



Public Health Assessment for

**ADMIRAL HOMES APPLIANCES
WILLISTON, BARNWELL COUNTY, SOUTH CAROLINA
EPA FACILITY ID: SCD047563614
NOVEMBER 13, 2006**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

Agency for Toxic Substances & Disease Registry Julie L. Gerberding, M.D., M.P.H., Administrator
Howard Frumkin, M.D., Dr.P.H., Director

Division of Health Assessment and Consultation..... William Cibulas, Jr., Ph.D., Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Cooperative Agreement and Program Evaluation Branch Richard E. Gillig, M.C.P., Chief

Exposure Investigations and Site Assessment Branch Susan M. Moore, M.S., Chief

Health Promotion and Community Involvement Branch Susan J. Robinson, M.S., Chief

Site and Radiological Assessment Branch Sandra G. Isaacs, B.S., Chief

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PUBLIC HEALTH ASSESSMENT

ADMIRAL HOMES APPLIANCES

WILLISTON, BARNWELL COUNTY, SOUTH CAROLINA

EPA FACILITY ID: SCD047563614

Prepared by:

The South Carolina Department of Health and Environmental Control
Division of Health Hazard Evaluation
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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SUMMARY

The South Carolina Department of Health and Environmental Control (SCDHEC), under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) evaluated the public health significance of the Admiral Homes Appliances site. This public health assessment was undertaken at the request of concerned residents. SCDHEC determined whether exposure to contaminants is likely to cause adverse health effects and recommended actions to reduce or prevent possible health effects. This document went out for public comment from January 17, 2006 – March 17, 2006. The public comments that were received have been addressed in Appendix C.

ATSDR classifies sites as to their public health hazard category. Under ATSDR's classification system, the Admiral Homes Appliances site would be classified as "no apparent public health hazard". This means that human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below the level of a health hazard. Private wells, monitored during environmental investigations at the site, are contaminated with mercury and TCE. Every home with mercury detections was offered bottled water. Five homes accepted this offer, and exposure at these homes has stopped. A carbon filtration system has been installed in the house with TCE in the well. This home is owned by a local company, which has no plans to have anyone live in the house on a full time basis. Employees while in town on business occasionally use the house.

Although it is not known for certain how long the exposure lasted, SCDHEC has estimated how many years the people drinking this water may have been exposed. Based on limited historical sampling, it is likely that exposure to elevated concentrations of mercury and TCE lasted for five years or less. Estimates of a health hazard are based on the amount of chemical a person may have been exposed to, for how long, and what type of person (child or adult). Adverse health effects due to the exposure from drinking this water are not likely to occur, because the concentrations are low and people were exposed for a relatively short period of time. Exposures to either mercury or TCE at concentrations below the MCL are likely to be without appreciable risk of adverse health effects.

Surface soil and sediment samples collected from the Imhoff area contained chromium and nickel above screening levels. People do not live on this property, which is now owned by the company. The Imhoff area is the only part of the property without a fence, but there is a locked gate blocking the road to the area. While it is possible for people who trespass on this property (Imhoff area) to have incidental exposure to soil and sediment, potential exposures and potential health effects are probably minimal. It is likely that chromium from historical discharge at the facility has been transformed in the environment from more toxic to less toxic forms of the compound. There also is a margin of uncertainty with estimating exposure and reference doses; therefore noncancer effects are not likely if a person is eating this dirt or sediment. The estimated doses may overestimate the risk because the model assumes people will eat a certain amount of dirt everyday, and the estimated doses are only slightly above reference doses.

The following recommendations have been made: 1) limit access to the Imhoff area soils and sediments; and 2) institute a program, which regularly (quarterly) collects and analyzes samples of water from private wells downgradient of the site. This program needs to continue until an

alternative water supply is available to residents living close to the Admiral Homes Appliances site.

BACKGROUND

The South Carolina Department of Health and Environmental Control, under a cooperative agreement with ATSDR evaluated the public health significance of the Admiral Homes Appliances site. This public health assessment was undertaken at the request of concerned residents. SCDHEC determined whether exposure to contaminants is likely to cause adverse health effects and recommended actions to reduce or prevent possible health effects. ATSDR is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by SARA, to conduct public health assessments at hazardous waste sites. The Admiral Homes Appliances site is not on the United States National Priorities List (NPL) of hazardous waste sites.

A. Site Description and History

The Admiral Homes Appliances site is southeast of the town of Williston, on County Road 65 in Barnwell County, South Carolina. The site consists of the manufacturing plant, refurbishing plant, former equalization lagoon, former transfer pipe area, the former Imhoff System (septic tank, sludge drying bed, trickling filter, and polishing tank), the Imhoff wetland area, intermittent Spur Branch, Spur Branch (year-round stream), Willis Millpond, and the Willis Millpond spillway (Figure 1). The Imhoff Tank, the drying beds, and trickle filter were removed in January – February 2005. The refurbishing plant refurbishes used drink vending machines, and is not part of the site.

The Imhoff tank was an above-ground concrete structure approximately 30 feet by 20 feet, and 10 feet high (ENSR, 2004). The Imhoff system was not used for treatment of any wastewater since 1982. The former equalization lagoon is about 30 feet wide and 40 feet long. The waste layer at the bottom of the lagoon was encountered at about six feet below the surface and was about two feet deep. There was a sludge drying bed adjacent to the Imhoff tank, but it was removed along with the Imhoff system. It was about 40 feet by 30 feet in size (ENSR, 2004).

The pre-1982 manufacturing process consisted of forming and stamping of steel into freezers. The processes included conversion coating and spray-booth painting. The conversion coating process used an alkali solution to clean the metal, a zinc-phosphate spray to prepare the surface and a chromic acid cleaner to enhance paint retention (ENSR, 2004). Wastewater generated from these processes was routed through the equalization lagoon and the Imhoff system. Wastewater from the equalization lagoon flowed through the transfer pipe into the main, baffled tank of the Imhoff tank structure. Solids precipitated out of the wastewater in the baffled tank. Wastewater would then flow into a small holding tank (polishing tank). Water in the polishing chamber was then pumped into the trickle filter through a series of pipes. The discharge from the Imhoff system was piped through the wetland area toward the intermittent part of Spur Branch stream (ENSR, 2004). The location of the former Imhoff system is east of the manufacturing plant (Figure 1). The intermittent Spur Branch becomes a year round or perennial stream, Spur Branch. Two miles downstream, Spur Branch, was dammed to create Willis Millpond.

The manufacturing plant area is bounded on the east by County Road 65, on the south by East Main Street, on the west by the Dixie Narco refurbishing plant and an undeveloped wooded area, and by County Road 215 (Elko Street) on the north (Figure 2). A brief history of the facility is presented below:

- Prior to the construction of the manufacturing facility, there was a trailer park on the property. The Imhoff system, consisting of the above ground septic tank, a sludge drying bed, a trickle filter, and a polishing tank, was constructed to treat sanitary waste from the trailer park. Based on the information we have, it appears that the trailer park discharged domestic sanitary waste to the Imhoff system from 1952 to 1966.
- In May 1966, Chill Chest, a division of Revco, constructed the manufacturing facility and began operations at the current location of the Dixie Narco facility.
- The plant constructed the equalization lagoon on the plant property and discharged industrial wastewater and sanitary waste into the lagoon. Wastewater was then piped to the Imhoff system then discharged toward the intermittent part of Spur Branch.
- From 1968 to 1986, ownership of the facility changed several times. The current owner, Dixie Narco, began manufacturing soft drink vending machines at the facility in 1989. Prior to Dixie Narco, the plant primarily manufactured household appliances.
- The Imhoff system received waste from the manufacturing facility from 1966 to 1982. Starting in 1982, waste was discharged to the Town of Williston wastewater treatment plant. After the system was shut down, part of the pipe from the equalization lagoon to Dixie Narco Boulevard, was removed.
- From the late 1970's until 2004 (current), various investigations and sampling events have taken place at the facility or parts of the facility. The first investigations were conducted by SCDHEC and facility personnel. The first U.S.EPA investigation was conducted in 1989.
- Previous investigations have shown that sediment, effluent, soil, groundwater (limited samples), soil from the closed lagoon, and contents of the Imhoff system were contaminated with elevated levels of chromium, zinc, and nickel. These chemicals have all been associated with historical processes at the facility.
- Sediment samples collected in 1979 from the Imhoff area contained 18,000 ppm of chromium, 18,000 parts per million (ppm) of nickel, and 150,000 ppm of zinc. Iron, nickel, and zinc were all found in effluent samples collected in 1981.
- Surface soil samples collected from the Imhoff area in 1988 contained high levels of chromium (15,217 ppm), nickel (20,652 ppm) and zinc (83,676 ppm).
- Three private water wells were sampled in 1989. One well contained 8 ppb of 1,1-dichloroethane. There is no U.S.EPA regulatory or health screening level for this

chemical. Three private wells were also sampled in 1999. Two of these same wells were also sampled in 1989. One of the wells contained low levels of 1,1-dichlorethane. Additional private well samples were collected as part of the remedial investigation. The data from the most recent private well sampling can be found in the Environmental Contamination Section of this document.

- □ Dixie-Narco (current owner of the manufacturing facility) signed an Administrative Order on Consent with the United States Environmental Protection Agency (U.S.EPA) in September 2000, to conduct the remedial investigation and feasibility study.
- □ The Draft Remedial Investigation (RI) report was completed in September 2004.

B. Site Visit

Tracy Shelley and Minda Johnson (with SCDHEC Bureau of Land and Waste Management) visited the site before the March 4, 2004 public meeting. The general public does not have access to the plant. The location of the former Imhoff System is on private property; the property is currently owned by Dixie-Narco. A SCDHEC project manager and EPA representative visited the site of Fall 2005, at that time, the Imhoff system had been removed by EPA. No other changes have been made to the site since that visit.

C. Demographics, Land Use, and Natural Resource Use

The Admiral Home Appliances site is in Williston, Barnwell County, South Carolina. Current population estimates were taken from the 2000 Census. The area around the site encompasses two census block groups (1 and 2). The manufacturing facility is in Block Group 2. Block Group 1 is just east of Williston and extends north and south of the town. Block Group 2 includes parts of Williston, extending northeast of the town, along Willis Pond Road. The total population in these two census blocks is about 2,200 people. Block Group 1 is 71% white and 27% black. Block Group 2 is 67% black and 32 % white. In both of these areas, about 30% of the population are children.

Land use around the site is a combination of farming, residential, and commercial/industrial. There is large amount of property around the site that is not developed. The property is bordered on the north by the Williston Industrial Park, commercial property to the west, undeveloped land on the south, and residential properties on the east.

Three surface water bodies are associated with the site, the intermittent part of Spur Branch, the perennial part of Spur Branch, and Willis Millpond. The intermittent stream crosses the east side of the Imhoff wetland area, discharging 1800 feet northeast of the facility. This stream does not always contain running water. The perennial part of Spur Brand extends from Ralph Road (northeast of the facility) to the east-northeast 1.5 miles before discharging into Willis Millpond. Willis Millpond was approximately eight acres in size. In May 2003, the dam for the millpond failed due to heavy rain. The pond is now only about 3 acres in size. Material from the pond washed north into the spillway and across Willis Pond Road (ENSR, 2004). Historical discharge from the facility entered the Imhoff wetland area, into Spur Branch, and eventually into Willis

Millpond. There is also a private pond just east of the facility and two other private ponds farther east (Figure 2).

The Town of Williston gets its drinking water from three groundwater wells named the Industrial Park well, Elko Street well, and the Halford Street well. The Town of Williston supplies about 3,300 customers with water. The water is treated for pH, bacteria, and iron. The water supply is tested for bacteria, radiological substances, and chemicals. The Industrial Park well is 1,000 feet from the Dixie Narco facility, and the Elko Street well is greater than a mile from the facility. There are four general hydrogeologic units, or aquifers, known at the site. The uppermost aquifer is the water table or surficial aquifer. The water quality of this aquifer is poor, with high iron content. The next aquifer occurs in different geological units, the Barnwell Group and the Mcbean, Congaree, and Ellenton formations or the Tertiary Units. Groundwater usually occurs under semi-confined conditions in these formations. Private wells are generally completed in this aquifer. Beneath the Tertiary aquifer are the Cretaceous aquifers, which in the area of the site, appear to be hydraulically separated by a clay unit. The Cretaceous aquifers beneath the area include the Black Creek Formation and the underlying Middendorf Formation. These aquifers are the principal water supply aquifers for the Upper Coastal Plain. There is a hydraulic connection between the shallow and deep aquifers, especially during periods of increased rainfall (ENSR, 2004)

Private wells in the area are thought to be 70 to 140 feet in depth. The shallow private wells sampled during the remedial investigation are likely installed in the Barnwell Group. The deeper private wells may be installed in the deeper, Mcbean Formation (ENSR, 2004). Groundwater monitoring wells ranged from about 15 to 130 feet in depth. As of October 2006, the project to extend public water lines to the area closest to the site should begin soon as the contract has been awarded. All homes will be offered municipal water. Financial assistance should be available to residents, so the cost of hooking up to public water should not prohibit people from connecting to public water.

D. Health Outcome Data

At the request of concerned residents, a summary of cancer incidence and mortality were completed for the zip code, which includes Williston and surrounding area. Fewer cancer cases and deaths occurred in the zip code than expected. A copy of the report is in Appendix B.

COMMUNITY HEALTH CONCERNS

There have been several public meetings to present information about the site. There have also been meetings with individuals in the community. At these meetings area residents have expressed health concerns about the site. Most of the health concerns are about the safety of their private and public water supplies. Area residents have also been concerned in general, about the rates of heart disease, diabetes, strokes, and cancer.

Other concerns have been raised at several local meetings held in early 2005, to prepare for a Leadership Institute in Williston. There were no site-specific health concerns raised at these meetings, or at the Leadership Institute that was held in May 2005.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

Environmental investigations have taken place at the site from the mid 1970s until the completion of the draft remedial investigation (RI) in 2004. Some of these early investigations were very limited in scope. The most complete investigation took place as part of the draft remedial investigation. The majority of data presented in this public health assessment were collected during the RI.

Screening values for public health assessments are chemical concentrations in specific media used to select chemicals for further evaluation. These values include U.S.EPA Maximum Contaminant Levels (MCLs), those calculated by SCDHEC, ATSDR's Environmental Media Evaluation Guides (EMEGs), and other relevant guidelines. EMEGs are derived from ATSDR Minimal Risk Levels (MRLs). EMEGs are the estimates of a daily human exposure to a chemical likely to be without an appreciable risk of non-carcinogenic adverse effects. MCLs are the maximum permissible levels of contaminants in public water.

The Draft Remedial Investigation (RI) report was completed in September 2004. The RI included the Phase 1A, Phase 1B, Phase 2, and Phase 2B investigations. The Phase 1A investigation determined the environmental impact from potential source areas. Phase 1B expanded on the Phase 1A investigation. Phase 1 included the collection of samples from groundwater, soil, surface water and sediment, Imhoff system, a geophysical survey of part of the site, excavation of test pits around the former wastewater system, and sampling of public and private water supply wells. Phase 2 of the RI was initially intended to fill data gaps identified in the Phase 1 investigation. The Phase 2 investigation was expanded to further define the extent of contamination of soil and groundwater.

Background samples were collected for soil, groundwater, surface water, and sediment studied for the remedial investigation.

A. On-site

On-site areas include the manufacturing facility, the former equalization lagoon, and the transfer pipe area. On-site samples included, soil (majority subsurface), groundwater, and soil vapor.

Soil

Soil samples were collected from a temporary monitoring well, permanent monitoring wells, test pits, and soil borings. A total of sixteen test pits were excavated to collect shallow subsurface and subsurface soil samples. Four test pits were excavated in the equalization lagoon. These test pits were dug to allow for the collection of samples from the soil above the waste, samples of the waste material, and from the soil below the waste material. Four test pit samples were dug on the plant property to determine if site-related contaminants were released from the transfer pipe that was removed in 1982. Eight additional test pits were excavated along the route of the existing portion of the transfer pipe. Four soil samples (subsurface) were also collected from soil borings taken from the pipe transfer area (just east of the facility) and the equalization lagoon.

A few surface soil samples (0-1.5 feet in depth) were collected on-site. One sample was collected from the temporary monitoring well (TMW12) installed in the center of the former lagoon. Four surface soil samples (0-1 foot in depth) were collected from the equalization lagoon test pits. These samples were classified as surface soil, but were collected below asphalt and subgrade material that lies on top of the former lagoon. Three additional surface (0-1 foot in depth) samples were collected from soil borings located east and west of the transfer pipe along the eastern edge of the property line of the facility.

There were no metals detected in surface soil above soil screening levels on the plant property. Chromium was detected above the soil screening level for adults (hexavalent chromium: 2,000 ppm for adults and 200 ppm for children) in several samples from the equalization lagoon (8,550 ppm, 6,910 ppm, 2,380 ppm, and 6,310 ppm). High levels of nickel were detected in several soil samples from the equalization lagoon (6,780 ppm, 8,130 ppm, 5,710 ppm, 8,920 ppm). Concentrations were below the soil screening level for adults (10,000 ppm). There were several VOCs detected in soil from the equalization lagoon, but concentrations were all less than 1.0 ppb. None of these samples are surface samples (all deeper than 1 foot) and most areas are under asphalt, which makes contact and exposure to these soils unlikely under current conditions and land use.

Groundwater

Groundwater samples were collected from permanent and temporary monitoring wells during all phases of the remedial investigation at the site. Monitoring well results for 36 permanent monitoring wells (shallow and deep) and 43 temporary monitoring wells on the plant property and in the transfer pipe area will be discussed in this section. Most of the on-site permanent monitoring wells are on plant property and in the storage area (just east of the plant building) (Figure 3). There is one permanent well cluster (MW 11) in the transfer pipe area, just east of the storage area. Samples were collected from both deep and shallow monitoring wells. Temporary monitoring wells were also used to determine the location for permanent monitoring wells. Groundwater sampling at the site has been comprehensive, with no obvious data gaps or sample location gaps.

Table 1 shown below is a summary table of the on-site groundwater data collected from permanent monitoring wells. For complete sample results refer to the Remedial Investigation Report (ENSR, 2004). The results shown below present the maximum concentration of several volatile organic compounds (VOCs) found during the remedial investigation and in what monitoring well the chemical was found above its MCL. For 1,1-dichloroethane, there is no MCL or reference dose for this chemical. The screening level for the remaining chemicals shown in Table 1 is the U.S. EPA MCL. Trichloroethene (TCE) was detected in nearly all of the on-site monitoring wells, above its MCL. 1,2-Dichloroethene was found in many of the monitoring wells, but was not found above its U.S.EPA MCL. Benzene was only found above its MCL in one monitoring well (MW-4), next to the facility. Lower levels of benzene were found in a couple of other wells next to the facility.

TABLE 1. Summary of On-Site Groundwater Results for Permanent Monitoring Wells

CHEMICAL	LOCATION	CONCENTRATION RANGE (ppb)	SCREENING LEVEL (ppb)
Benzene	MW-4	ND-140	5 ¹
Carbon Tetrachloride	MW-7, 11, 24, 25	ND-37	5 ¹
1,1-Dichloroethene	MW-4, 8	ND-17	7 ¹
1,1-Dichloroethane	NA	ND-37	None
Tetrachloroethene	MW-4, 8	ND-13	5 ¹
Trichloroethene	MW-2, 4, 5, 8, 9, 10, 11, 27	0.18-320	5 ¹

1=U.S.EPA MCL
NA=Not Applicable
None=No MCL or other screening level available
ND=Not Detected
PPB=Parts per Billion
MW=Monitoring Well

Groundwater samples were also collected from 43 temporary monitoring wells on the plant property and in transfer pipe area (Figure 3). These wells were installed in both shallow and deep areas of the aquifer. These data are summarized in Table 2, including the location of wells with concentrations above MCLs. The types of VOCs and the concentrations were similar in both permanent and temporary monitoring wells. Trichloroethene was the VOC most frequently detected at levels above its MCL in these temporary wells. The other VOCs in Table 2 were infrequently detected above their MCLs in the on-site wells. Temporary monitoring wells were also used to determine the location for installation of the permanent monitoring wells and were properly abandoned after sampling. Temporary monitoring well four contained several VOCs, similar to those found in permanent MW-4.

TABLE 2. Summary of On-site Temporary Groundwater Monitoring Well Data

CHEMICAL	LOCATION	CONCENTRATION RANGE (ppb)	SCREENING LEVEL (ppb)
Benzene	TWM 4	ND-67	5 ¹
Carbon Tetrachloride	TMW-21, 73, 76, 77	ND-26	5 ¹
1,1-Dichloroethene	TMW-4, 66	ND-11	7 ¹
Lead	TMW 12, 21	ND-49.8	15 ²
Nickel	TMW-12	ND-773	100 ¹
Tetrachloroethene	TMW-4	ND-10	5 ¹
Trichloroethene	TMW-4, 16, 19, 20, 22, 23, 24, 27, 28, 29, 56, 58	ND-130	5 ¹

1=U.S. EPA MCL

2=U.S.EPA Action Level

ND=Not Detected

PPB=Parts per Billion

TMW=Temporary Monitoring Well

Soil Gas

Soil gas samples were collected from vapor probes installed through the floor of the warehouse part of the Dixie Narco plant. The soil vapor samples were collected over an 8-hour period. Soil vapor samples were collected to determine if VOCs in groundwater could move out of the soil into the building as a vapor. The screening levels are either U.S. EPA reference air concentrations or ATSDR EMEGs for air. VOCs were detected, but none were found above screening levels.

TABLE 3. Soil Vapor Data

CHEMICAL	CONCENTRATION (ppb)	SCREENING LEVEL (ppb)	SOURCE
Benzene	ND-1.8	4	ATSDR
Cis-1,2-Dichloroethene	ND-50	200	ATSDR
Ethylbenzene	ND-4.7	230	U.S.EPA
Tetrachloroethene	ND-22	40	ATSDR
Toluene	ND-16	100	U.S.EPA
Trichloroethene	ND-14	100	ATSDR
Xylenes	ND-14.5	100	ATSDR

ND=Not Detected
 PPB=Parts per Billion

B. Off Site

Off-site samples included soil, groundwater (permanent and temporary monitoring wells), residential wells, public water supply wells, surface water, and sediment.

Soil

Soil samples have been collected around the Imhoff system, from the area where the wetland area meets the intermittent stream, and from areas near Willis Millpond. A large number (85) of surface soil samples (0-6 inches) were collected off-site, with most samples collected around the Imhoff system and where the wetland area meets the intermittent stream. Thirty-five (0-12 inches) samples were also collected from off-site areas. Samples were also collected from test pits and soil borings. Soil sampling at the site has been comprehensive, with no obvious data gaps or sample location gaps (Figure 4).

Surface soil samples collected from the Imhoff discharge/wetland area consistently contained chromium above soil screening levels for children (200 ppm for hexavalent), with many locations also containing chromium above the screening level for adults (2,000 ppm). Chromium concentrations ranged from 450 to 15,900 ppm. The highest chromium level was found in a sample collected from the central part of the discharge area. The average chromium concentration (4,300 ppm) in the soil from the discharge area was above screening levels for both children and adults. Background soil chromium concentrations averaged around 10 ppm. The chromium was not consistently speciated, so it is not known how much of the measured chromium is the hexavalent versus trivalent type of chromium. The soil screening level assumes that all the chromium in the soil samples is hexavalent chromium. Hexavalent chromium is considered the toxic form of chromium. If the chromium in soil is the trivalent form, none of the sample concentrations would exceed soil screening levels for children or adults. Chromium in sediments is typically in trivalent form.

Nickel was elevated in several surface soil samples (range 1,780 to 11,300 ppm) collected from the Imhoff discharge/wetland area. Nickel concentrations exceeded the screening level for children (1,000 ppm) at six sample locations. The screening level of 10,000 ppm for adults was exceeded in several of the surface soil samples.

Eight samples were collected from the area around Willis Millpond. There were no site-related chemicals found above screening levels for children or adults in surface soil samples collected from the area around the pond. No site-related chemicals were found above screening levels in soil samples collected from surface soil (0-12 inches) and soil borings collected from the sludge drying bed. There were a couple of VOCs present in these soils, but concentrations were very low, less than 1.0 parts per billion (ppb), and were below soil screening levels.

Groundwater

Off-site groundwater has been sampled from permanent monitoring wells (27), temporary monitoring wells (48), private water supply wells (58), and public water supply wells (2). Monitoring wells, 25 to 130 feet deep, collect samples of shallow and deep groundwater. The results in Table 4 below show the concentration of inorganic compounds and volatile organic compounds (VOCs) found during the remedial investigation and in what monitoring well the chemical was found above its MCL. The screening level for the chemicals is the U.S. EPA MCL. Off-site groundwater sampling has been comprehensive, with no obvious data gaps or sample location gaps.

Twenty-seven permanent monitoring wells have been installed to monitor off-site groundwater to evaluate the extent of movement of chemicals off site (Figure 3). About half of these 27 wells contained one or more site-related chemicals above U.S.EPA MCLs. Nickel was found above its MCL in three monitoring wells, all within the Imhoff area. Nickel was not found above its MCL in on-site wells. Mercury was found above the MCL in one monitoring well (MW 37D), located northeast of the facility. Trichloroethene was found in six off-site monitoring wells above its MCL. There were several other VOCs, 1,1-dichloroethene, tetrachloride, 1,2-dichloroethene, and 1,1-dichloroethane, found in off-site monitoring wells, but they were all below their MCLs.

TABLE 4. Summary of Off-Site Groundwater Data for Permanent Monitoring Wells

CHEMICAL	LOCATION	CONCENTRATION RANGE (ppb)	SCREENING LEVEL (ppb)
Carbon Tetrachloride	MW-15D, 16D, 31D	ND-12	5 ¹
Mercury	MW-37D	5 (Total)	2 ¹
Nickel	MW-15, 16, 20	ND-774	100 ¹
1,1-Dichloroethene	None	ND-2.8	7 ¹
Tetrachloroethene	None	0.14-1.1	5 ¹
Trichloroethene	MW-13, 14, 17, 31, 36D, 38	ND-110	5 ¹

1=U.S.EPA MCL
None=None above Screening Levels.
ND=Not Detected
MW= Monitoring Well
PPB=Parts per Billion

Fifty-eight temporary wells were used to sample off-site groundwater. A couple of these wells were located between the former Imhoff System and the plant building. These wells were used to determine locations for permanent monitoring wells and were properly abandoned after sampling. Both shallow and deep groundwater was sampled from these wells. Table 5 below is a summary of the temporary monitoring well results and which location concentrations exceeded comparison values. Benzene, 1,1-dichloroethene, lead, and tetrachloroethene, all found in on-site temporary wells above MCLs, were not found in the off-site temporary wells above their MCLs. Trichloroethene was consistently found in on-site and off-site temporary and permanent monitoring wells above its MCL (Table 5). Other chemicals, including, benzene, lead, and nickel were less frequently found in groundwater wells above their MCLs. Similar VOCs were found in on-site and off-site permanent and temporary monitoring wells. Concentrations of VOCs were generally less in the off-site wells when compared to on-site monitoring data.

TABLE 5. Summary of Off-site Temporary Monitoring Well Results

CHEMICAL	LOCATION	CONCENTRATION (ppb)	SCREENING LEVEL (ppb)
Carbon Tetrachloride	TMW-73	ND-20	5 ¹
1,1-Dichloroethene	None	ND-2.1	7 ¹
Nickel	TMW-37, 40, 59, 60, 61	ND-576	100 ¹
Tetrachlorethene	None	ND-2.6	5 ¹
Trichloroethene	TMW-36, 53, 54, 66, 74, 75, 83, 87	ND-90	5 ¹

¹=U.S. MCL

ND=Not Detected

None=None Above Screening Level

TMW=Temporary Monitoring Well

PPB=Parts per Billion

As part of the investigation, fifty-eight residential wells have been sampled. Fifty-three wells were identified and sampled during Phase I. Five additional wells were sampled during Phase 2. The private wells are within a mile of the site (Figure 5). Eleven wells contained mercury, with two (5.1 ppb and 3.3 ppb) containing mercury above the U.S. EPA MCL of 2.0 ppb. These wells are northeast of the facility. One well contained mercury just below (1.9 ppb) the MCL, and the others contained very small amounts of mercury, well below the MCL. Mercury was first detected in private wells sampled in November-December 2001, but the detections were below the MCL. It has not been determined that mercury is a site-related chemical or comes from another, unidentified source. Bottled water was provided to five of the seven homes. The other residents refused the offer of bottled water.

One private well, just northeast of the facility, contained trichloroethene (17 ppb) above the MCL of 5.0 ppb. The house is currently empty. A point of entry or whole-house filter was installed in 2003. The house is owned by a private company, which has no plans to have anyone live in the house full-time. They may use the house occasionally when in Williston on business.

Several wells tested as part of investigations for the site, have contained very low levels of several VOCs. The concentrations of these other VOCs, 1,1-dichloroethene, 1,2-dichloroethene, and tetrachloroethene are generally less than 1.0 ppb, which are below the MCLs for these chemicals. These wells are generally just east of the site. These chemicals were also found in on-site and off-site groundwater monitoring wells.

Private water supply wells have also been sampled during previous investigations. Three wells were sampled in each round of sampling in 1989 and 1999. At least a couple of these wells were sampled in both rounds of sampling. All three of these wells were also sampled as part of the remedial investigation at the site. The well that contained TCE above its MCL also contained very low levels of 1,1-dichloroethane (8 ppb) in 1989. This same well contained very

low levels of TCE (0.6 ppb) in the 1999 sampling. Mercury was not analyzed in the 1989 samples, and was not found in the 1999 round of sampling.

Two public water supply wells for the City of Williston have also been sampled during the Remedial Investigation. There have been no site-related chemicals found in these public water supply wells. These water wells are upgradient from the site. The wells are also monitored as part of required regulatory monitoring for public water supplies. There have been no chemicals reported for any of these public water supply wells. Residents should receive a copy of the consumer confidence report from the City of Williston every year. Contact the city at (803) 266-7015, to receive a copy of the report. These reports are sent out each year to summarize annual sampling of community water supplies. The Industrial Park well was sampled for fluoride, mercury, and metals in the first quarter of 2004, nitrates, mercury, and VOCs in the third quarter of 2004. The Elko well was sampled for VOCs in the first and third quarter, mercury in the third quarter, and semivolatile organic compounds (SVOCs) in the first quarter of 2004. The Halford Street well was sampled for VOCs, SVOCs, and nitrates in the third quarter of 2004.

Surface Water and Sediment

Facility wastewater flowed from the plant to the Imhoff system, into Spur Branch, and eventually to Willis Millpond (ENSR, 2004). Surface water and sediment samples were collected in the Imhoff discharge area, the intermittent part of Spur Branch, Spur Branch (perennial), Willis Millpond, downstream of the pond, and a private pond. Willis Millpond was approximately eight acres in size. In May 2003, the dam for the millpond failed due to heavy rain. The pond is now only about 3 acres in size. Surface water and sediment sampling has been comprehensive, with no obvious data gaps or sample location gaps (Figure 6).

A total of thirty-four surface water samples were collected during the remedial investigation. There have been no detections of any chemicals above screening levels in surface water. This includes, Spur Branch Creek, and two private ponds. Water and sediment samples were also collected directly from the Imhoff System. There were no detections above screening levels, and contact with these materials is unlikely. The Imhoff tank was ten feet deep, and casual contact was unlikely to occur. The entire system was removed in January 2005, which eliminates any potential for contact.

The screening levels for sediment are determined in the same way as for soil; however, the amount of sediment a person would eat would likely be less than for soil. Surface sediment samples were collected from zero to 6 inches in depth. A total of fifty-five sediment samples were taken during the remedial investigation. Chromium was the only site-related chemical detected above the screening level for children (200 ppm). These samples were collected close to the facility (Figure 6). Table 6 below shows the sediment results and sample location with chromium concentrations above the screening level. Chromium was also found in off-site soil. A few of the sediment samples were analyzed for total as well as hexavalent chromium. Based on these data, it appears as though most of the chromium in sediment is trivalent chromium. In sample 3 from Phase 2, sediment contained 2,180 ppm total chromium and only 44 ppm hexavalent chromium. In sample SD4, total chromium was 2,820 ppm and hexavalent chromium was 7.7 ppm. The concentrations of hexavalent are very low, far below the 200 ppm screening

level for children. It is likely that most of the sediment samples with high chromium are the trivalent form rather than the hexavalent form of chromium. If most of the chromium in sediments is the trivalent kind, none of the sediment concentrations would be higher than the screening level for children or adults. There were no other chemicals present in sediment above screening levels.

TABLE 6. Sediment Chromium Concentrations in Intermittent Spur Branch

CHROMIUM CONCENTRATION (ppm)	SAMPLE LOCATION
2,180	SD3
2,820	SD4
1,370	SD6
900	SD5
2,370	SD55

SD=Sediment Sample
 PPM=Parts per Million
 See Figure 6 in Appendix B

Sediment samples collected from the perennial part of Spur Branch and Willis Millpond did not contain any site-related chemicals above screening levels. The intermittent part of Spur Branch stops about Ralph Road (Figure 6). All of the sediment samples with high chromium concentrations were found in the intermittent part of the creek.

Sediment concentrations greater than the screening level should not be considered unsafe, because screening levels were calculated using conservative measures of exposure. It is assumed that a child or adult would have to eat a certain amount of sediment from the creek everyday for many years.

C. Quality Assurance and Quality Control (QA/QC)

The majority of the environmental monitoring data evaluated for this assessment are from the 2004 Draft Remedial Investigation for the site. Quality Assurance and Quality Control conclusions drawn for this public health assessment are determined by the validity of the analysis and conclusions made and the availability and reliability of the referenced information. SCDHEC assumes that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. Overall, the data appears to be reliable.

D. Physical and Other Hazards

There are no physical or other hazards noted at the site. The facility is an operating manufacturing facility. The property (excluding the Imhoff area) is fenced, which limits trespassers' access to the facility.

PATHWAYS ANALYSIS

The Pathways Analysis Section contains discussions of how chemicals move in the environment and how people can be exposed to those chemicals. Exposure only occurs when a chemical comes into contact with people and enters the body. Environmental monitoring data has shown that a few private wells have/may have been impacted by the site. The source of the mercury in private wells has not been determined. The project to bring public water into the area closest to the site should begin in approximately six months. The remedial investigation at the site also found soil and sediment with chromium concentrations above screening levels. Nickel was present in off-site soil above its screening level.

There are two types of exposure pathways, completed and potential. Completed means that SCDHEC is sure that someone has been exposed to site-related chemicals. For a pathway to be completed, there must be a source of the chemical (the site), contaminated media at the site (groundwater), some way people can be exposed (people use private wells), and SCDHEC knows people have been exposed (they are drinking the water). People could have been exposed in the past, could be exposed now, or in the future. This means that someone could have been exposed to soil five years ago, could be exposed now (trespasser) or five years from now if the site is not cleaned up.

There is one completed exposure pathway associated with the Admiral Homes Appliances site – exposure to chemicals through drinking water from private wells. One well contained TCE above its MCL. TCE was not detected in this well in the 1989 sampling, but was found at very low levels in the 1999 sampling. Because TCE was not detected previously, it is likely that the well has only contained TCE above its MCL for a few years. The people who lived in this house the last few years could have been exposed to TCE through drinking the water (ingestion), bathing and showering (inhalation). A filtration system was installed at the house with the TCE in 2003, and the house is currently unoccupied. It is owned by a local company, which has no plans to have anyone live in the house full time. It is occasionally used by a company employee while in Williston on business.

Trichloroethene has a short half-life in both air and surface water, but will last much longer in groundwater. TCE can absorb to soil, which can then be an ongoing source of the chemical to groundwater. We know that TCE or possibly tetrachloroethene was used at one time at the facility. TCE can be a breakdown product of tetrachloroethene, which is used as a degreasing solvent. Groundwater on-site and off-site is contaminated with both of these chemicals. There is only one private well contaminated with TCE, a contaminant known to migrate in groundwater, which could impact additional private wells. TCE can also degrade into dichloroethene and vinyl chloride. DCE was also found in on-site and off-site groundwater.

The geology around the Williston area is complex, with interbedded layers of clays, silts and sands. Groundwater at the site flows toward the east, southeast, south-southeast. Groundwater flow is generally in the direction of the Imhoff system. The private well containing TCE is down gradient from the site and it is likely that without remediation, additional private wells could become affected by contaminants from the site. Trichloroethene is associated with past operations at the site and is found in on-site and off-site groundwater monitoring wells.

Two other private wells contained mercury above its MCL. At this point in the site investigation, it is not known whether the mercury found in private wells comes from the site or some other source. Several other wells contained much lower levels of mercury. Only one monitoring well (MW 37D) northeast of the site, contained mercury above the MCL. Mercury was not found in any of the three wells sampled in the 1999 private well sampling. In the 2001 Phase one sampling, mercury was not found above its MCL. At least two of these wells were sampled in 1999 and 2001. Based on this information, it appears that these wells have been contaminated for approximately five years or less. All seven of the homes with mercury detections were offered bottled water. Five homes accepted the offer of bottled water, and exposure at these homes has stopped.

Mercury can be found in the environment in several forms, from both man-made and natural sources. The most common natural forms are metallic mercury, mercuric sulfide (cinnabar ore), mercuric chloride, and methylmercury. Methylmercury is formed when bacteria in the environment change other kinds of mercury into methylmercury. It is primarily a concern in surface water because it can build up in fish tissue. Mercury is mined as cinnabar ore, which is then refined to recover the mercury. This liquid metal mercury is used in thermometers, barometers, batteries, and electrical switches. Dental amalgams also contain metallic mercury. Some inorganic mercury compounds have been used as fungicides (ATSDR, 1999). Mercury is an element and its chemical structure cannot be broken down.

Most mercury found in the environment is metallic and inorganic. Metallic mercury is the type of mercury that is converted to methylmercury. Inorganic mercury does not accumulate in the food chain. Generally, most of the mercury found in groundwater is not methylmercury. Mercury in groundwater likely comes from atmospheric sources (ATSDR, 1999). The specific type of mercury found in private wells tested during the site investigation has not been determined.

The second type of exposure pathway is a potential exposure pathway. This means we do not have all the information we need to determine whether or not exposure has occurred or is possible. For example, if we know that off-site soil is contaminated with chemicals, but do not really know if a person has been eating the dirt, it is considered a potential exposure pathway. Off-site soil, sediment, and on-site air (soil gas) are considered potential exposure pathways for this site. The potential exposure pathways are outlined in Table 7 below.

TABLE 7. Potential Exposure Pathways

Exposure Pathway Elements					Time
Source	Environmental Medium	Point of Exposure	Route of Exposure	Exposed Population	
Admiral Homes Appliances	Soil	Off-site	Ingestion, Contact with Skin, Inhalation of Dust	Trespassers	Past Present Future
Admiral Homes Appliances	Sediment	Off-site	Ingestion, Contact with Skin	Area Residents	Past Present Future
Admiral Homes Appliances	Air (Soil Vapor)	Facility (on-site)	Inhalation	Workers	Past, Present, Future

Off-site soil and sediment are considered potential exposure pathways because we have no information that area residents ate or regularly came in contact with either soil or sediment. The contaminated soil and sediment are primarily found close to the former Imhoff system and are not in any residential yards. There are no crops or gardens in this area. The area is a wooded wetland area and it is not known if or how many people could have been exposed to these soils. The company now owns this area. The company removed the structures that make up the Imhoff System in January 2005. We do not have any specific exposure information to determine if anyone has been exposed to contaminated soil or sediment.

Soil gas is also a potential exposure pathway. It is possible that VOCs present in soil below the manufacturing facility could migrate through the floor into the warehouse building. Soil gas samples were collected through the floor of the building. While it is possible that VOCs could migrate into the building, measured soil gas concentrations were very low, all below screening levels.

Surface soil samples collected from the area around the Imhoff system contained chromium and nickel above screening levels. High levels of chromium and nickel were found in both 1988 and 2004. These samples were collected in the wetland area associated with the Imhoff system. While the system was originally installed on private property, it is not in a residential area. A person working in this dirt or a child playing in the wetland area could ingest contaminated soil or sediment.

Soil ingestion is an important exposure route for children, especially those younger than six years old. Children are more likely to ingest large amounts of soil when compared to adults. Although adults are less likely to ingest large amounts of soil, soil ingestion remains a potentially

significant exposure source to environmental contaminants. People may touch the contaminated soil, and then put their hands in their mouth while eating or smoking. Breathing contaminated dust from the soil is also an important route of exposure. Because sediments are wet, while incidental ingestion and contact can happen, the exposure is not likely to be significant. Contaminated sediments are a more important factor for accumulation of chemicals in fish and wildlife that people may then catch/hunt and eat. Neither chromium nor nickel, both found in high concentrations in some sediments near the Admiral Homes Appliances site, significantly accumulate in fish or wildlife.

Before 1982, wastewater generated from the manufacturing process flowed from the equalization lagoon, through the transfer pipe, into the main tank of the Imhoff system. Wastewater then flowed into the polishing tank, and was pumped through a series of pipes into the trickle filter. The discharge was then pumped through the wetland and into the intermittent part of Spur Branch. Sediments in this part of Spur Branch, closest to the Imhoff area, contained high levels of chromium. In some sediment samples, hexavalent chromium and total chromium concentrations were both measured. In these samples, most of the total chromium seems to be the trivalent form, rather than the more toxic hexavalent form of chromium. If most of the chromium in sediments is the trivalent kind, chromium concentrations are unlikely to pose a public health concern.

There are several, recurring themes throughout the literature regarding reactions and behaviors of chromium in the environment. The first is that reduction of hexavalent chromium to trivalent chromium is much more frequently observed than oxidation of Cr (III) to Cr (VI). Secondly, Cr (III) is less mobile than Cr (VI) in most soil/water systems due to the relative insolubility of Cr (III) at pH values greater than five. This may be why at the Admiral Homes Appliances site, sediment and soil contamination was largely limited to the area close to the facility, the Imhoff area and the upper part of the intermittent stream. Wastewater containing chromium was discharged from the facility, and has not moved very far away from the plant. In a few sediment samples, both hexavalent and trivalent chromium were both analyzed in a single sample. Chromium compounds are stable in the trivalent state and can occur naturally in ores. The hexavalent (VI or chromate) form is the second most stable valence state. It rarely occurs naturally, but is produced from anthropogenic sources (ATSDR, 1999).

Chromium chemistry is complex and, at a minimum, accurate data for dominant reactions in each process (adsorption/desorption, oxidation/reduction, precipitation/dissolution) must be available (Rai et al., 1989). In each environment under study, one must be able to understand how each of these processes work in order to understand the chemistry of chromium in the environment. Chromium can exist in the environment as Cr (III) or Cr (VI). The toxicity, its aqueous concentrations, and mobility in the environment are dependent on its oxidation state. Chromium introduced into or existing naturally in the environment may undergo changes in oxidation state (Rai et al., 1989).

Nickel is found naturally in soil. Reportedly, the zinc-phosphate spray used in the plant processes prior to 1982, contained a lot of nickel (ENSR, 2004). It is likely that the high levels of nickel found in off-site soil was processed through the Imhoff system and discharged into the wetland area. Generally, nickel in the environment does not move a lot in the environment. This

is probably why most of the nickel-contaminated soil is found close to the Imhoff area. Much of the nickel released into waterways as runoff is associated with particulate materials. It is strongly absorbed to soil and sediment. How strongly it is absorbed to sediment and soil depends on environmental factors such as pH, organic matter, type of clay minerals, and texture of the dirt (ATSDR, 2003).

Exposure pathways can also be eliminated if one of the elements discussed above is not present and will never be present. An example of this is if groundwater is contaminated, but everyone living in the area is on public water and will never drill a private well for a drinking water supply. Groundwater as a future exposure pathway has been eliminated. Public water is being brought into the area closest to the site. The contract for the water line extension project has been awarded by the city and should begin soon, as of October 2006.

The three public water supply wells for Williston are upgradient from the site and are not likely to be affected by contamination at the Admiral Homes Appliances site. It is extremely unlikely that the three public water supply wells will be impacted by contaminated groundwater from the site. These wells are 1000 feet or more, west and upgradient from the site. This exposure pathway has been eliminated.

On-site soil has also been eliminated as an exposure pathway. The on-site area is either occupied by the manufacturing facility or paved, which limits contact and exposure to these soils unlikely if not nearly impossible.

Child Health Considerations

ATSDR recognizes that infants and children may be more sensitive than adults to environmental exposures. This sensitivity is a result of several factors: 1) Children may have greater exposures to environmental toxicants than adults because pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults; 2) Children play outdoors close to the ground which increases their exposure to toxicants in dust, soil, surface water, and in the ambient air; 3) Children have a tendency to put their hands in their mouths while playing, thereby exposing them to potentially contaminated soil particles at higher rates than adults; 4) Children grow and develop rapidly, they can sustain permanent damage if toxic exposures occur during critical growth stages; and 5) Children and teenagers may disregard "No Trespassing" signs and wander onto restricted locations.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluation

There is often little information about the health effects caused by low-level environmental exposures. Most human exposure studies use information from industrial exposures, where the doses are much higher. Industrial exposure data normally do not include precise information about the dose, the purity of the chemicals, their interactions with other substances, and the duration of the exposure. For some chemicals, there is no information available on the effects in

people; therefore, we use data collected from studies using laboratory animals. Animals do not necessarily show the same responses that humans do when exposed to toxic substances. However, in animal experiments using carefully controlled doses and time periods, researchers observe health effects that they believe may also occur in people.

Information is not available to be able to say with certainty that if a person were exposed to chemicals at the site they would become sick. Information about these chemicals is usually obtained from laboratory studies. The animals in these studies are typically exposed at much higher levels than would be expected to occur at the Admiral Homes Appliances Site. It is very difficult to know what levels of these chemicals at the site can cause specific health effects. The kinds and severity of human health problems that can occur with exposure depend upon several factors: the amount of chemical exposure, duration of exposure, and route of exposure; body weight, age, sex, ethnic background, lifestyle factors, and genetic factors; general health of the person; individual reactions to chemicals; and, interactions with other chemicals or drugs.

In order to compare the amounts of a substance taken into the body to known standards, this section uses comparison doses. These doses are based on the amount of a substance that is consumed per day (milligrams/kilogram body weight/day, mg/kg/day). Comparison doses used in this section include ATSDR's Minimum Risk Level (MRL), which represents an estimate of daily human exposure to a dose of a chemical that is likely to be without adverse effects (for noncancerous effects) over a specified duration of exposure, and the U.S.EPA Reference Dose, which is an estimate of the daily exposure of people to a hazard that is likely to be safe during a lifetime (that does not include cancer). These doses represent levels at which harmful effects are unlikely to occur. They are calculated using safety factors for the most sensitive human populations, and if based upon animal measurements, additional factors are used.

The chemicals discussed in previous sections of this PHA, are compared to screening levels. Those chemicals found in exposure pathways above screening levels are discussed further in this section of the PHA. An estimated dose of exposure is then calculated and compared to known levels of concern to determine the likelihood of adverse effects. A level of concern is an estimated dose, below which, adverse health effects are not expected to occur. Levels of concern are normally U.S.EPA reference doses or ATSDR MRLs. This does not mean that if the estimated dose of the chemical is above these levels of concern a person will become sick, but that there is an increased risk that exposure could cause adverse health effects in exposed people.

There are uncertainties associated with the toxicological information for these chemicals. The level of concern (U.S. EPA reference dose) is based on studies using laboratory animals. In this assessment, SCDHEC compared an estimated dose a person might get from drinking water from wells that contained either mercury or TCE to their U.S.EPA reference doses for oral (drinking) exposure for the chemicals. An oral exposure dose was also calculated for carbon tetrachloride. The estimated dose was calculated for a person (adults and children) assuming that they drink two liters of water every day for their entire life. Exposure doses were also calculated for chromium and nickel, which were found in soil/sediment. It was assumed that people (adults and children) would eat a certain amount of soil/sediment every day for their lifetime. These estimates of exposure are very conservative and may over estimate the risk. There are also safety

factors built into U.S.EPA reference doses. This means that the reference dose is conservative and likely overestimates the risk.

Mercury and TCE were found in private wells above screening levels. TCE was also consistently found in on-site and off-site monitoring wells. Carbon tetrachloride was not found in private wells, but was frequently found in monitoring wells above screening levels. There were a few other VOCs found in groundwater (potential exposure pathway), but were found in only a couple wells above screening levels. For example, benzene was found at high concentrations, but only in one well.

Mercury

People can be exposed to mercury through drinking water from private wells that contain mercury. Not all forms of mercury easily enter your body, even if they come in contact with it; so it is important to know which form of mercury a person has been exposed to, and by which route (air, food, or skin). It is not known what type of mercury is found in the private wells, but it is not likely to be methylmercury. The U.S. EPA reference dose and ATSDR MRL are based on known exposure to methylmercury. The estimated dose a person would get from drinking water with the highest amount of mercury is about the same as the U.S.EPA reference dose (0.0001 mg/kg/day). This estimated dose is not at a level that we would expect adverse health effects. We estimated that exposure is likely less than five years. This estimation was based on historical (although limited) private well sampling in 1999, in which mercury was not found in private wells.

People drinking water containing mercury below the MCL (2.0 ppb) would have a dose far below the reference dose and should not pose a risk. However, it is possible that mercury levels could increase in these wells in the future.

When you swallow small amounts of metallic mercury, for example, from a broken oral thermometer, virtually none (less than 0.01%) of the mercury will enter your body through the stomach or intestines, unless they are diseased. Metallic mercury in the environment can be changed to methylmercury. Inorganic mercury compounds like mercurous chloride and mercuric chloride are white powders and do not generally vaporize at room temperatures like elemental mercury. If they are inhaled, they are not expected to enter your body as easily as inhaled metallic mercury vapor. When inorganic mercury compounds are swallowed, generally very little is absorbed through the intestinal tract. Some inorganic mercury can enter your body through the skin, but only a small amount will pass through your skin compared to the amount that gets into your body from swallowing inorganic mercury. Once inorganic mercury enters the body and gets into the bloodstream, it moves to many different tissues (ATSDR, 1999).

Different forms of mercury have different effects on the nervous system, because they do not all move through the body in the same way. When metallic mercury vapors are inhaled, they readily enter the bloodstream and are carried throughout the body and can move into the brain. Breathing in or swallowing large amounts of methylmercury also results in some of the mercury moving into the brain and affecting the nervous system. Inorganic mercury salts, such as mercuric chloride, do not enter the brain as readily as methylmercury or metallic mercury vapor (ATSDR, 1999).

The kidneys are also sensitive to the effects of mercury, because mercury accumulates in the kidneys and causes higher exposures to these tissues, and thus more damage. All forms of mercury can cause kidney damage if large enough amounts enter the body. If the damage caused by the mercury is not too great, the kidneys are likely to recover once the body clears itself of the contamination (ATSDR, 1999).

Trichloroethene

The estimated dose calculated for drinking water containing TCE (found in one well) would be less than the U.S.EPA reference dose. However, this is an old reference dose, and U.S.EPA does not currently have a reference dose on its IRIS database. There is no ATSDR chronic or intermediate oral MRL for this chemical.

There is no known exposure to trichloroethene at this site except for one private well. Exposure to trichloroethene may be associated with adverse effects on the liver and kidneys. Most of this information is based on results from laboratory studies, and SCDHEC does not know if the same problems will occur in people. There is also limited evidence of a link between heart, immunological, and developmental problems in people exposed to trichloroethene. Trichloroethene in drinking water, in combination with other VOCs has been associated with childhood leukemia, deaths around the time of birth, childhood disorders, and congenital abnormalities (Lagakos, 1986). TCE has also been associated with respiratory problems, skin problems, cardiovascular effects, leukemia and recurrent infections (Byers et al., 1988), and heart disease (Goldberg, 1990). These studies, however, did not provide sufficient evidence that just TCE causes these harmful health effects because the people were exposed to more than one chemical at the same time. It is difficult to determine which chemical or combination of chemicals would be associated with the various adverse effects. Moreover, information on other risk factors that could cause similar adverse effects was not included in this study. Exposure to TCE has also been associated with the development of hearing problems in children exposed through drinking water (ATSDR, 1994; Berg et al. 1995).

Chromium

Humans can absorb Chromium (VI) compounds through inhalation, dermal contact, and ingestion. Hexavalent chromium is more toxic than trivalent chromium. Inhalation exposures most often occur in workplace settings and are less likely in environmental settings. It is known that people who drank water with very high chromium concentrations (20 ppm) do suffer from adverse health effects. These effects include oral ulcers, diarrhea, and leukocytosis (Zhang and Li, 1987). The estimated dose (0.57 mg/kg/day) received from drinking water as reported previously (20 ppm) would be much higher than what a child (0.04 mg/kg/day) or adult (0.01 mg/kg/day) could get eating soil around the area of the former Imhoff system. If a person ate soil with the highest amount of chromium (found near the Imhoff system area), and it is assumed that all of the chromium in soil/sediment around the site is hexavalent rather than trivalent chromium, the estimated dose would be higher than the U.S.EPA reference dose (0.003 mg/kg/day). The estimated dose from the average concentration of chromium found in off-site soil, would be about the same for adults (0.003 mg/kg/day) as the reference dose. The estimated dose for children (0.01 mg/kg/day) would be slightly higher than the reference dose.

However, if most of the chromium is trivalent, the estimated dose of exposure for both children and adults, would be much less than the reference dose of 1.5 mg/kg/day. Adverse health effects

are unlikely because most ingested hexavalent chromium is reduced to the less toxic trivalent chromium in the body. Also, it is highly likely that due to environmental conditions, hexavalent chromium released into the environment will be reduced to trivalent chromium.

The reference dose is based on animal studies using rats exposed to hexavalent chromium. Although the highest soil concentrations of chromium near the Imhoff area could lead to doses higher than the U.S.EPA reference dose, the confidence in the reference dose is low. There is no ATSDR oral MRL for chromium. The reference dose has a low confidence because the animal experimental conditions did not reflect a lifetime exposure, there were a small number of animals tested, and there was a lack of toxic effects at the highest doses tested. Supporting studies were of equally low quality (U.S.EPA-IRIS, 1998).

In most instances, gastrointestinal (GI) absorption of ingested Cr (VI) compounds are greater than GI absorption of Cr (III) compounds. Absorption of chromium from oral exposure appears to be significantly less efficient than from inhaled aerosols or gases (Outridge and Scheuhammer, 1993). The kidney is the principal route of excretion of nearly all ingested chromium compounds. Exposures of sufficient intensity to some chromium compounds produce kidney and liver damage, internal hemorrhage, dermatitis (from skin contact), and respiratory problems (from inhalation exposure) (FDA, 1993). In both human and laboratory animal subjects, gastrointestinal uptake of Cr (VI) is 2-10% of the presented dose (*presented dose was not defined*)(Outridge and Scheuhammer, 1993).

The human body can reduce the potential for adverse effects after exposure to hexavalent chromium. The body possesses mechanisms in the lung and stomach to reduce hexavalent chromium to the less toxic trivalent chromium. Thus, at low levels of exposure to hexavalent chromium (like what can occur through exposure to soil), the body has the potential to reduce Cr (VI) to Cr (III) before the former compound can interact with DNA. There may, however, be a threshold, above which the reductive capacity is reduced. Large doses of hexavalent chromium are required to bypass the reducing capacity of the stomach and to enter the blood in toxicologically significant amounts (Barceloux, 1999). "Large doses of hexavalent chromium" was not defined.

Dermal absorption depends on the physical and chemical properties of the compound, the vehicle, and the integrity of the skin. Both chromium(III) and chromium(VI) can penetrate human skin to some extent, especially if the skin is damaged. Hexavalent chromium is reduced to the less toxic trivalent form within the skin (NRC, 1974). Systemic toxicity has been observed in humans following dermal exposure to chromium compounds, indicating significant cutaneous absorption. Dermal contact in chromium sensitized individuals can also lead to allergic dermatitis. The risk of sensitization to hexavalent chromium depends on the duration and amount of exposure (Barceloux, 1999). Hypersensitive individuals may develop rashes and erythema from contact with contaminated soil or consumer products containing chromium (ATSDR, 1998). Dermal exposure is very difficult to estimate. There is not a lot of information available to estimate the dose from this exposure pathway. Dermal effects are possible if an adult or child had extensive contact with contaminated material. We do not have any specific exposure information to determine if anyone has been exposed to contaminated soil or sediment.

Nickel

People can be exposed to nickel from contaminated soil through ingestion, inhalation of dust, and contact with the skin. The most common harmful effect of nickel in humans is an allergic reaction. The most common reaction is a skin rash at the point of contact. People who are sensitive to nickel have reactions when nickel comes in contact with the skin (ATSDR, 2003). People can be sensitized to nickel from jewelry or from previous exposure to nickel, most likely at work. It is possible that if two people are exposed to nickel from soil around the Imhoff system at the site, one, both or neither one may have a reaction. If neither person reacts, they have probably not been previously sensitized to the metal. People who are not sensitive to nickel must be exposed to large amounts of the metal to have adverse effects.

Adults that were exposed to a known amount of nickel (7 mg/kg/day) from drinking water with 250 ppm of nickel suffered from stomach aches, effects of their blood, and kidneys. This exposure dose would be much greater than an adult (0.008 mg/kg/day) or child (0.03 mg/kg/day) would get from eating dirt around the Imhoff system containing the highest amount of nickel. The dose a child could get from eating dirt at the site would be slightly higher than the reference dose (0.02 mg/kg/day). Although it is slightly higher, there is a margin of uncertainty with estimating exposure and reference doses, therefore noncancer effects are not likely if a person is eating this dirt. The estimated doses may overestimate the risk because people must eat a certain amount of dirt everyday.

The most severe health effects in people have occurred from exposure in the workplace. Workplace exposures are most often higher than a person could get from exposure to contaminated soil in the Imhoff area. Exposure to nickel dust in the workplace has been associated with lung and nasal sinus cancers. There is no reason to expect residents who live around the site to be exposed to enough nickel to increase the cancer risk. The primary targets are the respiratory tract following inhalation and oral exposure, and the immune system following inhalation, oral, or dermal exposure (ATSDR, 2003).

D. Health Outcome Data

At the request of concerned residents, a summary of cancer incidence and mortality were completed for the zip code, which includes Williston and surrounding area. Fewer cancer cases and deaths occurred in the zip code than expected. There were no specific cancer sites that were significantly elevated in cases (incidence) or deaths (mortality). A copy of the report is in Appendix B.

COMMUNITY HEALTH CONCERNS

1) Area residents have expressed health concerns about the site. Most of the health concerns are about the safety of their private and public water supplies.

Response: Public water supply wells are west and upgradient of the site, and it is extremely unlikely that groundwater contamination from the site impacts these wells. These wells were also sampled during the remedial investigation and regularly as part of state required monitoring. There have been no chemicals reported for any of these public water supply wells. Residents should

receive a copy of the consumer confidence report from the City of Williston every year. Please contact the city at (803) 266-7015 to receive a copy of the report. These reports are sent out each year to summarize annual sampling of community water supplies.

There are private wells that contain mercury above the MCL. These homes have been offered bottled water, and 5 of the 7 homes are using it. There are several other homes with low levels of mercury, but concentrations do not exceed the MCL and drinking this water does not pose a health risk. In addition, there is a plan in place for the city/county to provide public water to those homes closest to the site.

2) Area residents have also been concerned in general, about the rates of heart disease, diabetes, strokes, and cancer.

Response: We have no evidence indicating whether releases from Admiral Homes Appliances might have caused these problems, but none of the chemicals reported in off-site sampling are known to cause these diseases.

Cardiovascular disease is the leading cause of death and disability in South Carolina. Coronary heart disease and stroke are the principal components of cardiovascular diseases. These diseases affect African-American men and women more severely than whites. Black men are more than twice as likely to die of cardiovascular disease, while black women have 50 percent more strokes than white women. Cardiovascular disease causes more than 36 percent of all deaths in South Carolina, making it the leading cause of death in the Palmetto State. South Carolina's age-adjusted death rates for stroke (72 deaths per 100,000) and heart disease (246 deaths per 100,000) in 2002 exceeded the Healthy People 2010 goals of no more than 48 and 166 deaths, respectively, per 100,000. For more detailed information about these diseases visit the following SCDHEC web page <http://www.scdhec.gov/news/releases/reports.htm>.

Diabetes is the sixth leading cause of death in South Carolina and has an immense impact on public health and medical care. The overall prevalence of diabetes has increased over the past 14 years, from 5.6 percent in 1988 to 8.1 percent in 2001. It increased persistently from 1997 to 2001, with the most dramatic increase (130 percent) among black men. The statewide prevalence in the black and other ethnic minority populations at 10.6 percent is higher than in the white population (7.3 percent). However, the racial disparity is narrowing, not because of an improvement in the minority rates, but because of an increase in the white population. Over 1,000 South Carolinians died from diabetes in 2002. Diabetes increases an individual's risk for blindness, lower extremity amputation, kidney failure, nerve disease, hypertension, ischemic heart disease and stroke. More than 350,000 South Carolinians are affected by diabetes, many of which are undiagnosed. One of every seven patients in a South Carolina hospital has diabetes (SCDHEC, 2004).

The challenge is to make health professionals and individuals with diabetes fully aware of these guidelines and to take immediate medical action. The S.C. Diabetes Prevention and Control Program (SC DPCP) works with providers in office-based practices in medically underserved areas of the state to increase diabetes self-management skills in patients. The SC DPCP has agreements with eight of the 19 state Community Health Centers, which participate in the National Diabetes Collaborative. The SC DPCP works with the centers to improve diabetes care by

increasing the percentage of people with diabetes who receive the recommended foot and eye exams, influenza and pneumonia vaccinations, and hemoglobin A1c tests. Likewise, the partnership is working toward reducing health disparities for populations at risk for diabetes (SCDHEC, 2004).

At the request of concerned residents, a summary of cancer incidence and mortality were completed for the zip code, which includes Williston and surrounding area. Fewer cancer cases and deaths occurred in the zip code than expected. There were no specific cancer sites that were significantly elevated in cases (incidence) or deaths (mortality).

CONCLUSIONS

ATSDR classifies sites as to their public health hazard category. Under ATSDR's classification system, the Admiral Homes Appliances site is classified as "no apparent public health hazard". This means that human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below the level of a health hazard.

Private wells, monitored during environmental investigations at the site, are contaminated with mercury and TCE. Every home with mercury detections was offered bottled water. Five of seven homes accepted this offer and exposure at these homes has stopped. A public health hazard may exist at the two remaining homes not using the bottled water. It is recommended that these two homes use municipal water when it is connected in late 2006 or early 2007. A carbon filtration system has been installed in the house with TCE in the well. This home is owned by a local company, which has no plans to have anyone live in the house on a full time basis. The house is occasionally used by employees while in town on business. Public water is being brought into the area. Financial assistance will likely be available to residents, so the cost to connect to public water should not be prohibitive.

Although it is not known for certain how long the exposure lasted, we have estimated how many years the people drinking this water may have been exposed. Based on limited historical sampling, it is likely that exposure to elevated concentrations of mercury and TCE lasted for five years or less. Estimates of a health hazard are based on the amount of chemical a person may have been exposed to, for how long, and the life stage of the person (child or adult). Adverse health effects due to the exposure from drinking this water are not likely to occur, because the concentrations are low and people were exposed for a relatively short period of time. This conclusion assumes that no additional wells become contaminated, concentrations do not increase in wells SCDHEC knows are contaminated, and public water never becomes available to area residents living around the site. Exposures to either mercury or TCE at concentrations below the MCL are likely to be without appreciable risk of adverse health effects.

Surface soil and sediment samples collected from Imhoff area contained chromium and nickel above screening levels. People do not live on this property, which is now owned by the company. While it is possible for people who trespass on this property to eat soil and sediment, potential exposures and potential health effects are probably minimal. It is likely that chromium from historical discharge at the facility has been transformed in the environment from more toxic to less

toxic forms of the compound. Therefore, noncancer effects are not likely if a person is eating this dirt or sediments.

Soil gas is also a potential exposure pathway. While it is possible that VOCs could migrate into the Dixie Narco building, measured soil gas concentrations were very low and below screening levels; therefore, the soil gas exposure poses no apparent risk.

RECOMMENDATIONS

- 1) Limit access to Imhoff area soils and sediments (the one area that is not currently fenced).
- 2) Institute a program which regularly (quarterly) collects and analyzes samples of water from private wells downgradient of the site, if they are outside of the area that will be served by public water.
- 3) Encourage remaining two private well owners that haven't accepted an alternate water supply, to accept municipal water when it is brought to the area in late 2006 or early 2007.

PUBLIC HEALTH ACTION PLAN

As of now, Dixie Narco is the owner of the property that encompasses the Imhoff area, discharge area, and approximately 35 acres of surrounding land. SCDHEC will work with the company to restrict access to contaminated soil and sediment around the Imhoff area.

Public water lines will be installed in the residential area where mercury and TCE were detected in private wells. This area will be part of a monitoring program to be decided during the Record of Decision (ROD) process. As of October 2006, the contract has been awarded and is to begin soon, for completion in late 2006 or early 2007.

EPA is testing any remaining private wells quarterly.

PREPARERS OF REPORT

Tracy Shelley
South Carolina Department of Health and Environmental Control

Nancy Whittle
South Carolina Department of Health and Environmental Control

ATSDR Regional Representative
Bob Safay
Division of Regional Operations, Region IV

ATSDR Technical Project Officer
Jennifer Freed
Cooperative Agreement and Program Evaluation Branch
Division of Health Assessment and Consultation

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APPENDIX A
FIGURES

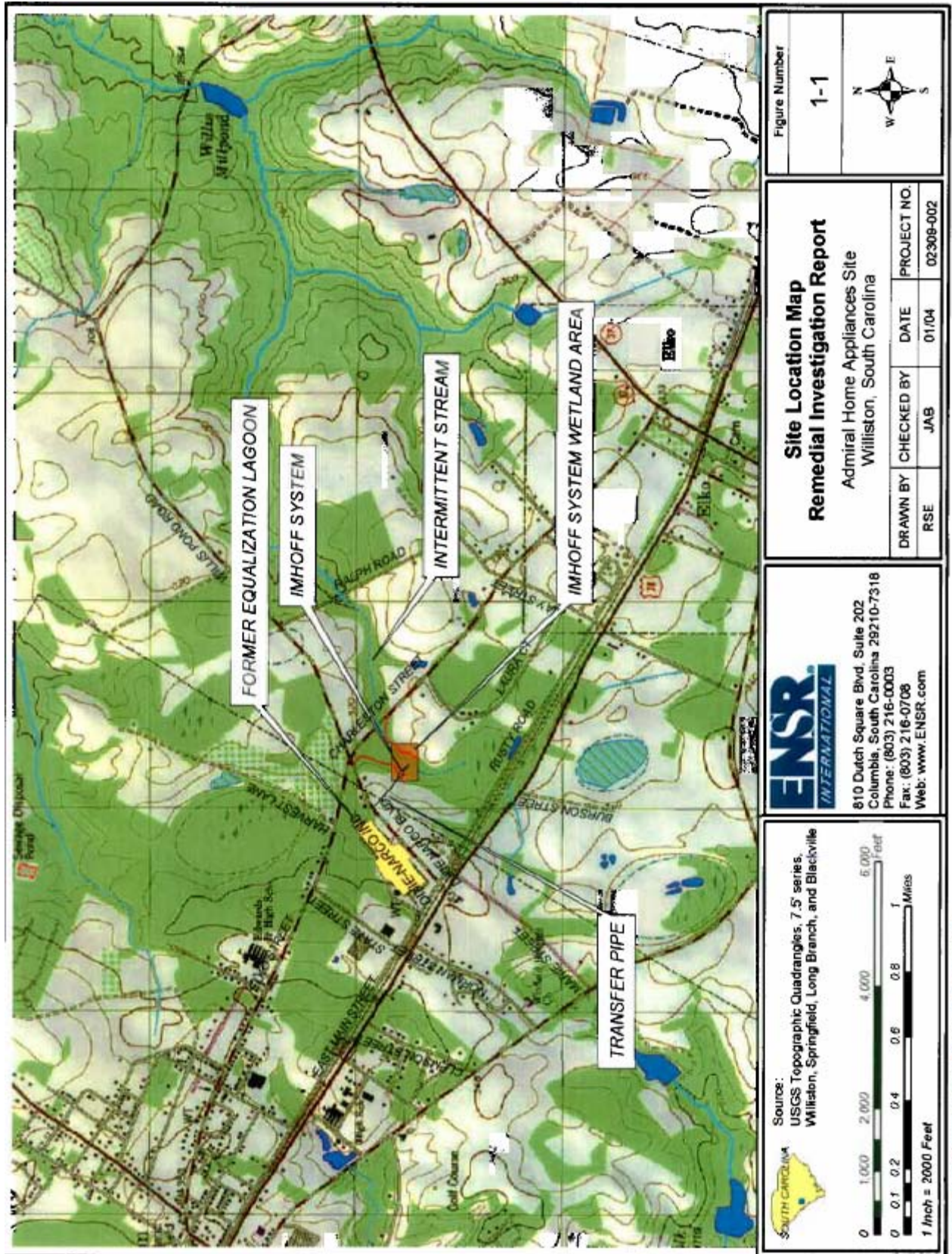


Figure 1. Site Location Map

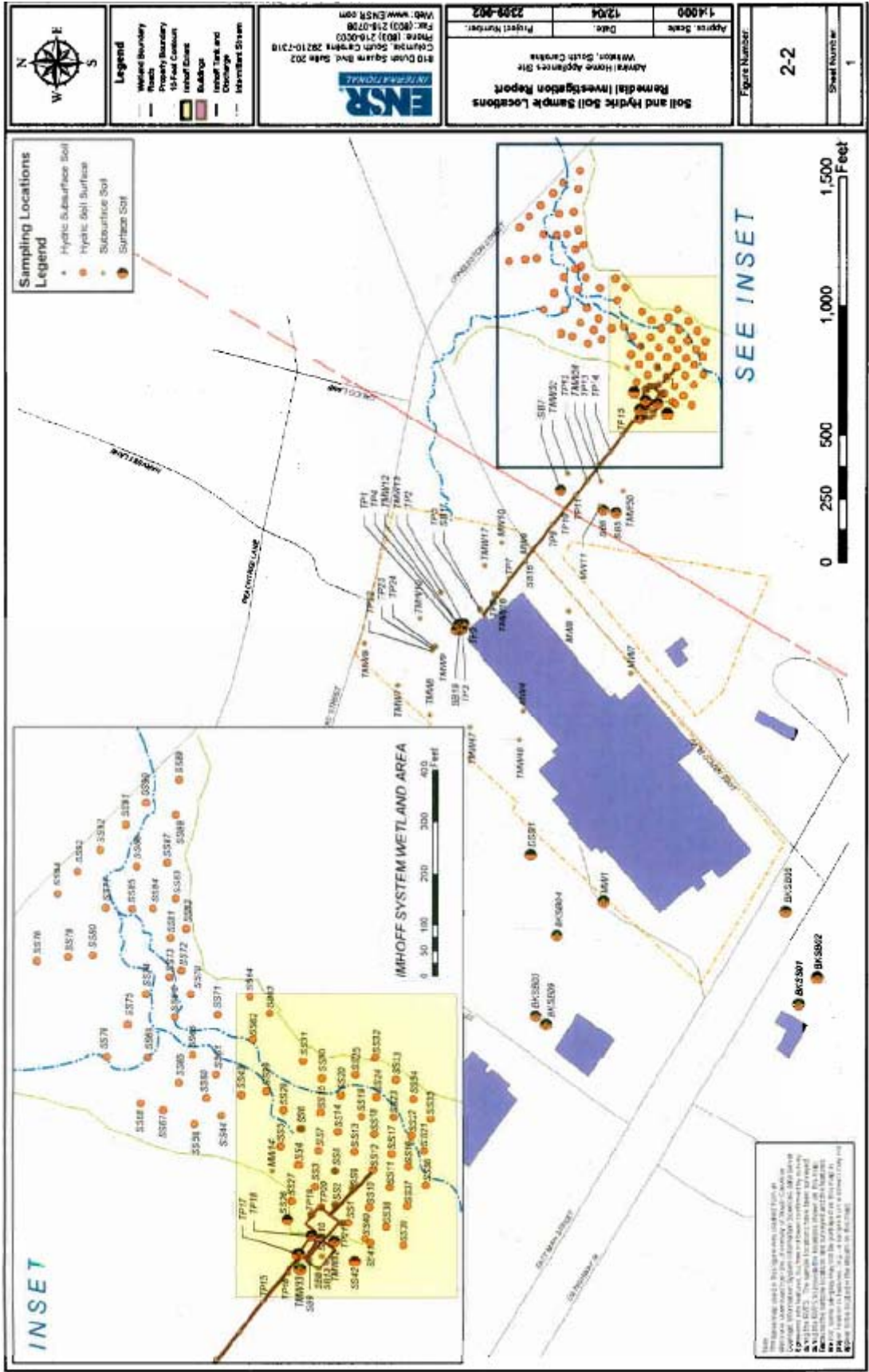


Figure 4. Soil Sampling Locations

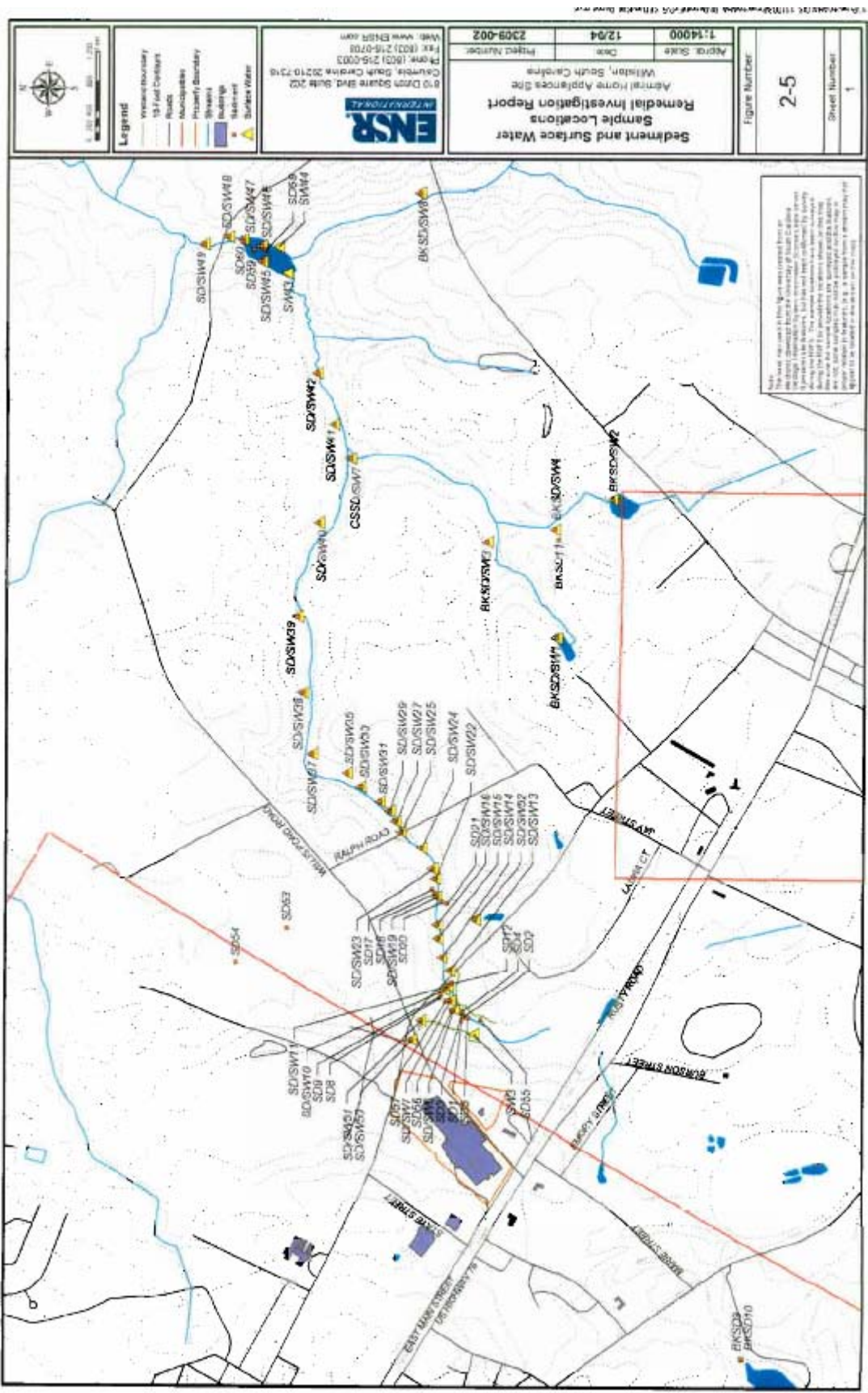


Figure 6. Sediment and Surface Water Locations

APPENDIX B-CANCER STATISTICS

Summary of Cancer Incidence and Mortality for Zip Code 29853 (Williston, SC)

Cancer Incidence in Zip Code 29853

The first step in the analysis of cancer data for zip code 29853 was to look at the number of new cancer cases diagnosed in the zip code and compare this to the number of cancer cases expected (see Table 1). This first step determines if there is anything unusual with cancer patterns in the area. The number of "expected" cancer cases is calculated by using South Carolina cancer rates and applying them to the population of the zip code.

Table 1 shows what types of cancer occurred in zip code 29853 from 1996-2001, and how many cancer cases were expected. Overall, there were fewer cases of cancer than expected. A total of 174 new cases of cancer occurred in the zip code, while 199 cases were expected. The most common types of cancer were prostate, colon/rectum, female breast, and lung cancers. These types of cancer are also the most common cancers occurring across all of South Carolina.

The analysis did not reveal any specific types of cancer where the number of cases was significantly higher than expected.

Cancer Deaths in Zip Code 29853

To assess cancer deaths in this zip code, cancer mortality data from 1998-2003 were used. The same process used to analyze new cancer cases was also used to analyze cancer deaths. Table 2 shows the number of cancer deaths that occurred and the number expected in the zip code. A total of 87 cancer deaths occurred in this zip code, while 88 deaths were expected. Therefore, there were fewer cancer deaths than expected.

The analysis did not reveal any specific types of cancer where the number of deaths was significantly higher than expected.

Conclusions

To summarize, fewer cancer cases and deaths occurred in zip code 29853 than expected. There were no specific cancer sites that were significantly elevated in cases or deaths.

In order for a true cancer cluster to exist, the number of cancers occurring must be more than would be expected by chance. Along with statistical testing, there are several other criteria that determine whether a true cancer cluster exists. First, a cancer cluster would more likely involve rarer types of cancer rather than more common cancers like lung or breast cancers. Also, a cancer cluster would occur with one specific type of cancer rather than having excesses in several different types of cancer.

Taking all these criteria into consideration, this office has concluded there is no evidence of cancer clustering in zip code 29853.

For questions about this report, please contact Susan Bolick-Aldrich at the SC Central Cancer Registry.

Report provided by:

SC Central Cancer Registry
Department of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201
Phone: (800) 817-4774 or (803) 898-3696

Information on cancer incidence provided by the SC Central Cancer Registry, Office of Public Health Statistics and Information Services, SC Dept. of Health and Environmental Control.

Information on cancer mortality provided by the Division of Vital Records and the Division of Biostatistics, SC Dept. of Health and Environmental Control.

11/01/05

Table 1. Analysis of New Cancer Cases in Zip Code 29853, 1996-2001

<u>Cancer Site</u>	<u>Observed No. of Cases</u>	<u>Expected No. of Cases</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest*</u>
Prostate	31	31.7	0.98	0.02
Colon/Rectum	27	23.3	1.16	0.60
Female Breast	24	29.4	0.82	0.98
Lung/Bronchus	18	31.5	0.57	5.79
Bladder	9	8.0	1.13	0.13
Non-Hodgkin Lymphoma	5	6.9	0.73	0.51
Other and Ill-Defined	5	6.1	0.82	0.19
Oral/Pharynx	5	5.3	0.94	0.02
Melanoma of Skin	4	6.5	0.61	0.99
Kidney/Renal Pelvis	2	5.2	0.39	1.94
ALL SITES	174	198.9	0.87	3.11

Excludes in situ cases of cancer to allow for comparison.

Excludes cancer sites with less than 5 cases expected due to the unreliability of statistical tests based on small numbers.

*The Chi-Square Statistical Test allows us to determine if the differences between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of cases is significantly different from the expected number of cases.

Prepared by: SC Central Cancer Registry, Office of Public Health Statistics and Information Systems, Department of Health and Environmental Control, 2600 Bull St., Columbia SC 29201

November 1, 2005 cmm

Table 2. Analysis of Cancer Deaths in Zip Code 29853, 1998-2003

<u>Site</u>	<u>Observed No. of Deaths</u>	<u>Expected No. of Deaths</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest</u>
Lung/Bronchus	13	25.9	0.50	6.46
Colon/Rectum	13	8.8	1.48	1.99
Female Breast	10	6.6	1.51	1.72
Other and Ill-Defined	6	6.5	0.93	0.04
Prostate	4	5.6	0.72	0.43
ALL SITES	87	88.3	0.99	0.02

Cancer sites with less than 5 cancer deaths expected are not analyzed due to the unreliability of statistical tests based on small numbers.

*The Chi-square statistical test allows us to determine if the difference between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of deaths is significantly different from the expected number of deaths.

Prepared by: SC Central Cancer Registry, Office of Public Health Statistics and Information Services, Department of Health and Environmental Control, 2600 Bull St., Columbia, SC 29201

Appendix C

Public Comments and SC DHEC Responses

This public health assessment was available for public comment during the period of January 16, 2006 – March 16, 2006. The document was available for viewing at the Williston public library. Notification was sent via a press release to the community and fact sheets mailed out to residents that indicated an interest. All public comments received are summarized below and addressed by SCDHEC.

Comment: “Where are the recommendations about off-site exposure or contamination?”

Response: Exposure to chemicals in drinking water from private wells is the only documented complete exposure pathway at the Admiral Homes Appliances site. Several actions have already taken place to prevent off-site exposure or contamination. One private well contained TCE above the MCL. A filtration system was installed at this house in 2003. This house is currently unoccupied and the owners have no plans for anyone to live in this house full-time. Two other private wells contained mercury above its MCL and five other private wells contained mercury below its MCL. All seven homes with any mercury detection were offered bottled water – five homes accepted and two did not (one of these with well above the MCL, and the other well below the MCL). As of October 2006, the Town of Williston has obtained a grant and is currently in the process of installing public water lines in the residential area where mercury and TCE were detected in private wells. It is recommended that the remaining home with mercury above the MCL accept the offer of municipal water when available.

Previous investigations have shown that there was soil and sediment contaminated with elevated levels of chromium, nickel and zinc. The contaminants were primarily found close to the former Imhoff system and not in any yards. Wastewater discharges to the Imhoff system stopped in 1982. In January and February 2005, the majority of the Imhoff system structures were removed. Dixie Narco owns the property that encompasses the Imhoff area, discharge area and about 35 acres of surrounding land. SCDHEC will work with Dixie Narco to restrict access around the Imhoff area.

Comment: “The ATSDR document did not factor any of the longtime exposure that the nearby community has been exposed to.”

Response: Length of exposure was considered in this evaluation. Surface soil and sediment samples collected in earlier sampling did show elevated levels of chromium, nickel and zinc around the Imhoff system. There was the potential for human exposure, however; there is no way of knowing if area residents regularly came in contact with or were exposed to either soil or sediment in the wetland area associated with the Imhoff system. These metals are not particularly mobile and tend to stay in the stream channel or the flood zone around the stream.

In regards to drinking groundwater from private wells, there is limited historical sampling data. The groundwater data that was collected did not indicate levels that are considered hazardous to

human health, with the exception of mercury in two wells that was above the EPA MCL for drinking water. These homes were offered bottled water.

Comment: “In 1989, several private wells were tested. Why were these people allowed to continue drinking water from their wells – what recommendations were given on their behalf at that time.”

Response: As noted above, there is limited historical groundwater/private well sampling data. The first reported groundwater/private well sampling was of three wells in 1989. These samples were analyzed for metals and volatile organic compounds (VOCs). Nickel was the only contaminant slightly above the MCL. One other well had 1,1-Dichloroethane present – there is no health standard for this chemical. Three groundwater/private wells were sampled in 1999 for metals and VOCs. Two of these wells were also sampled in 1989. Mercury was not analyzed in 1989 and was not found in the 1999 samples. The 1999 samples were below the detection limit or below the MCL for all constituents tested. This data did not indicate levels that are considered hazardous to human health. There is no information as to whether recommendations were made or not to the owners of the private wells. Currently residents with impacted wells have been offered bottled water, and public water will be brought to residents in the area closest to the site.

Comment: “How has the longtime exposure affected women of childbearing age: How might it have affected pregnancies?”

Response: As summarized in our conclusions, there has only been minimal exposure to contaminants from this site. We do not know if women of childbearing age were exposed and if so, at what dose and how long. The contaminants that were at high levels around the Imhoff system were chromium, nickel and zinc. The ATSDR ToxFAQ on chromium states that “we do not know if exposure to chromium will result in birth defects ...” “Birth defects have been observed in animals exposed to chromium (VI)”.

In regards to nickel, the ATSDR ToxFAQ states “animal studies have found increases in newborn deaths and decreased newborn weight after ingesting very high amounts of nickel. Nickel can be transferred from the mother to an infant in breast milk and can cross the placenta.”

In regards to zinc, the ATSDR ToxFAQ states “we do not know if excess zinc can cause developmental effects in humans.” Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.”

TCE and mercury were the contaminants of concern in the groundwater/private wells. Historical data from limited sampling from private wells did not indicate levels that would be harmful to human health. Both TCE and mercury have been associated with birth defects and developmental problems.

Comment: “Considering the site’s history and impact on nearby neighborhood, there are obvious

grounds for an in-depth health study, and we request that of ATSDR and SC DHEC.” There were several comments asking for an explanation of “no apparent health hazard”.

Response: The Admiral Homes Appliance site is classified under the ATSDR’s classification system as “no apparent public health hazard”. This means that human exposure is occurring or has occurred in the past, however; the current exposure is below the level of a health hazard.

We know that people drinking water from the private wells with mercury and the one with TCE were exposed but we don’t know for how long. Based on the limited historical groundwater data, SC DHEC estimated that exposure to elevated concentrations of mercury and TCE lasted five years or less. We know that the concentrations were low and people were exposed for a relatively short period of time. As a result, exposures to either TCE or mercury concentrations at a low level are not likely to cause adverse health effects. An in-depth health study is not warranted at this site.

Surface soil and sediments that contained contaminants above screening levels were found around the Imhoff system. Originally this was private property – the company now owns the property. Someone could have ingested soil or regularly come in contact with the contaminated soil. We do not have any specific information to know if someone was exposed to contaminated soil.

Comment: “Considering the level of contamination was probably much higher ten or fifteen years ago or even more, I would like to suggest that the amount of toxins that were ingested via well water was far greater than current estimates.”

Response: The limited historical groundwater/private well sampling data does not show high levels of contaminants.

Comment: “The public health assessment seems to be full of assumptions, and the community has its own about exposure and causation.”

Response: Since there is limited historical sampling and exposure data, reasonable informed (worst case) assumptions were made to account for potential risk.

Comment: A concern was raised that there are many chemicals of concern, in addition to mercury and there are many health problems and diseases that could have resulted from long term exposure to chromium, mercury, TCE, nickel and zinc even in small doses.

Response: We don’t have any specific information that anyone was exposed to contaminants above the screening level for a long period of time.

Comment: “How did you factor in the fragile elderly, those already weakened by illness, and children when making your assumptions about what is unlikely to have had an adverse effect?”

Response: The public health assessment does take into consideration child health issues. Children are more sensitive than adults to environmental factors. Evaluating children as most sensitive to possible environmental exposures would also include the frail elderly and those suffering other illnesses in this grouping.

Comment: “If a garden of root crops were planted in this field where various toxins were found, these substances of concern could have been absorbed by the plant, especially if they were, for example turnips, or sweet potatoes. Therefore, persons eating these garden foods would have ingested larger amounts of the toxins into their bodies.”

Response: The soil and sediment around the Imhoff System did have levels of contamination above the health screening level, however; people do not live on this property. There are no crops or gardens in this area.

Comment: “This assessment was developed after studying old files and records related to the site and without adequate citizen/resident (from those living close to the site) input as it relates to their health issues...”

Response: The author of the Admiral Homes Public Health Assessment did visit the site on several occasions and spoke to residents. Both the EPA Community Relations staff person and the DHEC Community Liaison visited the community several times and spoke to individuals regarding their concerns. EPA conducted several public meetings that gave residents the opportunity to voice concerns and ask questions.

Comment: There were several comments related to “we request further study”. We are asking for a community health study or exams, particularly for the families that were impacted and for children in these communities.”

Response: As noted above, this site was classified a no apparent public health hazard. It is unlikely that adverse health effects due to exposure to drinking water occurred. Concentrations of the contaminants in the private well water were low and the exposure was likely for less than five years. The data does not indicate a need for further health study or health exams.

Comment: “Lastly, how was this public health assessment distributed to the public?” Did the many who attended the public meetings receive a copy, were they informed that it was at the Williston Library. “The community should have a public meeting...”

Response: A fact sheet (see Appendix D) was sent out to those individuals who signed in at public meetings. The fact sheet explained that SC DHEC was taking written comments on the draft public health assessment and the timeline for the public comment period. The fact sheet informed individuals that a copy would be placed in the Williston Public Library for review. Also the public could request a copy by mail, e-mail or phone from Nancy Whittle, SC DHEC. A press

release also went out to the local newspapers (see Appendix D). At this time, we do not plan to hold a public meeting.

Comment: There were several comments that this document is not factual, that DHEC willfully covered up and concealed information from the community.

Response: This public health assessment was written after extensive review of the historical environmental sampling data and the data collected during the EPA remedial investigation/feasibility study. Conclusions were made based on this data and on available scientific research.

DHEC records are available to the public through the DHEC Freedom of Information Office. Copies of records can be released to interested citizens.

Comment: There is a concern that this report was from flawed information, that it distorted the fact that millions of gallons of deadly chemicals were illegally released into the wetlands affecting people, animals and vegetation.

Response: This report does acknowledge that the Imhoff system received waste from the manufacturing facility from 1966 to 1982. The system was not designed to address these types of contaminants. As noted earlier, although there was the potential for exposure from sediment and soil, we do not know if people ingested the soil and if so what level of exposure they may have had.

Comment: This document is deceptive since the site was classified as “no apparent health hazard”.

Response: This issue has been addressed earlier in this document.

Comment: There were questions regarding whether staff visited the site and did anyone question the people surrounding the site regarding health problems.

Response: As noted earlier in this section, staff did visit the site and staff talked to people in the community regarding health concerns.

Comment: “Has anyone checked the information provided by DHEC to see if it was correct and credible?”

Response: The draft Admiral Homes Public Health Assessment was reviewed by staff from EPA, Region 4 and by staff at ATSDR before being released to the public for comment.

Comment: “Have these people been tested to see if there are traces of those chemicals in their bodies since it was present in their water? This needs to be done, as well as a health study. Is ATSDR the agency that conducts these types of studies and/or exams?”

Response: The people who were potentially exposed to mercury and TCE in their drinking water have not been tested by DHEC or ATSDR. Since the concentrations of the contaminants were low and people were exposed for a relatively short period of time, their health risk is minimal.

Comment: “How did DHEC determine that people were exposed to elevated concentrations of mercury and TCE for only five years?”

Response: As stated in the draft Admiral Homes Public Health Assessment, “the estimation was based on historical (although limited) private well sampling in 1999, in which mercury was not found in private wells”. The private well that contained TCE above the MCL was sampled in 1989 and was not detected at that time. This well was also sampled in 1999 and found to have very low levels of TCE. Because TCE was not detected in 1989 and only at low levels in 1999, “it is likely that the well has only contained TCE above its MCL for a few years”.

Comment: “How many years, days or hours does it take for chemicals like mercury or TCE to have an effect on a human body? How long does it take for these chemicals to effect pregnant women, or children?”

Response: Currently, we don’t have information available to say with certainty that if a person was exposed to chemicals at a site that they would get sick. Most of the scientific evidence that we have comes from laboratory studies with animals typically exposed to much higher levels than would be expected to occur at the site.

There are a number of factors that can affect whether or not someone may become sick and how long it will take before they become sick. These factors include:

- Amount and type of chemical exposure
- How long someone is exposed
- How it gets into the body
- The individual’s health status
- Body weight

Comment: “This report states that adverse health effects due to the exposure from drinking the water are not “likely” to occur. What scientific document was this taken from?”

Response: As noted earlier, based on the limited historical data and data from the EPA RI/FS, the author of the public health assessment made this decision based on professional judgment, using studies cited in ATSDR’s toxicological profiles for the individual contaminants.

Comment: “I don’t see anywhere in this report of any air testing for the people of the surrounding communities.”

Response: Air testing would only be relevant for Volatile Organic Compounds (VOCs). The concentration of the VOCs would have to be elevated and the water table shallow before contaminant gases could affect people in their homes. The same would be true for off-gassing of groundwater used in the home for washing/showering. The home that was contaminated with TCE was provided a carbon filter to prevent TCE from entering the home through the water pathway.

Comment: “Just as blood flows thru the body, and water flows is continuously flowing through the wetland. When one is poisoned so are the other parts, people, animals, and vegetation.”

Response: This depends on the extent of the contamination and whether there is a completed exposure pathway.

Comment: “On page 2 of this report it states that the water was pumped through the wetland area toward the intermittent part of Spur Branch Stream. This statement should read that it was pumped into the wetland area **in hopes** that it would head toward the intermittent part of Spur Branch Stream.”

Response: On page 2, the statement that “discharge was piped through the wetland area toward the intermittent part of Spur Branch Stream” was taken from ENSR, 2004. Natural processes of erosion and deposition would carry it through the wetlands and towards the stream.

Comment: On page four there is a reference to two other private ponds. The Private Pond listed should be given names in relation to ownership in the same manner that the other (named) pond was a name was given by DHEC.”

Response: Because the name of the pond is the same as the name of the owner, the name has been removed from this document for confidentiality reasons and will only be referred to as private pond # 1, 2 etc.

Comment: “On page 5 where was the information obtained that referred to the aquifers in this area?”

Response: The information in this report was obtained from an ENSR report from 2004. According to staff from ENSR, the information came from two reports:

- “Geology and Groundwater of the Savannah River Plant and Vicinity, South Carolina” - U.S. Geological Survey, Water Supply Paper #1841, 1967
- “Geology and Groundwater Resources of Allendale, Bamberg, and Barnwell Counties and part of Aiken County, South Carolina” – South Carolina Water Resources Commission Report #155, 1989

Comment: “On page 5 of this report there is a reference to a Leadership Institute that was held in Williston on May 2005; what was this and who attended?”

Response: The Medical University in Charleston in partnership with Westinghouse/SRS conducted this workshop. Staff from MUSC and Westinghouse worked with the Town of Williston, County officials and citizens to form a local planning committee to plan the workshop. Speakers from both federal/state government and local academic institutions provided information on resources such as housing, health care, and transportation needs.

Comment: “On page nine there was a soil gas sample from vapor probes. Can I have a complete copy of this report?”

Response: Yes, this report is available via the Freedom of Information Act (FOIA).

Comment: “On page 14 of this report it states that the Williston water is up gradient from the Site. This is total deception.”

Response: The statement that “these wells are upgradient from the site” is based on actual groundwater data. Two of the public water supply wells for Williston were sampled during the remedial investigation – there were no site-related chemicals found in these wells.

Comment: “The huge pumps pull water from all directions for miles.”

Response: Pumping from a well in a water table aquifer lowers the water table near the well. This area is known as a cone of depression. Groundwater flows toward the well into the cone of depression. The diameter of a cone of depression is dependant on the well construction, the water-bearing material, and the pumping rate. It is a value that can be directly calculated. It is unlikely that these well have an influence of miles.

Comment: “Do they test the water after they periodically flush the system?”

Response: At the time of flushing, they are analyzing for chlorine residual. They do monthly sampling and flush on a semi-annual basis. If there are problems or concerns, they flush as needed.

Comment: There was another concern about children and a statement that “nothing in the report shows that any tests were performed on children in the communities”.

Response: There were no tests performed on children since this site was classified as “no apparent health hazard”. As noted in an earlier response, the document does take into consideration the special issues related to children on pages 20 and 21 of the document.

Comment: “Two schools are within a mile of this site. Has any test been done on the water at the Williston-Elko Elementary, Williston-Elko High School and Williston –Elko Middle School?”

Response: All of these schools are supplied by the public water system. The public water system was tested for site related contaminants during the remedial investigation and no site related contaminants were found in these wells. The public water system is monitored on a regular basis.

Appendix D
Fact Sheet and Press Release



Fact Sheet

SC Department of Health and Environmental Control • 2600 Bull Street • www.scdhec.gov • Promoting and protecting the health of the public and the environment

The South Carolina Department of Health and Environmental Control (SC DHEC), under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has completed the draft Admiral Homes Appliance site public health assessment. We are announcing a 60-day public comment period on this document.

PUBLIC COMMENT PERIOD

SC DHEC is currently taking written comments on the draft public health assessment. The **public comment period** began on **January 17, 2006** and ends on **March 17, 2006**. Please send your written comments via mail or e-mail to:

Nancy Whittle
EQC Community Liaison
SC DHEC
EQC Administration
2600 Bull Street
Columbia, SC 29201
whittlnc@dhec.sc.gov

Any comments you submit, a copy will be provided to the Division of Health Assessment and Consultation, ATSDR. A copy of the public health assessment with this fact sheet and a fact sheet on Health Assessments will be placed in the Williston Branch Public Library. The Williston Branch Public Library is located at 205 Springfield Rd. The phone number is (803) 266-3027. An information repository has been established under the name Admiral Homes Appliances, and these will be placed in this file. If you would like a hard copy of the public health assessment document, please contact Ms. Whittle at the above address or call her at (803) 896-8967.

FINDINGS

The draft public health assessment addresses:

- Types and levels of environmental contamination
- Whether people are being or have been exposed to the contamination
- Whether the contamination may affect people's health

A health assessment is not the same thing as a medical exam or a community health study. It sometimes leads to those things, as well as to other public health activities. To learn more about the health assessment, you may view the attached fact sheet.

If you have any questions concerning the public health assessment, you may contact Ms. Whittle or the Agency for Toxic Substances and Disease Registry at 1-888-422-8737.



South Carolina Department of Health
and Environmental Control

NEWS RELEASE

Division of Media Relations
2600 Bull Street
Columbia, S.C. 29201
(803) 898-3886
www.scdhec.gov/news

FOR IMMEDIATE RELEASE

Jan. 24, 2006

Public comment period open on Williston-area project

COLUMBIA – Residents in the Williston area are invited to comment on the proposed Admiral Homes Appliance public health assessment, the S.C. Department of Health and Environmental Control reported today.

“Copies of the draft public health assessment and other fact sheets are available for review at the Williston Branch Public Library at 205 Springfield Road in Williston,” said Nancy Whittle, community liaison for DHEC’s Environmental Quality Control.

Whittle said the public comment period began Jan. 17 and will continue through March 17. Materials at the Williston Branch Public Library have been placed in a file under the name Admiral Homes Appliances.

Residents requested the health assessment to determine whether contamination from past activities at the Barnwell County manufacturing facility could cause adverse health effects.

Mercury and solvents have contaminated groundwater in the area, while soil and sediment samples have shown levels of chromium and nickel.

“We will share the public comments with the federal Agency for Toxic Substances and Disease Registry’s Division of Health Assessment and Consultation,” Whittle said.

Whittle said the draft public health assessment addresses issues including the types and levels of contamination at the site, whether people have been exposed to the contamination and whether the contamination could affect people’s health. A health assessment is not the same as a medical examination or a community health study. It may, however, lead to those types of activities.

Comments and requests for copies of the library materials may be sent to:

-more-

Nancy Whittle
S.C. DHEC
EQC Community Liaison
2600 Bull Street
Columbia, S.C. 29201

Comments may also be sent to Ms. Whittle via email at whittlnc@dhec.sc.gov.

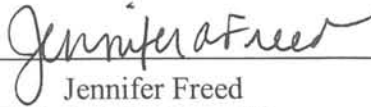
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For further information:

Thom Berry (803) 898-3885
berrytw@dhec.sc.gov
BNR1672

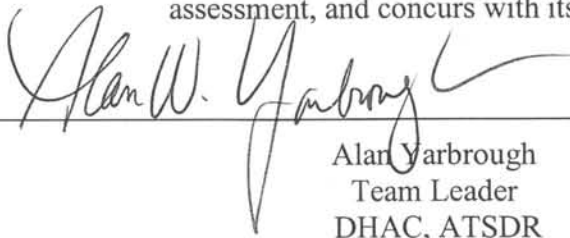
CERTIFICATION

This Admiral Homes Public Health Assessment was prepared by the South Carolina Department of Health and Environmental Control under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health assessment was begun. Editorial review was completed by the Cooperative Agreement Partner.



Jennifer Freed
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health assessment, and concurs with its findings.



Alan Yarbrough
Team Leader
DHAC, ATSDR