ATSDR Agency for Toxic Substances & Disease Registry

Public Health Assessments & Health Consultations

PUBLIC HEALTH ASSESSMENT

D. L. MUD, INCORPORATED
ABBEVILLE, VERMILION PARISH, LOUISIANA

1. SUMMARY

The D. L. Mud site is an oil field drilling mud mixing facility located approximately 3.5 miles southwest of Abbeville in Vermilion Parish, Louisiana. It was placed on the National Priorities List (NPL) and designated a Superfund Site in October of 1989. The site underwent remedial clean-up in 1987 whereby all structures and the majority of contaminated material were removed from the site. The site was placed on the NPL based on the sampling results obtained prior to the 1987 remediation.

The Louisiana Department of Health and Hospitals, Office of Public Health, Section of Environmental Epidemiology and Toxicology (OPH/SEET) and the Agency for Toxic Substances and Disease Registry (ATSDR) conclude that the D. L. Mud site poses no public health hazard based on the data reviewed on current site conditions. Prior to clean up, the site may have posed a public health hazard, but we are unable to determine past exposure levels and effects on public health.

The most prevalent contaminant remaining on-site is barium. Barium, a common component of drilling mud, was detected at elevated levels in the surface soils where the process area and storage tanks were once located. It was detected in the surface water and sediment of the on-site drainage ditches below levels of concern. It was also found in drinking water along with arsenic, these results are further discussed in the toxicological evaluation and public health implications section of this document.

Past completed exposure pathways existed from exposure through ingestion and dermal contact to surface soils, sediment, and surface water. Past exposure may have occurred to former site workers, trespassers onto the site and children who may have played in the canals and ditches near the site. Under current site conditions, this exposure would be minimal and unlikely to result in adverse health effects. Ingestion of the groundwater is also considered a completed exposure pathway based on the naturally occurring arsenic levels detected in some of the residential wells surrounding the site.

The main concerns expressed by the local community were related to the environmental contamination present at the site and the possible health effects which might result from exposure to these contaminants. The LOPH/SEET and the Agency for Toxic Substance and Disease Registry's Health Activities Recommendation Panel determined that community and health professional education was necessary to advise the community regarding the public health hazard from chronic exposure to arsenic in the private well drinking water as well as

contaminants on site. A public meeting was conducted to explain the findings of the public health assessment and to provide information to the community after residential well sampling occurred in 1993.

The site, which is now in the deletion process, is currently at operation and maintenance status. The site risks associated with the soils have been eliminated or reduced to acceptable levels by institutional controls, excavation, and off-site disposal of these soils at appropriate waste disposal facilities. Potentially responsible parties have put deed notices into property files associated with the site. These notices serve to notify future landowners of land use restrictions and EPA access rights. Contaminated subsurface soils were excavated. Excavation bottoms underwent confirmatory sampling and were backfilled. Wastes generated from remedial activities were disposed of at two facilities in Louisiana. The groundwater is monitored quarterly and a site inspection will be conducted annually. A Final Close Out Report was completed for this site by the EPA in June 1999 [9].

2. BACKGROUND

A. SITE HISTORY AND DESCRIPTION

Site History

The D. L. Mud site is located approximately 3.5 miles southwest of Abbeville in Vermilion Parish, Louisiana (Appendix B: Figure 1). It is located on Parish Road P-7-31 in a relatively rural area. Land use is mainly agricultural.

This site was used as an oil field drilling mud mixing and storage by its original owner. Drilling muds, salt water, and other drilling fluids were placed in storage tanks located on site. Considerable amounts of waste oils and diesel fuel reportedly were spilled onto the surface soils. Illegal dumping of other wastes was reported to have taken place on the site. The United States Environmental Protection Agency (EPA) placed the site on the National Priorities List (NPL) in October 1989.

The D. L. Mud site was once part of a 25.56 acre parcel of land known as the Galveston Houston Yard or the LeBoeuf Yard. The parcel of land was owned by Lafayette Equipment Sales and Services, Inc. from September 1969 to May 1975 when it was sold to Gulf Coast Pre-Mix Mud Services, Inc. In January 1979, Gulf Coast Pre-Mix Mud Services, Inc. and Gulf Coast Pre-Mix Trucking, Inc. merged into G. H. Drilling Fluids, Inc. In 1981, the southern 12.78-acre parcel of the original 25.56-acre site was acquired by the Dowell Division of Dow Chemical Company, (Dowell Fluid Services). D. L. Mud, Inc. purchased the site in March 1985 from Dowell Schlumberger, Inc., Dowell's successor in interest. The remaining adjacent parcel of land is known as the Gulf Coast Vacuum Superfund Site which is being evaluated in a separate Public Health Assessment [1].

EPA conducted sampling inspections at the site in 1980 and 1985. A more detailed sampling program was conducted by the EPA Technical Assistance Team (TAT) in July 1985 and an Expanded Site Inspection (ESI) was performed by the EPA Field Inspection Team (FIT) in 1987. The site information and sampling data collected in the ESI was used to determine if the site posed a significant environmental and human health risk. The results from these studies led to the site's placement on the NPL [2,3].

In 1987, the site underwent remedial clean-up operations, through a cooperative agreement between Dowell Schlumberger, Incorporated, and the Louisiana Department of

Environmental Quality (LDEQ). Remediation began in April 1987 and was completed in August 1987. The remediation process included:

1. Removal and disposal of the remaining drilling muds that were stored in the 16 existing storage tanks.

2. Removal and disposal of the 16 storage tanks, their bases, roof, and piping, etc.

3. Removal and disposal of an area of contaminated soils located on the site but believed to have originated from illegal dumping.

4. Backfilling and grading of all excavations to conform with the natural contour of the land.

From December 1990 through September 1992, EPA conducted a Remedial Investigation/ Feasibility Study (RI/FS) at the D. L. Mud site. Twelve separate field sampling efforts were performed and included the collection of approximately 200 on-site and off-site samples from the following environmental media: surface soil, subsurface soil, sediment, surface water, and groundwater.

In February of 1992, the Louisiana Department of Health and Hospitals (LDHH) in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR) completed a Preliminary Public Health Assessment using data that was available prior to the RI/FS.

During the fall of 1992, EPA requested PRC Environmental Manager Inc. to oversee the sampling of six trenches dug centrally in six impoundment areas visible in a 1974 aerial photograph of the D. L. Mud site [8]. Black, oil-like contaminants were observed in the trenches dug in impoundments 1, 2, and 3, but not in the trenches dug in impoundments 4, 5, and 6. Base neutral acid extractable (BNA), total metals, and volatile organic compounds (VOCs) were investigated in soil at depths from 3-5 feet below ground surface in impoundments 1, 2, and 3, and at 4-8 feet below ground surface in impoundments 4, 5 and 6 (Appendix B: Figures 2,3).

EPA's Record of Decision (ROD) was signed in September of 1994 and called for excavation and offsite disposal of sludges and contaminated subsurface soil. In addition, groundwater was to be monitored and institutional controls (such as fences and deed restrictions) were to be implemented. The Consent Decree was signed in April, 1998.

In June 1998, the potentially responsible parties put deed notices into the property files affiliated with the D.L. Mud, Incorporated site in order to apprize future owners of certain land use restrictions and EPA access rights. Subsurface soil excavation began in October 1998. Remediation was completed in February 1999 with the installation of a six-foot chain link fence with triple strands of barbed wire around the entire site, in order to control access to the site by trespassers.

All visually stained or odoriferous soils were removed during the construction remedial action. Materials generated during remediation activities were disposed of at Laidlaw's White Castle, Louisiana landfarm and Waste Management's Walker, Louisiana landfill. Confirmatory samples were obtained from the excavation bottom. Excavated areas were backfilled with off-site soils and unstained soils which were stockpiled during excavation activities. The backfill was compacted and graded to correspond to the surrounding drainage

pattern. The Remedial Action Report was accepted and the Close Out Report completed in June, 1999. The site is now in the process of deletion from the NPL list.

Site Description

During the site visit in 1993, the site was observed to be fenced and clear of all structures It was flat and overgrown with weeds. The only visible features remaining in 1993 were several monitoring wells and two concrete slabs which were used to store drums containing materials generated during sampling events.

There are two surface drainage features which may receive runoff from the site: the LeBoeuf Canal West Branch and the LeBoeuf Canal. The West Branch flows through the site from west to east and into the LeBoeuf Canal. The LeBoeuf Canal, borders the site to the east and generally remains stagnant, except during periods of heavy rain when it flows to the south.

State Highway 335 passes one half mile east of the site. A small, unpaved road crosses both the Gulf Coast Vacuum site and the D. L. Mud site from Parish Road P-7-31, leading to the fields in the east. A locked gate at the D. L. Mud property line restricts public access onto the site.

As of 1999, there is now a 6 foot high chain link fence with 3 strands of barbed wire surrounding the site. Signs are posed on the fence around the perimeter of the site. There are no structures present and site maintenance includes periodic mowing.

B. SITE VISIT

On January 26, 1993 a site visit was conducted at the D. L. Mud site. Representatives of the Section of Environmental Epidemiology and Toxicology (OPH/SEET) and LDEQ performed a site walk-through noting what were then the current site conditions.

In 1993, an open, unpaved access road approached the site from Parish Road P-7-31. The access road crossed the adjacent Gulf Coast Vacuum site and entered the site from the northwest corner. The site was enclosed within a four foot high barbed wire fence. The fence line was overgrown with weeds and small trees. The entrance gate was locked but there were no signs which declared this area as a hazardous waste site.

In 1993, there were no structures remaining on the site. It consisted of an open field overgrown with weeds and grass. Monitoring wells were observed at several locations on site. Several drums were observed near the northern property line. The LDEQ representative believed the drums contained purged well water from the site monitoring wells. A small pile of household garbage was observed near the entrance gate. There were no visible signs of contamination or physical hazards.

In May and October of 1996, LOPH/SEET staff also visited the site. It was overgrown with vegetation. No site activity was noted. The site remains in this same condition currently.

C. DEMOGRAPHICS, LAND USE AND NATURAL RESOURCE USE

According to the 1990 census data, approximately 50,055 persons live in Vermilion Parish, Louisiana. Abbeville, located 3.5 miles northeast of the site, is the largest city in Vermilion Parish with a population of 11,187. The population in Abbeville is comprised of 6,607 Caucasian Americans, 4,146 African Americans and 434 Other Americans.

Tables 1 and 2 in Appendix A describe the population distribution of the area by race, sex and specific age groups.

The population within a three-mile radius of the site is estimated at 2,600. Most of this population is made up of the residents and workers from local industries and farms in the area. Three parks, one school, and one cemetery are situated within a three-mile radius of the site. The boys camp, Woodman of the World Camp, is located 0.8 miles from the site.

Within a one-mile radius of the site, approximately 160 persons occupy 75 residences and approximately 54 persons are associated with four commercial or industrial areas. There are no schools, hospitals, parks, or other public sites or institutions within one mile of the site.

Approximately 39 private wells are located in the vicinity of the site. Twenty of these wells are listed for domestic water supply. The nearest residential water well is approximately 2,000 feet northeast of the site. A survey of well construction records indicate that residential well depths typically range from 80 to 230 feet below ground surface.

Land use surrounding the site is generally agricultural (rice, crawfish, soybeans, cattle). Residences are located near the facility on parish road P-7-31 and LA Hwy. 335. The west side of Abbeville is less than three miles northeast of the site. The town of Perry is located less than two miles east of the site.

Elevated canals were built to transport irrigation water from the Vermilion River (1.5 miles east of the site) to the Abbeville area. They were commercially operated until the late 1970's. The use of these canals as a source of irrigation water diminished due to a decrease in flow volume from the Vermilion River. Many of these canals have been replaced by private irrigation wells. Rice is the main crop irrigated with water from these canals and wells.

The public water supply in the area is dependent upon groundwater as a source. The City of Abbeville operates three wells located in the northeast part of the city. Residents located outside of Abbeville obtain their drinking water from private wells. The water supply for the town of Perry is also obtained from private wells. Well testing has occurred, the results are discusses further in other sections of this document.

D. HEALTH OUTCOME DATA

Health Outcome Data

The Louisiana Tumor Registry (LTR) was used to ascertain cancer cases. The Tumor Registry, operated by Louisiana State University Medical Center, is a population-based cancer registry covering the entire state of Louisiana. The population estimates used are from the U.S. Bureau of the Census. Cancer incidence data is evaluated later in this document under the Public Health Implications Section.

3. COMMUNITY HEALTH CONCERNS

Health concerns previously reported in the 1992 Preliminary Public Health Assessment include: fear of toxic exposure to drinking water from private wells adjacent to the site, discoloration and a metallic taste in the water due to mercury, possible contamination of the Chicot Aquifer, and potential pollution of the Vermilion River which is used for primary and secondary recreation and the propagation of fish and wildlife [4]. In February of 1991, the

Technical Assistance Grant representative agreed that these were still the major health concerns.

Since 1990, SEET has been in contact with the community periodically to determine and address community health concerns. To help determine the health concerns a Community Assistance Panel (CAP) was established in 1992. On April 12, 1993, SEET met with the Abbeville CAP, consisting of 9 community members. All members expressed their concerns and assisted SEET in planning a public meeting to inform the community of the public health assessment process and to receive comments from the community. Approximately 50 community members attended a public meeting on April 19, 1993. Approximately 30 people voiced concern during the meeting and seven filled out community concern reports. During the CAP meeting, the public meeting, and previous community contacts, residents raised the following health-related concerns:

1. Is there a possibility that the private wells around the site are or could become contaminated?
2. Will residents be informed of the results of tests done on their private wells in the past and in the future?
3. Is the Chicot (deep) aquifer in danger of being contaminated?
4. Is there a higher cancer rate, especially for young adults, in the area?
5. Can studies be done to look into the cancer rate?
6. Is there a cancer cluster around the Pershing Broussard Hazardous Waste pit?
7. Are the children who will be attending the Woodman of the World camp, 0.8 miles west of the site, being exposed to site contaminants?
8. Is there a threat to health by eating crawfish from the area?
9. Is the Vermilion River, which is used for primary and secondary recreation and the propagation of fish and wildlife, being polluted?
10. Who should be contacted about developing municipal water systems in the area?

Members of the Community Assistance Panel were contacted in March 1996 to obtain any present concerns regarding the D. L. Mud site. No new concerns were expressed at this time and members were aware of the recent short term activity on the site to remediate small impoundment areas and visually contaminated soils in the summer of 1996.

4. ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The tables related to this section list the contaminants of concern. These contaminants are evaluated in the subsequent sections of the public health assessment to determine whether exposure to the existing contaminants has public health significance. ATSDR and SEET select and discuss these contaminants based upon the following factors:

1. Concentrations of contaminants on and off the site.
2. Field data quality, laboratory data quality, and sample design.
3. Comparison of on-site and off-site concentrations with health assessment comparison values for [1] non-carcinogenic endpoints and [2] carcinogenic endpoints, and
4. Community health concerns.

If a contaminant is listed in the data tables that follow, it does not necessarily mean that it will cause adverse health effects from exposure. Instead, it indicates which contaminants will be evaluated further in the public health assessment.

Comparison values for the health assessment are concentrations of contaminants in specific media that are used to select contaminants for further evaluation. These include the Environmental Media Evaluation Guide (EMEG), Reference Dose Media Evaluation Guide (RMEG) and Cancer Risk Evaluation Guide (CREG) values provided by ATSDR. The EMEGs and RMEGs are comparison values derived for health effects with non-cancer end points, whereas, the CREG comparison values are estimated contaminant concentrations based on a one excess cancer in a million persons exposed over a lifetime. They are calculated from the EPA cancer slope factors. Comparison values are not intended to be used as predictors of adverse health effects or setting clean-up levels. Media concentrations below these levels are not likely to pose a health threat, however, levels above the comparison values do not necessarily mean a health threat is likely. Comparison values do not take into consideration highly sensitive or susceptible persons.

EPA collected the data presented in this subsection during the Remedial Investigation (RI), performed in 12 separate field efforts from December 1990 through September 1992. Approximately 200 on-site and off-site samples were collected from the following environmental media: surface soil, subsurface soil, sediment, surface water, and groundwater. The samples were analyzed for organic and inorganic contaminants using EPA guidelines.

A. ON-SITE CONTAMINATION

Surface Soil (0-1 foot)

A total of 22 composite surface soil samples were collected to evaluate potential residual contamination on-site (Appendix B: Figure 4). These samples were collected at a depth ranging from 0-1 foot below ground surface. While this depth range may be appropriate for sampling purposes, for adequate health calls based on surface soil sample results, samples taken from 0-3 inches are most adequate. The analytical data for the surface soils indicate that residual inorganic contamination appears to be centered near the former storage tank area in the northern portion of the facility. Inorganic contamination is also present on-site due to surface water runoff from the Gulf Coast Vacuum (GCV) site. The levels of inorganics decreased with increasing distance from these areas and eventually reached background levels in the southern portion of the facility.

Barium is the most widespread residual contaminant, and in fact, the only contaminant detected which was substantially above background values. This is not surprising, considering the previous use of D. L. Mud as a barium sulfate based drilling mud blending facility. Table 3 in Appendix A, presents the range of barium concentrations detected on-site and ATSDR's comparison value [1].

Subsurface Soil (>1 foot)

On-site subsurface soil samples (>1 foot) were collected from various locations throughout

the site. These locations were chosen based on 1) known past usage, such as the former storage tank area and former surface impoundments; 2) indications of contamination evident during monitoring well installation; and 3) a need to characterize untested areas. Four areas with discolored soils and/or elevated organic vapor readings were determined from on-site subsurface soil sampling. These areas, shown in Figure 5, include soil taken around monitoring wells G-22, G-23, soil boring SB-30, and the former surface impoundments. Sampling results of subsurface areas revealed the presence of residual inorganics and to a lesser extent the presence of limited organics. However, none of the contaminants detected were at a level which exceeded ATSDR's comparison values.

Sediment

Seven sediment samples were collected from the ditches and abandoned irrigation canals on or adjacent to the site. One canal runs east-west through the site and the other borders the site on the southeast. Barium was the only contaminant detected to be significantly above background levels and exceeded of ATSDR's comparison value. The maximum level was detected in sediment sampled from the abandoned irrigation canal which crosses the site. The concentration range and comparison value are presented in Appendix A, Table 4 [1].

Surface Water

A total of 11 surface water samples were collected from on-site locations, to evaluate the potential impact of the site on the surface water quality. These samples were collected from the ditches and abandoned irrigation canals. One canal runs east-west through the site and the other borders the site to the southeast.

Barium was the only contaminant detected that was significantly above background levels and exceeded ATSDR's comparison value. The concentration range and comparison value are presented in Table 5 in Appendix A [1].

Groundwater (On-Site Monitoring Wells)

Nineteen groundwater samples were collected during six separate sampling events from December 1990 through December 1991. These samples were collected at various times from the 12 on-site monitoring wells (Appendix B: Figure 6). One of the wells, D-8, is located at the southern most point on the D. L. Mud property. It is considered a background well, since it is far enough away and up gradient from the former active portion of the facility.

Table 6 in Appendix A presents the concentration ranges of the contaminants found in the groundwater which exceed ATSDR's comparison values [1].

The CREG (Cancer Risk Evaluation Guide) is calculated to determine the arsenic concentration which would result in an excess cancer risk of 1 person in 1 million persons. Another way to say this is that if 1 million people were to drink 2 liters of per day for 70 years of this water, the increase in cancer due to the arsenic would occur in 1 person. In contrast to ATSDR, the USEPA develops drinking water standards called Maximum Contaminant Levels (MCLs). The MCL for arsenic is 10 micrograms per liter (µg/l). These standards, which are enforceable by law, provide the maximum concentration of contaminants which are permissible in a public water supply. They are protective of public health but also based on what is technically achievable and feasible.

Chromium was detected at elevated concentrations in several wells, however, additional sampling indicated that the elevated levels were due to sediments present in the sample.

Once the sediments were filtered out, the chromium levels in the groundwater samples were at levels comparable to background.

E. OFF-SITE CONTAMINATION

Surface Soil

The only off-site samples collected were background samples which were collected from areas not impacted by the site. A total of eight off-site (background) surface soil samples were collected from pastures north and northwest of the site. No contaminants were detected which exceeded ATSDR's comparison values.

Subsurface Soil

Based on site history and previous investigations at the D. L. Mud and Gulf Coast Vacuum sites, it is believed that no off-site subsurface soil contamination has occurred as a result of the D. L. Mud site, therefore no samples were collected.

Sediment

Seven sediment samples were collected off-site, from nearby drainage ditches and canals, located upstream from surface water runoff from the site (Appendix B: Figure 3). These samples were used as background samples to compare with levels detected on-site. None of the levels of the site related contaminants detected at these locations exceeded ATSDR's comparison values.

Surface Water

Three off-site surface water samples were collected from a nearby drainage ditch located upstream from where surface water runs off the site (Appendix B: Figure 7). These samples were used for background values to compare with the levels detected on-site. The values for contaminants detected off-site did not exceed ATSDR's comparison values.

Groundwater

Residential Wells

During the remedial investigation of the Gulf Coast Vacuum site, EPA collected a total of seven groundwater samples from residential water supply wells, ranging in depths between 80 and 230 feet below ground level, near the two sites. The locations of these wells to the site are shown in Appendix B, Figure 8.

Organic contaminants were not detected in the residential water supply wells located near the site. Appendix A, Table 7 demonstrates that arsenic was the only inorganic contaminant detected which exceeded ATSDR's comparison value [1]. Compared to the other three residential wells tested, R-3 had an elevated arsenic concentration of 48 parts per billion (ppb).

Sampling of residential water wells located near the site was also conducted by the LOPH during April and May of 1993. Twenty-one wells, including the four previously sampled by EPA, were sampled during this time. Eleven of the 21 wells had detectable levels of arsenic which ranged between 5 ppb and 99 ppb. The maximum level detected (99 ppb) came from the same well that reported the maximum level during the EPA sampling.

Biota (plants & animals)

EPA did not sample any plants or animals near the site. The contaminant of concern, barium sulfate, is considered relatively insoluble and tightly bound to the soil matrix. It is unlikely that plants or animals would accumulate contaminants from this site at levels which could cause health problems in humans.

C. QUALITY ASSURANCE AND QUALITY CONTROL

In preparing this document, SEET relied on the information provided in the referenced documents and contacts. Only data collected using appropriate sampling and laboratory methods were considered in this analysis. Data with demonstrated QA/QC problems were excluded from tables and calculations but may be discussed in the body of the text if they provide unique and relevant information. Whenever possible, data were taken directly from laboratory data sheets, not secondary source documents.

D. PHYSICAL AND OTHER HAZARDS

At completion of remedial activities in 1999, a 6 foot fence topped with 3 strands of barbed wire was erected to prevent access. The site is now clear of all structures. One concrete pad remains. No physical or other hazards are present on the site.

5. PATHWAYS ANALYSIS

To determine whether nearby residents are exposed to contaminants migrating from the site, SEET and ATSDR evaluate the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: A source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure and a receptor population.

ATSDR categorizes an exposure pathway as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. Completed pathways require that the five elements exist and indicate that exposure to a contaminant has occurred in the past, is currently occurring, or will occur in the future. Potential pathways, however, require that at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present. Appendix A, Table 8 identifies the completed and potential exposure pathways. The discussion that follows incorporates only those pathways that are important and relevant to the site.

A. COMPLETED EXPOSURE PATHWAYS

Pathways Related to the Site

Surface Soil Pathway

Past exposure pathways were possible through contact with contaminated surface soils from the site. Soil ingestion is considered the main route of exposure from the contaminated surface soil in the past. Workers at the former facility and elementary age children and teens who trespass onto the site were the most likely exposed populations.

The contamination of the on-site surface soils has occurred directly from the everyday operation of the former facility and the waste handling practices of the former owners. The areas most impacted include the former process and storage tank areas and the area down gradient of surface runoff from the Gulf Coast Vacuum site.

Sediment Pathway

Exposure has occurred through ingestion or dermal contact in the past to contaminated sediments in the ditches and canals on or adjacent to the site.

Contamination of the ditches and canals has occurred mainly from surface water runoff from the D. L. Mud site and the Gulf Coast Vacuum site. The majority of the runoff drains into the LeBoeuf Canal, which at one time served as a commercially operated irrigation system, drawing water from the Vermilion River. Some sections of the canal are now filled in or dammed up and it is no longer connected to the river. Most of the time, the water in the canal is stagnant. However, the flow is toward the south during periods of rain.

Surface Water Pathway
Past and current exposure pathways are present through ingestion or dermal contact from contaminated surface water in the ditches and canals on or adjacent to the site.

Contamination of the ditches and canals has occurred mainly from surface water runoff from the D. L. Mud site and the Gulf Coast Vacuum site. The majority of the runoff drains into the LeBoeuf Canal which at one time served as a commercially operated irrigation system, drawing water from the Vermilion River. Some sections of the canal are now filled in or dammed and it is no longer connected to the river. Most of the time, the water in the canal is stagnant. During periods of rain, the flow is toward the south.

Dermal exposure and ingestion of surface water by children playing in the ditches and canals, are the main route of exposure to contaminants in the surface water. The most likely exposed population are children who may play in the ditches or canals. However, the ditches and canals near the site are relatively small and are overgrown with weeds and small trees. It appears that children would not be attracted to play in these areas and exposure would be very low.

Pathways Unrelated to the Site

Groundwater Pathway (Residential Wells)
Past and present exposure pathways are possible from groundwater in the residential wells near the site. The points of exposure are residential water taps.

Arsenic was detected in all four of the residential wells sampled by EPA during the RI for Gulf Coast Vacuum and in 11 of 21 wells sampled by OPH at levels which exceeded ATSDR's comparison value. Arsenic was also detected at comparable levels in the site monitoring wells and the background monitoring well. The background well is sufficiently removed from the site and is located in an up gradient position, believed to be unaffected by site contamination. Because the levels of arsenic in the residential wells are similar to those in the background wells, we believe that the levels in the residential wells represent natural background conditions and are not a result of site contamination. However, the possible health effects from ingestion of water from the residential wells will be evaluated in the following toxicological evaluation section.

B. POTENTIAL EXPOSURE PATHWAY

Sediment Pathway
Ingestion is the main route of exposure to contaminants in the sediments. The most likely exposed population are children who play in the ditches or canals. However, the ditches and canals near the site are relatively small and are overgrown with weeds and small trees. It appears unlikely that children would be attracted to play in these areas, therefore, exposure would potentially be very small or non-existent.

Ground Water Pathway
Exposure is possible to residents drinking ground water from the residential wells near the

site in the future, where contaminants may have migrated to potable water sources. The points of exposure are residential water taps.

6. PUBLIC HEALTH IMPLICATIONS

A. TOXICOLOGICAL EVALUATION

Introduction

To evaluate health effects, the Agency for Toxic Substances and Disease Registry (ATSDR) has developed minimal risk levels (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. The MRLs are developed for each route of exposure, such as ingestion and inhalation, and for length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days) and chronic (greater than 365 days). The ATSDR presents these MRLs in Toxicological Profiles. These chemical specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. When MRLs are not available, reference doses (RfD) provided by the EPA are used for comparative purposes.

The health effects, which result from the interaction of an individual with a hazardous substance in the environment, depend on several factors. One is the route of exposure, for instance, whether the chemical is breathed, consumed with food or water, or contacts the skin. Another factor is the dose to which a person is exposed, and the amount of the exposure dose that is actually absorbed into the body. Mechanisms by which chemicals are altered in the environment or absorbed into the body, are also important. Many variations in these mechanisms exist from one individual to another.

The toxicological profiles for chemical substances of concern at the D. L. Mud site have been reviewed. These documents interpret all known information on the substances and specify the level at which people might be affected.

When performing an exposure assessment all routes of exposure (ingestion, inhalation, and skin contact) must be considered to determine the overall exposure to a chemical (5). Because it is difficult to accurately determine the amount of absorption through the skin, MRLs for skin exposure have not been developed. For this reason, it is difficult to determine the health effects from skin exposure. However, because the levels of the chemicals detected are relatively low and generally not widespread, it is unlikely that harmful effects from exposure through skin contact have occurred in the past or will occur in the future.

For the D. L. Mud site, several different exposure scenarios were considered to determine the degree of exposure to the population in the past or in the future. The following scenarios, where they apply, will be considered and referred to throughout the toxicologic evaluation section.

To estimate the exposure dose from past and future soil ingestion we assume the following:

- An adult who worked on-site during facility operation; assuming the adult visited the site 5 days a week, 50 weeks a year for 14 years (years facility was operating). We will also assume the adult weighs 70 kg and ingests 100 mg of soil per day (through hand to mouth activities and ingestion of dust particles).

- A child (5-16 yrs), who may have wandered or played on the site in the past; assuming the child visits the site 3 days a week, 26 weeks a year for 11 years (years facility has been abandoned), weighs 35 kg and ingests 200 mg soil per day. A pica child, usually between 2 to 6 years old who typically ingests a larger quantity of soil, would weigh approximately 16 kg and have a soil ingestion rate of 5000 mg of soil per day.

- A child who, in the future, may wander or play on the site; assuming the child visits the site 3 days a week, 26 weeks a year for 13 years (the maximum number of years a child/teen might play on site; from age 5 to age 18), weighs 35 kg and ingests 200 mg of soil a day.

To estimate the exposure dose from ingestion of water we assume, a resident uses his/her private well water for drinking for an entire lifetime (70 years). To determine the amount of the exposure dose, we assume the water will be ingested by adults, weighing 70 kg and drinking 2 liters of water a day, and for children, weighing 10 kg and drinking 1 liter of water a day.

B. CHILD HEALTH INITIATIVE

As part of the ATSDR Child Health Initiative, ATSDR Public Health Assessments and Health Consultations must point out whether any site-related exposures are of particular concern for children. Young children are especially sensitive to the health effects of environmental contaminants since they have greater possible exposure. Children often play in dirt and are more likely to eat soil by putting their hands in their mouths. A child's physiology is also different from an adult's causing chemicals to have a greater affect on a child's central nervous system and other organs. Estimated exposure doses to site-related contaminants were calculated for children at the D.L. Mud site.

Arsenic

Arsenic was detected in the on-site groundwater monitoring wells. Arsenic was also detected in several residential water wells near the site. The presence of arsenic in the groundwater is believed to be unrelated to site contamination, but rather representative of natural background conditions. Residents, whose private water wells contained arsenic and who used their water for drinking and cooking, have been exposed in the past and will potentially be exposed in the future, if they continue using it for these purposes.

The estimated oral exposure doses, for children and adults for ingestion of groundwater with the maximum concentration of arsenic detected, exceed EPA's chronic oral RfD. The oral exposure dose, determined from the maximum concentration of arsenic in residential wells, approaches the Lowest-Observed-Adverse Effects-Level (LOAEL) (0.014 mg/kg/day) for children but not for adults. At a long-term dose above this level of exposure, adverse health effects may be realized. Possible health effects from exposures to arsenic by oral route above the LOAEL may include effects to the skin.

Perhaps the single most characteristic effect of long-term oral exposure to arsenic is a pattern of skin changes. This includes a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso. While these skin changes are not considered to be of public health concern, a small number of the corns may ultimately develop into skin cancer [6]. Arsenic ingestion above the LOAEL has also been reported to increase the risk of cancer in the liver, bladder, kidney, lung and skin. High levels of arsenic have been related to heart, vascular system, stomach, and nervous system effects.

Arsenic is classified as an EPA Group A carcinogen, a known human carcinogen. A cancer risk value was estimated to determine the risk of cancer posed by arsenic in the groundwater. There is a slight increase in the probability of developing cancer over a lifetime from ingestion of arsenic at levels detected in the groundwater.

Barium

Barium, a silvery-white metal occurring in nature in many different forms, is found primarily as the mineral barite. Barium and its compounds have a wide variety of uses in many different industrial applications.

Barium was detected on-site in soil, sediment and surface water. Exposure to barium through soil ingestion may have occurred in the past to adults who worked at the site and to children who may have wandered or played on-site.

Based on the concentration and the surface soil exposure scenarios presented in the introduction to this section, the estimated exposure doses do not exceed the EPA chronic oral RfD. Therefore, adverse health effects are considered unlikely.

While exposure to elevated levels of barium does not appear to cause cancer, if enough barium entered the body, some other possible health effects may include changes in the function and chemistry of the heart, and a shortened lifespan. People, who eat or drink smaller amounts of barium for a shorter period of time, may experience difficulties in breathing, increased blood pressure, changes in heart rhythm, stomach irritation, minor changes in blood, muscle weakness, changes in nerve reflexes, swelling of the brain and damage to the liver, kidney, heart and spleen [7]. However, for the levels of barium detected at the site and the infrequency of contact with contaminants, adverse health effects are unlikely.

C. HEALTH OUTCOME DATA EVALUATION

Data Review

The Louisiana Tumor Registry (LTR) was used to ascertain cancer cases. The Tumor Registry, operated by Louisiana State University Medical Center, is a population-based cancer registry covering the entire state of Louisiana. The registry has been in operation in the New Orleans metropolitan area since 1974, in South Louisiana since 1983 and in the rest of the state since 1988. By law, every health care provider is required to report newly diagnosed cancers.

The period of time selected for evaluation of cancer incidence data was 1988-1996, which was the most recent data available for this part of the state at the time of this analysis. Cancer incidence was chosen for this review because cancer death rates are affected by multiple factors: how advanced the cancer was at the time of diagnosis, access to health care, and other factors not related to exposure. A case was defined as an individual residing in the selected census tract who was diagnosed with a new primary malignant cancer during the evaluation period. The variables used to analyze the cancer data included: address at time of diagnosis, parish of residence, primary cancer site, histology type, dates of diagnosis, age at diagnosis, date of birth, race, sex, LTR identification number and census tract, block group and block numbers. Information on other risk factors such as occupational exposures or personal lifestyle habits are not available in the abstracted medical data used in this review.

Census Data

In order to compare the cancer incidence rates around the D.L. Mud site with parish or regional rates, it is necessary to have specific population data. Population data, categorized by age and race, and health outcome data are both available at the Census Tract level. Census Tracts are subdivisions of parishes. They usually have between 2,500 to 8,000 persons and are designed to be relatively similar with respect to population characteristics, economic status, and living conditions.

The D. L. Mud site lies within Census Tract 9505 of Vermilion Parish. According to the 1990 census data, the total population for Census Tract 9505 is 4,454 persons.

Data Analysis

For the Census Tract discussed, analysis was completed for all cancer types combined and for selected cancer types. The following specific cancer types were able to be analyzed because there were at least three observed cases in the Census Tract: lung and prostate.

Analysis of cancer incidence was conducted using standardized incidence ratios (SIRs). The SIR is calculated by dividing the observed number of cases by the expected number of cases. The expected number was derived by multiplying a comparison population's age-race-sex-specific incidence rates and the Census Tract's age-race-sex-specific population data. SIRs were calculated when three or more cases were observed in census tract. SIRs were calculated for all races combined and for whites. A separate analysis for African-Americans was not done because of small numbers. The Acadiana, Louisiana (Region IV) average annual incidence rates (1988-1996) were used to derive the expected number of cases. Region IV includes Acadia, Evangeline, Iberia, Lafayette, St. Landry, St. Martin, St. Mary and Vermilion parishes.

Evaluation of the observed and expected number is accomplished by interpreting the ratio of these numbers. If the observed number of cases equals the expected number of cases, the SIR will equal one (1.0). When the SIR is less than one, fewer cases were observed than expected. For SIRs greater than one, more cases were observed than expected.

Caution should be exercised, however, when interpreting the SIR. The interpretation must take into account the actual number of cases observed and expected, not just the ratio. Two SIRs can have the same number, but represent very different scenarios. For example, a SIR of 1.5 could mean three cases were observed and two were expected (3/2=1.5). Or it could mean 300 cases were observed and 200 were expected (300/200=1.5). In the first instance, one excess cancer occurred, which could easily have been due to chance. But, in the second instance, 100 excess cancers occurred and it would be less likely that this would occur by chance alone.

To help interpret the SIR, the statistical significance of the difference can be calculated. In other words, the number of observed cases can be determine to be significantly different from the expected number of cases or the difference can be due to chance alone. "Statistical significance" for this review means that there is less than five percent chance (p-value<0.05) that the observed difference is merely the result of random fluctuation in the number of observed cancer cases. If the SIR is found to be statistically significant, then the difference between the expected and observed cases is probably due to some set of factors that influence the rate of that disease.

Because cancer is, unfortunately, so common (more than 1 in 3 of us will develop cancer in our lifetime), every community will experience a certain number of cancers. Through the

years, you would expect some fluctuation in the numbers. One year, there may be a few more cases of cancer A and the next year a few less. This occurs by chance. There is no specific cause. Just like flipping a coin, although you expect that you will get heads half the time and tails half the time, it doesn't always come up even. Out of 10 coin tosses, you may get seven heads and three tails or four heads and six tails. The more tosses you make, the closer you will probably come to getting a 50-50 mix. This is why, in order to determine if cancer rates are elevated, the statistical significance must be considered.

Result of Cancer Incidence Analysis

Standardized incidence ratios were computed for all cancers combined and for specific cancer sites when three or more cases were observed in the Tract. The following tables summarize the results. Appendix A, Table 9 shows the results of the SIR analysis for the Tract for all races combined by primary cancer type using Region IV cancer rates as the comparison. In general, there were fewer cases observed than expected. For males, all sites, lung and prostate were significantly low when compared to the region. For females, all sites combined was significantly lower when compared to the region.

Appendix A, Table 10 displays the results of the SIR analysis for the Tract for whites by primary cancer type using Region IV cancer rates as the comparison. For white males, all sites, lung and prostate were significantly lower than when compared to the region. For white females, all sites combine was significantly lower when compared to the region.

No cause or reason for the differences in cancer rates can be determined by this type of review. The influence of established risk factors for each type of cancer was not evaluated. This screening helps to identify unusual patterns of adverse health effects and direct future public health actions.

D. COMMUNITY HEALTH CONCERNS EVALUATION

SEET has addressed each of the community concerns about health as follows:

1. **Is there a possibility that the private wells around the site are or could become contaminated?**
   Previous sampling of the residential wells around the site have indicated that these wells have not been affected by site contamination. There is a possibility that residential wells around the site could be contaminated in the future as a result of migration of contamination, particularly arsenic, beneath both the D. L. Mud site and the adjacent Gulf Coast Vacuum site. However, EPA will conduct long-term groundwater monitoring around both sites (at least 30 years) which should detect if contamination is migrating toward any private wells.

1. **Will residents be informed of the results of tests done on their private wells in the past and in the future?**
   LOPH conducted residential well sampling around the three Superfund Sites in Vermilion Parish in 1993. Each resident whose well was sampled was informed of the results. Results from past residential well sampling, conducted by EPA, are on file at the Vermilion Parish Library. In addition, results from any future testing of residential wells will be made available to the residents.

1. **Is the Chicot (deep) aquifer in danger of being contaminated?**
   The deep monitoring wells at the Gulf Coast Vacuum site are completed in the "Lower Aquifer Unit" which corresponds to the Abbeville Unit of the Chicot Aquifer System.

Sample results from the wells in the Lower Aquifer Unit do not indicate it has been affected by site contamination. EPA will conduct long-term groundwater monitoring on a quarterly basis around both sites (at least 30 years) which should detect if contamination is migrating to the deeper aquifer.

1. **Is there a higher cancer rate, especially for young adults, in the area?**
   Review of the current information provided in the Louisiana Tumor Registry indicates that there is no statistically significant increase in the cancer rate for young adults in Vermilion Parish. However, the development of cancer is very complex and each individual who develops a particular cancer has unique risk factors associated with genetics and lifestyle, which may have contributed to its cause. We do not have information on risk factors for each individual with cancer who live in the community near the site. Therefore, it is not possible to determine a definite causal relationship between risk factors, exposure to contaminants at the site, and the development of cancer.

1. **Can studies be done to look into the cancer rate?**
   There is a tumor registry in Vermilion Parish which serves to collect cancer mortality and incidence data. Additionally, SEET is using a Geographic Information System (GIS) as a surveillance tool to spatially relate adverse health outcomes, i.e. cancer with environmental contaminants. Specifically, detailed analysis will be done within a two-mile radius of superfund sites. These reports will be provided to the public upon completion.

1. **Is there a cancer cluster around the Pershing Broussard Hazardous Waste pit?**
   Currently, there is no data available that is discrete enough to determine if a true cancer cluster exists in the community surrounding this site. Residents have reported 10 to 12 individuals around this site with various types of cancer. The development of a particular type of cancer has unique risk factors associated with each individuals genetic background and lifestyle, which may have contributed to its cause. Therefore, it is not possible to determine a definite causal relationship between risk factors, exposure to contaminants at the site, and the development of cancer.

1. **Are the children who will be attending the Woodman of the World camp 0.8 miles west of the site, likely to be exposed to site contaminants?**
   The fence erected around the site should keep children and other trespassers out. Long-term groundwater monitoring on a quarterly basis will detect whether contaminated groundwater is migrating from the site toward the wells at the camp.

1. **Is there a health threat by eating crawfish from the area?**
   Biota sampling (crawfish, fish, wild game, crops) has not been conducted around the site. Barium , the primary contaminant of concern, is present in a form that is not readily soluble and unavailable for absorption by humans and other biota. Based on the concentrations and types of contaminants detected at the D. L. Mud site, it appears unlikely that plants or animals would accumulate contaminants at levels which would cause health problems in humans.

1. **Is the Vermilion River, which is used for primary and secondary recreation and the propagation of fish and wildlife, being polluted?**
   The site is generally flat and is above the 100-year floodplain at an approximate 10-foot elevation. It is bounded to the south and east by levees and ditches associated with

abandoned irrigation systems. With the exception of the abandoned canals, site drainage is promoted by grading that results in surface water discharge through two ditches, one flowing to the north and the other toward the south. The abandoned canals are diked to contain surface water that collects within them. None of the surface runoff flows directly into the Vermilion River so it is unlikely that the limited site contamination is impacting the water quality in the river.

1. **Who should be contacted about developing municipal water systems in the area?**
   The Louisiana Department of Health and Hospitals, Safe Drinking Water Program should be contacted for guidance in construction of municipal water systems.

   Address: DHH Safe Drinking Water Program
   6867 Bluebonnet, Bin #26
   Baton Rouge, LA 70810

   Phone #: (225) 765-5054

7. CURRENT SITE CONDITIONS

Remediation was considered completed in February 1999. Remedial action included monitoring ground water, excavating and disposing visually stained soil and trash, and establishing deed notices/restrictions on the use of the property. The surface was backfilled, graded, and revegetated.

The site is completely surrounded by a six-foot chain link fence with three strands of barb wire and periodic mowing takes place. Signs are posted on the fence around the perimeter of the site and provide identifying information. One concrete pad remains on the site; however, drums are not staged there. An Operations and Maintenance plan is in place which includes a 30-year quarterly ground water monitoring program and annual site inspection. Ground water monitoring data collected to date identified some metals, only arsenic at levels of concern; all volatile and semi-volatile organic contaminants were below detectable limits. This data will be available in an annual report.

The public comment period for deletion from the National Priorities List began January 7, 2000. This period ended February 12, 2000. The site was deleted from the NPL on March 7, 2000.

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