-DCP have been identified and removed through source removal and cleanup efforts. No further source removal activities are indicated at this time.

b) Completed remedial actions have performed appropriately and reasonable upgrades and modifications have been made to enhance mass removal. The groundwater treatment system has operated efficiently and effectively as designed. No shutdowns or mechanical difficulties were encountered with the system during its operation since 1990. No other reasonable remedial action could effectively restore the groundwater to cleanup levels.

c) The current remedial system in place at the site consists of a pump and treatment system. Based on the believed behavior of the contaminant in aquifer soils and the rate of contaminant reduction, it is unknown when, or if, cleanup levels could be reached. The same rate of cleanup is expected if the remedial system is removed and levels are allowed to degrade naturally. However, natural attenuation is not a reasonable remedy at the site because it is unknown whether natural processes will ever result in attaining cleanup levels over the entire plume. Further, the same rate of contaminant reduction is observed whether or not the pump and treatment system is operation.

d) Based on the mechanics of the source term in the groundwater (sorption onto soil clay and fines) no other remedies, either conventional or innovative, could be reasonably expected to remediate the contaminant to cleanup levels.

5) Estimated costs of the existing remedy.

The remedy in place at the site had a capital cost of approximately $2.7 million. The annual operation and monitoring cost is approximately $25,000 per year when the system is operating. To date, approximately $ 4.2 million have been expended on site remediation.

6) Other considerations.

It is anticipated that monitoring of the groundwater conditions at the site will continue indefinitely under the direction of the State of California DTSC. It is EPA's intent that semiannual sampling of the four monitoring wells continue and land restrictions be imposed. Land restrictions would assure that no nearby use of the groundwater affects

plume migration as long as contaminant levels remain above cleanup levels. All of the surrounding land at the site is owned by Del Norte County so that land restriction controls should be easily implemented.

7.0 Conclusion

Based on the above, the U.S. EPA judges that remediation of the aquifer to the MCL for 1,2-DCP is not practicable from an engineering standpoint. Therefore, a TI waiver of the MCL for 1,2-DCP is appropriate for this site.