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NSB KINGS BAY
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LETTER TRANSMITTING CHANGE PAGES TO CORRECTIVE ACTION PLAN FOR SITE 11
NSB KINGS BAY GA
7/19/2001
NSB KINGS BAY

31547-000
09.01.00.0157

IN REPLY REFERTO:

5090
Ser FE4/1755
19 JUL 2001



DEPARTMENT OF THE NAVY

NAVAL SUBMARINE BASE
1063 USS TENNESSEE AVENUE
KINGS BAY, GEORGIA 31547-2606

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Billy Hendricks
Georgia Department of Natural Resources
Environmental Protection Division
205 Butler Street, SE, Suite 1252
Atlanta, GA 30334

Dear Mr. Hendricks:

Per your letter of April 16, 2001, enclosure (1) is the changed pages to our Corrective Action Plan (CAP) for Site 11, Old Camden County Landfill. If these changes are acceptable, please replace the pages as follows:

a. Remove and replace the executive summary, page viii. We updated it to say that your department approved the original CAP, that we performed in-situ oxidation, and that we discontinued pump and treat operation.

b. Remove and replace Chapter 2. We added the history of in-situ oxidation, the shutdown of recovery wells, the future removal of interim measures equipment and future chemical injection and vegetable oil injection.

c. Remove and replace Chapter 7. We updated it to say that pump and treat remediation was discontinued. We stated the goal of 100 micrograms per liter of total chlorinated ethenes (summation of PCE, TCE, DCE, and VC) but removed the redundant goals of 100 micrograms per liter for the individual constituents TCE, DCE, and VC.

d. Add to existing Table 2-1 two new pages. These update the list of documents we submitted.

e. Add to existing reference page new page R-5. We used these additional references in previous chapters.

I certify, under penalty of law, that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly

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gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The SUBASE Kings Bay point of contact is Ken Yargus, (912) 673-2001, extension 1217. Please address all correspondence to "Commanding Officer, Naval Submarine Base, Kings Bay, 1063 USS TENNESSEE Avenue, Kings Bay, GA 31547-2606."

Sincerely,



JOHN R. GARNER
Leader, Environmental Division
Facilities & Environmental
By direction of the
Commanding Officer

Enclosure: 1. Changed pages to Corrective Action Plan for Site 11, Old Camden County Landfill

Copy to:

SOUTHNAVENGCOM (Anthony Robinson)
J.A. Jones Environmental Services (Sam Ross)
J.A. Jones Environmental (SUBASE) (Kim Owens)
COMNAVREG SE (Laila Capers)

EXECUTIVE SUMMARY

Bechtel Environmental, Inc. (Bechtel) was contracted by the Department of the Navy, Naval Facilities Engineering Command, Southern Division, to provide remedial services as the Navy's Environmental Response Action Contractor. Bechtel prepared this Corrective Action Plan (CAP) in July, 1998 for remediation of contaminated Groundwater at Site 11, Old Camden County Landfill at the Naval Submarine Base (NSB) Kings Bay in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), and the Hazardous and Solid Waste Amendments (HSWA) of 1984. Naval Submarine Base, Kings Bay, Georgia, updated this CAP in July, 2001.

The CAP describes four alternatives, including the preferred alternative, for remediation of the contaminated groundwater at Site 11 to the United States Environmental Protection Agency and Georgia Department of Natural Resources (GDNR) Maximum Contaminant Levels. To achieve this objective, the preferred alternative specifies remediation of the source areas that were identified during the December 1997 direct-push sediment sampling event by the United States Geological Survey (USGS) utilizing in-situ chemical oxidation, containment of the dissolved groundwater plume utilizing pump and treat technologies, and discharge of treated groundwater to the NSB land application system and/or an on-site infiltration gallery. The active remedial measures proposed herein will be supplemented by monitored natural attenuation and risk reduction measures for the residents of the adjacent subdivision.

GDNR approved this CAP in 1998 and the preferred alternative was commenced. In-situ chemical oxidation was performed in three phases from 1998 through 2000, with another treatment proposed in 2001. Pump and treat operation was discontinued in 1999. Remediation work plans are approved by GDNR before work starts.

2.0 INVESTIGATION AND REMEDIATION

2.1 PREVIOUS INVESTIGATIONS

The investigative process provides for the evaluation of the nature and extent of the releases of hazardous constituents and the collection of necessary data to support interim and final corrective action activities. ABB Environmental Services, Inc. (ABB-ES) initiated RFI activities in January 1992. The nature and extent of contamination at Site 11 has been characterized and areas affected by site releases have been identified. The RFI and subsequent investigations provided the physical and chemical data needed to support the corrective action proposed herein. Table 2-1 provides a summary of the investigations carried out to date and associated source documents.

A description of the site-specific hydrogeology, including a conceptual model, can be found in the RFI Interim Report for Site 11 (ABB-ES, 1993) and the report, Hydrology of the Shallow Aquifer System in the Vicinity of Site 11 (USGS, 1998).

2.2 REMEDIATION EFFORTS

A Groundwater extraction and treatment system was designed and installed as an interim measure (IM) to hydraulically control further migration of contaminated groundwater. Initial construction of the IM began in September 1993 with start-up activities occurring in March 1994. The first phase of the IM included the installation of five groundwater recovery wells and their associated conveyance system, a diffused aeration tank for groundwater treatment, and vapor-phase carbon drums for off-gas air treatment. The recovery wells were positioned in the areas with the highest known concentrations of contaminants along the western side of the landfill and right-of-way (ROW) of Spur 40. The second phase of the IM included the addition of a new recovery well, which was centrally located within the existing recovery well network. Four recovery wells operated (RW-1, -3, -4, and -6) at a combined flow rate of approximately 55 gallons per minute. The recovered groundwater was treated to below MCLs and discharged to the NSB Kings Bay Land Application System (LAS). Figure 2-1 shows the former IM system layout. Recovery wells RW-7 and RW-8 were added to the IM system in February, 1999, but were shut down in March 1999 due to repeated fouling of the wells, pumps, and effluent piping (Bechtel, 1999b). IM equipment remained inoperative and will be removed in 2001.

In-situ chemical oxidation treatment was performed from November 1998 to February 1999 and was repeated in June and July 1999. A suspected source area was excavated in September, 1999. In-situ chemical oxidation treatment was repeated in January, March, and April, 2000. A total of 34,850 gallons of 50% hydrogen peroxide and an equivalent amount of ferrous oxide were injected into the contaminate source area. This reduced the contaminant levels in the most contaminated area by more than ninety per cent (Bechtel, 2000). In-situ chemical oxidation treatment will be repeated in 2001 to remove residual contamination below the originally treated area (CH2MH, 2001).

After chemical oxidation treatment, vegetable oil may then be injected in the landfill area to enhance the reductive oxidation and electron donor conditions necessary to promote microbial reductive dechlorination of chlorinated solvents. The Georgia Department of Natural Resources (GDNR) will review the work plan for the final in-situ chemical oxidation and the vegetable oil injection prior to these actions (CH2MH, 2001).

2.3 CONTAMINANTS AND AREAS OF REMEDIAL CONCERN

2.3.1 Plume/Source Area Delineation

The contaminants of concern for corrective action activities, as identified by GDNR, are PCE, TCE, DCE and VC. In order to define areas of remedial concern, groundwater data were compared to MCLs for the contaminants of concern. The data initially used included the September 1997 groundwater monitoring event (see Figure 2-2), two direct-push investigations performed in March and September 1997 by ABB-ES (see Figures 2-3 through 2-8), and a direct-push sediment sampling event performed by the USGS in December 1997 (see Figures 2-3 and 2-9).

In the anaerobic biodegradation process, PCE is reduced to TCE, then DCE and VC. For this reason, the areas of higher concentrations of PCE were sought out as source areas during the development of this CAP. The data presented on Figures 2-4 and 2-9 indicated the presence of two distinct source areas of PCE. The groundwater monitoring event and the direct-push efforts performed by ABB-ES (Figure 2-4) generally defined this source area, while the USGS direct-push sediment sampling event (Figure 2-9), which was performed utilizing the previous data as a starting point, further isolated the source areas to two distinct locations.

The data presented on Figures 2-4 through 2-8 indicated a dissolved groundwater plume, which extends downgradient from the two source areas in a narrow, cigar-like shape. In the areas closest to the source area, the highest chlorinated ethene constituent is PCE. In the areas downgradient from the source areas, the PCE concentrations decrease and the daughter products TCE, DCE and VC begin to appear due to biodegradation of the PCE. The highest chlorinated ethene concentrations appear to be limited to the areas directly downgradient from the source areas; therefore, dispersion of the plume appears to be minimal in the crossgradient directions.

The data shown on Figure 2-8 define the downgradient extent of the PCE plume, and also indicate the presence of low-level concentrations of the daughter products TCE, DCE and VC. Based upon the information provided in the report, *Selecting Remedial Goals by Assessing the Natural Attenuation Capacity of Ground-Water Systems* (USGS, 1998), natural attenuation can be utilized to effectively remediate these areas as part of an overall remediation strategy. A copy of this report is provided in Appendix A.

2.3.2 Crooked River Plantation Subdivision Private Well Survey/Groundwater Monitoring

Between the dates of June 1 and June 6, 1998, a private well survey was conducted in the Crooked River Plantation Subdivision, within the boundaries shown on Figure 2-10. A resident at each property location within the given boundary was contacted, either by phone or in person. In all, a total of 58 residents were contacted and 25 private wells were located within the survey boundaries. The wells ranged from 10 feet to 40 feet below ground surface. None of the wells were being utilized for drinking water purposes.

On June 5 and 6, 1998, a total of 21 of the located wells were sampled for analyses of the contaminants of concern. A sample could not be collected from four of the wells, due to problems with the irrigation pump or the well itself. Only one well, located at 122 Plantation Court (formerly called 223 Plantation Court), was found to contain concentrations of the contaminants of concern at or above Federal MCLs. The sample collected at 122 Plantation Court contained 2 ug/l (micrograms per liter) of VC, which is equal to the Federal MCL. This sample also contained 1 ug/l of DCE, which is below the Federal MCL. The well located at 108 Cottage Court (formerly called 209 Cottage Court) contained 56 ug/l of DCE, and 1 ug/l vinyl chloride, both of which are below Federal MCLs. The well located at 102 Plantation Court (formerly called 203 Plantation Court) contained 1 ug/l of TCE, which is also below the Federal MCL. None of the remaining samples contained concentrations of PCE, TCE, DCE, or VC above laboratory detection limits. The analytical results are summarized on Table 2-2. Subsequent sampling results from the wells at 102 Plantation Court, 122 Plantation Court, and 108 Cottage Court are summarized in groundwater monitoring reports (JAJMS, 2001).

7.0 CONTINGENCIES AND EXIT STRATEGY BASED UPON LONG TERM MONITORING RESULTS

A long term monitoring plan specifies monitoring well installations, monitoring well abandonments, sampling frequencies, sampling locations, and analytical parameters (Bechtel, 1999a). The plan states that if any sampling location is below MCLs for a design-specified period of time, the sampling frequency at that location will be reduced.

In-situ oxidation and targeted excavation successfully reduced source area contamination (Bechtel, 2000 and GDNR, 2000). Pump and treat remediation was discontinued in March 1999 due to repeated fouling of extraction wells and pumps. (Bechtel, 1999b and Bechtel, 2000). Unused treatment equipment will be removed and extraction wells will be abandoned in 2001 (GDNR, 2001).

Concentrations of total chlorinated ethenes (summation of PCE, TCE, DCE, and VC) must be reduced to less than 100 micrograms per liter (ug/L) at each monitoring well associated with this site. This criterion is based upon the information provided in the report, Selecting Remediation Goals by Assessing the Natural Attenuation Capacity of Ground-Water Systems (USGS, 1998, Appendix A).

Table 2-1 (Continued)
 Site 11 Investigation, Chronology and Source Documents

Corrective Action Plan
 Site 11, Old Camden County Landfill
 Naval Submarine Base
 Kings Bay, Georgia

Program and Activity	Dates Conducted	Activities	Source Documentation
Interim Measures	1 Feb 99 - 30 Apr 99	IM system operation and shutdown In-Situ Chemical Oxidation Groundwater sampling	IM Progress Report, February 1, 1999 - April 30, 1999 (Bechtel, May 1999)
Monitoring	Jun 99 - present	Groundwater sampling	Groundwater Monitoring Plan for Site 11, Old Camden County Landfill, U.S. Naval Submarine Base, Kings Bay, Georgia (Bechtel, June 1999)
Interim Measures	Jul 98 - Jul 00	IM system operation and shutdown In-Situ Chemical Oxidation Groundwater sampling	Completion Report for Interim Measures, Site 11, Jul 98 - Jul 00 (Bechtel, July 2000)
Monitoring	Jul - Sep 99	Groundwater sampling	Quarterly Groundwater Monitoring Report (Bechtel, September 1999)
Monitoring	Oct - Dec 99	Groundwater sampling	Quarterly Groundwater Monitoring Report (Bechtel, December 1999)
Monitoring	Jan - Mar 00	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, March 2000)
Corrective Action	Oct 99 - Mar 00	IM system operation and shutdown In-Situ Chemical Oxidation Groundwater sampling	Semi-Annual Corrective Action Assessment Report (Bechtel, April 2000)
Monitoring	Apr - Jun 00	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, June 2000)
Monitoring	Jul - Sep 00	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, October 2000)
Corrective Action	Apr 00 - Sep 00	IM system operation and shutdown In-Situ Chemical Oxidation Groundwater sampling	Semi-Annual Corrective Action Assessment Report (JAJMS, October 2000)
Corrective Action	Oct 00	Source Area Delineation	Work Plan, Source Area Delineation at Site 11 (CH2M Hill, October 2000)

Table 2-1 (Continued)
 Site 11 Investigation, Chronology and Source Documents

Corrective Action Plan
 Site 11, Old Camden County Landfill
 Naval Submarine Base
 Kings Bay, Georgia

Program and Activity	Dates Conducted	Activities	Source Documentation
Monitoring	Sep - Nov 00	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, December 2000)
Monitoring	Dec 00 - Feb 01	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, March 2001)
Corrective Action	Oct 00 - Mar 01	IM system operation and shutdown In-Situ Chemical Oxidation Groundwater sampling	Semi-Annual Corrective Action Assessment Report (JAJMS, April 2001)
Monitoring	Apr - Jun 01	Groundwater sampling	Quarterly Groundwater Monitoring Report (JAJMS, June 2001)

References, continued

Bechtel, 1999a. *Groundwater Monitoring Plan for Site 11, Old Camden County Landfill, NSB Kings Bay, Georgia*. Prepared for SOUTHNAVFACENGCOC, Charleston, South Carolina (June).

Bechtel, 1999b. *IM Progress Report, February 1, 1999 - April 30, 1999, Site 11, Old Camden County Landfill, NSB Kings Bay, Georgia*. Prepared for SOUTHNAVFACENGCOC, Charleston, South Carolina (May).

Bechtel, 2000. *Completion Report for Interim Measures, Site 11, Jul 98 - Jul 00, Old Camden County Landfill, NSB Kings Bay, Georgia*. Prepared for SOUTHNAVFACENGCOC, Charleston, South Carolina (July).

GDNR, 2000. *Re: Final Completion Report for In-Situ Chemical Oxidation Site 11 Old Camden County Landfill, Naval Submarine Base Kings Bay*. Georgia Department of Natural Resources, Hazardous Waste Management Branch, to Naval Submarine Base, Kings Bay, GA (September 13, 2000).

GDNR, 2001. *Re: Request to Modify Corrective Action Plan, Letter 5090 Ser FE4/0907*. Georgia Department of Natural Resources, Hazardous Waste Management Branch, to Naval Submarine Base, Kings Bay, GA (April 16, 2001).

JAJMS, 2001. *Quarterly Groundwater Monitoring Report, April - June 2001, Site 11, Old Camden County Landfill, Naval Submarine Base Kings Bay, Georgia*. Prepared for Naval Submarine Base, Kings Bay, GA (June).

CH2MH, 2001. *Work Plan No. 2, Revision No. 00, Groundwater Remediation at Site 11, Old Camden County Landfill, Naval Submarine Base Kings Bay, Georgia*. Prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.