RECORD OF DECISION

MYSTERY BRIDGE ROAD/U.S. - HIGHWAY 20 SUPERFUND SITE
NATRONA COUNTY, WYOMING
OPERABLE UNIT 1 - GROUND WATER

SEPTEMBER 24, 1990

RECORD OF DECISION
MYSTERY BRIDGE ROAD/U.S. HIGHWAY 20 SUPERFUND SITE
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DECLARATION STATEMENT

SITE NAME AND LOCATION

Mystery Bridge Road/U.S. Highway 20 Site
Natrona County, Wyoming
Operable Unit 1 - Ground Water

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 1 - Ground Water (OU 1) of the Mystery Bridge Road/U.S. Highway 20 (Mystery Bridge) Superfund site in Natrona County, Wyoming. This 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 the National Contingency Plan (NCP).

This decision document explains the basis for selecting the remedy for this site. The information that forms the basis of this remedial action decision is contained in the Administrative Record for this site and is summarized in the attached decision summary.

The State of Wyoming concurs with the selected remedy for OU 1. The State of Wyoming, however, feels that the CERCLA remedial action and measures being developed under the Resource Conservation and Recovery Act (RCRA) to address contamination from the Sinclair/Little America Refinery Company (LARCO) property at the site need to be integrated into a single comprehensive planning and remediation effort.

ASSESSMENT OF THE SITE

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, or the environment.

DESCRIPTION OF SELECTED REMEDY

The Mystery Bridge Superfund site has been divided into two operable units: ground water (OU 1) and contaminant source areas (OU 2). Past and current removal actions were implemented to prevent the migration of contaminants from source areas. The selected remedy presented in this ROD addresses ground water that has been contaminated by these sources. It describes remediation intended to reduce the levels of contaminants in ground water that were released from the KNEnergy, Inc (KN) and Dow Chemical Company and Dowell-Schlumberger, Inc. (Dow/DSI) facilities. Ingestion of and direct contact with contaminated ground water have been determined to pose the principal threat to human health. OU 2 will address contaminated subsurface soils in the vicinity of the industrial properties at the site and is expected to complete remediation of contaminant sources. A separate ROD will be prepared for the remediation of OU 2.

The remedial action selected by EPA for OU 1 includes a system for extracting contaminated ground water from locations near the KN and Dow/DSI facilities, treating the extracted water to remove contaminants, and reinjecting the resulting clean water into the ground. The selected remedial actions for OU 1 will address the ground water plume emanating from the Dow/DSI facility that contains volatile halogenated organic (VHO) contaminants and the ground water plume emanating from the KN facility that contains aromatic hydrocarbon contaminants including benzene, ethylbenzene, toluene and xylene

(BETX). The major components of the selected actions that are common to both the VHO and BETX plumes include:

- monitoring ground water, discharged treated water, and air; and
- implementation of temporary institutional controls, such as deed and/or user restrictions.

VHO Plume: **Air Stripping Treatment with Limited Water Extraction.** The major components of the selected remedy for the VHO plume include:

- extraction of VHO contaminated ground water in the upgradient portion of the plume;
- air stripping of extracted ground water;
- reinjection of treated ground water; and
- natural attenuation in the downgradient portions of the plume.

BETX Plume: **Air Stripping Treatment of Extracted Ground Water.** The major components of the selected remedy for the BETX plume include:

- extraction of BETX contaminated ground water;
- air stripping of extracted ground water;
- reinjection of treated ground water to injection wells.

This remedy assumes continuation of the ongoing KN removal actions.

DECLARATION OF 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 permanent solutions and alternative treatment technologies, to the maximum extent practicable. However, because complete treatment of the principal threats of the site was found to not be practicable, this remedy does not satisfy in full the statutory preference for treatment as a principal element. Only a portion of the VHO plume will be treated. Natural attenuation will reduce contaminant levels in the remaining downgradient portion of the plume. Because of the hydrogeologic conditions in the area, extraction and treatment of the entire VHO plume would cause contamination from the nearby plume emanating from the LARCO facility (referred to as the RCRA plume) to migrate further into the residential area. The LARCO facility is under jurisdiction of RCRA and contamination at the facility is being addressed under this authority. The entire BETX Plume will be remediated through treatment as a principle element.

Because this remedy may result in hazardous substances remaining on site above health-based levels, a review of the remediation will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

James J. Scherer
Regional Administrator
EPA Region VIII

Sept. 24, 1990
Date

DECISION SUMMARY
MYSTERY BRIDGE ROAD/U.S. HIGHWAY 20 SUPERFUND SITE
OPERABLE UNIT 1 - GROUND WATER

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I. SITE NAME, LOCATION AND DESCRIPTION

The Mystery Bridge Road/U.S. Highway 20 (Mystery Bridge) Superfund site (Figure 1) is located in Section 5, Township 33N, Range 78W 6th P.M. in Natrona County, one mile east of Evansville, Wyoming. The site includes two residential subdivisions (Brookhurst and Mystery Bridge) and an industrial area to the south where certain hazardous materials have been used. The site is bordered on the north by the North Platte River, on the west by the Sinclair/Little America Refining Company (LARCO), and on the south by U.S. Highway 20. Mystery Bridge Road and the Mystery Bridge subdivision extend along the eastern perimeter of the site.

Topography of the area varies from flat or gently sloping to slightly rolling. The slope of the land surface is less than 2 percent but ranges between 7 and 25 percent along the banks of the North Platte River. The 100- and 500- year floodplains are within 50 to 100 feet of Elkhorn Creek and the North Platte River. Because of upstream reservoir regulation, the relatively large channel capacity of the river and rare heavy precipitation events, the North Platte River does not have an extensive history of flooding.

Drainage is mainly overland flow to man-made diversion structures and to Elkhorn Creek. Elkhorn Creek is a perennial stream that crosses the site and flows in a northeasterly direction into the North Platte River. Water from Elkhorn Creek is used for washing equipment at industrial facilities. During the summer, water is diverted for irrigation of nearby fields.

The Mystery Bridge site is underlain by an alluvial aquifer which previously served as a water supply to all of the homes in the area. After discovery of organic compounds in water from this aquifer, all but six of these homes began using other water sources. Currently only two wells in the residential area are being used to provide drinking water. The alluvial aquifer is also used for fire fighting by KNEnergy, Inc. (KN). The uppermost bedrock aquifer, the Teapot Sandstone formation, provides water to a number of industrial wells in the area of the site. Except for ground water, no other natural resources on the site are used. The North Platte River is used for recreational fishing.

The residential area, located on the northern two thirds of the site, consists of 125 lots which range in size from two to five acres. Houses were constructed on approximately 100 of these lots between 1973 and 1983. According to population data collected in 1987, approximately 400 people lived within the Brookhurst subdivision. In addition, approximately 250 people comprised the work force for the industrial properties bordering the residential area. Within a 1-mile radius of the study area, the total work daytime population is approximately 1000 people. The population within a 3-mile radius was approximately 3000 people, which included 2160 people in the community of Evansville.

An industrial area is located along the southern perimeter of the site to the south of the Burlington Northern Railroad (BNRR) right-of-way and north of the highway. Present industrial operations at the site include companies which provide oil field services, bulk fuel storage for local delivery, natural gas processing and compressing, and supply commercial chemicals. Several petroleum refineries operate to the west of the site. Other businesses located along U.S. Highway 20 include truck sales, grading, moving and storage, and public utilities.

Past and present surface and subsurface storage units and other structures at the site include several underground and above ground storage tanks, abandoned drums, an unlined waste pond and a concrete lined waste pond. Although several of the units have been removed, these features have released contaminants from the industrial facilities at the site and are discussed in detail in the next section.

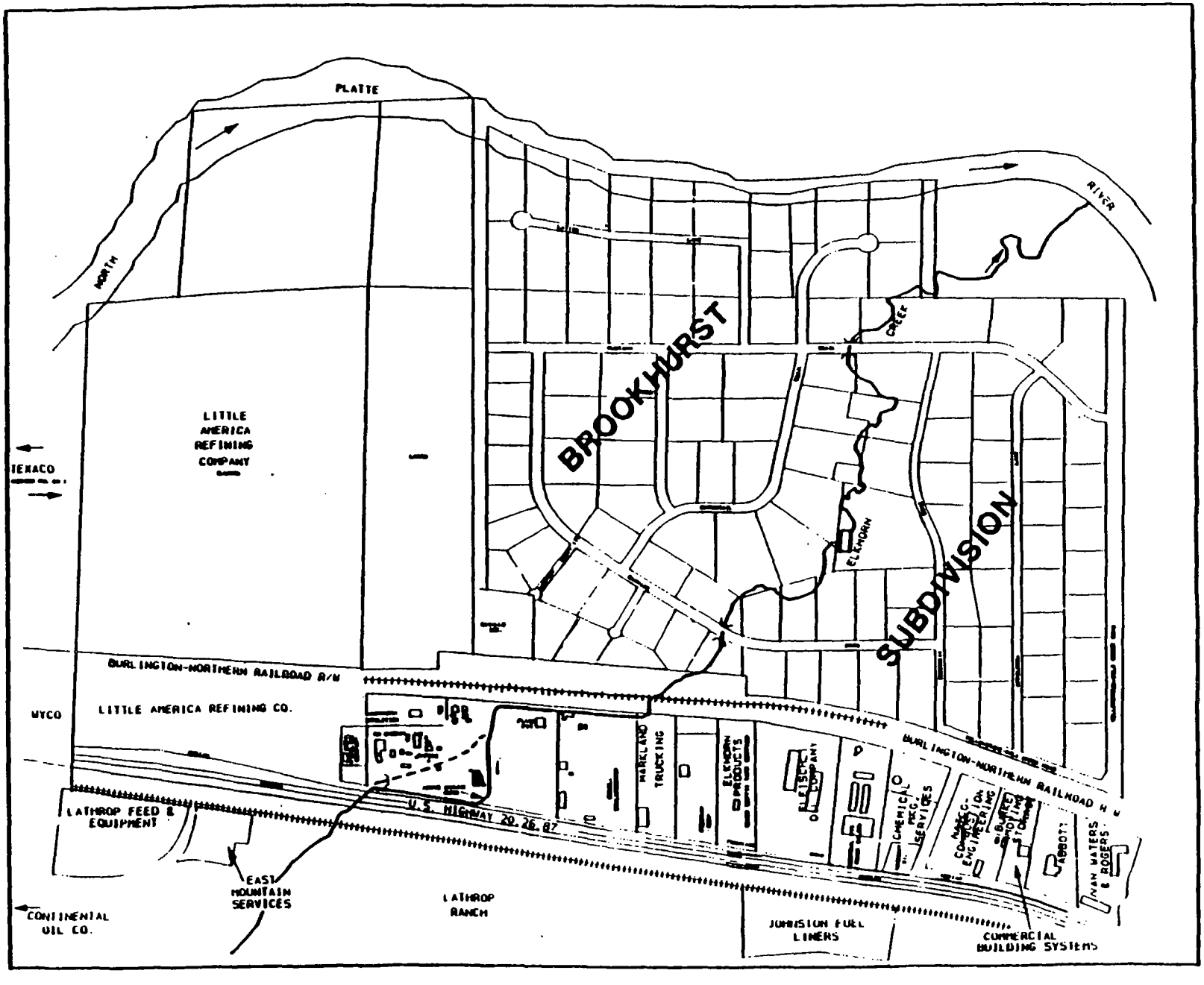

Figure 1

Mystery Bridge

Site Map

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Initial Investigations

In August of 1986, residents complained of poor air and water quality in and around the residential subdivisions. As a result, the Wyoming Department of Environmental Quality (WDEQ), the Natrona County Health Department and the Office of Drinking Water in EPA Region VIII began an investigation of the site. Results of early sampling activities indicated organic compounds in residential wells and tap water. Residents were advised not to use their well water for drinking or food preparation purposes. In the same year, the State of Wyoming began providing bottled water to residents. Under the Superfund Removal Program, EPA took over the lead responsibility for removal activities including providing bottled water. As part of the removal program, EPA also installed monitoring wells and conducted sampling programs to further investigate the release of contaminants and gather information to evaluate the need for further removal action.

The Agency for Toxic Substances and Disease Registry (ATSDR) assessed the public health risk posed by volatile organic compounds in the ground water at the site. ATSDR determined that there was an imminent and significant health threat to site residents and that if action were not taken within one year, the levels of contaminants would increase the lifetime cancer risk for individuals drinking well water from the area.

In March 1987, EPA began an Expanded Site Investigation (ESI) to further define the nature and extent of contamination in air, soil, surface water and ground water at the site and to respond to community concerns. The ESI delineated several potential plumes of ground water contamination and identified several potential sources of contaminants. Based on the findings of the ESI, the Mystery Bridge site was proposed for the National Priorities List (NPL) in June of 1988. Listing of the Mystery Bridge site on the NPL was finalized on August 28, 1990.

The ESI concluded that one or more contaminated ground water plumes originate near the Dow/DSI property, and that another ground water plume resulting from the release of aromatic hydrocarbons originates near the KN facility. The report also concluded that soils at the Dow Chemical Company and Dowell-Schlumberger Inc. (Dow/DSI) facility were contaminated and soils at KN could be contaminated. A third major plume was identified as entering the subdivision from the LARCO property to the west.

The LARCO facility is under the authority of the Resource Conservation and Recovery Act (RCRA) and was not investigated as part of the CERCLA activities at the Mystery Bridge site. The contamination associated with the LARCO facility is being addressed through a unilateral 3008(h) corrective action order issued on December 1, 1988 on which LARCO and EPA are negotiating a consent decree. The contaminated ground water (referred to as the RCRA plume) is believed to be made up of floating petroleum/hydrocarbon products.

Based on an imminent and substantial endangerment to public health revealed by the ESI, EPA decided to supply an alternative permanent water system for the subdivision. The water supply project was separated into two phases: Phase I included the design and construction of a water transmission line from the municipal water supply in Evansville to the site and a distribution system throughout the residential area; Phase II involved upgrading the Evansville water filtration facility and included the design and construction of a new water intake and its corresponding pump station, a new transmission line from the new intake to the Evansville water filtration facility, and a new sedimentation basin. Phase II was required because the existing intake was below the Casper wastewater treatment plant discharge and the water quality was unacceptable. The system was put into operation in January 1989.

Concurrent with the initial scientific studies, EPA also conducted research to identify potentially responsible parties (PRPs), parties who may be liable pursuant to CERCLA, for the clean up of contamination at the site. Notice letters regarding removal actions and remedial activities were sent in late 1986 and 1987 to various PRPs identified including Dow Chemical Company, Dowell-Schlumberger, Inc., and KNEnergy, Inc.

Pentachloraphenol (PCP) was detected in two soil samples and several wells located on the BNRR right-of-way. Over 60 abandoned 55-gallon drums were also found on the property. Analysis of samples from the drums indicated that 11 of the drums contained aromatic hydrocarbons and other chemical compounds. These drums were relocated to a BNRR freight building. The remaining drums were found to contain typical trash and were disposed of by WDEQ. In 1988, a soil contamination study conducted at the BNRR property concluded that soil underlying the drums was not contaminated.

Removal Actions

In December 1987, KN and Dow/DSI each entered into Administrative Orders on Consent to perform removal actions at their respective facilities. Dow/DSI and KN agreed to take immediate actions to control suspected sources of ground water contamination on their respective properties and to prevent further migration of contaminated ground water into the subdivision.

Dow/DSI: The Dow/DSI facility uses mobile mounted pumps, tanks and other asscciated equipment to perform oil and gas production enhancement services for the oil and gas industry. Dow/DSI performs its own truck repair and stores solvents in drums on site.

A gravel leach sump for disposal of truck wash water located on the western portion of the property had been in operation since shortly after the facility began operations. The wash water is believed to have contained chlorinated solvents. Also located on the western part of the property, a 1000-gallon underground oil/water separator tank was used to separate oil film and solids washed from trucks. Separated wash water left the separator and flowed through a vitreous tile drain to the leach sump system. A toluene storage area was located at the north end of the facility. Contaminants were released from both the wash water disposal system and toluene storage area.

Because of these releases and the resulting contamination, and in accordance with the Administrative Orders on Consent, Dow/DSI prepared an Engineering Evaluations/Cost Analysis (EE/CA) report to document the extent and nature of the releases of contaminants, and to propose expedited removal actions to control migration of contaminants and eliminate sources of contaminants beneath and adjacent to their property. As a result of drilling and sampling activities at the Dow/DSI facility in 1987, several volatile halogenated organic (VHO) soil contaminants were identified in the ground water and soil near the abandoned chlorinated sump area. The VHO group includes chlorinated organic compounds. The EE/CA prepared by Dow/DSI evaluated removal technologies and recommended a removal action that was then implemented.

Removal activities at the Dow/DSI facility began in January 1988. This removal included the excavation and off-site landfilling of approximately 440 cubic yards of contaminated surface soils from the chlorinated sump area. The oil/water separator, the decommissioned waste oil tank and portions of the vitreous tile drain were also removed from the site. A soil vapor extraction (SVE) system was used in the chlorinated sump area and removed over 300 pounds

of contaminants from the soil. Almost 6,000 pounds of solvents were removed from soils from the toluene storage area using a SVE system.

KN: KN has operated a natural gas fractionation, compression, cleaning, odorizing, and transmission plant at the site since 1965. Operational maintenance activities are performed on-site.

Originally constructed as an earthen impoundment, a flare pit was used to collect spent material generated by the facility. Materials that may have been placed in the flare pit include: 1) crude oil condensate; 2) absorption oil; 3) emulsions, antifoulants, and anticorrosive agents; 4) liquids accumulated in the flare stack; 5) potassium hydroxide treater waste; and 6) lubrication oils and blowdown materials from equipment in the plant. In October 1984, the western half of the impoundment was backfilled and a new concrete lined flare pit was constructed on the eastern half. Use of the flare pit was discontinued and the pit was decommissioned in 1987. Waste streams formerly collected in the flare pit were rerouted into above storage tanks for temporary storage or recycling.

A catchment area, a low spot in the ground just west of Elkhorn Creek, collected surface run-off water containing contaminants from the plant area and steam condensate from the dehydration unit. Various activities were undertaken by KN to reroute materials away from this area in 1984.

In 1965, an underground pipe burst during facility start-up and 5,000 to 10,000 gallons of absorption oil were injected under pressure into the ground beneath the process area. Absorption oil is used at the KN processing facility to remove impurities from the natural gas stream. Other releases occurred between 1965 and 1987 in the form of small leaks and spills near the flare pit and catchment area.

Because of these releases and the resulting contamination, and in accordance with the Administrative Order on Consent, KN prepared an EE/CA report. An investigation was conducted as part of the EE/CA for removal actions at the KN facility. A soil vapor survey was conducted in the vicinity of the flare pit, and soil boreholes and ground water were sampled. Additional samples were collected from soils between the concrete flare pit and the flare stack, and also beneath the concrete flare pit. Several aromatic hydrocarbon contaminants were identified in the soils and ground water near the flare pit. Benzene, ethylbenzene, toluene and xylenes (BETX) are included in the aromatic hydrocarbons group. A floating layer of BETX contaminants was identified during subsequent ground water sampling at the KN facility. Based on additional drilling and sampling, aromatic hydrocarbons were identified within the boundaries of a section of soil that is stained by what is believed to be absorption oil from past releases in the process area and flare pit location. The stained soil on the KN property extends across the northeastern portion of the Dow/DSI property, through the railroad right-of-way and slightly into the residential area.

In November 1989, removal actions designed to remove BETX contaminants from the ground water and soil beneath the KN facility began. Pursuant to this removal action, volatile BETX contaminants are being removed from the ground water and soil using a SVE system and a ground water treatment system. As of July 31, 1990, the KN removal system had recovered approximately 6,000 gallons of BETX contaminants and has extracted approximately 135 pounds of benzene from the soils and ground water beneath the KN facility.

Remedial Investigation/Feasibility Study (RI/FS)

In December 1987, an Administrative Order on Consent was issued to Dow/DSI and KN requiring them to conduct a Remedial Investigation/Feasibility Study (RI/FS) to characterize the extent of contamination and identify alternatives for cleaning up the site. The RI/FS report,

which was completed in June 1990, concluded that two plumes of contaminated ground water originate in the industrial area south of the subdivision and are migrating through the subdivision in a northeast direction. The first of these plumes is contaminated with VHO compounds (referred to as the VHO plume), and extends from the Dow/DSI facility to the North Platte River. The second plume is contaminated with BETX compounds (referred to as the BETX plume), and extends from the KN facility to the BNRR property and possibly into the subdivision directly north of the KN facility. In addition, a layer of BETX contaminants originating at the KN facility and extending slightly into the subdivision was found floating on the ground water.

PCP contamination near the BNRR property that was identified during the ESI was not detected in subsequent ground water sampling conducted for the RI/FS. However, EPA will further address the PCP contamination during activities conducted for the second operable unit for the site which will evaluate contaminant source areas as discussed in Section IV.

The RI/FS also identified areas of contaminated soils related to the industrial properties at the site including Dow/DSI, KN, Van Waters and Rogers, NATCO, Sivalls, Permian, and Mobile Pipeline. Much of this soil has been removed or cleaned up as part of the removal actions described above. However, some underground soil contamination remains in the industrial area of the site. This contamination will be addressed during the studies conducted for contaminant source areas of the Mystery Bridge site (see Section IV).

As part of the RI/FS, in September 1989, EPA prepared a baseline risk assessment (BRA) to estimate potential health and environmental risk which could result if no action were taken at the site. The BRA indicated that exposure to ground water could result in significant risks due to contaminants at the site. Details of the BRA are summarized later in Section VI.

The RI/FS, completed in June 1990, suggested that ground water plumes of VHO compounds emanating from the Dow/DSI property and BETX compounds emanating from the KN property are not commingled in the area downgradient from the Dow/DSI and KN facilities. The data also suggested the VHO plume could be commingled with the RCRA plume. Since the most recent data contained in the RI/FS was from ground water samples taken in September and October 1989, EPA requested the data be updated prior to issuing this ROD to determine if these conditions had changed.

In July 1990, ground water samples from 20 wells were collected by consultants for Dow/DSI (with split samples obtained by EPA and consultants for KN) and analyzed for selected VHO and BETX compounds. The primary objectives of this sampling were to further assess possible commingling of the contaminant plumes and to investigate the current degree of contamination as it may have been affected by the ongoing KN removal action. Results of the July sampling suggest that there is no current commingling of the VHO plume with the BETX plume nor the VHO plume with the RCRA plume. The July 1990 data are somewhat conflicting with historical data with respect to BETX compounds in the ground water northeast of the KN property line and the volume of the BETX plume appears to be greater than that estimated in the RI/FS.

III. HIGHLIGHTS OF COMMUNITY INVOLVEMENT

Community interest in problems at the Mystery Bridge site became very intense in late 1986 when site contamination problems first surfaced and the ATSDR advisory was issued. Early public meetings, many of which were attended by as many as 100 people, often became highly emotional encounters between concerned residents and public officials. Media coverage was extensive, including coverage by local and State newspapers and television stations, as well as some national television coverage.

State legislators and Congressional staff members took a great interest in site activities. The community's letter-writing campaign extended to the White House.

Initial community involvement was coordinated by an EPA removal program community relations coordinator, as well as by an EPA field liaison, EPA's representative in Casper, and the Emergency Response Branch's On-Scene Coordinator for the site.

EPA's removal community relations coordinator prepared a Community Relation Plan in December 1986. The Plan was revised in November 1988 by the remedial community involvement coordinator.

Between December 1986 and July 1987, EPA held five public meetings. From December 1986 through October 1989, EPA issued five Fact Sheets and 14 Information Updates. In January 1990, EPA distributed a Fact Sheet on the risk assessment for the site. In addition, EPA provided for public comment on work plans, sampling plans, the Community Relations Plan, alternative water supply options, and other key documents throughout site activities. EPA issued responsiveness summaries for comments received during these comment periods.

From April 1987 through June 1988, EPA representatives participated in a Governor's Task Force and Oversight Committee on a regular basis. From June 1988 through October 1989, EPA worked with WDEQ and the Natrona County Health Department to continue a monthly forum for discussing issues with community members.

To further fulfill the requirements of CERCLA/SARA Section 113 (k)(2)(i-v) and Section 117, the Administrative Record file for the removal actions was established at EPA's Denver office and at EPA's Wyoming field office in Casper. EPA also provided a copy of the record to one community group who requested it under the Freedom of Information Act (FOIA). The Administrative Record for the remedial activities was established at the Natrona County Library in Casper and in EPA's Denver office.

The Proposed Plan for OU 1 was issued on July 3, 1990 with a one-quarter page advertisement placed in the *Casper Star Tribune* on July 1, 1990 outlining remedial alternatives and announcing the public comment period and public meeting. The public comment period was open from July 5 to August 3, 1990. The public meeting was held July 18, 1990 at the Casper City Council Chambers. A transcript of the public meeting is included in the Administrative Record.

Approximately five community members attended the Proposed Plan public meeting. Two oral comments were received at the public meeting and three sets of written comments were received during the public comment period.

Details of community involvement activities and responses to official public comment on the Proposed Plan are presented in the Responsiveness Summary attached to this ROD.

IV. SCOPE OF ROLE OF OPERABLE UNIT WITHIN SITE STRATEGY

The Mystery Bridge site has been divided into two operable units: one to address ground water (OU 1) and the other to evaluate contaminant source areas (OU 2). The remedy selected in this ROD is for the first operable unit and addresses the contaminated ground water emanating from the Dow/DSI and KN facilities. This ground water poses the principal threat to human health and the environment due to ingestion of and contact with water from wells that contain contaminants above the Maximum Contaminant Levels (MCLs) established by the Safe Drinking Water Act.

EPA will evaluate remaining source areas in OU 2 and, as necessary, will determine whether further action is required for contaminated subsurface soils in the vicinity of the industrial properties that were identified during the RI/FS and represent possible continuing sources of ground water contamination. Questions raised by comments received during the public comment period regarding the BNRR property will be further evaluated during OU 2.

EPA believes additional consideration of the contaminant source areas is necessary to ensure the long-term effectiveness of the ground water clean up. The RI focused primarily on contaminated ground water and did not address mechanisms which may transport contaminants from soils to water. Removal actions for the Dow/DSI and KN facilities prevent further migration from source areas into residents' ground water. Questions remain concerning the ability of the removal actions to eliminate sources of contamination. For example, the SVE and hydrocarbon recovery activities at the site may not be effective on soils below the ground water. There are also inherent technical difficulties in cleaning the stained soil areas above the ground water and the floating BETX contaminants.

V. SITE CHARACTERISTICS

Site Geology and Hydrology

The site is located within a narrow strip of Quaternary alluvial floodplain and terrace deposits along the North Platte River and Elkhorn Creek. The upper 1.5 to 13 feet of the alluvial deposit is a surficial soil layer which consists of a mixture of sandy silt and clayey silt. The remaining alluvium ranges in thickness from 13 to 68 feet. It is well-sorted coarse to medium sand with little fine sand and trace amounts of silt and gravel.

Bedrock crops out to the southeast and northwest of the site. In the uppermost 200 to 300 feet of bedrock the formations are in ascending order: 1) Teapot Sandstone, consisting of medium- to fine-grained sandstone with shale partings and 2) the Lewis Shale, consisting of thick bedded shale grading into brown sandstone.

The bedrock surface at the site is beneath a layer of alluvium. A clay layer indicating weathered bedrock was encountered at the contact between the alluvium and bedrock in almost every borehole. A valley in the bedrock surface that roughly parallels the present course of Elkhorn Creek was also identified. This valley was probably eroded by a former course of the North Platte River. Bedrock elevations increase on both flanks of the valley. To the east, this increase is part of a divide separating the site from an adjoining drainage. The alluvium pinches out in the east, restricting movement of ground water towards the residential area. The bedrock surface is less regular to the northwest. A comparison of bedrock surface topography to alluvial ground water flow directions shows that the shape of the bedrock valley significantly affects ground water movement in the alluvial aquifer. The low permeability layer at the bedrock surface also appears to confine the contaminants to the upper alluvial aquifer.

The horizontal component of ground water flow within the alluvial aquifer is consistently to the northeast with only minor and local variations. The flow direction appears to be controlled to a certain degree by the alignment of the valley in the bedrock surface. Although water level differences between the alluvium and underlying bedrock have been variable, they generally confirm the potential for ground water in the bedrock to flow into the alluvium in the valley from peripheral portions of the local area.

Based on the character of the alluvial materials at the site and on hydraulic tests conducted within the alluvium, the ground water seepage velocity for horizontal flow within the alluvium ranges from 0.21 to 4.9 feet per day, with an average value of 2.12 feet per day. The seepage velocity represents the rate at which dissolved contaminants would be transported with the

ground water in the absence of hydrogeochemical factors such as adsorption onto sand grains in the aquifer.

There is potential discharge of contaminated ground water from the VHO plume to the North Platte River over the next few years. Data from the RI/FS indicate that the water quality criteria for the river will continue to be met because the volume of contaminants will be insignificant relative to the volume of water in the river.

Nature and Extent of Contamination

The scope of the RI at the Mystery Bridge site included studies for all media that may be contaminated. Soils in the residential area, surface water and sediments from Elkhorn Creek, and air quality at the site were investigated and determined not to be of concern with regard to contaminant pathways at the site.

Areas of contaminated soils were identified on the industrial properties at the site. This contamination will be evaluated more fully during the activities conducted for OU 2.

Sources of ground water contamination at the Dow/DSI and KN properties are discussed below. The pathway of migration for contaminants in both the VHO plume originating beneath the Dow/DSI facility and BETX plume originating beneath the KN facility is through the shallow alluvial aquifer moving in a northeasterly direction towards the North Platte River.

Dow/DSI: Potential sources of contaminants at Dow/DSI include 1) a 1000 gallon oil/water separator, 2) a vitreous drain line, 3) an empty waste oil tank, 4) chlorinated leach sump, and 5) toluene storage area. The first three were removed as part of the Dow/DSI removal action discussed above.

The ground water plume emanating from Dow/DSI is characterized by elevated levels of VHOs including the following chlorinated compounds:

1,1-dichloroethene (1,1 DCE);
trans-1,2-dichloroethene (t-1,2 DCE);
trichloroethene (TCE);
tetrachloroethene (PCE);
1,1,1-trichloroethane (1,1,1 TCA); and
1,1-dichloroethane (1,1 DCA).

MCLs and proposed MCLs were exceeded for TCE, t-1,2 DCE and PCE in wells sampled between 1987 and 1989. Table 1 summarizes data from the RI/FS and ESI reports, and recent July 1990 sampling for VHO concentrations in monitoring wells considered to be located within the VHO plume and their MCLs or proposed MCLs. These contaminants were released to the ground water from equipment washing operations at or near the chlorinated sump on the western portion of the Dow/DSI facility. A toluene and xylene plume apparently originates at the former toluene storage area, but is considered of minor importance as the concentrations are below MCLs.

Table 1: VHO Plume Contaminants

Well ID	Current Date	Contaminants (ug/l)											
		t-1,2 DCE			1,1,1 TCA			TCE			PCE		
		Current	Average *	Maximum	Current	Average *	Maximum	Current	Average *	Maximum	Current	Average *	Maximum
MCL			70 **			200			5			5 **	
EPA 1-1	7/90	2	2.8	4	6	15	21	22	29	37	35	34	37
EPA 1-2	4/89	<1	<1-<5	<5	8	18	31	4	55	110	17	37	45
EPA 1-6	4/89	<1	<1-<5	<5	11	8.5	11	1	5.6	10	15	17	23
EPA 1-7	4/89	5	3.9	5.0	23	73	99	180	138	190	77	87	110
EPA 2-1	4/89	<5	<5	<5	15	13	15	23	26	29	37	31	37
EPA 2-2	4/89	<5	<5	<5	15	14	21	25	36	52	39	36	40
EPA 2-3	7/90	<1	<1-<5	<5	<1	<1-<5	<5	2	6.3	15	4	7.0	13
EPA 2-8	4/89	<5	<5	<5	7	6.8	11	<1	2.3	4.0	10	8.7	12
EPA 2-9	4/89	<5	<5	<5	13	25	31	11	13	22	50	45	50
EPA 2-10	4/89	<5	<5	<5	<1	1.7	2.5	<1	49	130	<1	7.5	15
EPA 2-15	4/89	2	1.9	2.5	11	38	90	110	75	130	57	70	130
MK MW-1	4/89	24	24	24	4	4	4	110	110	110	38	38	38
PCMW-2	4/89	<1	1.9	2.5	9	56	78	10	17	28	42	67	88
PCMW-4	4/89	<5	<5	<5	1	9.1	21	<1	5.6	17	6	11	22
MW87-2	9/89	<1	<1-<10	<10	<1	25	70	<1	<1-<10	<10	16	27	89
MW87-4	9/89	<1	<1-<15	<15	<1	40	150	2	20	71	7	87	320
MW87-6	7/90	<10	<1-<500	<500	<10	<1-<500	<500	<10	78	250	<10	78	250
MW87-7	9/89	<1	47	180	<1	56	140	220	172	340	7	75	150
MW87-8	9/89	<1	<1-<10	<10	<1	26	100	5	57	220	23	142	540
DSI MW-1	9/89	<5	<5	<5	9	9	9	430	430	430	20	20	20
DSI MW-3	9/89	<5	<5	<5	<5	<5	<5	<5	<5	<5	20	20	20
DSI MW-4	9/89	<5	<5	<5	<5	<5	<5	44	44	44	23	23	23
DSI MW-6	7/90	<100	<5-<100	<100	<100	<5-<100	<100	<100	34	50	<100	<5-<100	<100

** Detection Limit/2 value used for averaging purposes*

*** Proposed MCL*

The shape and trend of the TCE ground water contamination has been found to be similar to the ground water plume for total VHO compounds, as TCE is the major constituent in the VHO group. VHO compounds are highly mobile in the aquifer and contamination from Dow/DSI has travelled with the northeasterly flow of ground water. The plume of contaminated ground water with levels exceeding MCLs or proposed MCLs extends below the residential area of the site as shown on Figure 2. Vertical extent of the VHO contamination is limited to the shallow alluvial aquifer. The volume of ground water at the site containing VHO contaminants above the MCLs or proposed MCLs was estimated in the RI/FS report to be 1096 acre-feet.

KN: Three sources of contamination have been identified on the KN property including: 1) the flare pit, 2) the catchment area and 3) the process area. High concentrations of BETX compounds have been found in monitoring wells near these sources. These compounds are believed to be components of absorption oil and other liquids associated with refining activities at the KN facility. A summary of data for BETX concentrations from the RI/FS and ESI reports, and recent July 1990 sampling in monitoring wells considered to be located within the BETX plume and their MCLs or proposed MCLs are provided in Table 2. Recent drought conditions have lowered the water table, and free hydrocarbons containing BETX compounds have been found floating on top of the water. Some of this material was recovered by KN as part of the removal action. A large area of stained soil below the surface remains on KN's property. Final remediation of this contamination and of the floating hydrocarbons will be addressed as part of the OU 2 activities.

BETX compounds are less mobile in the aquifer and are present in the ground water near the source at the KN facility. Migration of the BETX may be inhibited by preferential adsorption to the soil matrix as well as by biological degradation of adsorbed and dissolved residues. The contaminated plume of BETX compounds occurs under the KN facility and extends downgradient of the facility close to the northern property boundary as shown on Figure 3. A conservative approach to estimating the volume of ground water contaminated with BETX compounds would be to consider all wells where BETX compounds in excess of their MCLs or proposed MCLs have ever been detected. This would include several wells on the KN property, plus wells north of the property line. If the dissolved BETX plume is taken to include all of these wells, the estimated volume of contaminated ground water would be about 25 acre-feet rather than 10 acre-feet estimated in the RI/FS.

VI. SUMMARY OF SITE RISKS

As part of the RI/FS, EPA prepared a Baseline Risk Assessment for the Mystery Bridge site in December 1989. This risk assessment was carried out to characterize, in the absence of remedial action (i.e., the "no-action" alternative), the current and potential threats to human health and the environment that may be posed by contaminants migrating in ground water or surface water, released to the air, leaching through the soil, remaining in the soil, or bioaccumulating in the food chain at the site. Figure 4 provides a glossary of the key risk terms from the BRA that are used in this section of the ROD.

The risk assessment began by compiling a list of contaminants from the results of the various sampling activities that were measured to be above detection limits or above natural background levels. Thirteen indicator contaminants were selected based on concentrations at the site, toxicity, physical/chemical properties that affect transport/movement in air, soil and ground water and prevalence/persistence in these media. These indicator contaminants were judged to represent the major potential health risks at the site.

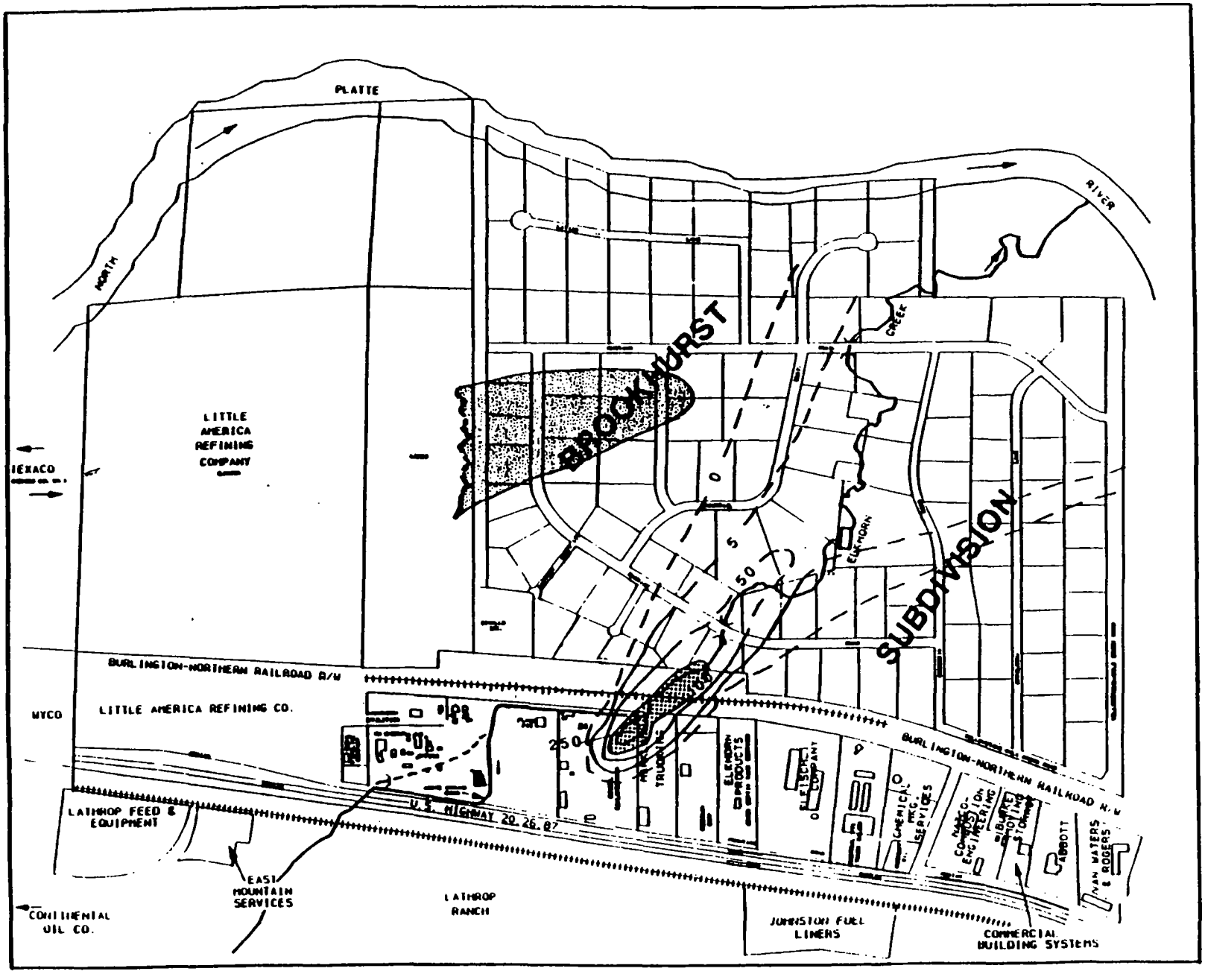

Figure 2

Mystery Bridge

VHO Plume

LEGEND

— — 50 TCE

Isoconcentration Contour (in ug/l)

Approximate Areal Extent of RCRA Plume in the Residential Area

Illustrative Example of Ground Water That Would be Treated

0 600 1200

APPROX. SCALE IN FEET

Table 2: BETX Plume Contaminants

Well ID	Current Date	Contaminants (ug/l)											
		Benzene			Ethyl-benzene			Toluene			Total Xylenes		
		Current	Average *	Maximum	Current	Average *	Maximum	Current	Average *	Maximum	Current	Average *	Maximum
MCL			5			700 **			2000 **			10000 **	
EPA 1-9	7/90	<1	2.4	4	<1	1.7	3	<1	<1-<5	<5	<3	<1-<5	<5
EPA 1-10	7/90	<1	5.9	19	7	5	11	<1	2.5	10	<3	7.6	21
EPA 2-11	7/90	<5	22	70	4	22	82	<5	<1-<10	<10	8	194	760
EPA 2-11 (fp)	7/90	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0
EPA 2-14	7/90	<1	<1-<5	<5	<1	<1-<5	<5	<1	<1-<5	<5	<3	<1-<5	<5
KN MW-2	2/88	<5	<5	<5	<5	<5	<5	<5	20	38	<5	<5	<5
KN MW-3	2/88	<5	<5	<5	2	2.3	2.5	<5	<5	<5	6	88	170
KN MW-5	2/88	<500	<500	<500	<500	<500	<500	<500	<500	<500	180	180	180
KN MW-6	7/90	<1	160	320	<1	<1-<500	<500	<1	<1-<500	<500	<3	461	920
KN MW-6 (fp)	7/90	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5	0.5
KN MW-7	7/90	<1	<1-<250	<250	<1	70	140	<1	<1-<250	<250	<3	551	1100
KN MW-7 (fp)	7/90	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.7	1.7	1.7
KN ABC-11	7/90	<5	18	33	<5	56	110	<5	43	83	110	705	1300
KN ABC-11 (fp)	4/89	<1000	<1000	<1000	2000	2000	2000	2000	2000	2000	18000	18000	18000
KN ABC-24	7/90	<1	<0.5-<5	<5	<1	<0.5-<5	<5	<1	<0.5-<10	<10	<3	2.7	7
KN ABC-25	10/89	<0.5	2.5	7	<0.5	<0.5-<1	<1	<0.5	<0.5-<10	<10	1	5.1	14
KN ABC-26	10/89	220	180	220	790	513	790	520	191	520	6900	4083	6900
KN ABC-26 (fp)	10/89	<100	100-<1000	<1000	2000	1500	2000	3300	1900	3300	19000	18000	19000
KN ABC-27	10/89	<5	<5	<5	<5	<5	<5	38	45	52	300	184	300
KN ABC-27 (fp)	10/89	9600	9600	9600	1400	1400	1400	9600	9600	9600	13000	13000	13000
KNP-2	10/89	<500	240	250	150000	75025	150000	390	390	390	1100000	550800	1100000
KNP-2 (fp)	10/89	<100	<100	<100	2100	2100	2100	340	340	340	1400	1400	1400

** Detection Limit/2 value used for averaging purposes*

*** Proposed MCL*

(fp) = Floating Product in ppm

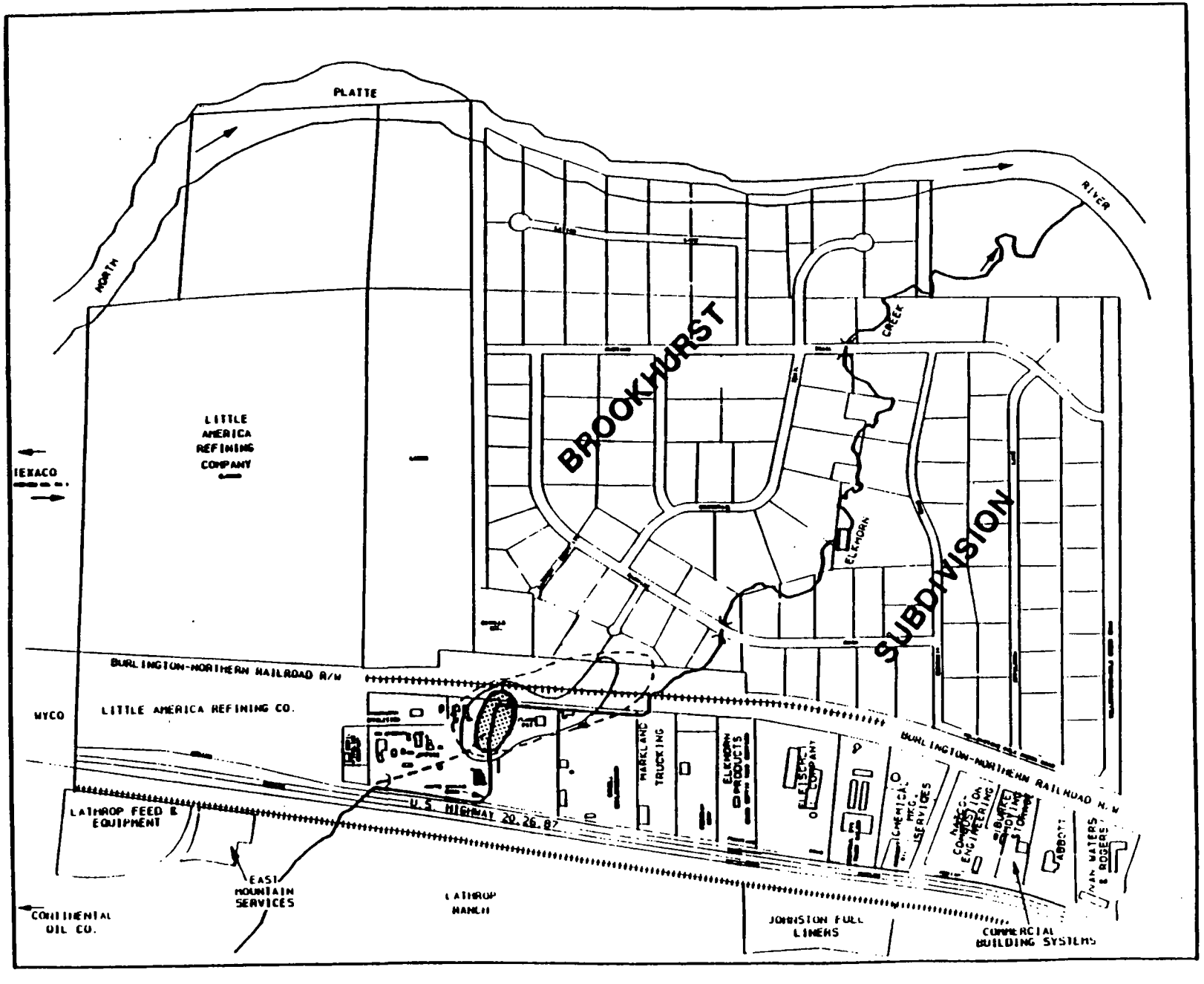

Figure 3

Mystery Bridge

BETX Plume

LEGEND

Approximate Areal Extent of Ground Water With BETX Concentratio > MCLs or Proposed MCL (Based on RI/FS Estimate)

Approximate Areal Extent of Floating Hydrocarbons Layer

Approximate Areal Extent of Stained Soil

0 600 1200

APPROX SCALE IN FEET

Figure 4
Key Risk Terms

Carcinogen: A substance that increases the incidence of cancer.

Chronic Daily Intake (CDI): The average amount of a chemical in contact with an individual on a daily basis over a substantial portion of a lifetime.

Chronic Exposure: A persistent, recurring, or long-term exposure. Chronic exposure may result in health effects (such as cancer) that are delayed in onset, occurring long after exposure ceased.

Exposure: The opportunity to receive a dose through direct contact with a chemical or medium containing a chemical.

Exposure Assessment: The process of describing, for a population at risk, the amounts of chemicals to which individuals are exposed, or the distribution of exposures within a population, or the average exposure of an entire population.

Hazard Index: An EPA method used to assess the potential noncarcinogenic risk. The ratio of the CDI to the chronic RfD (or other suitable toxicity value for noncarcinogens) is calculated. If it is less than one, then the exposure represented by the CDI is judged unlikely to produce an adverse noncarcinogenic effect. A cumulative, endpoint-specific HI can also be calculated to evaluate the risks posed by exposure to more than one chemical by summing the CDI RfD ratios for all the chemicals of interest exert a similar effect on a particular organ. This approach assumes that multiple subthreshold exposures could result in an adverse effect on a particular organ and that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures. If the cumulative HI is greater, than one, then there may be concern for public health risk.

Reference Dose (RfD): The EPA's preferred toxicity value for evaluating noncarcinogenic effects.

Risk: The nature and probability of occurrence of an unwanted, adverse effect on human life or health, or on the environment.

Risk Assessment: The characterization of the potential adverse effect on human life or health, or on the environment. According to the National Research Council's Committee on the Institutional Means for Assessment of Health Risk, human health risk assessment includes: description on the potential adverse health effects based on an evaluation of results of epidemiologic, clinical, toxicologic, and environmental research; extrapolation from those results to predict the types and estimate the extent of health effect in humans under given conditions of exposure; judgements as to the number and characteristics of persons exposed at various intensities and durations; summary judgements on the existence and overall magnitude of the public-health program; and characterization of the uncertainties inherent in the process of inferring risk.

Slope Factor: The statistical 95% upper confidence limit on the slope of the dose response relationship at low doses for a carcinogen. Values can range from about 0.0001 to about 100,000, in units of lifetime risk per unit dose (mg/kg-day). The larger the value, the more potent is the carcinogen, i.e., a smaller dose is sufficient to increase the risk of cancer.

Exposure Assessment

Although exposure pathways were identified for ground water, surface water and sediments, residential soils, and air media at the site, the risk assessment indicated that only the ground water pathway could result in significant health risks. Of the 13 indicator contaminants studied in the BRA, PCE, TCE, 1,1 DCA and benzene were determined to be the primary contaminants of concern in the ground water pathway.

Because of the northeasterly flow of ground water in the alluvial aquifer at the site, contaminants introduced into the ground water below the sources at the southern section of the site could be transported across the residential areas. Thus, a significant potential exposure pathway involving ground water is likely to exist for the subdivision residences which currently use site ground water for domestic purposes. All but two of the residences now use a non-contaminated municipal water supply in place of ground water. The pathway for contaminants is intercepted for residents using the municipal water supply; however, potential risk of exposure to the ground water contaminants remains. In addition, considering the potential for future land development at the site, future residences could potentially be located on properties currently used by industries. The ground water pathway is therefore likely to be complete for these future hypothetical residences. Two important exposure scenarios, the Current Resident and Future Hypothetical Resident, were developed based on the fact that ground water is the primary exposure medium at the site.

Intake of contaminants present in ground water could potentially occur via three routes: 1) ingestion of ground water; 2) dermal contact with water while bathing, showering, cooking or swimming (also ground water used for outdoor domestic and/or agricultural purposes); and 3) inhalation of indoor air contaminants volatilized while bathing, showering, or cooking, or that volatilized and directly accumulated in the living spaces. In addition, use of contaminated ground water in a home cooling unit (i.e., swamp cooler) could potentially lead to the inhalation of volatilized contaminants. The contaminant intake equations and values chosen for various intake parameters were derived from the standard intake equation and data presented in EPA guidance documents. Chronic daily intakes (CDIs) were estimated in the BRA. Representative exposure point concentrations were developed from the sampling data for contaminants measured in EPA monitoring wells in the residential area.

The Reference Dose values (RfD) for a substance represents a level of intake which is unlikely to result in adverse non-carcinogen health effects in individuals exposed for a chronic period of time. The RfDs (in mg/kg-day) for the contaminants include: 1,1 DCA = 0.01; 1,1,1 TCA = 0.09; 1,2 DCE = 0.02; PCE = 0.01; xylenes = 2; toluene = 0.3; and ethylbenzene = 0.1.

The slope factor represents the upper 95 percent confidence limit value on the probability of response per unit intake of a contaminant over a life time (70 years for the analysis in the BRA). Slope factors used in the BRA for the contaminants (in $(mg/kg\text{-}day)^{-1}$) include: TCE = 0.11; 1,1 DCA = 0.091; PCE = 0.051 and benzene = 0.029.

Toxicity Assessment

Indicator contaminants present in the ground water include VHO and BETX compounds. The following discussion comes from the toxicological profiles of these contaminants presented in the BRA.

VHOs TCE is classified as a group B2 carcinogen (a probable human carcinogen). TCE has been shown to cause pulmonary adenocarcinoma, lymphoma, and hepatocellular carcinoma multiple strains of mice. Subchronic and chronic exposures of animals to TCE appears to

result in liver and kidney toxicity. PCE has been classified as a group C carcinogen (a possible human carcinogen) based upon evidence that the chemical causes hepatocellular carcinoma in mice. Mouse and rat studies have indicated that PCE is a teratogen and a reproduction toxin. In addition, both oral and inhalation exposure of laboratory animals to PCE for intermediate and long-term exposure leads to liver, kidney and spleen toxicity. 1,1 DCA, t-1,2 DCE and 1,1,1 TCA are not demonstrated human carcinogens. 1,1 DCA appears to cause kidney damage in laboratory animals exposed subchronically via the inhalation route. Rats exposed to t-1,2 DCE via inhalation developed progressive damage to the lung and fatty changes in the liver. Chronic inhalation exposure of laboratory animals to 1,1,1 TCA resulted in hepatoxicity (fatty changes in the liver and increased liver weights).

BETX EPA considers benzene to be a group A carcinogen. This listing signifies that there is "Sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer." In sensitive humans, alterations in bone marrow have been shown to form during short-term exposures to approximately 10 ppm benzene. Several studies have demonstrated an increased incidence of non-lymphocytic leukemia from occupational exposure. Intermediate and chronic exposure to benzene can adversely effect the hematopoietic and immune systems.

Ethylbenzene, toluene and xylenes are classified as non-carcinogens. Ethylbenzene is acutely toxic to the lung and central nervous system. However, subchronic and chronic exposures of laboratory animals to this compound cause liver and kidney damage, as well as testicular toxicity. The teratogenicity of ethylbenzene has also been indicated in rats. A primary target for toluene toxicity is the central nervous system. In humans acute exposures to 100 ppm of toluene via inhalation causes fatigue, sleepiness, decreased manual dexterity and decreased visual acuity. Exposure to high levels of toluene, as occurs in solvent abuse, can result in permanent central nervous system effects such as tremors, atrophy, and speech, hearing, and vision impairment. Animal studies indicate that toluene is also a development toxin causing growth inhibition and skeletal anomalies. Xylene orally administered to animals can result in central nervous system toxicity and has also been shown to cause ultra-structural liver changes (although these changes are not necessarily adverse effects). Xylene has also been shown to be a fetotoxin and a teratogen in mice at high oral doses.

Risk Characterization

The BRA evaluated the potential non-carcinogenic and carcinogenic risks posed by the indicator contaminants in the various exposure media at the Mystery Bridge site. Carcinogenic risk is presented as a probability value (i.e., the chance of contracting some form of cancer over a lifetime). The estimate of carcinogenic risk is conservative and may overestimate the actual risk due to exposure.

In the risk characterization, the aggregate carcinogenic risk due to ground water indicator contaminants at the site is compared to an acceptable target risk. The chance of one person developing cancer per one million people (or 10^{-6}) is used as a target value or point of departure above which carcinogenic risks may be considered unacceptable. The 10^{-6} point of departure is used when ARARs are not available (i.e., no MCLs or proposed MCLs for the indicator contaminants) or are not sufficiently protective of human health and the environment.

Carcinogenic Risk. Carcinogenic risk is typically estimated by multiplying the CDI of an indicator contaminant by its slope factor. A summary of carcinogenic risks for residents living directly above and using contaminated ground water from the VHO and BETX plumes in the Current Resident scenario is provided in Table 3. The aggregate carcinogenic risk is 8.1×10^{-5} for the VHO plume and 4.7×10^{-5} for the BETX plume. Total carcinogenic risk due to ground water consumption exceeded 10^{-6} at both the VHO and BETX plumes. The primary source of risk posed by the VHO plume was PCE and TCE contamination. The major component of the risk values calculated for the BETX plume were based on the risk due to exposure to benzene.

Carcinogenic risks were also calculated for selected indicator contaminants for residents using ground water from wells at the Dow/DSI and KN properties in the Future Hypothetical Resident scenario. These risks, shown in Table 3, also exceeded 10^{-6}. The aggregate carcinogenic risk for the VHO plume was 3.2×10^{-4} and 1.7×10^{-4} for the BETX plume.

Non-Carcinogenic Risks. The ratio of CDI to RfD was computed for each contaminant and the resulting ratios are summed to give the hazard index. Non-carcinogenic hazard indices were calculated for both the Current Resident and Future Hypothetical Resident scenarios. Results indicated the aggregate hazard indices do not exceed unity; therefore, EPA believes that there is no non-carcinogenic public health threat.

Risks Due to Indoor Air Contamination. There is a high likelihood that the residents who use contaminated well water are being exposed to indoor organic vapor contaminants that have volatilized from the well water. This exposure occurs through inhalation of volatilized contaminants while showering, bathing, or cooking, as well as volatilized contaminants from home cooling units. Quantitative risk calculations were not done for indoor air because there is a high degree of uncertainty associated with the generic (non site-specific) and inhalation risk factors. Although not quantified, this exposure to contaminated indoor air adds additional risk for subdivision residents using contaminated well water.

Another potential source of site-related indoor air contamination is the direct emanation and accumulation of volatilized plume water in the living spaces of residences located directly over the contaminated ground water plumes. The risks from this direct accumulation of indoor organic vapors is considered to be insignificant when compared to the risks from inhaling volatilized shower, bath or cooking water.

Environmental Risks

The ecological effects due to releases from industrial areas are not expected to be significant for three reasons: 1) these industrial areas do not provide habitat resources for wildlife ; 2) the sampling data for surface water and sediments at Elkhorn Creek indicates minor levels of contamination from the site; and 3) contamination of the North Platte River via ground water plume discharge is expected to be relatively insignificant due to the high rate of river flow as compared with the rate of ground water discharge.

VII. DESCRIPTION OF ALTERNATIVES

A feasibility study was conducted to develop and evaluate remedial alternatives for OU 1 at the Mystery Bridge site. Remedial alternatives were assembled from applicable remedial technology process options and were initially evaluated for effectiveness, implementability, and cost. The alternatives meeting these criteria were then evaluated and compared to nine criteria required by the NCP. In addition to the remedial alternatives, the NCP requires that a no-action alternative be considered at every site. The no-action alternative serves primarily as a point of comparison for other alternatives.

Table 3: Carcinogenic Risk Characterization

VHO Plume

Scenario/Pathway	Benzene	PCE	TCE	1,1 DCA	Methylene Chloride	Pathway Total
Current Resident						
Ingestion	7.0E-07	2.5E-05	5.1E-05	2.3E-06	2.5E-07	7.9E-05
Absorbtion	1.3E-06	8.9E-08	1.9E-07	8.5E-09	9.0E-10	1.6E-06
Aggregate						**8.1E-05**
Future Hypothetical Resident *						
Ingestion	-	7.1E-05	2.5E-04	-	-	3.2E-04
Absorbtion	-	2.9E-07	1.0E-06	-	-	1.3E-06
Aggregate						**3.2E-04**

BETX Plume

Scenario/Pathway	Benzene	PCE	TCE	1,1 DCA	Methylene Chloride	Pathway Total
Current Resident						
Ingestion	1.4E-05	1.3E-06	2.8E-06	3.0E-06	8.3E-07	2.2E-05
Absorbtion	2.5E-05	4.8E-09	1.0E-08	1.1E-08	3.0E-09	2.5E-05
Aggregate						**4.7E-05**
Future Hypothetical Resident *						
Ingestion	5.8E-05	-	-	-	-	5.8E-05
Absorbtion	1.1E-04	-	-	-	-	1.1E-04
Aggregate						**1.7E-04**

** selected contaminants only*

Each remedial alternative acknowledges the removal activities that have occurred or are currently taking place assumes continuation of the ongoing activities. While sources are being controlled by the removal actions, ground water remains contaminated with VHO and BETX compounds released from the sources. The remedial alternatives described in this ROD address this ground water contamination.

A ground water model has been developed to simulate transport of dissolved VHO compounds through the alluvial ground water system. The model incorporates a variety of physical, chemical, and biological factors which can affect the rate of contaminant migration through the aquifer. Known variability and expected uncertainty in these factors were incorporated into the model by performing 5,000 duplicate model runs with model parameters selected randomly from within their known or expected ranges. The resulting model runs provided an expected range of contaminant concentrations over time, from which statistically most-probable contaminant transport rates could be estimated. Contaminant transport rates were used to estimate time frames for the remedial alternatives developed in the RI/FS. This transport model was not applied to the BETX plume because downgradient migration of BETX compounds from the KN property to the BNRR property appears to be minimal.

The action levels for remediation are the MCLs and proposed MCLs for the contaminants of concern. Attainment of these levels will be protective of human health and the environment. However, EPA recently studied the effectiveness of ground water extraction systems in achieving specified goals and found that it is often difficult to predict the ultimate concentration to which contaminants in the ground water may be reduced. The study did find that ground water extraction is an effective remediation measure and can achieve significant mass removal of contaminants. Most of the remedial alternatives described in this section include ground water extraction systems and assume that it is technically feasible to achieve MCLs or proposed MCLs in the ground water.

Except for the no-action alternative which includes ground water monitoring only, each alternative includes the following common elements:

Ground Water Monitoring. Ground water monitoring during the remedial activities will be used to evaluate performance of the remedial action. Monitoring points are anticipated to be located upgradient of the plume (to detect contamination from other sources), within the plume (to track the plume movement during remediation), and downgradient (to detect plume migration). Monitoring points to the west of the VHO plume would be used to evaluate whether commingling with other plumes occurs in the future. Ground water samples would be analyzed for site indicator compounds as determined during remedial design. Existing monitoring wells and possibly additional monitoring wells to be installed would be used for ground water monitoring. The specific locations and frequency of ground water monitoring will depend on the remedial alternative selected and site conditions at the time of implementation. Monitoring would continue after remedial objectives are met to ensure residual contaminants desorbing into ground water will not exceed MCLs or proposed MCLs in the future.

Temporary Institutional Controls. Temporary restrictions on the construction and use of private water wells, such as well restrictions in property deeds, well construction permits, and/or deed notices during remediation would effectively restrict human consumption of ground water exceeding MCLs and proposed MCLs in the residential area until remediation goals for ground water are achieved. Actual institutional controls to be used will be determined during remedial design.

VHO Plume

Seven remedial alternatives for the VHO plume were considered for detailed evaluation and are described below. Table 4 provides a summary of the alternatives. Alternative V2 contemplated collection of VHO-impacted ground water and transport to an off-site RCRA treatment facility. This alternative was eliminated early in the evaluation process because it would be technically infeasible to implement and would involve costs that would be grossly excessive compared to its overall effectiveness.

Alternative V1 - **No-action with ground water monitoring.**

Under this alternative, EPA would take no further action to control the source of contamination. However, long-term monitoring of the site would be necessary to monitor contaminant migration. Monitoring using previously installed monitoring wells and residential wells can easily be implemented.

Because this alternative would result in contaminants remaining on-site, CERCLA requires that the site be reviewed every five years. If indicated by the review, remedial actions would be implemented at that time to remove or treat the wastes.

Alternative V1 relies on natural processes in the ground water to reduce VHO levels in the aquifer. Results of contaminant transport and fate modeling described previously indicated that the most-probable time required for natural processes to reduce contaminant concentrations by two orders of magnitude at the downgradient edge of the subdivision (i.e., at the North Platte River) would be approximately seven years. A two order of magnitude reduction would result in VHO concentrations below MCLs and proposed MCLs. Consequently, it is expected that VHO contaminants will have been effectively flushed out of the aquifer beneath the subdivision within seven years. The ground water would be restored to a Classification I aquifer suitable for drinking water purposes. There is a minimal chance that complete flushing would take as long as 19 years.

The present worth cost for Alternative V1 would be $71,000. Since the alternative requires "no-action", there would be no capital cost. However, operation and maintenance (O&M) costs are estimated to be $11,000 for ground water monitoring.

Alternative V3 - **Extraction of VHO-impacted ground water, aerobic biological treatment of extracted ground water, and discharge of treated ground water to the North Platte River.**

Extraction of ground water with VHO concentrations exceeding MCLs or proposed MCLs would be accomplished with an extraction well system. Assuming an extraction system of ten wells and a volume of impacted ground water of 1096 acre-feet, extraction would be completed in one to two years after initiation of the alternative. The actual number of wells could change as determined by remedial design. The time for remediation could vary depending on several factors including the pumping rate and the volume of impacted ground water.

A sequencing batch reactor system would provide aerobic biological treatment of extracted ground water and would facilitate destruction of organic constituents. The treatment system would be expected to volatilize some of the VHO contaminants which would be released to the atmosphere.

Aerobic biological treatment of ground water would produce a sludge that would require disposal. An estimated 170 tons of non-hazardous sludge per year would be generated. The sludge would be expected to meet all RCRA criteria for land disposal.

Table 4: Summary of VHO Plume Alternatives

Component		Alternatives							
		V1	V3	V4	V4A	V5	V6	V6A	V7
Common Elements	Ground Water Monitoring	X	X	X	X	X	X	X	X
	Institutional Controls		X	X	X	X	X	X	X
Extent of Ground Water Extraction	Extraction of Ground Water with VHO Concentrations > MCLs		X	X	X	X			
	Extraction of Upgradient Ground Water With VHO Concentrations > MCLs						X	X	
Treatment Technology	Aerobic Biological Treatment of Extracted Ground Water		X						
	Air Stripping of Extracted Ground Water			X			X		
	Carbon Adsorption of Extracted Ground Water				X			X	
	Chemical Oxidation of Extracted Ground Water					X			
	Natural Attenuation of VHOs in Downgradient Plume						X	X	
	In-situ Bioremediation of VHOs in Downgradient Plume						(X)	(X)	
	In-situ Bioremediation of VHO Plume								X
Disposition of Treated Water	Injection of Treated Water to Up/Downgradient Wells						X	X	
	Discharge of Treated Water to North Platte River		X	X	X	X			
	Discharge of Treated Water to Elkhorn Creek						(X)	(X)	

(X) = Option or Contingency

Treated ground water would be discharged to the North Platte River. For cost estimation purposes, it was assumed that a treatment facility would be located on industrial property. The discharge would be sampled as necessary to comply with National Pollutant Discharge Elimination System (NPDES) permit requirements.

Capital cost for Alternative V3 would be over $2 million with O&M costs of $165,000. The present worth cost would be almost $2.5 million.

Alternative V4 - **Extraction of VHO-impacted ground water, air stripping of extracted ground water, and discharge of treated ground water to the North Platte River.**

This alternative is similar to Alternative V3, except that extracted ground water would be treated in an air stripping tower on-site to remove VHOs. In the air stripping process, VHOs are transferred from the water phase to the air phase and discharged to the atmosphere. Air stripper vapor discharge would be sampled as necessary to comply with Wyoming Air Quality Standards and Regulations.

Alternative V4 would involve capital costs of over $1 million and O&M costs of $129,000. The present worth cost would be approximately $1.3 million.

Alternative V4A - **Extraction of VHO-impacted ground water, carbon adsorption treatment of extracted ground water, and discharge of treated ground water to the North Platte River.**

This alternative is similar to alternatives V3 and V4, except that extracted ground water would be treated in a carbon adsorption system on-site to remove VHOs. In the carbon adsorption process, VHOs are adsorbed onto activated carbon, thereby removing them from the ground water. The spent carbon is typically thermally or chemically regenerated for reuse.

Present worth cost for this alternative would be almost $1.4 million. Capital cost would be $1.2 million with O&M costs of $128,000.

Alternative V5 - **Extraction of VHO-impacted ground water, chemical oxidation of extracted ground water, and discharge of treated ground water to the North Platte River.**

This alternative is similar to alternatives V3, V4, and V4A, except the chemical oxidation of contaminants in extracted ground water would be implemented on-site using controlled reactor vessels. A retention time of approximately a few minutes should be sufficient to treat influent ground water VHO concentrations to the required levels.

Capital cost for Alternative V5 would be $1.1 million with O&M costs equal to $282,000. Present worth cost is $1.7 million.

Alternative V6 - **Extraction in the upgradient portion of the plume which contains the highest VHO concentrations, air stripping of extracted ground water, discharge of treated ground water to Elkhorn Creek or reinjection upgradient or downgradient of the extraction well system, and natural attenuation in the downgradient portions of the plume.**

An extraction well system would remove ground water with VHO levels exceeding MCLs and proposed MCLs in the upgradient portion of the plume. Assuming one extraction well and a volume of VHO-impacted ground water in the upgradient portion of the plume of 57 acre-feet, extraction should be completed in about one year following implementation of the remedy. The actual number of extraction wells could change as determined by the remedial design.

Extracted ground water would be treated to remove VHOs in an air stripping tower on-site as described for Alternative V4. Concentrations of VHOs in the treated ground water would be reduced to MCLs or proposed MCLs.

Treated ground water would be reinjected upgradient or downgradient of the extraction well. Downgradient injection points could accomplish the following objectives: 1) provide additional hydraulic containment of the upgradient portion of the VHO plume being extracted; 2) minimize the possibility of any interaction related to VHO remediation efforts with nearby plumes and/or free BETX contaminants associated with the KN facility; and 3) assist remediation in the downgradient portion of the VHO plume. The final reinjection locations(s) would be determined during remedial design. Treated ground water would be sampled as necessary to comply with Wyoming Underground Injection Control (UIC) program requirements.

Alternative V6 relies on natural processes in the ground water to reduce VHO levels in downgradient portions of the aquifer. Concentrations of VHOs should decline two orders of magnitude, which would be sufficient to lower the VHO concentrations to MCLs and proposed MCLs, within about six years. An extraction well system in the upgradient portions of the plume would help prevent VHO concentrations in ground water leaving the northern Dow/DSI property boundary from exceeding MCLs or proposed MCLs. VHO concentrations throughout the aquifer would therefore meet MCLs and proposed MCLs within six years under Alternative V6. However, there is a minimal chance that a complete flushing could take as long as 18 years.

In situ bioremediation in the downgradient portion of the plume was considered as an additional component of Alternative V6. However, it was not incorporated for the following reasons: 1) this type of treatment is designed primarily for source control, not area control; 2) the uncertainties in remediation time associated with this treatment; 3) extraction and injection of treated water would cause nearby plumes to migrate further into the residential area; and 4) treatability studies would be required.

Costs for Alternative V6 would include capital cost of $183,000, O&M costs of $122,000, and present worth cost of $354,000.

Alternative V6A - Extraction of the upgradient portion of the plume which contains the highest VHO concentrations, carbon adsorption treatment of extracted ground water, discharge of treated ground water to Elkhorn Creek or reinjection upgradient or downgradient of the extraction well system, and natural attenuation in the downgradient portions of the plume.

This alternative is Similar to Alternative V6, except extracted ground water would be treated to remove VHOs in a carbon adsorption system on-site similar to Alternative V4A.

Alternative V6 costs would include $357,000 in capital cost, $114,000 for O&M, and a present net cost of $518,000.

Alternative V7 - *In situ* bioremediation of VHO-impacted ground water.

In situ bioremediation of ground water with VHO concentrations exceeding MCLs and proposed MCLs would involve addition of an oxygen source, nutrients, and hydrocarbon feedstock, such as methane, to the aquifer to promote the activity of organisms which co-metabolize VHOs. An injection and extraction well circulation system would distribute oxygen, nutrients, and co-metabolites through the aquifer. Assuming the extraction and injection well system would consist of six extraction wells and four injection wells, VHO concentrations would

be expected to be reduced to MCLs and MCLs in two to five years. The actual number of wells for the system could change as determined by remedial design. Treatability testing would be necessary to determine design parameters for *in situ* bioremediation.

Ground water monitoring would be performed during the two to five years of *in situ* ground water treatment and following completion of treatment to verify the reduction of VHO concentrations in the aquifer.

Capital cost for this alternative would be $425,000 and O&M costs would be $133,000. Present worth cost would be over $1 million.

BETX Plume.

For the BETX plume, five remedial alternatives (including the no-action alternative) remained following the screening analysis. Table 5 summarizes the alternatives for the BETX plume. Each of the remedial alternatives designed to address the BETX plume are described below. Alternative B2 contemplated collection of BETX-impacted ground water and transport to an off-site RCRA treatment facility. This alternative was eliminated early in the evaluation process because it would be technically infeasible to implement and would involve costs that would be excessive compared to its overall effectiveness.

Alternative B1 - No-action with ground water monitoring.

Similar to Alternative V1 for the VHO plume, Alternative B1 relies on presently occurring natural processes to reduce concentrations on the BETX compounds in the aquifer. The time frame for the ground water to be restored to a Classification I aquifer under the no-action alternative is unknown.

The costs associated with ground water monitoring for this alternative would be $11,000 in O&M. Present worth cost would be $137,000.

Alternative B3 - Extraction of BETX-impacted ground water, aerobic biological treatment of extracted ground water, discharge of treated ground water to either injection wells located upgradient or downgradient of the extraction well system or to Elkhorn Creek

Extraction of ground water with BETX concentrations above MCLs or proposed MCLs would be accomplished in Alternative B3 with an extraction well system. Assuming a volume of impacted ground water of ten acre-feet as estimated in the RI/FS, the time of aquifer remediation has been calculated to be approximately three months. If the volume of impacted ground water is assumed to be 25 acre-feet, based on a more conservative approach, the time for remediating the aquifer is extended to approximately eight months. Ground water extraction and treatment would continue until MCLs and proposed MCLs are permanently attained in the BETX plume.

Extracted ground water would be passed through an oil/water separator to remove free hydrocarbons. Recovered hydrocarbons would be recycled. It was assumed that the existing oil/water separator would be used for this purpose.

Following separation of aromatic hydrocarbons, a sequencing batch reactor system, similar to the system described for Alternative V3 for the VHO plume, would provide aerobic biological treatment of extracted ground water and would facilitate destruction of organic constituents. The treatment system would be expected to volatilize some of the BETX compounds which would be released to the atmosphere.

Table 5: Summary of BETX Plume Alternatives

Component		Alternatives				
		B1	B3	B4	B5	B6
Common Elements	Ground Water Monitoring	X	X	X	X	X
	Institutional Controls		X	X	X	X
	Soil Vapor Extraction of BETX Contaminated Soils		X	X	X	X
	Hydrocarbons Recovery and Recycling		X	X	X	X
Extraction	Extraction of Ground Water with BETX Concentrations > MCLs		X	X	X	
Treatment Technology	Aerobic Biological Treatment of Extracted Ground Water		X			
	Air Stripping of Extracted Ground Water			X		
	Chemical Oxidation of Extracted Ground Water				X	
	In-situ Bioremediation of BETX Plume					X
Disposition of Treated Water	Injection of Treated Water to Up/Downgradient Wells		X	X	X	
	Discharge of Treated Water to Elkhorn Creek		(X)	(X)	(X)	

(X) = Option or Contingency

Aerobic biological treatment of ground water would produce an estimated 10 to 20 tons of sludge per year. The sludge would be expected to meet all RCRA criteria for land disposal.

Treated ground water would be discharged to injection wells upgradient or downgradient of the extraction well system or to Elkhorn Creek. Upgradient injection locations could facilitate movement of the contaminants toward extraction wells. Downgradient injection locations could serve to contain the plume and also provide hydraulic assistance in ground water collection. The discharge would be sampled as necessary to comply with NPDES and/or Wyoming UIC program requirements.

Costs for this alternative would include capital cost of $582,000, and O&M costs of $44,000. The present worth cost would be $750,000.

Alternative B4 - **Extraction of BETX-impacted ground water, air stripping of extracted ground water, and discharge of treated ground water to either injection wells located upgradient or downgradient of the extraction well system or to Elkhorn Creek.**

This alternative is similar to Alternative B3, except extracted ground water would be treated with an air stripper. It was assumed that the existing on-site air stripper would be used. In the air stripping process, BETX compounds are transferred from the water phase to the air phase and discharged to the atmosphere. Based on the best available control technology (BACT) analysis performed as part of the EE/CA for the KN current removal action, vapors emitted during air stripping and SVE treatment at the KN facility would be associated with an individual probability of cancer of 1×10^{-7}, which is within the acceptable limit established by the NCP. Based on this analysis, the WDEQ determined that the preferred approach for management of air stripper emissions for the KN removal action was venting the air stripper emissions at the top of the on-site flare stack, which raises the point of emissions to 110 feet above ground level, thereby decreasing the individual probability of cancer to 5×10^{-9}. Accordingly, this method of air emission management was implemented in connection with the current removal action and is included in Alternative B4. It was assumed that vapors emitted from the air stripping system would be vented from the flare stack and that risk levels similar to those for the current removal action would be associated with the system proposed. Discharge from the flare stack would be monitored as necessary to comply with Wyoming air quality standards.

The present worth cost for this alternative would be $248,000. The capital cost would be $73,000 with O&M costs of $51,000.

Alternative B5 - **Extraction of BETX-impacted ground water, chemical oxidation of extracted ground water, and discharge of treated ground water to either injection wells located upgradient or downgradient of the extraction well system or to Elkhorn Creek.**

This alternative is similar to alternatives B3 and B4, except chemical oxidation of extracted ground water would be implemented on-site using controlled reactor vessels similar to Alternative V5 for the VHO plume

Costs for this alternative would include $400,000 capital cost, $53,000 O&M costs, and a present worth cost of $577,000.

Alternative B6 - ***In situ* bioremediation of BETX-impacted ground water.**

In situ bioremediation of ground water would involve adding an oxygen source and nutrients to the aquifer in order to promote the activity of organisms which degrade contaminants in a manner similar to Alternative V7 for the VHO plume. The injection/extraction well system would

consist of one extraction well and one injection well. It was assumed that one of the three existing aromatic hydrocarbons recovery wells would be used for extraction, and an existing on-site injection well would be used for injection. The actual number and location of wells for the system could change as determined by remedial design. Prior to mixing, extracted water would be passed through an oil/water separator to remove BETX contaminants extracted with ground water. Recovered BETX contaminants would be recycled. To the extent technically practicable, *in situ* bioremediation would continue until the ground water achieves MCLs and proposed MCLs which would be expected to be within two to five years. Treatability testing would be necessary to determine design parameters for *in situ* bioremediation.

This alternative would cost $87,000 in capital cost with $37,000 for O&M. The present worth would be $344,000.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives developed in the FS were analyzed in detail for both the VHO and BETX plumes using nine evaluation criteria. The resulting strengths and weaknesses of the alternatives were then weighed to identify the alternative for each plume providing the best balance among the nine criteria. These criteria are: 1) overall protection of human health and the environment; 2) compliance with applicable or relevant and appropriate requirements (ARARs); 3) reduction of toxicity, mobility, or volume through treatment; 4) long-term effectiveness and permanence; 5) short-term effectiveness; 6) implementability; 7) cost; 8) state acceptance; and 9) community acceptance. Each of these criteria is described below.

VHO Plume

Criterion 1: Protection of Human Health and Environment

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

All the treatment technologies employed by the alternatives are protective of human health and the environment by eliminating or reducing risk through the treatment of contaminants in ground water. In addition, the institutional controls and the existing municipal water supply would minimize further use of ground water and therefore reduce exposure to contaminants. As the no-action alternative does not include treatment or controls, it provides no reduction in risk and will no longer be discussed with regard to the VHO plume.

Alternatives V6 and V6A, which contemplate limited extraction of ground water, provide the greatest overall protection. Extraction and injection of ground water throughout the entire VHO plume, as considered in alternatives V3, V4, V4A, V5, and V7, would accelerate eastward migration of the RCRA plume. The approximate areal extent of the RCRA plume is shown in the residential area on Figure 2. The resulting movement of the RCRA plume would increase the areal extent of contamination in the aquifer from that plume, thereby increasing potential risk to residents in the subdivisions.

Criterion 2: Compliance with Applicable Relevant and Appropriate Requirements (ARARs)

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other

substantive requirements, criteria, or limitations promulgated under Federal or State environmental siting law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide basis for a waiver from any of these laws. These ARARs are divided into chemical specific, action specific, and location specific groups.

All the VHO alternatives would comply with ARARs. The ARARs evaluation is provided as Exhibit 1.

Criterion 3: Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

The remedial alternatives all result in minimal residual risk. All the alternatives are expected to attain MCLs and proposed MCLs, thereby resulting in minimal risk from contaminant residuals in ground water. The institutional controls and the existing municipal water supply additionally mitigate residual risk by minimizing the use of ground water.

Alternatives V3, V5 and V7 result in no treatment residuals. Alternatives V4 and V6 release emissions to the atmosphere, but at negligible levels and minimal risk. Additional controls for these two alternatives include monitoring to ensure compliance with Wyoming air quality standards, and a BACT analysis to ensure emissions are minimized. Alternatives V4A and V6A require disposal or treatment of contaminated carbon filters, but pose minimal residual risk.

Criterion 4: Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the preference for a remedy that uses treatment to reduce health hazards, contaminant migration, or the quantity of contaminants at the site.

All the alternatives employ an irreversible treatment as a primary element to address the principal threat of contamination. Alternatives V6 and V6A treat a smaller volume of water than the other alternatives in order to avoid adverse effects to the RCRA plume.

Reduction in toxicity, mobility, and volume of contaminants in ground water is best accomplished by Alternative V5 through chemical oxidation. Alternatives V4 and V6 indirectly reduce toxicity and volume through photodegradation of contaminants. Photodegradation occurs when the contaminants, released to the atmosphere, are broken down by sunlight. Alternative V7 reduces toxicity and volume through treatment but would require treatability studies to evaluate its effectiveness. Alternatives V4A and V6A reduce mobility, but not volume or toxicity because these alternatives result in spent carbon filters containing the contaminants, requiring disposal or regeneration of the carbon. Alternative V3 reduces toxicity, mobility and volume of contaminants, but would produce 170 tons of non-hazardous sludge annually which would require disposal.

Criterion 5: Short-Term Effectiveness

Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy.

Alternatives V6 and V6A are not expected to pose any appreciable short-term risks to the community and workers during construction and implementation.

Alternatives V3, V4, V4A, V5, and possibly V7 are expected to cause adverse effects to the environment and human health by spreading the RCRA plume through the aquifer and possibly depleting the aquifer.

The high extraction volume in alternatives V3, V4, V4A, V5, and V7 are expected to attain remedial objectives in the shortest time, two years, with the exception of V7 which could take as long as five years. Alternatives V6 and V6A are expected to require six years to attain remedial objectives. These two alternatives would not result in the unacceptable effects on human health and the environment as are expected from the other alternatives through effects on the RCRA plume.

Criterion 6: Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. It also includes coordination of Federal, State, and local governments to clean up the site.

Alternatives V6 and V6A are most easily technically implemented because these alternatives involve activities primarily on the Dow/DSI facility, requiring the least amount of construction and least difficulty with property access. Alternative V7, and possibly V5, would be less easily implemented because of the need for treatability studies to better understand the applicability of *in situ* bioremediation and chemical oxidation to the site. Alternatives V3, V4A, and V6A present no technical difficulties, but require the additional burden of disposing of or treating residual sludges and carbon filters.

All alternatives require ground water monitoring. Alternatives V6 and V6A additionally require air monitoring. Monitoring activities would be coordinated with the State of Wyoming.

Criterion 7: Cost

This criterion examines the estimated costs for each remedial alternative. For comparison, capital and annual O&M costs are used to calculate a present worth cost for each alternative.

Alternatives V6 and V6A have the lowest capital and O&M costs, resulting in present worth of $353,822 and $518,407, respectively. These alternatives are the least expensive because they incorporate scaled-down ground water extraction in comparison to the other alternatives. V7 is the next most costly, with a present worth of $1,011,288. Alternatives V4 and V4A, which are scaled-up versions of V6 and V6A, and V5, differ in treatment method, but are otherwise similar and so cost nearly the same. Present worth estimates for these three alternatives range from $1,351,883 to $1,673,488. V3 is the most costly because of very high capital expenses, and has a present worth of $2,482,675.

Criterion 8: State Acceptance

EPA has involved the WDEQ in the RI/FS and remedy selection process. WDEQ was provided the opportunity to comment on the RI/FS document and the proposed plan, and took part in the public meeting held to inform the public of the proposed plan. WDEQ's statement in regard to the selected remedy, read at the public meeting, states in part "It is the position of the Department [WDEQ] that the proposed actions identified in alternatives B4 and V6 should be implemented as soon as possible". WDEQ went on to add that it concurs with the proposal to further investigate subsurface soil contamination sources as contemplated in OU 2.

WDEQ believes, however, that remedial actions taken under CERCLA should be integrated with the RCRA corrective action addressing the RCRA plume, forming a comprehensive effort to concurrently remediate all ground water contamination within the Brookhurst subdivision. WDEQ's comments are further addressed in the attached Responsiveness Summary.

Criterion 9: Community Acceptance

EPA solicited input from the community on the clean up methods proposed for the ground water at the Mystery Bridge site. Although public comments indicate no specific opposition to the preferred alternative, residents and their representatives did raise concerns about the methods and data used to reach that alternative. These issues are addressed in the attached Responsiveness Summary and some will be incorporated into OU 2 activities for the site.

BETX Plume

Criterion 1: Protection of Human Health and the Environment

All the treatment technologies employed by the remedial alternatives are protective of human health and the environment by eliminating or reducing risk through the treatment of contaminants in ground water. In addition, institutional controls and the municipal water supply would minimize further use of ground water and therefore reduce exposure to contaminants. As the no-action alternative does not include treatment or controls, it provides no additional reduction in risk and will no longer be discussed with regard to the BETX plume.

None of the alternatives is expected to adversely impact the RCRA plume as some of the VHO plume alternatives would.

Criterion 2: Applicable or Relevant and Appropriate Requirements (ARARs)

All the BETX alternatives would comply with ARARs. The ARARs evaluation is provided as Exhibit 1.

Criterion 3: Long-Term Effectiveness and Permanence

The remedial alternatives all result in minimal residual risk. All the alternatives are expected to attain MCLs or proposed MCLs, thereby resulting in minimal risk from contaminant residuals in ground water. The institutional controls and the existing municipal water supply additionally mitigate residual risk by minimizing the use of ground water.

Over the long term, each alternative will likely leave some residual BETX contaminants in subsurface soils on or near the KN facility. Problems related to these residuals will be addressed OU 2. Alternative B6, however, would help treat some of the residual BETX contaminants since *in situ* bioremediation would destroy contaminants with naturally occurring microorganisms in ground water and in subsurface soils.

Alternative B5 would result in no treatment residuals. Alternative B4 would release emissions to the atmosphere, but at negligible levels and minimal risk. The air stripper contemplated in Alternative B4 is currently operating as part of the KN removal action. Monitoring has demonstrated that air stripper emissions are within Wyoming air quality standards. Alternative B3 would result in 10 to 20 tons annually of non-hazardous residual sludge requiring off-site disposal.

Criterion 4: Reduction in Toxicity, Mobility, or Volume through Treatment

All the alternatives employ an irreversible treatment as a primary element to address the principal threat of contamination.

Reduction in toxicity, mobility, and volume of contaminants in ground water would best be accomplished by alternatives B5 and B6. Alternative B4 would remove contaminants from ground water and indirectly reduce toxicity and volume through photodegradation of the contaminants. Alternative B3 would reduce toxicity, mobility and volume of contaminants, but would produce 10 to 20 tons of non-hazardous sludge annually requiring disposal.

Criterion 5: Short-Term Effectiveness

None of the alternatives would result in adverse short-term effects for community and worker protection. However, Alternative B6 would require two to five years to achieve clean up, whereas alternatives B3, B4 and B5 are estimated to achieve clean up within one year.

Criterion 6: Implementability

Alternative B4 would most easily be implemented because the air stripper used in this alternative is currently in operation as part of the KN removal action. Alternative B5 would pose no undue problem with regard to this criterion. Alternative B3 would present no technical difficulties but requires the additional burden of disposing of residual sludge. Alternative B6 would be more difficult to implement because of the need for treatability studies to better understand the applicability of *in situ* bioremediation to the site.

All alternatives require ground water monitoring. Alternative B4 additionally requires air monitoring. Monitoring activities will be coordinated with the State of Wyoming.

Criterion 7: Cost

With the air stripper already in place, Alternative B4 has minimal capital costs. Its present worth of $247,917 is also the least among all alternatives. Alternative B6 is the next most expensive with a present worth of $334,553. Alternatives B5 and B3 are the most costly, with present worth estimates of $577,217 and $750,502, respectively.

Criterion 8: State Acceptance

State acceptance for this alternative is the same as described above for Alternative V6 for the VHO plume.

Criterion 9: Community Acceptance

Community acceptance for this alternative is the same as described above for Alternative V6 for the VHO plume.

IX. SELECTED REMEDY

EPA has selected the combination of alternatives V6 and B4 as the remedy for the ground water operable unit for the Mystery Bridge site. This remedy is made up of the following components:

Common Elements

- Monitoring ground water, discharged treated water, and air; and
- Implementation of institutional controls.

VHO Plume: Alternative V6

- Extraction of ground water with concentrations of VHOs above MCLs or proposed MCLs in the upgradient portion of the plume (i.e., on and/or near the Dow/DSI facility);
- Treatment of contaminated ground water with an on-site air stripping facility;
- Reinjection of treated water into the aquifer to provide additional hydraulic containment of the upgradient portion of the VHO plume being extracted, minimize any impact from the VHO remediation efforts on the RCRA plume and BETX plume, and enhance the natural attenuation process in the downgradient portions of the VHO plume; and
- Reliance on natural processes for reduction of VHO levels in downgradient portions of the VHO plume.

BETX Plume: Alternative B4

- Extraction of ground water with concentrations of BETX compounds above MCLs or proposed MCLs throughout the plume;
- Treatment of contaminated ground water with an on-site air stripping facility; and
- Reinjection of treated water into the aquifer to provide additional hydraulic control of the BETX plume and minimize any potential impact from the BETX remediation efforts on the RCRA and VHO plumes.

Alternative B4 assumes continuation of the ongoing KN removal action. This removal action would be expanded, if necessary, to recover any hydrocarbons originating from the KN operation that may exist outside of KN's facility. In addition, since no ground water in the residential areas is believed to be contaminated with BETX originating from KN at concentrations above MCLs or proposed MCLs, this remedy requires that no ground water contaminated above such levels will be allowed to enter the subdivision from the KN property. Periodic monitoring will be used to evaluate compliance with this condition.

The remedial design will specify the appropriate number and location of wells and monitoring points, and system parameters such as flow rates for both the VHO and BETX ground water treatment systems. Some modifications or refinements may be made to the remedy during remedial design and construction. Such modifications or refinements, in general, would reflect results of the engineering design process. Estimated cost for the selected remedy is $600,739. Details of the costs for each of the VHO and BETX remedies are shown in Table 6.

The selection of this remedy is based upon the comparative analysis of alternatives presented above, and provides the best balance of tradeoffs with respect to the nine evaluation criteria. ARARs for the selected remedy are shaded in the table provided as Exhibit 1. As pointed out in the comparative analysis, the impact of each VHO plume alternative on the RCRA plume was carefully considered. The close proximity of these two plumes prescribes a remedy that would not adversely affect the extent of the RCRA plume. VHO plume alternatives which include limited ground water extraction and minimally disturb the aquifer down gradient of the source areas meet this need. Air stripping was chosen as the appropriate treatment technology applied to the extracted ground water by weighing the factors outlined in the comparative analysis. Natural attenuation was chosen over *in situ* bioremediation for the downgradient portion of the VHO plume in Alternative V6 because it would not adversely impact the RCRA plume in any way, does not require treatability studies, is effective at the existing level of contamination, and has less uncertainty than bioremediation with regard to remediation time frame. The selection of Alternative B4 as the remedy for the BETX plume was also based upon the comparative analysis. A particular strength of this alternative is that it is already in place and has been proven effective as part of the KN removal action.

Based on the findings in the BRA for the Current Resident and Future Hypothetical Resident scenarios (see Table 3), the remedial action objectives for this site are the following:

1) Prevent ingestion of water containing t-1,2 DCE, 1,1,1 TCA, TCE, PCE, benzene, toluene, ethylbenzene, or xylene at concentrations that either a) exceed MCLs or proposed MCLs, or b) present a total carcinogenic risk range greater than $1x10^{-4}$ -$1x10^{-6}$; and

2) Restore the alluvial aquifer to concentrations that both a) meet the MCLs or proposed MCLs for t-1,2 DCE, 1,1,1 TCA, TCE, PCE, benzene, toluene, ethylbenzene, and xylene, and b) present a total carcinogenic risk range less than $1x10^{-4}$ -$1x10^{-6}$.

Remedial action goals specifically delineate action levels, area of attainment, and restoration time frame. The action levels are MCLs and proposed MCLs (as shown previously in tables 1 and 2). Attainment of these action levels will provide protectiveness of human health and the environment. The area of attainment shall be the entire VHO and BETX plumes, including those areas of the plumes within and outside the Dow/DSI and KN properties. Based on the contaminant transport modeling performed for the RI/FS, the restoration time frame for this remedial action shall be six years, with the expectation that remediation of the BETX plume should be no longer than one year, and with the acknowledgement that the restoration time frame may vary depending upon the outcome of OU 2 in addressing remaining sources, and other factors described below.

A further objective of this remedial action is to restore the ground water, with the exception of the area impacted by the RCRA plume, to its beneficial use, which is, at this site, a drinking water aquifer. Based on information obtained during the RI, and the analysis of all remedial alternatives, EPA and the State of Wyoming believe that the selected remedy will achieve this objective. It may become apparent, during implementation or operation of the ground water extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal. In such a case, the systems' performance standards and/or the remedy may be reevaluated.

Table 6: Selected Remedy Costs

VHO Plume	
Item	Cost
Direct Capital Costs	
Temporary Deed and/or User Restrictions	$15,000
Extraction Well System Installation	$3,500
Well Installation Supervision	$1,110
Well Pumps	$2,500
Influent and Discharge Piping	$5,000
Piping Installation	$4,000
Air Stripper System	$57,000
Air Stripper System Installation	$14,000
Discharge Pump	$2,500
Mobilization	$7,000
Equipment Decontamination	$5,000
Health and Safety Program	$10,000
Estimated Direct Capital Cost	$126,610
Indirect Capital Costs	
Contingency Allowance (25%)	$31,653
Engineering Fees (15%)	$18,992
Legal Fees (5%)	$6,331
Estimated Indirect Capital Cost	$56,975
Total Estimated Capital Cost	$183,585
Annual Operation and Maintenance Costs	
Ground Water Sample Collection	$2,600
Ground Water Sample Analysis	$8,400
Electricity (pumps, blower)	$4,320
Air Stripper Operation	$23,360
Air Stripper Maintenance	$13,440
Air Stripper Cleaning Solution	$1,500
Discharge Sampling (water)	$11,680
Discharge Analysis (water)	$54,750
Air Stripper Vapor Discharge Sampling	$1,664
Vapor Sample Analysis	$1,200
Estimated Annual Operation and Mainenance Cost	$122,914
Present Worth of Annual Operation and Maintenance Costs (i=5%)	$170,237
Total Estimated Cost VHO Plume	**$353,822**

From: RI/FS Report (June 1990)

BETX Plume	
Item	Cost
Direct Capital Costs	
Temporary Deed and/or User Restrictions	$15,000
Influent and Discharge Piping	$4,000
Piping Installation	$600
SVE Wells	$10,500
Product Recovery Well	$4,500
Product Recovery Pump	$2,500
Vacuum Pump	$7,500
Well Installation Supervision	$1,850
Mobilization	$3,000
Equipment Decontamination	$500
Health and Safety Program	$500
Estimated Direct Capital Cost	$50,450
Indirect Capital Costs	
Contingency Allowance (25%)	$12,613
Engineering Fees (15%)	$7,568
Legal Fees (5%)	$2,523
Estimated Indirect Capital Cost	$22,703
Total Estimated Capital Cost	$73,153
Annual Operation and Maintenance Costs	
Ground Water Sample Collection	$2,600
Ground Water Sample Analysis	$8,400
Electricity (pumps, blower)	$6,000
Air Stripper Operation	$6,400
Air Stripper Maintenance	$3,200
Air Stripper Cleaning Solution	$1,700
Discharge Sampling (water)	$3,200
Discharge Analysis (water)	$15,000
SVE Vapor and Stack Discharge Sampling	$1,664
Vapor Sample Analysis	$2,400
Estimated Annual Operation and Mainenance Cost	$50,564
Present Worth of Annual Operation and Maintenance Costs (i=5%)	$174,765
Total Estimated Cost BETX Plume	**$247,917**

From: RI/FS Report (June 1990)

The selected remedy will include ground water extraction for an estimated period of at least one year for the VHO plume and less than one year for the BETX plume, during which time the systems' performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. The operation monitoring period will be determined during remedial design. The operating system may include discontinuing operation of extraction wells in areas where cleanup goals have been attained, alternate pumping at wells to eliminate stagnation points, and pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into ground water for extraction and treatment.

X. STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. CERCLA also requires that the selected remedial action for the site comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a waiver is granted. The selected remedy must also be cost-effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that include treatment as a principal element. The following sections discuss how the selected remedy for contaminated ground water at the Mystery Bridge site meets these statutory requirements.

Protection of Human Health and Environment

In order to meet the remedial objectives outlined in the previous section, the risk associated with exposure to the contaminated ground water must fall within the acceptable risk for carcinogens. Attainment of MCLs and proposed MCLs will assure site risk falls within this range. The selected remedy protects human health and the environment by reducing levels of contaminants in the ground water through extraction and treatment, as well as through natural attenuation. EPA expects VHOs in ground water would be reduced to MCLs or proposed MCLs in six years and MCLs or proposed MCLs for BETX compounds would be attained within one to two years. However, there is a minimal chance that complete remediation may take as long as 18 years. Together with deed and/or user restrictions and the existing municipal water supply, the threat of exposure currently posed to residents from contaminated ground water would be significantly reduced if not eliminated. Of all the alternatives for both the VHO and BETX plumes, the selected alternatives provide the best protection to human health without significant adverse impact to the environment. No unacceptable short-term risks or cross-media impacts would be caused by implementing this remedy.

Attainment of Applicable or Relevant and Appropriate Requirements of Environmental Laws

All ARARs would be met by the selected remedy.

Chemical Specific ARARs. The selected remedy would achieve compliance with chemical specific ARARs related to the downgradient ground water and ambient air quality at the site. The relevant and appropriate requirements include primary drinking water standards established by the Safe Drinking Water Act. Some contaminants of concern identified for the site have MCLs. MCLs have been proposed for the remaining contaminants of concern and are to be considered. Values for the MCLs and proposed MCLs are shown on Table 1 for the VHO compounds and on Table 2 for the BETX compounds. Concentrations of BETX compounds throughout the entire BETX plume would be reduced below MCLs or proposed MCLs by the Alternative B4 treatment system. Concentrations of VHO compounds in the

while natural attenuation would reduce concentrations in the downgradient portion of the plume to below MCLs or proposed MCLs.

Benzene emissions from the air stripping treatment system will be monitored and if required, controls would be implemented to ensure would compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAP). At present it is not expected that constituents for which standards have been established by the Wyoming Air Quality Rules and Regulations will be produced in the treatment process. In the unlikely event that constituents are produced, the necessary controls would be implemented in order for the emissions to comply with the regulations.

Action Specific ARARs. The selected remedy would address and comply with action specific ARARs for injection of treated water back in to the ground according to Wyoming UIC program established by 40 CFR 147 and Wyoming Water Quality Rules and Regulations, Chapter IX. The ground water monitoring program which includes wells located upgradient, downgradient, and within the contaminated ground water would fulfill the requirements of the RCRA corrective action program.

Land disposal restrictions are not applicable to the selected remedy. Instead, RCRA section 3020 applies to reinjection of treated ground water into Class IV injection wells during CERCLA response actions. Since the goal is to clean up ground water to drinking water levels, health-based drinking water standards (MCLs), rather than land disposal restrictions, are the relevant and appropriate clean up standard.

RCRA requirements would be met as appropriate for owner and operators of hazardous waste treatment, storage, and disposal facilities. BACT analysis for construction, modification, and operation of the water treatment systems would comply with the requirements of Wyoming Air Quality Rules and Regulations and discharges would not be concealed. Similarly, BACT permit and data requirements for the ground water extraction/injection system would comply with Wyoming Water Quality Rules and Regulations.

Location Specific ARARs. The selected remedy would address and comply with all location specific ARARs for preservation and protection of the North Platte River floodplain according to the requirements of 40 CFR 6.302. RCRA location standards for treatment, storage and disposal facilities are relevant and appropriate for temporary storage tanks of recovered hydrocarbons.

Cost Effectiveness

EPA believes the selected remedy is cost-effective in mitigating the principal risk posed by contaminated ground water within a reasonable period of time. Section 300.430(f)(ii)(D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria: protection of human health and the environment, against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and produces the best overall effectiveness at the lowest reasonable cost. Therefore, the selected remedy is cost-effective as defined in the NCP. The estimated cost for the selected remedy is over $600,000.

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

EPA believes the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the Mystery Bridge site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility or volume achieved through treatment; short-term effectiveness; implementability; and cost, and also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Alternative V6 complies with ARARs; and reduces the toxicity, mobility, and volume of the contaminants in the ground water equally as well as the other VHO plume alternatives. Short-term effectiveness and protection of human health and the environment were critical in choosing Alternative V6 with natural attenuation for the downgradient portion of the VHO plume in light of effects on the RCRA plume and trade-off with remediation time frame.

Alternative B4 provides long-term effectiveness equally as well as alternatives B3 and B5. Although Alternative B6 has potential to best provide protection, it would require a greater remediation time frame and cost more than Alternative B4. Alternative B5 would accomplish a greater reduction in toxicity, mobility and volume of contaminants than B4, but at over twice the cost. Alternative B4 removes contaminants from ground water and will indirectly reduce the toxicity and mobility through photodegradation. Alternative B3 requires the additional burden of disposing of 10 to 20 tons of non-hazardous sludge annually. Since Alternative B4 would be a continuation of the ongoing air stripping operation at the KN facility, it would be the easiest to implement and cost the least of the BETX plume alternatives.

The State of Wyoming is in concurrence with the selected remedy. The Proposed Plan for the Mystery Bridge site was released for public comment in July 1990. The Proposed Plan identified alternatives V6 and B4 as the preferred remedy. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, EPA determined that no significant change to the remedy originally identified in the Proposed Plan was necessary.

Preference for Treatment as a Principal Element

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The principal threat to human health is from ingestion of and direct contact with contaminated ground water. The selected remedy reduces levels of BETX contaminants and the highest concentrations of VHO contaminants in ground water through treatment using air stripper systems. Natural attenuation of the downgradient portion of the VHO plume was selected over treatment because of the adverse effects on the nearby RCRA that would result from aquifer drawdown during pumping of that portion of the plume for treatment. If the downgradient portion of the plume is pumped, the RCRA plume could migrate further into the residential area and thus increase the risk of exposure to contaminated ground water.

ARAR CITATION	REQUIREMENT	EVALUATION
A. Location – Specific ARARs		
33 CFR 320 #3	Army Corps of Engineers Permit Program Regulations.	Regulations pertain to certain actions affecting navigable waters of the United States including discharges of dredged or fill material. No dredged or fill material to be generated. Regulation is neither applicable nor relevant and appropriate.
40 CFR 6.301 and 36 CFR 800	Action to protect landmarks, historical, and archaeological sites.	No landmarks, historical, or archaeological sites. Regulation is neither applicable nor relevant and appropriate.
40 CFR 6.302	Action to preserve and protect wetlands, floodplains, important farmlands, coastal zones, wild and scenic rivers, fish and wildlife, and endangered species.	Action likely in floodplain of North Platte River; other items not applicable. Regulation is applicable.
40 CFR 230	Guidelines for specification of disposal sites for dredged or fill material.	No dredged or fill material to be generated. Regulation is neither applicable nor relevant and appropriate.
40 CFR 264.18	Location standards for treatment, storage, and disposal facilities.	If temporary storage tanks of recovered hydrocarbons are used, regulation may be applicable.
50 CFR 200	Action to conserve endangered species or threatened species.	No endangered or threatened species. Regulation is neither applicable nor relevant and appropriate.
50 CFR 402	Action to conserve endangered species or threatened species.	No endangered or threatened species. Regulation is neither applicable nor relevant and appropriate.
16 U.S.C. 1131-36 50 CFR 35.1-.14	Actions to preserve federally owned wilderness areas as wilderness areas.	No wilderness area involved. Regulations are neither applicable nor relevant or appropriate.
16 U.S.C. 1451-64	Actions must be consistent with a state's approved coastal zone management program.	No coastal zone involved. Regulation is neither applicable nor relevant or appropriate.
33 U. 103 33 CF. 320-30	Permitting requirements for structures or work in or affecting navigable waters.	The proposed remedial actions will not affect navigable wate. Regulations are neither applicable nor relevant and appropriate

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Water Quality Rules and Regulations Chapter IX, Part C Sections 28(a) and 30(a).	Location criteria for the design and construction of biological and non-biological treatment ponds that accept commercial/industrial waste and waste water.	The remedial action will not use commercial/ industrial water and wastewater ponds. Regulation is neither applicable nor relevant or appropriate.
B. Chemical – Specific ARARs		
40 CFR 141.11	National Revised Primary Drinking Water Regulations: maximum contaminant levels for organic chemicals.	Relevant and Appropriate: ground water concentrations must not exceed maximum contaminant levels. Constituents of concern identified for the site for which MCLs have been promulgated include: 1,1,1-trichloroethane, trichloroethene, and benzene. Proposed MCl s are to be considered.
40 CFR 143.3	National Secondary Drinking Water Regulations: secondary maximum contaminant levels.	Non-enforceable, non health-based concentrations for drinking water. Regulation, although not enforceable, should be considered.
40 CFR 141.50	Maximum Contaminant Level Goals: drinking water quality goals set at levels of no known or anticipated adverse health effects, with a margin of safety.	Non-enforceable health goals for public water systems. Regulation is relevant or appropriate for constituents of concern with an MCLG greater than zero.
Clean Water Act Section 304	Ambient Water Quality Criteria for Protection of Aquatic Life and Human Health.	Applicable or Relevant and Appropriate: concentrations in any surface water must not exceed water quality criteria as a result of receiving ground water.
40 CFR 50.5	National Secondary Ambient Air Quality Standards for Sulfur Oxides.	At present it is not expected that sulfur oxides will be produced in the treatment process. In the unlikely event that sulfur oxides are produced, regulation would be applicable.
40 CFR 50.6	National Primary and Secondary Ambient Air Quality Standards for Particulates.	At present it is not expected that particulates will be produced in the treatment process. In the unlikely event that particulates are produced, regulation would be applicable.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 61	National Emission Standards for Hazardous Air Pollutants.	Regulations for benzene emissions are applicable for air stripping treatment system.
40 CFR 50.8	National Primary Ambient Air Quality Standards for Carbon Monoxide.	At present it is not expected that carbon monoxide will be produced in the treatment process. In the unlikely event that carbon monoxide is produced, regulation would be applicable.
Wyoming Water Quality Rules and Regulations, Chapter 1.	Water quality standards for Wyoming surface waters.	Federal requirements equal to or more stringent than State requirements. Regulation is neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter VIII, Sections 3 and 4.	Water quality standards for Wyoming ground waters.	Federal requirements equal to or more stringent than State requirements. Regulations are neither applicable nor relevant and appropriate.
Wyoming Air Quality Rules and Regulations, Section 3 (except for (a)(iii)).	Air quality standards for particulates.	At present it is not expected that particulates will be produced in the treatment process. In the unlikely event that particulates are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 3 (except for (a)(iii)).	Air quality standards for sulfur oxides.	At present it is not expected that sulfur oxides will be produced in the treatment process. In the unlikely event that sulfur oxides are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 6.	Air quality standards for sulfuric acid mist.	At present it is not expected that sulfuric acid mists will be produced in the treatment process. In the unlikely event that sulfuric acid mists are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 7.	Air quality standards for hydrogen sulfide.	At present it is not expected that hydrogen sulfide will be produced in the treatment process. In the unlikely event that hydrogen sulfide is produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 8.	Air quality standards for photochemicals.	At present it is not expected that photochemicals will be produced in the treatment process. In the unlikely event that photochemicals are produced, regulation would be applicable

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Air Quality Rules and Regulations, Section 10 (except for a).	Air quality standards for nitrogen oxides.	At present it is not expected that nitrogen oxides will be produced in the treatment process. In the unlikely event that nitogen oxides are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 11.	Air quality standards for fluorides.	At present it is not expected that fluorides will be produced in the treatment process. In the unlikely event that fluorides are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 12.	Air quality standards for carbon monoxide.	At present it is not expected that carbon monoxide will be produced in the treatment process. In the unlikely event that carbon monoxide is produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 14.	Air quality standards for particulate emissions.	At present it is not expected that particulate emissions will be produced in the treatment process. In the unlikely event that particulate emissions are produced, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 16.	Air quality standards for odors.	At present it is not expected that odors will be produced in the treatment process. In the unlikely event that odors are produced, regulation would be applicable.
C. Action – Specific ARARs		
40 CFR 122	EPA Administered Permit Programs: The National Pollutant Discharge Elimination System.	Regulation refers to discharges from treatment system. Substantive requirements are applicable or relevant and appropriate for alternatives that propose discharges to off-site surface water body, and relevant and appropriate for discharges to on-site surface water body.
40 CFR 125	Criteria and standards for the National Pollutant Discharge Elimination System.	Substantive requirements are applicable or relevant and appropriate for alternatives that propose discharges to off-site surface water body, and relevant and appropriate for discharges to on-site surface water body.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 129	Establishes effluent limitations for certain pollutants.	None of the identified compounds have been observed at the site. Regulation is neither applicable nor relevant and appropriate.
40 CFR 136	Guidelines establishing test procedures for the analysis of pollutants.	Substantive requirements are applicable or relevant and appropriate for alternatives that propose discharges to off-site surface water body, and relevant and appropriate for discharges to on-site surface water body.
40 CFR 144	Underground Injection Control Program	Defer to State of Wyoming regulations. Regulations is neither applicable nor relevant and appropriate.
40 CFR 146	Underground Injection Control Program: criteria and standards.	Defer to State of Wyoming regulations. Regulations is neither applicable nor relevant and appropriate.
40 CFR 147	Wyoming underground injection control programs.	Regulation is applicable for injection of treated ground water back into aquifer.
40 CFR 221	Applications for ocean dumping permits.	Ocean dumping is not viable alternative. Regulation neither applicable nor relevant and appropriate.
40 CFR 264 (specified sections)	Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities.	See below.
40 CFR 264.91 - 100	Requirements for releases from Solid Waste Management Units.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.91	Required programs.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.92	Ground Water protection standard.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.93	Hazardous constituents.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.94	Concentration limits.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.95	Points of compliance.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.96	Compliance period.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.97	General ground water monitoring requirements.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.98	Detection monitoring program.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.99	Compliance monitoring program.	Solid Waste Management Units not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.100	Corrective action program.	Establishes ground water monitoring program to demonstrate effectiveness of corrective action. Substantive requirements of regulations are potentially relevant and appropriate.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.111	Closure performance standard.	Regulation neither applicable nor relevant and appropriate.
40 CFR 264.117	Post-closure care and use of property.	Regulation pertains to closure of hazardous waste disposal facilities. Hazardous waste disposal facilities not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.171 - 178	Use and management of hazardous waste containers.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.171	Condition of containers.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.172	Compatibility of waste with containers.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.173	Management of containers.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.174	Inspections.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.175	Containment.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.176	Special requirements for ignitable or reactive waste.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.177	Special requirements for incompatible wastes.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.
40 CFR 264.178	Closure.	Regulation neither applicable nor relevant and appropriate - does not pertain to this site.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.190 - 198	Requirements for facilities that use tank systems for storing or treating hazardous waste.	If remedy includes the use of tanks to store or manage RCRA wastes, these regulations are applicable.
40 CFR 264.190	Applicability.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.191	Assessment of existing tank system's integrity.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.192	Design and installation of new tank systems or components.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.193	Containment and detection of releases.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.194	General operating requirements.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.195	Inspections.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.196	Response to leaks or spills and disposition of leaking or unfit tank systems.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.197	Closure and post-closure care.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.198	Special requirements for ignitable or reactive waste.	If remedy includes the use of tanks to store or manage RCRA wastes, this regulation is applicable.
40 CFR 264.220 - 221, 226-228	Requirements for surface impoundments.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.220	Applicability.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.221	Design and operating requirements.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.226	Monitoring and inspection.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.227	Emergency repairs; contigency plans.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.228	Closure and post-closure care.	Surface impoundments not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.251	Waste piles: design and operating requirements.	Waste piles not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.258	Waste piles: closure and post-closure care.	Waste piles not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.271,273, 276,278,281-282	Requirements for land treatment.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.271	Treatment program.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.273	Design and operating requirements.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.276	Food chain crops.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.278	Unsaturated zone monitoring.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.280	Closure and post-closure care for land treatment units.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.281	Special requirements for ignitable or reactive wastes.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.282	Special requirements for incompatible wastes.	Land treatment not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.301,303 304,310,314.	Requirements for landfills.	Landfills not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.301	Design and operating requirements.	Landfills not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.303	Monitoring and inspection.	Landfills not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 264.310	Closure and post-closure care.	Landfills not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.314	Special requirements for bulk and containerized liquids.	Landfills not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.340,341 343,345,351	Requirements for incinerators.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.340	Applicability.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.341	Waste analysis.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.343	Performance standards.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.345	Operating requirements.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 264.351	Closure.	Incinerators not envisioned. Regulation is neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 267 (specif ections)	Interim standards for owners and operators of new hazardous waste land disposal facilities.	Hazardous waste land disposal facilities not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 267.10	Environmental performance standard.	Hazardous waste land disposal facilities not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 267.23	Closure and post-closure.	Hazardous waste land disposal facilities not envisioned. Regulation neither applicable nor relevant and appropriate for ground water remediation.
40 CFR 268	Land disposal restrictions.	Land disposal restrictions are not applicable to these activities. Instead of LDR, RCRA section 3020 applies to reinjection of treated ground water into Class IV injection wells during CERCLA response actions. Moreover, for CERCLA response action where, as here, the goal is to clean up ground water to drinking water levels, the Agency believes that health-based drinking water standards (e.g., MCLs), rather that LDRs, will generally be the relevant and appropriate clean up standard.
40 CFR 268.30	Waste-specific prohibitions for solvent wastes.	Ground water injection exempt from land disposal restrictions for solvent wastes. Therefore, regulation is neither applicable nor relevant and appropriate for injection of treated ground water.
40 CFR 268.41	Treatment standard expressed as concentration in waste extract.	Regulation may be applicable for land disposal of sludge from biological treatment of ground water.
40 CFR 268.50	Restricts storage of hazardous waste.	Proposed remedial actions do not include hazardous waste storage for more than 90 days. Regulation is neither applicable nor relevant and appropriate.
40 CFR 270	EPA Adminstered Permit Program: The Hazardous Waste Permit Program.	Regulation neither applicable nor relevant and appropriate: administrative actions are waived for Superfund remedial actions.
40 CFR 403	General pretreatment regulations for existing and new sources of pollution.	Regulation neither applicable nor relevant and appropriate - not pertinent to site.

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Water Quality Rules and Regulations, Chapter III, Section 15	Data requirements for permit applications for the construction of treatment works, disposal systems, and other potential sources of pollution.	Regulation incorporates treatment of ground water exceeding MCLs. Regulation is applicable.
Wyoming Water Quality Rules and Regulations, Chapter IX.	Permit requirements for construction, modification, and operation (BACT).	Substantive requirement of BACT analysis are applicable.
Wyoming Water Quality Rules and Regulations, Chapter XI, Section 5.	Requirements for design and operation of sewerage and public water works, and land application.	No sewerage or water works or land application facilities are proposed. Regulations are neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Section 24.	Requirements for design and operation of sewerage and public water works, and land application.	No sewerage or water works or land application facilities are proposed. Regulations are neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Sections 50 and 53.	Requirements for design and operation of sewerage and public water works, and land application.	No sewerage or water works or land application facilities are proposed. Regulations are neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Part C.	Requirements for design and operation of sewerage and public water works, and land application.	No sewerage or water works or land application facilities are proposed. Regulations are neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Part C.	Requirements for design and operation of sewerage and public water works, and land application.	No sewerage or water works or land application facilities are proposed. Regulations are neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Section 25.	General requirements for discharge from wastewater treatment facility.	Federal requirements equal to or more stringent than State requirements. Regulation is neither applicable nor relevant and appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Section 26.	Requirements for discharge to POTW.	Remedial actions do not include discharge to POTW. Regulation is neither applicable nor relevant and appropriate.

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Water Quality Rules and Regulations, Chapter XI, Part E, Sections 50 (b) and (d) and 53.	Design considerations for land application facilities.	The remedial action will not use land application. Regulation is neither applicable nor relevant or appropriate.
Wyoming Water Quality Rules and Regulations, Chapter XI, Part B, Section 10(b) (ii).	Design requirements for pump stations for domestic and municipal wastewater.	No domestic or municipal wastewater involved. Regulation is neither applicable nor relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 13.	Restrictions on the open burning of wastes.	No open burning of wastes involved. Regulation is neither applicable nor relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 14.	Restrictions on visible emissions from new sources.	Visible emissions would not be generated by groundwater technologies. Regulation is neither applicable nor relevant.
Wyoming Air Quality Standards and Regulations, Section 18.	Prohibits the use of methods or devices which would conceal or dilute an emission from a source.	Regulation potentially applicable or relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 19.	Emissions excursions due to unusual operating conditions shall not be a violation of the regulations.	Regulation potentially applicable or relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 21.	Permitting requirements for new sources of air emissions.	Substantive requirements potentially applicable or relevant and appropriate for alternatives utilizing technologies which would result in air emissions.
Wyoming Solid Waste Management Rules, Sections 8.a(1),(2),(4) and (5), 10.a(15), 11.a(4), 11.c(1), and 11.d(1).	Requirements for solid waste disposal sites and hazardous waste disposal sites.	Proposed remedial technologies do not include the development of a solid or hazardous waste disposal site. Regulation neither applicable nor revelant and appropriate
Wyoming Environmental Quality Act, Wyoming Statue 35-11-301(a).	Prohibits discharge of wastes to state waters without a permit.	Regulation neither applicable nor revelant and appropriate - defer to NPDES requirements.

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Environmental Quality Act, Wyoming Statue 35-11-109a(vi).	Provides State with authority to enter and inspect property at which air, water, or land pollution source is located.	Regulation neither applicable nor revelant and appropriate - no substantive requirements.
Wyoming Environmental Quality Act, Wyoming Statue 35-11-102.	General policy and purpose of Wyoming Environmental Quality Act.	Regulation provides no substantive requirements. Regulation is neither applicable nor relevant and appropriate.

ARAR CITATION	REQUIREMENT	EVALUATION
A. Location Specific ARARS		
40 CFR 6.302	Action to preserve and protect wetlands, floodplains, important farmlands, coastal zones, wild and scenic rivers, fish and wildlife, and endangered species.	Action likely in floodplain of North Platte River; other items not applicable. Regulation is applicable.
40 CFR 264.18	Location standards for treatment, storage, and disposal facilities.	If temporary storage tanks of recovered hydrocarbons are used, regulation may be applicable.
B. Chemical Specific ARARS		
40 CFR 141.11	National Revised Primary Drinking Water Regulations: maximum contaminant levels for organic chemicals.	Relevant and Appropriate: ground water concentrations must not exceed maximum contaminant levels. MCLs have been identified for 1,1,1-trichloroethane, trichloroethene, and benzene. Proposed MCLs are to be considered.
40 CFR 143.3	National Secondary Drinking Water Regulations: secondary maximum contaminant levels.	Non-enforceable, non health-based concentrations for drinking water. Regulation, although not enforceable, should be considered.
40 CFR 141.50	Maximum Contaminant Level Goals: drinking water quality goals set at levels of known or anticipated health effects, with a margin of safety.	Non-enforceable health goals for public water systems. Regulation is relevant or appropriate for constituents of concern with an MCLG greater than zero.
Clean Water Act Section 304.	Ambient Water Quality Criteria for Protection of Aquatic Life and Human Health.	Applicable or Relevant and Appropriate: concentrations in any surface water must not exceed water quality criteria as a result of receiving ground water.
40 CFR 50.5	National Secondary Ambient Air Quality Standards for Sulfur Oxides.	At present it is not expected that sulfur oxides will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
40 CFR 50.6	National Primary and Secondary Ambient Air Quality Standards for Particulates.	At present it is not expected that particulates will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
40 CFR 61	National Emission Standards for Hazardous Air Pollutants.	Regulations for benzene emissions are applicable for air stripper treatment system.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 50.8	National Primary Ambient Air Quality Standards for Carbon Monoxide.	At present it is not expected that carbon monoxide will be produced in the treatment process. In the unlikely event that it is, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 3 (except for (a)(iii)).	Air quality standards for particulates.	At present it is not expected that particulates will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 3 (except for (a)(iii)).	Air quality standards for sulfur oxides.	At present it is not expected that sulfur oxides will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 6.	Air quality standards for sulfuric acid mist.	At present it is not expected that sulfuric acid mists will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 7.	Air quality standards for hydrogen sulfide.	At present it is not expected that hydrogen sulfide will be produced in the treatment process. In the unlikely event that it is, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 8.	Air quality standards for photochemicals.	At present it is not expected that photochemicals will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 10 (except for a).	Air quality standards for nitrogen oxides.	At present it is not expected that nitrogen oxides will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 11.	Air quality standards for fluorides.	At present it is not expected that fluorides will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 12.	Air quality standards for carbon monoxide.	At present it is not expected that carbon monoxide will be produced in the treatment process. In the unlikely event that it is, regulation would be applicable.
Wyoming Air Quality Rules and Regulations, Section 14.	Air quality standards for particulate emissions.	At present it is not expected that particulate emissions will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.

ARAR CITATION	REQUIREMENT	EVALUATION
Wyoming Air Quality Rules and Regulations, Section 16.	Air quality standards for odors.	At present it is not expected that odors will be produced in the treatment process. In the unlikely event that they are, regulation would be applicable.
C. Action Specific ARARs		
40 CFR 147	Wyoming underground injection control programs.	Regulation is applicable for injection of treated ground water back into aquifer.
40 CFR 264.190 - 198	Requirements for facilities that use tank systems for storing or treating hazardous waste.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.190	Applicability.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.191	Assessment of existing tank system's integrity.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.192	Design and installation of new tank systems or components.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.193	Containment and detection of releases.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.194	General operating requirements.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.195	Inspections.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.196	Response to leaks or spills and disposition of leaking or unfit tank systems.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.197	Closure and post-closure care.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.
40 CFR 264.198	Special requirements for ignitable or reactive waste.	If remedy includes the use of tanks to store or manage RCRA wastes, regulation is applicable.

ARAR CITATION	REQUIREMENT	EVALUATION
40 CFR 268	*Land disposal restrictions.*	Land disposal restrictions are not applicable to these activities. Instead of LDR, RCRA section 3020 applies to reinjection of treated ground water into Class IV injection wells during CERCLA response actions. Moreover, for CERCLA response action where, as here, the goal is to clean up ground water to drinking water levels, the Agency believes that health-based drinking water standards (e.g., MCLs), rather than LDRs, will generally be the relevant and appropriate clean up standard.
Wyoming Water Quality Rules and Regulations, Chapter III, Section 15.	Data requirements for permit applications for the construction of treatment works, disposal systems, and other potential sources of pollution.	Remedy incorporates treatment and disposal of ground waters exceeding MCLs. Regulation is applicable.
Wyoming Water Quality Rules and Regulations, Chapter IX.	Permit requirements for construction, modification, and operation (BACT).	Substantive requirement of BACT analysis are applicable.
Wyoming Air Quality Standards and Regulations, Section 18.	Prohibits the use of methods or devices which would conceal or dilute an emission from a source.	Regulation potentially applicable or relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 19.	Emissions excursions due to unusual operating conditions shall not be a violation of the regulation.	Regulation potentially applicable or relevant and appropriate.
Wyoming Air Quality Standards and Regulations, Section 21.	Permitting requirements for new sources of air emissions.	Substantive requirements potentially applicable or relevant and appropriate for alternatives utilizing technologies which would result in air emissions.

mbresp6

RESPONSIVENESS SUMMARY
MYSTERY BRIDGE ROAD/U.S. HIGHWAY 20 SUPERFUND SITE
OPERABLE UNIT 1 - GROUND WATER

INTRODUCTION

This responsiveness summary is organized into four sections:

I. Background of Community Involvement
II. Community Concerns
III. State Concerns
IV. PRP Concerns.

I. BACKGROUND OF COMMUNITY INVOLVEMENT

Community interest in problems at the site became very intense in late 1986 when site contamination problems first surfaced and the ATSDR advisory was issued. Early public meetings, many of which were attended by as many as 100 people, often became highly emotional encounters between concerned residents and public officials. Media coverage was extensive, including coverage by local and State newspapers and TV stations as well as some national television coverage.

State legislators and Congressional staff members took a great interest in site activities. The community's letter-writing campaign extended to the White House.

The community was divided early over appropriate means of obtaining information and having input to decisions being made about site activities. Three groups formed, each with its own interest, making communication difficult. One group clearly was interested in having the government buy their properties and move them out of the area. Another group was a board established during the early phase of the Brookhurst Subdivision's growth to serve as a legal entity for Brookhurst residents in improvement projects. A third group was made up of residents of the Mystery Bridge Subdivision who asked that they be recognized separately from either group in Brookhurst.

Initial community involvement was coordinated by an EPA removal program community relations coordinator, as well as by a field liaison from EPA's Office of External Affairs, EPA's Wyoming office representative and EPA's On-Scene Coordinator for the site. Early activities included meetings with citizen groups and interested parties and a public meeting held at the Evansville School on December 5, 1986. On that date, EPA also issued a fact sheet describing EPA's role in site work and immediate plans for the site. Those plans included providing bottled water to site residents until a permanent supply could be provided. EPA began installing bottled water dispensers on December 15. Most residents signed up by January.

EPA's removal community relations coordinator prepared a Community Relations Plan in December 1986. The plan included activities designed to disseminate information, identify key concerns of residents and other interested parties, keep public officials informed and develop an overall communication network for the site.

On January 14, 1987, EPA held a second public meeting at the Evansville School and released a second Fact Sheet. Topics at the meeting included EPA's installation of a monitoring well system, plans for a permanent water supply favoring an Evansville hook-up, and a discussion of air monitoring work, including work to be performed by the Wyoming Department of Environmental Quality (WDEQ) and limited indoor monitoring to be

conducted by EPA. The January 14, 1987 fact sheet and a subsequent January 20, 1987 fact sheet also focused on these aspects of site work. One community group at the meeting demanded that a complete health assessment of the subdivision be performed by EPA.

On February 14, 1987, at the request of one community group, Wyoming's new Governor, a state Senator and the Director of the WDEQ, visited an estimated 100 residents at the subdivision to hear their concerns and reaffirm the State's commitment to them. Three days later, on February 17, the Governor issued a press release identifying a schedule for State investigations, including soil sampling, investigation of dumping sites, and investigation of complaints lodged regarding industries contributing to the contamination. Additionally, in response to citizen concerns, the Governor announced that a 1,000 gallon tanker from the National Guard would arrive on February 17 and begin dispensing water to site residents to be used for other domestic purposes, such as bathing and showering.

On February 27, 1987, EPA held a third public meeting and distributed the first EPA information update (Update No. 1). The update described EPA's authorities under the remedial and removal programs, as the Agency began studies leading toward long-term remediation of the site. The update also contained a discussion of recent and projected community involvement activities. These included a three-day visit by an EPA representative to meet with concerned citizens. EPA also announced that a community involvement representative would be made available after March 2nd to meet with residents and hear their concerns. Other activities included development of an initial mailing list of residents and concerned individuals for use in disseminating site information. The update identified a toll-free number for community members to contact EPA directly with questions or concerns.

An estimate 150 people attended the February 27th public meeting. EPA presented a progress report on actions related to groundwater monitoring and plume delineation as well as evaluation of a permanent public water supply system. EPA and WDEQ staff discussed soil sampling, surface and tap water sampling, ambient air monitoring, indoor air monitoring, a source inventory and an area waste disposal inventory. EPA explained the hazard ranking system (HRS) and how it is used in determining NPL listing. A public health advisor from ATSDR answered questions about possible health effects of the contamination. Some residents vehemently voiced their concerns about health risks.

By the week of March 2nd, two community liaisons had been posted in the area by EPA and Wyoming's Governor. Both were temporarily situated in EPA's Wyoming field office in Casper. During early March, the liaisons held meetings with community groups and individual community residents and involved public officials. Vital concerns expressed during these meetings continued to relate to fears regarding the health and safety of children and adults at the site and frustration over perceived government indifference. Some residents continued to assert that relocation was the only solution acceptable to them. Additional issues which were emerging included: concern regarding the safety of showering with contaminated well water; concern over the safety of Evansville's drinking water as a permanent alternate water supply due to elevated trihalomethanes (THM) levels and traditional mistrust of Evansville's water quality; water resource concerns; concern regarding the potential for "off gassing" (i.e., the potential for upwardly migrating vapors from contaminated groundwater to cause soil and air contamination); and concern whether EPA would be able to ensure that surrounding industries would not recontaminate the area in later years.

The liaisons initiated contact with local TV and press representatives on March 5th to explain their role in the community involvement efforts and to notify the media of their

availability. A press briefing was held by representatives from EPA and the Governor's office at the end of March which included representatives from local television stations (Ch. 2, 14 and 20) and newspapers (the Casper Star Tribune and Casper Journal). Due to requests of press members in attendance, briefings were provided on the scope of the ESI work plan, the HRS process, and its relationship to NPL listing.

Other community involvement activities in March 1987 included distribution of Update No. 2 and a THM fact sheet, and establishment of two information centers, one located at the Evansville School Library and one at EPA's Wyoming office. The work plan for the ESI, which included the sampling plan for ESI work, was also released for public comment from March 6 - 20, 1987. Copies of the report were made available for review at the two information centers. Additional copies were provided to the three organized community groups for distribution to their members and other interested residents. On March 26, 1987, EPA issued a press release announcing upcoming ESI activities to be conducted under the direction of the EPA Remedial Project Manager. The Governor's office also initiated activities in March to provide free counseling through the Central Wyoming Counseling Center, in response to residents' concerns over mental stress created from living at the site. Approximately seven subdivision families took advantage of this service.

April 1987 activities included an invitation for the public to review and submit comments on EPA's evaluation of potential permanent water supply sources, as contained in the draft version of the Permanent Water Supply Source for the Brookhurst Subdivision. The public comment period extended from April 3rd to April 17th.

On April 13, 1987, Governor Sullivan announced the formation of the Brookhurst Environmental Task Force. The Task Force was composed of representatives from the Brookhurst and Mystery Bridge subdivisions, EPA, WDEQ, the Natrona County health and planning departments, the Casper Board of Public Utilities, the Wyoming Community Development Authority (WCDA), Natrona County legislators, and the Mayor of Evansville.

Three local residents, including members of the three community groups and a representative-at-large from the Mystery Bridge area, were members. The Task Force's goal was to increase interagency communication and coordination to expedite resolution of environmental problems at the site and to involve area residents in the process. Three Task Force meetings were held in April focusing on such issues as providing available WCDA housing to interested residents and possible replacement of the National Guard water truck.

On April 15, EPA mailed its responsiveness document to commenters on the draft ESI work plan. The comments were also discussed at an April 16, 1987 public meeting held at the Casper City Council Chambers. Other topics of discussion at that meeting included status of WDEQ investigation of 34 complaints regarding industries in the area, an overview of EPA's water quality program, presentation of public water supply options, the status of the ESI, and the status of temporary housing activities. Speakers included EPA, WDEQ and WCDA representatives.

On May 4, 1987, EPA released sampling results from 28 monitoring wells sampled during March. Well samples had been tested for 129 priority pollutants, including pesticides and metals. EPA Update No. 3 was also prepared and distributed in May. The update addressed continued concern of residents over the safety of using contaminated well water for irrigating gardens and watering livestock, and included a Fact Sheet clarifying ATSDR and EPA's evaluation of health effects from exposure to contaminated well water. The Task Force held three more meetings in May continuing to explore numerous issues, including issues related to options for a permanent water supply system.

Task Force meetings continued in June. In mid-June, the representative from one of the Brookhurst groups resigned from the Task Force, citing concern that Brookhurst residents' wishes had been ignored in the choice of Evansville as the supplier of a permanent water supply system for the site and voicing her opinion that the Task Force was not worthwhile. The final draft ESI report was released by EPA on June 30, 1987, with public comment solicited from June 30-July 14. Copies of the report were distributed to the Brookhurst and Mystery Bridge groups as well as placed in the two current information centers at EPA's Wyoming office and the Evansville Town Hall. The Town Hall was selected instead of the Evansville School library due to the limited summer hours in which the school was open to the public.

On July 9, 1987, a public meeting was held at the Casper City Council Chambers for citizens to discuss the ESI report with EPA and WDEQ representatives. The meeting included a heated exchange regarding the ESI report's findings that the site was "habitable" and a buyout was unwarranted, as well as its recommendation that the site be hooked up to the Evansville water supply with the water intake relocated above the Casper wastewater treatment plant. As a result of concerns voiced at this meeting, the public comment period for the ESI report was extended through July 21.

Also in July 1987, with identification of a permanent water supply and growing emphasis on the installation of the permanent supply system, the Governor requested that the Task Force begin to redefine its role and membership composition to reflect a new focus directed at providing oversight and serving as a liaison between the Governor, the state, county commissioners, EPA and site residents. Plans were made to disband the existing Task Force by the end of July when final approval of the ESI report was anticipated. The Task Force was to be replaced with an oversight committee with a focus on overseeing the timely implementation of the permanent water supply system.

On July 21st, at the request of the Brookhurst Citizens Committee (BCC), members of the BCC met in Denver, Colorado with EPA's Regional Administrator. The residents' purpose for the meeting was to voice their concerns regarding health effects and to stress their conclusion that a buyout was the most protective and cost-effective solution for the site. The meeting ended abruptly when the EPA Regional Administrator reaffirmed EPA's position that the subdivision was safe with the planned water supply and that residents would not be relocated.

In August 1987, EPA released its responsiveness summary addressing comments obtained from citizens on the final draft ESI report. EPA Update No. 4, also distributed during the month, addressed concerns regarding the permanent water system, including fire protection in connection with the new water system, user rates, potential water supply concerns and concern by residents over industrial user hookups.

The newly formed Governor's Oversight Committee held its first meeting on August 13 with subsequent Governor's Oversight Committee meetings occurring on August 27th, September 4th, and thereafter on a periodic basis. Membership included many members of the original Task Force and expanded resident representation to five. Residents chose their own representatives for the Committee. The Governor's objectives for the committee were identified at the August 13 meeting. These objectives included serving as a direct liaison with the Governor's office and EPA; ensuring construction time-lines were maintained; coordinating residents' inquiries; releasing updated information on the progress of the water transmission line; overseeing the construction project; and serving as a technical coordination body between the federal government, the State and Natrona

County. EPA used this forum regularly to update site residents about site activities and to discuss concerns raised at the meetings by resident representatives.

In October 1987, EPA distributed Update No. 5, providing a status on the water supply source decision and water line installation. EPA's Administrative Record for public use for this action was placed in EPA's Wyoming office. Again, due to concerns regarding public hours, the location of the second information center was switched from the Evansville Town Hall to the Natrona County Library in October. Because of space constraints at the library, however, only the index of the Administrative Record and key technical documents were housed there.

In December 1987, EPA Update No. 6 was distributed. It included a discussion of the two Administrative Orders on Consent (consent orders) issued by EPA on December 15 to three PRPs – KN Energy, Dow Chemical Company and Dowell Schlumberger. The focus of the removal orders was to clean up suspected sources of groundwater contamination on KN and Dow Chemical Company/Dow Schlumberger properties. Update No. 6 also discussed a third consent order negotiated by EPA with the three parties requiring the PRPs to conduct the RI/FS phase of Superfund activities at the site. The purpose of the RI/FS work was to investigate environmental damage and identify alternatives for cleaning up site contamination. The RI/FS Administrative Order on Consent was submitted for public comment from December 5, 1987 to January 29, 1988, the Agency designating a longer comment period than usual due to the holidays.

On January 27, 1988, the Governor sent a memo to the Governor's Oversight Committee addressing some members' feelings that the committee should disband. The Governor recommended instead that the committee remain in force until all members collectively agreed its goal had been accomplished and suggested meetings should be scheduled only when necessary. Governor's Oversight Committee meetings continued periodically through the spring of 1988 providing updates on the progress of the removal work and exploring other site issues consistent with the committee's objectives.

EPA updates were prepared and distributed in March and May 1988. These updates provided a status on the progress of removal work, RI/FS work and RCRA work at the site. On March 16, EPA released its responsiveness summary to public comments on the RI/FS Administrative Order on Consent. A public comment period was held from April 14 - 27 on the PRPs' draft RI/FS work plan.

On June 2, the status of Superfund and RCRA enforcement investigations and related WDEQ site investigations were discussed at a Governor's Oversight Committee meeting. During the meeting, Governor's Oversight Committee members discussed the need for streamlining and again redefining composition and goals of the committee to address a different set of objectives reflective of the growing focus of site work on RI/FS activities.

In late May and early June 1988, the EPA Community Involvement Coordinator and contractor personnel conducted meetings in Wyoming and Colorado with site residents, public officials and representatives of the PRPs, to aid in updating EPA's community relations plan for the site.

On June 22, EPA released its responsiveness summary to public comments on the draft RI/FS work plan. The final work plan was approved on July 13, 1988.

On August 24, the Governor announced that the Oversight Committee had indeed fulfilled its mission with the virtual completion of the water line and indicated that EPA and WDEQ would continue some forum for discussing technical issues with community members

throughout the RI/FS. On August 26, EPA and WDEQ sent a special notice announcing the formation of a new technical coordination group with two important objectives: (1) informing and discussing site activities with the public, and (2) interagency coordination.

The newly formed Technical Coordination and Discussion Group (TH.D.) met on a regular basis with members of the community to discuss technical progress at the site and to ensure continued coordination among the various governmental entities involved. The last of these meetings was held October 26, 1989.

The Governor's office provided for minutes of these meetings to be recorded. Meetings minutes were regularly distributed to everyone on the site mailing list.

In November 1988, EPA issued the revised Community Relations Plan for the site providing site background, community involvement history and a strategy for continuing to work with community members and various governmental organizations to ensure involvement in the decision-making process.

EPA prepared and distributed additional information updates in August 1988, October 1988, December 1988, April 1989, August 1989, and October 1989. These updates contained information on the status of site activities and addressed concerns raised during periods between updates. In addition, the Agency developed and distributed a fact sheet in January 1990 which discussed the results of the site risk assessment.

The RI/FS for the site was completed in June 1990. In July 1990, the Proposed Plan was mailed to everyone on the site mailing list and distributed to the Administrative Record at the Natrona County Library. A public comment period was held from July 5 - August 3, 1990 on the Proposed Plan. A public meeting was held July 18, 1990 at Casper City Council Chambers to discuss the Proposed Plan with the interested public. An ad summarizing the Proposed Plan and announcing the public meeting was placed in the Casper Star Tribune July 1, 1990.

EPA received three sets of written comments during the public comment period. Two of these were from lawyers representing PRPs at the site; one was from a technical expert hired by attorneys representing approximately 268 parties (84 or 85 families) in connection with claims arising from contamination of the Brookhurst and Mystery Bridge subdivisions. Two oral comments were received at the public meeting. Comments are summarized below, along with EPA's responses.

II. COMMUNITY CONCERNS

A summary of verbal comments made during the July 18, 1990 Mystery Bridge public meeting, and EPA's responses to those comments follow:

Comment #1: One resident commented that her residential well was contaminated with BETX, but EPA's maps included in the proposed plan indicated that the well is within the VHO plume, and not within the BETX plume.

EPA Response #1: During the public meeting, the Remedial Project Manager stated that he could not respond directly to the comment, but would investigate and respond in writing. On September 21, 1990, the response was sent to the commenter; a copy of the letter is included as Exhibit 1 to this summary. EPA's response stated that, based on the analytical results from samples taken from monitoring wells several times from 1987 through 1990, EPA believes there is no correlation between the BETX plume from KN or the plume emanating from the LARCO facility and any BETX in her well.

Comment #2: The same resident asked if the proposed remedy would eliminate the non-VHO chemicals from her well water.

EPA Response #2: EPA believes that if the proposed remedy performs as expected, contaminants from DOW/DSI and KN, including non-VHO contaminants, in the ground water throughout the site will be reduced to levels that are in compliance with the federal and state regulations and the health risks from ingestion of the ground water contaminated from these sources will be reduced to acceptable levels.

Comment #3: The same resident requested that she receive a copy of the RI/FS report for review.

EPA Response #3: The commenter was told at the public meeting that the RI/FS and all the other reports are available for public review at the three locations listed in the Proposed Plan. EPA sent a copy of the RI/FS report to the commenter. In addition, this particular commenter has been receiving technical documents leading to the RI/FS for the past two years because she has been on EPA's technical document mailing list.

Comment #4: One attendee at the public meeting asked how many years the EPA would be monitoring the ground water to make sure that the remedy is effective.

EPA Response #4: The Remedial Project Manager answered the question in two parts. During the remedial action phase, EPA will monitor to evaluate the behavior of the ground water system and the removal of the contamination. After the ground water has been cleaned up to acceptable levels, and if contamination is left on site, EPA would continue to monitor at least every five years until the potential for contamination of the ground water is eliminated. The second operable unit (OU 2) for the site will address contaminant source areas, particularly those soils on and immediately adjacent to the industrial areas.

EPA received one letter providing comments from the community during the public comment period. The letter came from Dr. Patrick Sullivan. A copy of this letter is appended to this summary as Exhibit 2. Dr. Sullivan is an independent environmental consultant hired by the law firm of Spence, Moriarity and Schuster in Cheyenne, Wyoming. This law firm represents approximately 268 parties (84 or 85 families) in connection with claims arising from contamination of the Brookhurst Subdivision.

The comments are grouped under a topic heading. Each specific comment made by Dr. Sullivan is first quoted, and then the EPA response is provided.

TOPIC: Characterization of the Alluvial Aquifer-Aquifer Homogeneity.

Comment #5: The RI/FS assumes that the alluvial aquifer is composed of homogeneous porous media that is a "poorly sorted clay to sandy clay with a coefficient of permeability ranging from 3.9×10^{-3} to 5.6×10^{-5} cm/sec" that was determined from five samples (page 28).

EPA Response #5: The statement cited refers to laboratory permeability tests conducted on undisturbed samples of "the upper fine grained layer" collected during monitoring well installation. These are samples of the surficial soil layer at the site, which generally lies above the local potentiometric surface and above the saturated aquifer zone. Thus, while these data are relevant to the possible transport and/or retention of contaminants spilled at the surface, they are not relevant to the question of ground water flow and contaminant transport through the saturated alluvial aquifer.

Comment #6: "The horizontal component of flow in the alluvial aquifer is consistently to the northeast with only minor and local variations. (page 29)".

EPA Response #6: Based on the ground water elevation maps given on Figures 19A, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, and 19J of the RI/FS report, the statement cited is an accurate portrayal of available data and site conditions. There appears to be no reason to question, qualify, or modify the cited statement.

Comment #7: "There were only eight wells (i.e., opportunities to characterize the alluvium in the subdivision) installed in the Brookhurst area. No detailed split-spoon sampling (or boring logs) were correlated or compared to determine alluvial soil texture variations".

EPA Response #7: OBG installed 11 monitoring wells on and adjacent to the site (Well IDs: OBG-2, -3, -4, -5, -6, -7, -8, -9, -11, -12, and -13). Of these, 6 were located within the Brookhurst Subdivision (see RI/FS Figure 11). All 11 wells were drilled to bedrock, and detailed boring logs developed from split-spoon samples are provided in Appendix D of the RI/FS report. The 1987 Expanded Site Investigation (ESI) includes comparable boring logs from 28 wells installed on behalf of EPA, including 10 located within the subdivision (RI/FS Figure 11). Consequently, detailed split-spoon sampling and boring logs are available for a total of 39 wells, 16 of which are located within the Brookhurst Subdivision.

Comment #8: "No resistivity studies (or borings) were completed to determine the potential presence of old river channels ..."

EPA Response #8: As noted above, data are available from 39 borings completed to bedrock in the area. In the RI/FS report, Figure 12 provides a map of the bedrock surface inferred from the boring data. A distinct channel in the bedrock surface is noted on the figure, and discussed on page 18 of the RI/FS report. In general, the axis of this channel coincides with the general northeasterly direction of ground water flow in the study area.

Comment #9: "Aerial photos of the subdivision in 1962 clearly show that the initial segment of Elkhorn Creek is man-made and the current contamination that exists at this site follows this man-made channel. How is this factor incorporated into the modeling of the alluvial aquifer?".

EPA Response #9: It is apparent from other maps of the area and from site surveillance that the channel of Elkhorn Creek has been artificially altered through the industrial properties south of the subdivision. However, it is not believed that channelization of Elkhorn Creek is a significant factor in the transport of contaminants through the underlying ground water aquifer.

The creek channel is only a few feet deep, whereas the ground water surface in the alluvium is about 30 feet deep. Thus, although the creek does appear to be losing flow as it traverses the site, it does not appear to be in direct hydraulic communication with the underlying ground water. The flow lost by the creek probably recharges the ground water by percolation through 20 feet or more of unsaturated alluvium. This recharge in turn is generally distributed over a considerable length of the creek, not concentrated in the industrial areas. Contaminated ground water is observed directly beneath the industrial properties, and in places upgradient from the creek bed. It is thus unlikely that the creek channel serves to direct the flow of contaminants on the surface or in the subsurface. Furthermore, the contaminant plumes, although well-defined, are not defined in such detail that they can be directly correlated with the right-angle bends observed in the channelized creek bed.

To the extent that the direction of contaminant plume movement can be correlated with either the natural or artificial direction of stream flow in Elkhorn Creek, it is probably because both the ground water and surface water gradients are generally to the northeast, towards the North Platte River. This general direction of ground water flow has been incorporated into modeling of the alluvial aquifer, but there appears to be no reason to incorporate the specific effects of recharge from Elkhorn Creek into the modeling.

Comment #10: "The VHO plume models in the 1987 Site investigation show trends toward the west side hydrocarbon plume direction.

EPA Response #10: The trends noted are believed to be largely artifacts of the data contouring. Subsequent data plots do not clearly show such trends (see RI/FS report Figures 50A, 50B, 50D, 52A, 52C, and 52E).

Comment #11: "The geologic data provided in the RI/FS do not support an interpretation of a relative uniform alluvial aquifer. It is strongly recommended that a more detailed characterization of the alluvial aquifer be completed ..."

EPA Response #11: EPA believes that substantial data have been collected on the nature of the alluvial aquifer at the site, and that the data overwhelmingly support a conclusion that the aquifer is in fact relatively homogeneous in its makeup and hydrologic properties, although it is recognized that the aquifer is of variable thickness because of its presence within a channel in the bedrock surface.

A review of the well log data provided in the ESI and Appendix D of the RI/FS report indicates that the predominant material detected below the level of first water occurrence is a tan, fine to coarse sand with some gravel, with a Uniform Soil Classification of SW (well-graded sand or gravelly sand with little or no fines). Approximately 84% of the total alluvium penetrated below the water table in 35 borings is classified as SW. In 15 of 35 borings, the entire alluvial interval penetrated is SW, while in only 2 of 35 borings does SW constitute less than half of the interval penetrated (in those two wells, the predominant material encountered below the water table is gravel, GP or GW). Based on gradation analyses of 11 samples collected during monitoring well installation, the proportion of sand varied from 46% to 90%, with the proportion of sand exceeding 75% in 10 of the 11 samples.

TOPIC: Modeling Analysis

Comment #12: "The discussion of the sensitivity analysis pertaining to the predictions of contaminant transport modeling (beginning on page 107) of VHO plume is only theory. What actual laboratory or field tests were performed to verify the selected conditions? ..."

EPA Response #12: The sources of data used in the sensitivity analyses are noted in the RI/FS on Table 10. Hydraulic conductivity, hydraulic gradient, porosity, and saturated thickness were based on field measurements at the site. Longitudinal and transverse dispersion coefficients were based on values reported in the literature for materials of similar composition to those observed during sampling of site borings. Retardation coefficients were based on published values of organic-carbon partition coefficients for contaminants of interest, plus estimates of soil organic carbon content, porosity, and bulk density based on values reported in the literature for materials of similar composition to those observed during sampling of site borings. In general, EPA believes that the data used in the sensitivity analyses are reasonably representative of site conditions.

Comment #13: "...The predictions and sensitivity analysis pertaining to the Brookhurst site would be more believable if the EPA could provide one or more examples of how modeling and the subsequent sensitivity analysis have actually performed in predicting remediation effectiveness for other sites..."

EPA Response #13: The sensitivity analyses were conducted in order to determine the sensitivity of model predictions to uncertainty in the model input parameters. Thus, the different input parameters were varied across their possible ranges of values as determined from site-specific data or published data, and predictions made of contaminant plume configurations. In this manner, it was possible to determine which input parameters were more important in affecting predicted plume configuration. In addition, by comparing predicted plume configurations with the observed configuration based on field data, it was possible to "calibrate" the model by selecting a set of input parameters which resulted in a predicted plume configuration most nearly consistent with the observed configuration. Thus, it is not necessary to demonstrate that the model reasonably predicts contaminant migration at other Superfund sites, as suggested by the commenter, since the model reasonably predicts past contaminant migration at this site.

TOPIC: Bedrock Surface

Comment #14: "The limited number of wells completed in the Brookhurst area does not provide many data points to determine a reasonable representation of the bedrock surface contours."

EPA Response #14: EPA believes that sufficient data are available to adequately represent bedrock surface contours. As noted above, data are available from 39 borings completed to bedrock in the area. Figure 12 of the RI/FS report provides a map of the bedrock surface inferred from the boring data. A distinct channel in the bedrock surface is noted on the figure, and discussed on page 18 of the RI/FS report. In general, the axis of this channel coincides with the general northeasterly direction of ground water flow in the study area. Figure 12 also shows the elevation of the top of bedrock at most of the wells in the study area, so that bedrock contour maps with a contour interval less than ten feet could be constructed if necessary

TOPIC: Trace Element Distributions and Cleanup

Comment #15: "EPA monitoring wells 1-3, 1-8, 1-9, 1-10, 2-11, and 2-14 that occur within or adjacent to the KN Energy BETX plume all either exceed chromium and/or lead MCL's. What is the extent of the distribution of these trace elements with this plume?...Are lead and chromium not a hazard?"

EPA Response #15: The reported concentrations of lead and chromium in unfiltered ground water samples exceeded MCLs at several wells. Twenty-five of forty samples exceeded the MCL for chromium, with the maximum value about 3 times the MCL. Fifteen of forty samples exceeded the MCL for lead, with the maximum value about 2.5 times the MCL. For chromium, the mean concentrations were approximately the same for wells upgradient of the industrial sites, on the industrial sites, and immediately downgradient of the sites (about 65 ug/L). For lead, the mean concentration for wells immediately downgradient from the industrial sites was about twice that for wells upgradient of or on the industrial sites. Most of the elevated lead values were from wells far to the east of the BETX plume from the KN property, and cannot be readily correlated with the plume.

It should be noted, however, that the elevated metals concentrations discussed above were for values from unfiltered ground water samples. Dissolved concentrations of metals in

ground water are generally determined from filtered samples so as to avoid bias from suspended particles in the water collected from a monitoring well. Only one filtered sample exceeded a primary MCL (234 ug/L silver in well EPA 1-12). Furthermore, none of the ground water samples reported in the ESI exceeded MCLs for any trace metals. Thus, there is not believed to be a significant health threat from trace metals in ground water in the study area.

TOPIC: Southeast Soil Gas Analysis

Comment #16: "...the GC air analyzer having a photoionizable (PID) detector will not detect compounds such as methylene chloride and acetone. In order to detect these compounds a FID detector would be required. Because a GC with a PID detector was used, a potential plume containing methylene chloride and acetone that is indicated in residential well waters was not investigated. This is suggested for the following reasons:

a) NATCO is a potential source of methylene chloride and acetone based on use of paint thinners, painting and stripping.

b) Numerous residential tap water analysis in the area adjacent to NATCO showed elevated levels (an order of magnitude) of methylene chloride and acetone compared to other Brookhurst samples...

d) ...many potential compounds from the southwest area may not have been detected.

As a result, no EPA monitoring wells were installed within the southwestern portion of the subdivision..."

EPA Response #16: It is believed that the commenter is actually referring to the southeastern part of the subdivision, since this is the area adjacent to the NATCO facility. The thrust of the commenter's statements are based on the results of ground water analyses from the ESI. Upon reviewing the data, EPA believes that neither acetone nor methylene chloride are of concern for the following reasons:

- Acetone - acetone levels of the order of 10 ug/L were reported in 11 of about 60 domestic tap water samples in 1987. Only one of the samples was from the vicinity of the NATCO facility; eight of the samples were from the northeastern part of the subdivision, adjacent to the river, and the other two were from the west-central part of the subdivision. Several values of about 20 ug/L were reported in wells in the southeastern part of the subdivision, although acetone was also detected in associated laboratory blanks and was detected at comparable levels in a contemporaneous field blank.

  Acetone was reported in 1987 from only three monitoring wells in the industrial area, and from none of the monitoring wells in the Subdivision. During subsequent sampling, acetone was reported only from three wells near the northern KN property line, although all three values are unreliable because acetone was also detected in the associated blank samples, suggesting laboratory contamination or presence of acetone in the sampling containers.

- Methylene chloride - methylene chloride was reported in several domestic tap water samples in 1987. In the area north of Rawhide Road, between Buckskin Road and Elkhorn Creek, methylene chloride was reported in four

wells at levels of 76 to 668 ug/L; in a fifth well in this area, methylene chlorid was reported at only 4 ug/L. All of these values are unreliable because methylene chloride was also detected in the associated blank samples, suggesting laboratory contamination or presence of methylene chloride in the sampling containers.

In the southeastern part of the Subdivision, near the NATCO facility, methylene chloride was reported in six domestic well samples at levels comparable to those seen in a field blank. Methylene chloride was also reported in the associated laboratory blanks.

In subsequent sampling of monitoring wells, methylene chloride was reported in February 1988 at about 20 ug/L in four wells in the industrial area and five wells downgradient of the industrial area. Methylene chloride was also reported in February 1988 at 480 to 910 ug/L at three wells along the northern property line of KN. All of these values are unreliable because methylene chloride was also detected in the associated blank samples, suggesting laboratory contamination or presence of methylene chloride in the sampling containers. In addition, all of the wells where methylene chloride was reported are interspersed among several more wells where methylene chloride was not detected, so there is no definite pattern of methylene chloride presence in the ground water.

Despite the fact that neither acetone nor methylene chloride has been unambiguously or continuously reported in ground water samples from the area, these parameters will continue to be monitored during remedial activities to assure that they pose no health risk.

TOPIC: Modeling and Homogeneous Aquifer

Comment #17: "The model in this RI/FS used hydraulic conductivity values based on the Horslov *(sic)* method ... One should be careful in using Harslov *(sic)* method values for the following reasons:

a) The Horslov *(sic)* method gives only an order of magnitude estimate for hydraulic conductivity...

b) There were not enough data collected for a proper Horslov *(sic)* analysis..."

EPA Response #17: The data collected during the slug tests were limited because of the rapid recovery of water levels in the wells due to the relatively high hydraulic conductivity of the alluvial aquifer material. Given the limited data available for analysis, the Horslev analysis may be most appropriate because it is the simplest, most direct method of slug test analysis. Furthermore, the relatively high degree of consistency among calculated values of hydraulic conductivity based on different methods (slug tests, pumping tests, and grain size analysis - see Appendix H) indicates that the hydraulic conductivity of the aquifer has been adequately characterized.

Comment #18: "Contaminant plume shapes clearly indicates the heterogeneities in the aquifer. The values used for model sensitivity analysis (Table 10) and the basis for these values, clearly show the heterogeneous nature of the aquifer".

EPA Response #18: It is recognized that the various aquifer tests suggest a degree of inhomogeneity. Calculated values of hydraulic conductivity based on the field tests range over more than an order of magnitude. However, data from nine of fourteen wells which

were tested range from 1.1 to 6.0 x 10^{-2} cm/sec and vary by only a factor of about five from minimum to maximum. Only one well exhibited a value less than 1 x 10^{-2} cm/sec, and only four exhibited values greater than 1 x 10^{-1} cm/sec. As noted below, this degree of heterogeneity in aquifer properties has been incorporated into the modeling predictions.

Comment #19: "While 'porosity range for these tests was 24 to 34%...' (page 28), sensitivity analysis uses 35 to 45% porosity..."

EPA Response #19: The commenter's observation is correct that some site data suggest a possibly lower range of porosity than that used in the modeling effort. On the other hand, the model sensitivity analyses indicated that porosity was a much less significant parameter than the Darcy velocity which is controlled by the hydraulic conductivity and gradient observed in the aquifer. Furthermore, the model calibration (as discussed above) indicated that the default value of porosity used in the model resulted in a predicted plume configuration which reasonably matched the observed plume configuration. Consequently, EPA does not believe that the inadvertent omission of lower porosity values in the modeling effort significantly affects the model predictions or the ultimate selection of remedy.

Comment #20: "...a description of the model is not provided, which makes it difficult to evaluate how the model is calibrated/validated...if the model is based on the analytical solution, then heterogeneities cannot be incorporated in the model".

EPA Response #20: The uncertainties in some aquifer properties noted above have been incorporated into the predictive modeling of contaminant transport through the stochastic features of the model employed. As noted on pages 107 and 108 of the RI/FS report, the contaminant transport model was based on "...an analytical solution for a two-dimensional contaminant plume in a uniform ground water flow field." Although it is true, as noted by the commenter, that an analytical model cannot directly incorporate aquifer heterogeneities, the application of the model in the present case implicitly incorporates such heterogeneities through its stochastic features. That is, as described on page 108, values of each input parameter are randomly chosen from their ranges of possible values and a value of contaminant concentration at a point and time of interest is calculated. The random selection of input parameters and calculation of contaminant concentrations is repeated thousands of times so as to develop a probability distribution of predicted contaminant concentrations. The most probable resulting value is thus one which does incorporate the uncertainty involved in representing the actual aquifer as a uniform, homogeneous aquifer.

TOPIC: Free Product Plume from LARCO

Comment #21: "EPA 2-4 well is located inside the free product plume from LARCO. However, ground water sample from this well shows Toluene, Xylenes, and Ethyl Benzene below detectable limits. These components are commonly found in gasoline and refinery products. Absence of these product in the ground water sample at EPA 2-4 well is a clear indication of sensitivity of dissolved hydrocarbons on the vertical location where sample was taken.

Hydrology literature is full of examples where dissolved product plume extends much further than the free product plume. Remediation efforts should take that into account. Also, adsorbed and trapped hydrocarbons in the vadose zone (unsaturated region) will continue to act as source of contamination for the ground water. Trapped hydrocarbons can exist even inside the water table due to seasonal water level fluctuations.

How does the LARCO result influence EPA's understanding of the BETX plume that is considered for remediation?..."

EPA Response #21: The LARCO facility is under the jurisdiction of the Resource Conservation and Recovery Act (RCRA) and contamination emanating from the LARCO property (referred to as the RCRA plume) is being addressed under RCRA authority. Well EPA 2-4 is generally indicated as being on the fringe of the RCRA plume, while well EPA 2-5 is shown as being in the interior of the RCRA plume (ESI, Figure 6-5). As can be seen from the data of Table 9 of the RI/FS report, the observed values of all four BETX compounds have consistently been observed at relatively high levels at well EPA 2-5. At well EPA 2-4, values slightly above detection levels have been sporadically observed for all BETX compounds except ethylbenzene. These results are believed to be consistent with the observations associated with the BETX plume originating at the KN property, where a plume of dissolved BETX compounds in excess of MCLs and proposed MCLs is located within a plume of floating hydrocarbons of greater extent (RI/FS report Figure 60).

EPA recognizes that there is not a perfect correlation between the presence of free hydrocarbons floating on the water table and the presence of elevated levels of BETX compounds. EPA agrees with Dr. Sullivan and recognizes that free hydrocarbons floating on the water table, or free hydrocarbons held in the aquifer pores above or below the water table, can constitute continuing sources of ground water contamination. Consequently, the proposed remedial action includes continuation of the ongoing removal action involving vapor recovery and free hydrocarbons recovery, as well as extraction and treatment of contaminated ground water. In addition, continued ground water monitoring following termination of the remedial action will detect any effects of continuing contaminant sources so that remedial actions can be reinstituted if necessary.

EPA will continue to coordinate the planning and implementation of the CERCLA/RCRA clean up activities for the ground water problems at the site.

TOPIC: PCP and Other Contaminants Heavier Than Water

Comment #22: "...No effort has been made to obtain vertical profile of PCP at any location. Since bedrock elevations are also not mapped, which can give potential trap locations for these heavier contaminants...Given that PCPs were detected in the vicinity of the Burlington-Northern Railroad right-of-way, there is the potential that heavy wood treating waste may exist and have accumulated within depressions of the bedrock surface".

EPA Response #22: PCP was reported at quantifiable levels in nine wells, and estimated levels in another four wells, in March 1987. The proposed MCL of 200 ug/L was equalled or exceeded at only four wells, only one of which (EPA 2-10) was immediately downgradient of the industrial areas south of the Brookhurst Subdivision.

The wells at which PCP was reported are widely scattered throughout the study area, and cannot be correlated with any industrial source. PCP was reported in an upgradient well (EPA 1-13 at 200 ug/L) and in a bedrock well (EPA 2-1 at an estimated 47 ug/L). PCP was reported in ground water at six locations along the Burlington Northern Railroad right-of-way, but it was not detected at another nine comparable locations along the railroad right-of-way. PCP was not detected in ground water prior to the March 1987 sampling event, and in only one instance was PCP reported subsequent to March 1987 (an estimated 26 ug/L in well EPA 2-6 in April 1989). The RI/FS report notes that PCP was not detected in any ground water samples collected during the RI/FS. Although PCP was not detected in ground water during the RI/FS, the commenter's suggestion is valid and possible PCP contamination will be evaluated in OU 2 for the site.

SECTION III. STATE CONCERNS

At the public meeting, representatives of the State of Wyoming made brief statements to describe the State's position on the proposed remedy. Those comments, provided in Exhibit 3, are summarized below and followed by EPA's response.

Comment #23: "Wyoming DEQ/WQD concurs with the selection of alternatives in Operable Unit #1 and the need for additional investigation of the subsurface soil contamination at the sources for Operable Unit #2."

EPA Response #23: EPA believes that the selected alternative is the best remedy for protection of public health and the environment and appreciates the concurrence of the State in the selection.

Comment #24: "The proposed CERCLA plan and measures being developed under RCRA to address the contamination from the LARCO property need to be integrated into a single comprehensive planning and remediation effort."

EPA Response #24: To the maximum extent practicable EPA will continue to coordinate the planning and implementation of the CERCLA/RCRA clean up activities for the ground water problems at the site. In addition, EPA will also continue to ask for the State's input and concurrence to the remedial action process to the maximum extent practicable.

Comment #25: "The Wyoming State ground water standards must be restored and maintained within an acceptable and timely fashion under both programs."

EPA Response #25: The State's ground water standards have been considered in the remedy selection process for OU 1. Given the technical limitations and the hydrological conditions at the site, EPA believes that the remedial action will achieve the State standard in a time frame that is appropriate and that is consistent of the State's goals and the requirements of CERCLA and the NCP.

SECTION IV. PRP CONCERNS

During the public comment period, letters were received from the legal representatives of KNEnergy, Inc. (KN) and Dow Chemical Company/Dowell-Schlumberger, Inc. (Dow/DSI). These letters are provided as Exhibits 4 and 5. Specific comments are summarized below and EPA's responses follow.

Comment #26: Representatives of Dow/DSI "are concerned that EPA's proposed Remedial Action Plan ... calls for the creation and independent study of a 'second operable unit' for soils...DSI and Dow object to the DSI site's inclusion in the 'second operable unit.'"

EPA Response #26: EPA will evaluate remaining source areas in OU 2 and, as necessary, will determine whether further action is required for contaminated subsurface soils in the vicinity of the industrial properties that were identified during the RI/FS and represent a possible continuing source of ground water contamination.

EPA believes additional consideration of the contaminant source areas is necessary to ensure the long-term effectiveness of the ground water clean up. The RI focused primarily on contaminated ground water and did not address mechanisms which may transport contaminants from soils to water. Removal actions for the KN and Dow/DSI facilities

prevent further migration from source areas into residential ground water. Questions remain concerning the ability of the removal action to eliminate sources of contamination.

Possible contamination at Dow/DSI will be included for consideration in OU 2 until further study indicates that there are no sources of contamination at the Dow/DSI facility. EPA acknowledges the removal actions that Dow/DSI have performed to date at the site.

Comment #27: The attorneys for Dow/DSI "submit that the underground biological treatment as proposed in alternative V6 is unnecessary." and that EPA consider the "option to select a natural attenuation remedy for the DSI site."

EPA Response #27: EPA's selected remedy, particularly Alternative V6, incorporates natural attenuation for the downgradient portion of the VHO plume. Although the alternative as described in the Proposed Plan contemplated *in-situ* bioremediation as an option for the downgradient portion of the VHO plume, EPA has not included *in-situ* bioremediation in the selected remedy for the reasons outlined in the ROD.

Comment #28: Dow/DSI commented that they support the alternative described in the proposed plan. "DSI and Dow agree with EPA that, with the installation of a permanent municipal water supply for the subdivision, all human exposure pathways have been eliminated...the municipal water supply has eliminated the ground water pathway."

EPA Response #28: EPA does not agree that the ground water pathway has yet been "eliminated." Rather, because of the municipal water supply, exposure via the ground water pathway has been reduced. One goal of remedial action in operable unit 1 will be elimination of this exposure pathway.

Comment #29: Representatives of KN submitted the following comments:

- From a management standpoint, EPA should consider each remedial alternative as a separate operable unit.
- EPA lacks the authority under CERCLA to address the KN-related materials at the site.
- Assuming that EPA has jurisdiction under CERCLA to address the KN-related materials, there is no ARAR for floating product.

EPA Response #29: In response to the first comment, EPA has considered separating the remedial action for the BETX and VHO plumes into individual operable units. However, in light of the close proximity of the plumes and the hydrogeological conditions at the site, remedial actions at one plume would effect the remedial actions and potentially the migration of contaminants in the other plume. Therefore, EPA believes that the remedial action for the BETX and VHO plumes should be coordinated as a single operable unit. The State of Wyoming is concerned that the contamination at the site be "integrated into a *single comprehensive planning and remediation effort.*" Although the State is referring primarily to coordination between the CERCLA action and RCRA measures for the plume emanating from the LARCO facility, it is apparent that any separation of the CERCLA action would only add to the State's concerns.

In its comments on the Proposed Plan, KNEnergy, Inc. has asserted that EPA lacks authority under CERCLA to address releases from the KN facility. KN bases this contention on the assertion that "the CERCLA petroleum products exclusion applies to KN-related materials at the Site." Specifically, KN contends that the hydrocarbon recovery and

recycling component of Alternative B4, and the ground water and soil treatment actions involved in the remedy involve petroleum products and, therefore, fall within the petroleum products exclusion.

EPA disagrees with KN's characterization of the contaminants released from the KN facility, and does not agree that the petroleum products exclusion is applicable to releases from the KN facility. Documents which form the basis of EPA's determination concerning the inapplicability of the petroleum exclusion to releases from KN's property are contained in the Administrative Record for the Site. This documentation includes information submitted to EPA by KN,[1] as well as the Expanded Site Investigation, the KNEnergy Engineering Evaluation/Cost Analysis, and the RI/FS.

KN operates a natural gas fractionation, compression, cleaning, odorizing and transmission facility on the southern border of the Brookhurst subdivision. There are three sources of contamination on KN's property. One source was a flare pit, into which KN placed numerous wastes, including hydrocarbon products and solvents, which were then burned. A second source was a catchment area, a low spot in the ground to which run-off was diverted. The third source was the plant itself, which, at some time in the 1960s, and perhaps continuing through the 1980s, released absorption oil.

The flare pit, originally an earthen impoundment, was used to collect spent materials generated by the facility. Materials that may have been placed in the flare pit include: 1) crude oil condensate, 2) absorption oil, 3) emulsions, antifoulants, and anticorrosive agents, 4) liquids accumulated in the flare stack, 5) potassium hydroxide treater waste, 6) lubrication oils, and blow down materials from equipment in the plant. In 1985, a concrete-lined flare pit replaced the earthen pit. Use of this new pit was discontinued when it was decommissioned in 1987.

Absorption oil is a generic term for a product used at the KN facility to absorb contaminants from the natural gas stream. Used absorption oil was released in 1965 when an underground pipe burst and injected several thousand gallons of the substance into the ground beneath the facility. Additional releases occurred from the flare pit, from the catchment area, and as a result of gradual losses from facility operations.

Pursuant to section 101(14), section 101(33), and section 104(a)(2) of CERCLA, petroleum products are excluded from the definition of hazardous substances.[2] KN contends that the contamination released from its facility consists entirely of petroleum products. Contaminants of concern released from the KN facility consist of benzene, ethylbenzene toluene, and xylene (BETX). Although these compounds are constituents of petroleum

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[1] KN's submittals to EPA on the petroleum exclusion issue include a report entitled "Applicability of the Petroleum Product Exclusion to Hydrocarbon Product Released From the KNEnergy Facility," Adrian Brown Consultants, Inc., February 20, 1990; a report entitled "Response to EPA Questions on 'Applicability of the Petroleum Product Exclusion to Hydrocarbon Product Released From the KNEnergy Casper compressor Facility,'" Adrian Brown Consultants, Inc., March 30, 1990; and a letter from Elizabeth H. Temkin and Jeffrey B. Gray to Bert Garcia, Remedial Project Manager, concerning "Applicability of the Petroleum Products Exclusion to KNEnergy Facility," dated April 3, 1990. EPA has also considered KN's 104(e) response and other information contained in the Administrative Record. Information and comments concerning KN's petroleum exclusion claim as it relates to the listing of this site on the National Priorities List can be found in the record for the NPL listing.

[2] This exclusion pertains to "petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph and the term does not include natural gas, liquefied natural gas, or synthetic gas usable for fuel or mixtures of natural gas and such synthetic gas." 42 U.S.C. Section 9601(14).

products, they are also designated hazardous substances pursuant to section 101 of CERCLA, 42 U.S.C. section 9601. EPA believes that the CERCLA petroleum exclusion is not applicable to releases of these hazardous substances from the KN facility.

Contamination emanating from the flare pit is not subject to the petroleum exclusion because it consisted of hazardous wastes mixed with petroleum products. See memorandum entitled "Scope of the CERCLA Petroleum Exclusion Under Section 101(14) and 104(a)(2)," OSWER Directive No. 9838.1, July 31, 1987. Materials deposited in the flare pit did not consist of natural gas, but were wastes either generated in the processing of natural gas or drained from the natural gas pipeline. Moreover, the used absorption oil source does not implicate the petroleum exclusion because absorption oil is a product used to pick up contaminants in the processing of gas. The samples of product recovered by KN in the subdivision showed levels of contaminants in excess of those that would be expected to appear in "new" absorption oil. Used oil that contains hazardous substances at levels which exceed those normally found in petroleum are subject to CERCLA jurisdiction. See Memorandum entitled "Scope of the CERCLA Petroleum Exclusion Under Section 101(14) and 104(a)(2)," OSWER Directive No. 9838.1, July 31, 1987. The contaminants in used absorption oil, specifically elevated levels of benzene, are hazardous substances to which a CERCLA response may be directed. In addition, according to the memorandum entitled "Scope of the CERCLA Petroleum Exclusion Under Section 101(14) and 104(a)(2)," OSWER Directive No. 9838.1, July 31, 1987, "where a petroleum product and an added hazardous substance are so commingled that, as a practical matter they cannot be separated, then the entire oil spill is subject to CERCLA response authority."

Finally, benzene is not only an ingredient in petroleum, it is also a component of many solvents. Once the benzene is in groundwater its source cannot be conclusively determined, and since it may have come from solvents, it is subject to remediation under CERCLA.

For these reasons, EPA is acting within its CERCLA authority in selecting a remedy for the site that addresses the contamination released from the KN facility, including ground water and soil treatment as well as hydrocarbon recovery and recycling.

KN has also commented on the lack of an ARAR for floating hydrocarbons. The layer of hydrocarbons floating on ground water presents a continuing source of ground water contamination, and thus presents a potential health risk. The floating product must, therefore, be considered within the scope of site clean up. MCLs for ground water contamination do exist, as discussed in the ROD. Clean up of substances causing MCLs in ground water to be exceeded is a logical approach to achieving site remediation goals, and clean up of the floating product is, accordingly, driven by MCLs for the constituents of the product. Moreover, ARARs do not define the limits of EPA's clean up authority. In accordance with CERCLA and the NCP, EPA's actions may address releases or potential releases of hazardous substances, and , as discussed in detail above, EPA has determined that the floating product is a hazardous substance and is not subject to the petroleum exclusion.

Exhibits

Exhibit 1 - Letter from EPA
Exhibit 2 - Letter from Dr. Sullivan
Exhibit 3 - Letter from State of Wyoming
Exhibit 4 - Letter from lawyers representing Dow/DSI
Exhibit 5 - Letter from lawyers representing KN

EXHIBIT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

Ref: 8HWM-SR

September 21, 1990

Ms. Pat Neville
6312 East Mustang
Evansville WY 82636

Dear Ms. Neville:

At the recent public meeting we held regarding our Proposed Plan for cleaning up ground water at the Mystery Bridge Road/U.S. Highway 20 Superfund site, you said that benzene, ethylbenzene, toluene and xylenes (BETX) had been detected in your residential well. You asked if the proposed treatment for VHOs would eliminate BETX from your well.

According to our records, your well was sampled during the Expanded Site Investigation (ESI) in April 1987. Table 6-11 of the ESI report indicates that BETX concentrations found in the sample taken from your well are below the maximum concentration limits (MCLs) established under the federal Safe Drinking Water Act.

Below are BETX concentrations found in the sample from your well compared to the established MCLs:

Chemical	Your Well	MCL
Benzene	2 ug/l	5 ug/l
Ethylbenzene	10 ug/l	700 ug/l
Toluene	13 ug/l	2,000 ug/l
Xylenes	52 ug/l	10,000 ug/l

We have not found BETX compounds above detection limits in samples taken several times from monitoring wells near your property from 1987 through 1989. The detection limits used were usually less than 5 ppb, which is at or below maximum concentration limits (MCLs) for these compounds. Because monitoring wells are constructed to provide precise information about contaminants in the aquifer, the monitoring well samples are probably a better indication of BETX in ground water in that area than results from residential wells.

Table 9 in the Remedial Investigation/Feasibility Study (RI/FS) report, which I sent to you, shows monitoring well data for EPA 2-3 (approximately 250 yards southwest of your property), OBG 13 (approximately 250 yards northwest of your property), and EPA 1-1 (approximately 250 yards southeast of your property).

The enclosed map shows these wells surrounding your property. These are the wells which would indicate if contamination is moving toward your well. As you can see from Table 9, none of the wells contains BETX above detection limits. The most recent sampling, conducted in July of this year, show the same results.

In addition, LARCO well MW-49 (see map), lies directly between your well and the plume emanating from the LARCO property. No BETX was found in samples taken from this well in July.

Given this sampling data, we have concluded that there is no correlation between the plumes emanating from KN or LARCO and any BETX in your well.

In response to your question concerning the effectiveness of the remedy on non-VHO contamination, EPA believes that if the proposed remedy performs as expected, contaminants from KN Energy and Dow/DSI, including non-VHOs, will be reduced to levels that are in compliance with federal and state regulations and the health risks from ingestion of the ground water contaminated from these sources will be reduced to acceptable levels.

If you have any questions, please feel free to call me at 1-800-759-4372, ext. 1526.

Sincerely,

Bert Garcia
Remedial Project Manager

EXHIBIT 2

90 AUG -2 PM 3:48

August 2, 1990

Bert Garcia (8HWM-SR)
Remedial Project Manager
U.S. Environmental Protection Agency
999 18th Street
Denver, CO 80202

RE: Mystery Bridge Road/U.S. Highway 20 Public Comment

Enclosed are my comments on the Feasibility Study and the Proposed Plan for the Mystery Bridge Road/U.S. Highway 20 Superfund Site Natrona County, Wyoming.

You may mail your response to:

Dr. Patrick Sullivan
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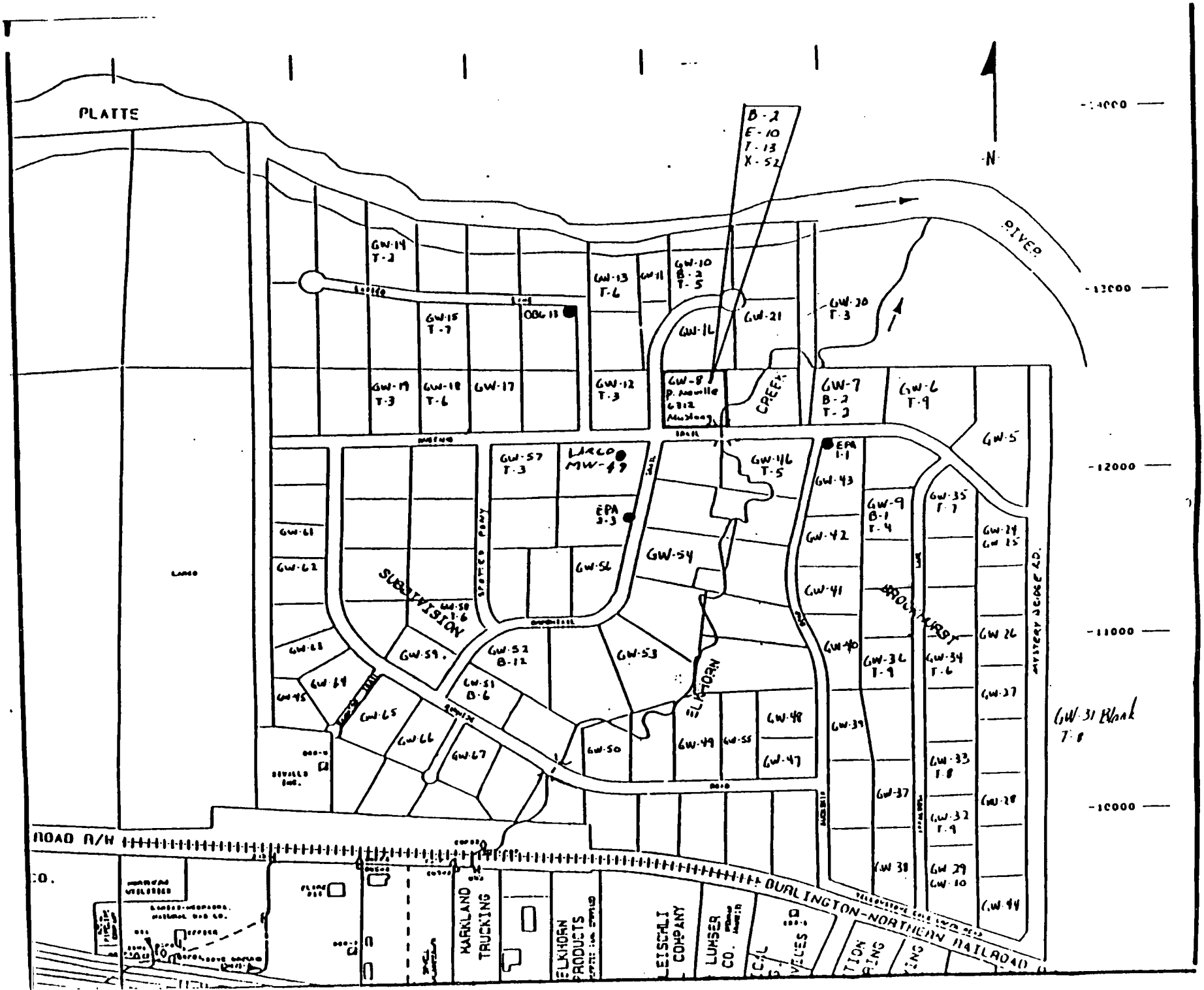
Patrick Sullivan


PLATTE
B-2
E-10
T-13
X-52
N
RIVER
GW-14
T-2
GW-15
T-7
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T-6
GW-11
GW-10
B-2
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CREEK
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GW-6
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I-1
GW-57
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LARCO
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GW-33
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GW-28
GW-32
T-9
GW-38
GW-29
GW-10
GW-44
GW-31 Blank
T-8
-14000
-13000
-12000
-11000
-10000
ROAD R/W
BURLINGTON-NORTHERN RAILROAD
MARKLAND TRUCKING
ELKHORN PRODUCTS
LEISCHLI COMPANY
LUMBER CO.

COMMENTS ON THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCIES FEASIBILITY STUDY AND THE PROPOSED PLAN FOR THE MYSTERY BRIDGE ROAD/U.S. HIGHWAY 20 SUPERFUND SITE NATRONA COUNTY, WYOMING

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The comments provided in this assessment deal with three major deficiencies of the June 1990 RI/FS Report and their impact on the selected remedial actions. These deficiencies pertain to 1) the characterization of the alluvial aquifer, modeling assumptions, model sensitivity analysis, and bedrock surface and heavy organics, 2) trace element distributions, 3) the use of PID detectors instead of FID detectors in the southwestern portions of the site for soil gas analysis, 4) aquifer homogeneity and modeling, and 5) implications of vertical sampling errors.

1. Characterization of the Alluvial Aquifer

Aquifer Homogeneity

The RI/FS assumes that the alluvial aquifer is composed of homogenous porous media that is a "poorly sorted clay to sandy clay with a coefficient of permeability ranging from 3.9×10^{-3} to 5.6×10^{-5} cm/sec" that was determined from five samples (page 28). "The horizontal component of flow in the alluvial aquifer is consistently to the northeast with only minor and local variations." (page 29).

These statements imply that modeling of groundwater flow and contaminate transport is accurately predicted and, thus, the estimated 6 years for the VHO plume to clear the subdivision is reasonable. However, the following should be noted:

a) There were only eight wells (i.e., opportunities to characterize the alluvium in the subdivision) installed in the Brookhurst area. No detailed split-spoon sampling (or boring logs) were correlated or compared to determine alluvial soil texture variations.

b) No resistivity studies (or borings) were completed to determine the potential presence of old river channels which should have been obvious due to the site location. The presence of the free hydrocarbon plume from the west side of the site which is at almost a 45 degree angle to the VHO plume is a good indication of the presence of at least one old channel through the subdivision.

c) Aerial photos of the subdivision in 1962 clearly show that the initial segment of Elkhorn Creek is man-made and the current contamination that exists at this site follows this man-made channel. How is this factor incorporated into the modeling of the alluvial aquifer?

d) The VHO plume models in the 1987 Site Investigation show trends toward the west side hydrocarbon plume direction.

The geologic data provided in the RI/FS do not support an interpretation of a relative uniform alluvial aquifer. It is strongly recommended that a more detailed characterization of the alluvial

aquifer be completed before implementing a no-treatment option in the Brookhurst subdivision.

Modeling Analysis

The discussion of the sensitivity analysis pertaining to the prediction of contaminant transport modeling (beginning on page 107) of VHO plume is only theory. What actual laboratory or field tests were performed to verify the selected conditions? As we all known with models, "garbage in, garbage out"!

The real issue with the model predictions pertain to previous Superfund remedial actions. The EPA has had many years of experience in the remediation of other sites contaminated with the same VHO plumes. The predictions and sensitivity analysis pertaining to the Brookhurst site would be more believable if the EPA could provide one or more examples of how modeling and the subsequent sensitivity analysis have actually performed in predicting remediation effectiveness for other sites. That is, the sites do not have to be identical, either the sensitivity analysis theory works or it does not.

Given that the EPA is depending upon theory to assure residence that the site will be clean in six years, there should be some proof that the modeling and sensitivity analysis works before implementing the no-treatment option in the Brookhurst subdivision.

Bedrock Surface and Heavy Organics

The limited number of wells completed in the Brookhurst area does not provide many data points to determine a reasonable

representation of the bedrock surface contours. Given that PCPs were detected in the vicinity of the Burlington-Northern Railroad right-of-way, there is the potential that heavy wood treating waste may exist and have accumulated within depressions of the bedrock surface.

In this regard, the EPA should at least proceed with a preliminary investigation to determine that wood treating wastes are not present at the site before implementing a no-treatment option of the Brookhurst groundwater.

2. Trace Element Distributions and Cleanup

EPA monitoring wells 1-3, 1-8, 1-9, 1-10, 2-11 and 2-14 that occur within or adjacent to the KN Energy BTEX plume all either exceed chromium and/or lead MCL's. What is the extent of the distribution of these trace elements with this plume?

The RI/FS does not discuss trace element hazards and the removal of these trace elements (air stripping is not an effective method for the removal of these elements from water).

Are lead and chromium not a hazard? If they are a hazard, the proposed treatment system is not adequate.

3. Southwest Soil Gas Analysis

"The soil boring program was designed to investigate the nature and extent of contamination in each potential source area identified by the soil vapor survey or to verify the absence of contaminants in areas without soil vapor detections."

"OBG performed a soil vapor survey to identify potential source areas of volatile organic contamination to ground water on the industrial properties near the Subdivision. The survey was conducted on each of twenty industrial properties along the southern boundary of the Subdivision and across U.S. Highway 20. The soil vapor survey was not meant to replace laboratory analyses, but were designed to identify potential source areas for the placement of soil borings for sampling and laboratory analyses."

"The majority of the soil vapor samples were collected at a depth of 3 ft and analyzed on site using a Photovac Model 10S70 portable GC air analyzer. Instrument internal libraries and BTEX gas standards were used for the preliminary identification and quantification of specific volatile organic compounds and a total photoionizable volatile compound concentration. The total concentration of volatile organic compounds was determined by summing the peak areas on the chromatogram and using the relative response factor for benzene for quantification. As such, all results were reported as parts per million of benzene."

"Shallow soil borings were advanced to a depth of 42 inches at four locations on each industrial property with no identified contamination." "The four samples from each property were composited to form a single sample which was analyzed for HSL semi-volatile compounds and those metals listed in Appendix III of 40 CFR Part 265 according to USEPA CLP protocol."

Using the procedure defined above, the GC air analyzer having a photoionizable (PID) detector will not detect compounds such as methylene chloride and acetone. In order to detect these compounds

a FID detector would be required. Because a GC with a PID detector was used, a potential plume containing methylene chloride and acetone that is indicated in residential well waters was not investigated. This is suggested for the following reasons:

a) NATCO is a potential source of methylene chloride and acetone based on use of paint thinners, painting and stripping.

b) Numerous residential tap water analysis in the area adjacent to NATCO showed elevated levels (an order of magnitude) of methylene chloride and acetone compared to other Brookhurst samples. This is significant, even if it is proposed that both are laboratory or blank contaminants and should not have been ignored.

c) Soil borings that were collected were composite samples and many volatiles may have been significantly diluted prior to analysis (and only represents 4 data points).

d) As a consequence of this procedure, many potential compounds from the southwest area may not have been detected.

As a result, no EPA monitoring wells were installed within the southwestern portion of the subdivision. It is highly recommended that a more detailed groundwater investigation in this area be completed to determine the absence of groundwater contamination in this area.

4. Modeling and Homogeneous Aquifer

The model in this RI/FS used hydraulic conductivity values based on the Horslov method (except for one value from a pump test). One should be careful in using Harslov method values for the following reasons:

a) The Horslov method gives only an order of magnitude estimate for hydraulic conductivity (Chirlin in Spring 1989 issue of Ground Water Monitoring Review).

b) There were not enough data collected for a proper Horslov analysis. To use the Horslov analysis, there must be enough data to form a straight line. Sometimes, a double straight line effect is observed in slug tests.

If a double straight line effect is observed, than the second straight line is representative of the aquifer conductivity (Bouwer in May-June 1989 issue of Ground Water Jr.). When only 2 or 3 data points are available (which is the case here), than hydrologist cannot select the proper straight line, and therefore the results from the analysis is questionable.

Contaminant plume shapes clearly indicates the heterogeneities in the aquifer. The values used for model sensitivity analysis (Table 10) and the basis for these values, clearly show the heterogenous nature of the aquifer.

While "porosity range for these tests was 24 to 34%..." (page 28), sensitivity analysis uses 35 to 45% porosity. An explanation for

this discrepancy is not provided. Saturated aquifer thickness varies from 14 to 39 feet (table 10), which is again a clear indication of heterogeneities present.

In addition, a description of the model is not provided, which makes it difficult to evaluate how the model is calibrated/validated. If it is a numerical model, then numerical dispersion can artificially lower the contaminant concentrations and underestimate the time needed for remediation. On the other hand, if the model is based on the analytical solution, than heterogeneities cannot be incorporated in the model.

5. Free Product Plume from LARCO

EPA 2-4 well is located inside the free product plume from LARCO. However, ground water sample from this well shows Toluene, Xylenes and Ethyl Benzene below detectable limits. These components are commonly found in gasoline and refinery products. Absence of these product in the ground water sample at EPA 2-4 well is a clear indication of sensitivity of dissolved hydrocarbons on the vertical location where sample was taken.

Hydrology literature is full of examples where dissolved product plume extends much further than the free product plume. Remediation efforts should take that into account. Also, adsorbed and trapped hydrocarbons in the vadose zone (unsaturated region) will continue to act as source of contamination for the ground water. Trapped hydrocarbons can exist even inside the water table due to seasonal water level fluctuations.

How does the LARCO result influence the EPA's understanding of the BTEX plume that is considered for remediation? What is the extent of the BTEX plume, given questionable sampling and or analysis?

6. PCP and Other Contaminants Heavier Than Water

The LARCO example shows the sensitivity of the dissolved contaminants concentrations to the vertical position of the sample collection point. If dissolved product is sensitive to the vertical location of the sample than, heavier contaminants are obviously sensitive to the sample location. No effort has been made to obtain vertical profile of PCP at any location. Since bedrock elevations are also not mapped, which can give potential trap locations for these heavier contaminants.

Based on these problems, it is strongly recommended that more detailed analysis for PCP profiles be determined.

EXHIBIT 3

DEQ STATEMENT
SUPERFUND PROGRAM PROPOSED PLAN
CASPER, WYOMING
JULY 18, 1990

My name is Larry Robinson and I represent the Wyoming Department of Environmental Quality, Water Quality Division. The Department would like to take this opportunity to thank the EPA for its cooperation and efforts to provide for participation in the process of identifying alternatives for addressing problems in the Brookhurst area.

Present state activities in the Brookhurst area include enforcement actions involving Little America Refining Company (LARCO), KN Energy, Dowell Schlumberger, Texaco Refining and Marketing, Inc., Amoco Pipeline Company and WYCO Pipeline Company. It is the responsibility of DEQ to ensure that the requirements of the Wyoming Environmental Quality Act are adequately addressed during the federal process and to take appropriate independent regulatory measures as may be necessary. This means ensuring that groundwater quality within the Brookhurst Subdivision is returned to an maintained at Class I or domestic use standards.

It is the position of the Department that the proposed actions identified in Alternatives B4 and V6 should be implemented as soon as possible. We also concur with the EPA proposal to provide additional study of the subsurface soil contamination sources on the KN Energy and Dowell Schlumberger properties during Operable Unit 2. It is also our position, however, that the proposed plan being developed under CERCLA and the plan being developed under RCRA to address the contamination plume entering the Brookhurst Subdivision from LARCO property need to be integrated into a single comprehensive planning and remediation effort. This is necessary in order to insure that groundwater quality within the Subdivision is protected or restored to Class I criteria within an acceptable and consistent time

frame. It is not possible to make an appropriate decision concerning the clean up of the VHO plume within Brookhurst Subdivision without knowing what actions will be taken and what time frame will be established to remediate the LARCO plume within the Brookhurst Subdivision.

A significant factor in selecting Alternative V6 and the longer time frame for clean up is the fact that several of the other alternatives have the potential to negatively impact the LARCO plume. Using this as an evaluation criteria is inappropriate in light of the fact that no time frame or remediation plan has been developed for the LARCO plume. This is of particular concern when the LARCO plume has been identified as having the greater health risk. We recognize that EPA intends to address the LARCO plume through the RCRA process. However, we feel that the CERCLA process must be structured such that it concurrently addresses this matter in order to adequately evaluate the remediation alternatives which have been presented.

Groundwater contamination and possible associated health effects within the Brookhurst Subdivision are an immediate and continuing problem. Extended time frames for clean up are a matter of concern to the DEQ. We agree that EPA proceed with the recommended removal actions at Dowell Schlumberger and KN Energy. We recommend developing a comprehensive proposal involving both RCRA and CERCLA programs resulting in a timely remediation of all groundwater contamination within Brookhurst Subdivision.

/jn

EXHIBIT 4

MONTGOMERY, GREEN, JARVIS,
KOLODNY & MARKUSSON

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August 3, 1990

VIA HAND-DELIVERY

Mr. Bert Garcia
Remedial Project Manager
United States Environmental
Protection Agency
Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202-2405

RE: Mystery Bridge Road/Highway 20 Site
Superfund Site, Natrona County, Wyoming
Proposed Remedial Action Plan

Dear Mr. Garcia:

The following comments on the U.S. Environmental Protection Agency's ("EPA") proposed Remedial Action Plan ("RAP") for the Mystery Bridge Road/U.S. Highway 20 Superfund Site ("the site") in Natrona County, Wyoming, are submitted on behalf of Dowell Schlumberger, Inc. ("DSI") and the Dow Chemical Company ("Dow"). DSI and Dow generally concur in EPA's selection of alternative B4 and V6 as the preferred remedial alternatives for the site. However, DSI and Dow have some concerns about certain aspects of the RAP as set forth below. The comments contained herein are submitted for EPA's review and consideration prior to the final selection of the site remedy. DSI and Dow request that these comments be included in the administrative record for this site.

DSI and Dow's primary concern about the RAP relates to the scope of the investigation already undertaken and the future activity proposed as a "second operable unit." As EPA is fully aware, pursuant to an Administrative Order on Consent ("AOC") entered by EPA in this matter on December 15, 1987, DSI, Dow and KNEnergy, Inc. ("KN") agreed to perform a Remedial Investigation/Feasibility Study ("RI/FS") of what was then termed the "Brookhurst Subdivision site," an area of mixed residential-industrial use one mile east of Evansville, Natrona County, Wyoming, "bounded by the North Platte River on the north, Sinclair/Little America Refinery on the west, the Burlington Northern Railroad on the south, and the Brooks-Hastings

Industrial complex on the east." (AOC, III, 1.) Dow, DSI and KN retained O'Brien & Gere Engineers, Inc. ("OBG" or "RI/FS contractor") to perform the RI/FS. In June of 1988, OBG submitted a workplan to EPA for the RI/FS which provided, in pertinent part, that soils within the "study area" identified in the AOC, above, would be investigated along with other media including surface and ground water and air. A sampling plan for the investigation of all these media was submitted to EPA in October, 1988. Neither the AOC nor the RI/FS workplan or sampling plans approved by EPA provide for division of the study area into "operable units."

Pursuant to the RI/FS sampling plan, soils within the Subdivision and on each of the industrial properties, including the DSI site, were sampled. At EPA's request, additional soil sampling to bedrock was performed at the DSI site in September of 1989 (RI/FS Report §6.03.2, June 1990). The results of these DSI soil sampling campaigns and the air, surface and ground water studies were regularly reported to EPA over a two-year period in technical memoranda and other documents. The results of these investigations formed the basis of the final RI/FS report first submitted to EPA in January, 1990, and accepted by EPA in June of 1990. EPA directed this process and regularly commented on OBG's efforts. EPA accepted the investigation as complete.

Dow and DSI are concerned that EPA's proposed Remedial Action Plan for the site calls for the creation and independent study of a "second operable unit" for soils. The RAP does not define the location and boundaries of this operable unit and the scope of the study contemplated. Having participated at great expense in a thorough study of the soils on the DSI site, DSI and Dow object to the DSI site's inclusion in the "second operable unit." As the direct result of a vigorous source removal action undertaken by DSI and Dow at the DSI site in 1987, (see, RI/FS Report §6.03.1, June 1990 and "Summary of Removal Activities through May 31, 1988 at the Dowell-Schlumberger Facility, Casper Wyoming", June 18, 1988 (WWC 1988)), concentrations of contaminants of concern in ground water have decreased dramatically and residual soil levels do not exceed those set by EPA (RI/FS Report, §§6.03.4 and 8.02.2, June 1990; see also David Duster letter to Swiatoslav Kaczmar dated November 22, 1989, attaching Stefancheck soil action levels for constituents of concern at DSI site). Furthermore, soil sampling firmly established that soil constituents from the DSI site do not extend beyond the site's boundaries. Clearly, the DSI site should not be included in a "second operable unit" requiring additional soil sampling of DSI's site and DSI should not bear the burdens associated with that operable unit. Should EPA pursue additional soil studies, DSI and Dow encourage EPA to adhere to the sampling and quality assurance and quality control protocols previously followed in

this matter in order to achieve a consistent and reliable work product.

DSI and Dow agree with EPA that, with the installation of a permanent municipal water supply for the Subdivision, all human exposure pathways have been eliminated. The data generated during the RI/FS support the conclusion that air, soil and surface water do not present an exposure pathway and the municipal water supply has eliminated the groundwater pathway. Therefore, DSI and Dow request that EPA adopt this position in any additional risk assessment done for this site as part of the "second operable unit."

Lastly, DSI and Dow agree with EPA's assessment that concentrations of constituents of concern in ground water within the Brookhurst subdivision are now at such reduced levels that natural attenuation will effectively resolve any continuing ground water impacts. Indeed, ground water concentrations both within the Subdivision and at the DSI site have decreased dramatically since 1987 (RI/FS Report, §8.02.2, June 1990). This attests both to the efficacy of the DSI removal actions and the natural attenuation processes at work in the Subdivision. DSI and Dow anticipate that additional ground water sampling performed during the Remedial Design, Remedial Action ("RD/RA") phase of this matter will show further reductions in ground water values since the last round of sampling was conducted in September, 1989 (RI/FS Report, §8.02.2, June 1990). These continuing reductions demonstrate that the DSI removal actions were sufficient and that the natural attenuation processes at work within the Subdivision are also effectively at work at the DSI site. Therefore, DSI and Dow submit that the underground biological treatment as proposed in alternative V6 is unnecessary. Based upon the foregoing, DSI and Dow request that the Record of Decision entered in this matter provide EPA the option to select a natural attenuation remedy for the DSI site.

In sum, with the few exceptions set forth above, DSI and Dow agree with and support the Remedial Action Plan proposed by EPA.

Very truly yours,

MONTGOMERY, GREEN, JARVIS,
KOLODNY & MARKUSSON

By H. Keith Jarvis

HKJ:alr

cc: J. P. Brosset, Dowell Schlumberger, Inc.
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S. Rook, Esq., The Dow Chemical Company
L. Korte, KNEnergy, Inc.
E. Temkin, Esq., Davis, Graham & Stubbs
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EXHIBIT 5

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JEFFREY B. GROY
892-7372

August 2, 1990

VIA HAND DELIVERY

Mr. Bert Garcia
Remedial Project Manager
U.S. Environmental Protection Agency
Superfund Remedial Branch, 8HWM-SR
999 18th Street, Suite 500
Denver, CO 80202

Re: Mystery Bridge Road/U.S. Highway 20 Site - Superfund Program Proposed Plan

Dear Mr. Garcia:

On behalf of our client, K N Energy ("KN"), we are providing written comments on the Proposed Plan (the "Plan") for the Mystery Bridge Road/U.S. Highway 20 site (the "Site"). Specifically, our comments will focus on the following: (1) KN believes that from a management standpoint EPA should consider each of the two remedies selected as a separate operable unit ("OU")(i.e., the Site should be divided into discrete units based on plume delineation); (2) EPA lacks the authority under the Comprehensive Environmental Response, Compensation, and Liability Act, as amended ("CERCLA"), to address the fractions of petroleum or natural gas detected at the KN property (the "KN-related materials"); and (3) even if EPA has jurisdiction under CERCLA to address the KN-related materials, there is no applicable or relevant and appropriate requirement ("ARAR") for the floating product. While some of our comments concern OU 2, because the Plan is limited to OU 1, we reserve our right to provide additional comments on OU 2 until such time as EPA proposes a plan for OU 2.

FROM A MANAGEMENT STANDPOINT, EPA SHOULD CONSIDER EACH REMEDIAL ALTERNATIVE AS A SEPARATE OPERABLE UNIT.

As noted on the Figure on page 2 of the Plan, it is clear that the Site can be divided into discrete units based on plume delineation. In fact, EPA has agreed in the Plan that the plumes should be addressed separately. Therefore, from a remedy

management standpoint and for ease of implementing and overseeing the separate remedies, KN proposes establishing OUs on a geographical or plume basis. Under KN's proposal, each plume and any associated areas of concern would be considered a separate OU,[1] with EPA entering into a separate consent decree that would implement the separate remedial actions for each plume. The cleanup phases, which EPA proposes in the Plan, could be implemented as part of each OU, as necessary.[2]

Dividing the Site into OUs on a geographical or plume basis is appropriate for a number of reasons. First, given that the Plan proposes separate remedial treatment systems for the BETX and VHO plumes, it only makes sense to treat each plume separately by establishing a separate OU for each plume. Second, treating the plumes separately is advantageous from a technical perspective. Each treatment system will be constructed by an individual company (i.e., KN will likely implement Alternative B4 and The Dow Chemical Co. ("Dow") will likely implement Alternative V6) and each system will be operated independently of the other system. Moreover, the success of cleaning up each plume will not depend on the effectiveness of both treatment systems. Instead, the clean up of each plume will depend entirely on the effectiveness of the treatment system for that plume. Third, it makes sense from a management and oversight perspective to divide the Site into OUs on a plume basis. Because the timeframes for completing the remedial actions, the milestones, and the reporting requirements will likely be different for each plume, because ARARs and progress toward meeting those (and other) remedial goals will be different for each plume and because community relations aspects of the overall remedy can best be dealt with by separating the plumes, it would

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1/ In the Plan, EPA has designated remedial action phases as OUs. Specifically, as proposed by EPA, each OU would address Site-wide impacts, except those attributable to LARCO, and would address both the soil and ground water media (although apparently OU 1 would focus on ground water and OU 2 would focus on soil). KN proposes instead establishing OUs on a geographical basis and each OU could, as necessary, address the media of concern in a phased approach.

2/ It is unclear from the Plan what components make up each OU. Specifically, because the Plan is so vague, it is difficult to know what is addressed in OU 1 and what is addressed in OU 2. For example, the Plan seems to address floating product in both OU 1 and OU 2. Therefore, until EPA provides more specificity concerning what each OU will address, KN has a concern about EPA's phased approach.

be more appropriate for EPA to oversee management of and compliance with the remedial alternatives if they are in separate OUs.

If EPA establishes each plume as a separate OU, it obviously makes sense for EPA to enter into a separate consent decree for each OU. Each consent decree, respectively, would address the phased approach EPA has in mind for cleaning up each of the plume-based OUs. In addition, entering into separate consent decrees is not only more efficient from EPA's oversight perspective but also more equitable from the PRPs' perspective. Specifically, it would be unfair for EPA to hold KN liable for Dow's plume and treatment system and vice versa. In fact, it would appear arbitrary and capricious for EPA to do so. Consequently, KN requests that EPA consider establishing plume-based OUs and entering into a separate consent decree for each OU.

EPA LACKS THE AUTHORITY UNDER CERCLA TO ADDRESS THE KN-RELATED MATERIALS AT THE SITE.

As you know, the materials currently detected at the KN property consist only of fractions of petroleum or natural gas. As a result, the CERCLA petroleum products exclusion applies to the KN-related materials at the Site and, as a matter of law, EPA lacks jurisdiction over the KN-related materials. More specifically, the hydrocarbon recovery and recycling action, a component of Alternative B4, is a remedial activity involving petroleum product. Likewise, the ground water and soil treatment actions also involved KN-related materials and, as a result, fall within the CERCLA petroleum products exclusion. Therefore, as to those aspects of Alternative B4, the petroleum products exclusion precludes EPA from relying on its CERCLA jurisdiction as to OU 1.

Nevertheless, as you know, KN has voluntarily undertaken numerous activities at the Site to prevent the introduction of KN-related materials into the environmental (e.g., decommissioning the flare pit and changing the facility's operation) and to clean up the residual KN-related materials (e.g., undertaking the removal action). CERCLA does not mandate that KN take these activities or any additional remedial activities. Rather, KN has undertaken these activities as a matter of good corporate citizenship. As you also know, KN stands ready to take any necessary and reasonable additional action required by the circumstances. Meanwhile, however, KN reserves the right to invoke the CERCLA petroleum products exclusion with respect to the KN-related materials at the Site.

ASSUMING EPA HAS JURISDICTION UNDER CERCLA TO ADDRESS THE KN-RELATED MATERIALS, THERE IS NO ARAR FOR FLOATING PRODUCT.

KN believes that it is logical to recover as much floating product as is technically feasible and cost effective. In fact, as part of its removal action, KN has voluntarily recovered floating product located beneath its property. KN has also proposed to EPA to extend its floating product recovery system offsite to recover the floating product that apparently is present beneath the Burlington Northern ("BN") property. Again, KN has done this, not because CERCLA mandates such an action, but to ensure the protection of the environment. Moreover, KN has done this even though from a health standpoint, petroleum product in the free or floating product phase at the Site is not a significant health risk because there is no credible exposure pathway.

KN's position concerning the mandatory removal of floating product at the Site is based on the language in CERCLA. CERCLA mandates that remedial actions selected at a site meet ARARs. See 42 U.S.C. § 9621(b). As noted in the RI/FS Report, the proposed ARARs for the Site encompass a variety of federal and state standards. There is, however, no ARAR for floating product. As a result, once the ground water beneath the floating product meets MCLs, KN believes that the remedial alternative has achieved its goal and has satisfied CERCLA's requirements. Continued recovery of floating product is not mandated. In fact, to pursue additional removal of free product on a diminishing-returns basis would not be cost effective and therefore would be inconsistent with the NCP. See, e.g., 55 Fed. Reg. 8666, 8726 (Mar. 8, 1990).

As KN has mentioned to EPA, KN will continue to remove floating product from its property as well as from under the BN property, as needed, until such time as it is technically infeasible to remove any more floating product. KN will not agree to remove all of the floating product as EPA appears to want done.[1/] CERCLA does not mandate this requirement.

1/ In fact, KN disagrees with EPA's statement on page 3 of the Plan to the extent it seems to require the total elimination of all contamination at the Site. Specifically, in the Plan, EPA states in the context of discussing the removal actions that "[c]ontamination of water from soils was stabilized but not entirely eliminated during the removal actions." Plan at 3 (emphasis added). CERCLA does not mandate the entire elimination of hazardous substances. It requires that the remedial actions

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Furthermore, it is not warranted from a public health standpoint. Finally, it is not even possible from a technical standpoint to eliminate all the floating product. Therefore, KN will refuse to cooperate with EPA to the extent EPA seeks to remove all floating product as part of the overall remedy for the Site.

One final comment is that of the three plumes at the Site the KN plume has clearly had the smallest impact on the environment. In fact, there has been no documented impact on the Brookhurst Subdivision from any KN-related materials. Nevertheless, KN to date has done more than any other company to address its materials and has done so voluntarily. Specifically, KN has undertaken extensive response actions--decommissioning the flare pit, instituting effective work practices and removing KN-related materials from the soil and ground water--to address the situation quickly and effectively. Even though its impact on the environment has been de minimis, KN has done these response actions as quickly as possible to ensure that public health and the environment were protected. KN respectfully requests that EPA consider KN's efforts when deciding how to implement the proposed remedial alternatives for the Site and in deciding whether to issue separate consent decrees to implement the remedial alternatives.

KN appreciates the opportunity to submit these written comments on the Plan. If EPA should have any questions concerning KN's comments, please contact either Elizabeth Temkin or me.

Sincerely,

Jeffrey B. Groy
for
DAVIS, GRAHAM & STUBBS

cc: Elizabeth Wald, Esq.
A. Michael Gaydosh, Esq.
Lawrence J. Corte, Esq.
Adrian Brown
H. Keith Jarvis, Esq.

1/(...continued)
meet a number of requirements, including attaining ARARs. Therefore, KN disagrees with EPA's statement to the extent it misleads the public as to how clean the Site will be once the remedial alternatives achieve their goals.