4/2/08-04145

Marine Corps Base Camp Lejeune Restoration Advisory Board Meeting Minutes

RAB Meeting: January 22, 2008

ATTENDEES:

Robert Lowder/Camp Lejeune
Andrew Smith/Camp Lejeune
Rodger Jackson/NAVFAC Mid-Atlantic
Cherryl Barnett/NAVFAC Mid-Atlantic
Bryan Beck/NAVFAC Mid-Atlantic
Kerry Buchinger/ NAVFAC Mid-Atlantic
Gena Townsend/USEPA Region 4
Randy McElveen/NCDENR
Matt Louth/CH2M HILL
Christopher Bozzini/CH2M HILL
Kim Henderson/CH2M HILL
Michael Cree/Osage
Laura Bader/RAB Co-Chair
Jerome Ensminger/RAB Member
Thomas Mattison/RAB Member
Brian Wheat/RAB Member
Richard Mullins/RAB Member
Marvin Powers/RAB Member

FROM: Kim Henderson/CH2M HILL

DATE: April 2, 2008

LOCATION

Coastal Carolina Community College, Business Technology Building, Room 103 in Jacksonville, North Carolina

MINUTES

6:00 PM

I. Welcome and Introductions

II. Radiological Material Investigation Brief

Objective: The purpose of this agenda item was to provide the results of the radiological material sampling conducted at Naval Field Medical Research Laboratory (NFMRL) (Installation Restoration [IR] Sites 19 and 20) and IR Site 69. This discussion was led by Base representative, Mr. Lowder.

Overview: The Base representative briefly reviewed the situation that led to the recent sampling activities and a chronology of events. Local media reported that the Base may have contaminated base drinking water with radiological material, reportedly from the former NFMRL and a known chemical warfare material (CWM) dump site (Site 69). A local

resident and RAB member expressed concerns that beta particles were identified at concentrations two and a half times greater than the regulatory limit in a public water supply well in 1984.

NFMRL operated from 1956 through 1960. Activities conducted at the lab included operation of an incinerator and use of low radioactivity medical tracer isotopes, and dogs were used as test subjects. "Beta-buttons" containing Strontium-90 were disposed of by burial near the lab and potentially at Site 69. The "beta-buttons" were reportedly not used for experimentation but were used on helmets, uniforms, and decks of Navy ships for visibility as they glow in the dark. The RAB reviewed a photo of a beta-button.

In November 1980, a beta-button was found by a worker during routine maintenance near the former lab. In December 1980, the Naval Energy and Environmental Support Activity (NEESA) removed 493 beta buttons and 2 animal carcasses from a burial pit. In June 1981, additional sampling was performed at NFMRL and Site 69, the suspected dump sites. Radioactive waste was removed from the NFMRL area and stored in six 55-gallon drums in building PT-25. The RAB reviewed figures of the locations of NFMRL, PT-25, and Site 69. During this discussion Mr. Ensminger noted that historical reports referred to a "rad pool" at Site 69. Mr. Lowder indicated that there is a pit present at the site and water or waste is not visible within the pit.

In July 1981, a draft final report of the findings was provided to the Base. Radiological levels were within acceptable limits (similar to naturally occurring levels) in soil, rooms within the former lab, and at the incinerator ash dump site at NFMRL. Areas showing high levels of radioactivity within the incinerator were decontaminated. Radioactivity levels detected at Site 69 were also determined to be naturally occurring or fallout. Based on these results, all areas were released for unrestricted use.

In 1983, a Base-wide Initial Assessment Study (IAS) was performed by NEESA and identified the NFMRL area as IR Site 19 and the associated incinerator as IR Site 20. Based on the results of the previous activities, both sites were identified for no further action. In April 1984, US Ecology Inc. brokered Southwest Nuclear Co. to remove and dispose of the radiological material. All material was disposed at Hanford Reservation in Washington. There is a copy of the manifest with a list of materials disposed.

In November 2006, the 9th Marine Regiment was proposed within the Sites 19 and 20 area. Therefore, in May 2007, the Base IR Program Manager submitted Sites 19 and 20 to the Navy for further investigation. The RAB reviewed a map of the proposed MILCON design and building demolitions.

In July 2007, a local resident/RAB member invited the media to a RAB meeting to report possible Camp Lejeune radiological contamination and historical radiological exceedances in drinking water wells based on information from the NCDENR web site. Mr. Lowder noted that the maximum contaminant level (MCL) was reported incorrectly on the NCDENR web site (reported at 4 pCi/L and actual is 50 pCi/L for beta particles) and there were no exceedances in Base drinking water wells in 1984 (detections were 9 and 10 pCi/L).

In July 2007, Radiological Affairs Support Office (RASO) conducted a surface survey and soil and concrete samples at the NFMRL lab and Site 69. The sampling results did not

indicate radioactivity detected above natural background levels. RASO concluded that there is no radiation exposure hazard for personnel in either the NFMRL or Site 69 areas.

However, to ensure protection of human health and the environment, RASO recommended a historical archives search of all radiological data and information associated with the former activities of the NFMRL and disposal of beta-buttons on Base and to conduct a detailed subsurface radiological evaluation of the former burial site. The Base asked RASO to provide scopes of work for the additional tasks as the subject experts.

Photos of the NFMRL complex and location of the former beta-button pit and former radiological material storage building PT-25 were reviewed.

Mr. Ensminger noted that the NEESA report from December 1980 identified that they cleaned up and removed 493 beta-buttons, 2 animal carcasses, and 160 pounds of contaminated soil. He questioned how 160 pounds of soil equates to six 55-gallon drums. Mr. Lowder stated that the manifests document the quantity disposed of and that he thought it was more that 160 pounds and that the material was repackaged based on loading requirements. He recommended reviewing the manifest rather than the cleanup report for the specific disposal information. Mr. McElveen stated that the report may have estimated an area of contamination and the actual contamination and removal may have extended beyond that. Mr. Lowder confirmed (on 2/22/08) from the manifests that a total of 1,337 pounds of soil were manifested for off-site disposal at Hanford Reservation, Richland Washington.

III. Tarawa Terrace Vapor Intrusion Investigation Brief

Objective: The purpose of this agenda item was to provide an update on the status of the vapor intrusion investigation at Tarawa Terrace. This discussion was led by Base representative, Mr. Lowder.

Overview: The Base representative briefly reviewed the situation that led to the recent sampling activities and a chronology of events. The Agency for Toxic Substances and Disease Registry (ATSDR) completed a draft groundwater and vapor contaminant model, using groundwater data collected from 1984 and 1994, showing potential contamination within the Base housing area. The modeling was conducted to track the historic movement of volatile organic compound (VOC) contamination from an off-Base source (ABC One-Hour Cleaners).

ABC Cleaners has been in operation since 1955. Historically, they used perchloroethene (PCE) as a cleaning solvent. Approximately 1-ton of still bottoms from PCE holding tanks were used as "pot hole" filler in the parking area over a 30-year period. In 1985, the Base discovered two VOC-impacted public water supply wells. In 1989, ABC Cleaners was placed on the National Priorities List (NPL). A Remedial Investigation was completed in 1992, a Record of Decision for groundwater was completed in 1993, and the remedial action (pump and treat system) began operation in 2002.

In July 2007, ATSDR provided the Base with the draft groundwater and vapor contamination delineations based on historic groundwater flow data collected in 1984 and 1994. The modeling was conducted using conservative assumptions; that there were ideal conditions for vapor intrusion at the Base Elementary School and Base Housing in 1984 and

1994 (e.g., sandy soils). Based on the ATSDR report, local media reported that there is a potential vapor intrusion concern in Tarawa Terrace Elementary School and Housing Area.

The RAB reviewed figures showing the location of the school, housing area, ABC Cleaners, impacted well locations, the 1984 model of predicted groundwater and vapor plumes, and the PCE and trichloroethene (TCE) shallow groundwater plume delineations from 2006 and 2007.

The Base had concerns with the ATSDR model because the groundwater and vapor plume delineations were estimated based on 1984 and 1994 data (no current model for 2007) and the vapor modeling used conservative assumptions to estimate how much contamination may have left the groundwater instead of estimating the potential for vapor intrusion. Therefore, a vapor intrusion investigation was initiated by the Base to ensure the safety of occupants within the Tarawa Terrace Elementary School and adjacent Base Housing.

The current EPA guidance for evaluation of vapor intrusion was used (*Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)"*. EPA530-D-02-004. November 2002) and recommends the vapor intrusion pathway be evaluated (using a 10^{-5} incremental individual lifetime cancer risk level) if contaminant plumes are located within 100 feet (ft) horizontally or vertically of a building. The Draft Navy/Marine Corps Policy *"Draft Policy on Evaluating the VI* Pathway", 2003 was also considered.

A sampling plan was developed, including split sampling by the Base and EPA for data consistency and quality control. The proposed sampling included collection of groundwater from three depths (shallow, intermediate, and deep) at eight separate locations, near slab soil samples and soil vapor samples at each side of the five smaller school buildings and two at each side of the main school building, and dependent on groundwater and soil vapor results, indoor air sampling. The RAB reviewed figures of the proposed sample locations.

PCE was only detected at a low concentration (0.09 parts per billion [ppb]) at only one sampling location at a depth of 100 ft below ground surface (bgs). The concentration was well below the vapor intrusion screening level of 11 ppb and no PCE daughter products were found. Benzene, toluene, ethylbenzene, and xylene (BTEX) and naphthalene were detected in shallow groundwater samples from two wells. The benzene concentration was equal to the vapor intrusion screening level of 14 ppb and this concentration exceeds the NC 2L Standard of 1 ppb. Naphthalene, detected at 700 ppb, exceeded the vapor intrusion screening level of 150 ppb. The source of benzene and naphthalene is attributed to a former underground storage tank (UST) site located adjacent to the sampling points.

Neither PCE or any of the daughter products were detected in soils. Only acetone, ethylbenzene, and isopropylbenzene were detected in trace amounts, at concentrations below their respective screening criteria, at various locations.

EPA Guidance recommends that soil vapor samples be taken at intervals of at least 5 ft bgs in order to evaluate vapor intrusion pathways. Due to the shallow depth of groundwater (~3 ft bgs), soil vapor samples were only collected at two locations. Benzene (2.6 parts per billion vapor [ppbv]), chloroform (1.4 ppbv), toluene (1.3 and 3.2 ppbv), mp-xylene (1.4

ppbv), and PCE (3.9 ppbv) were detected at concentrations well below vapor intrusion screening levels.

Because naphthalene was detected above the vapor intrusion screening level, the Base decided to collect air samples to confirm there was no vapor intrusion pathway. Air samples were collected with SUMMA canisters at four locations in the crawl space of the Tarawa Terrace Elementary School's main building (TT60) and outside of the building to collect ambient air for comparison. Naphthalene was detected in one of the crawl space samples at a concentration of 0.54 ppbv, well below the vapor intrusion screening level of 3 ppbv.

Additionally, indoor air samples were collected from building interiors at the Tarawa Terrace Elementary School and at two unoccupied houses to ensure building occupants would not be exposed to potential contaminants. EPA conducted the indoor air sampling using a Trace Atmospheric Gas Analyzer (TAGA). The TAGA is contained in a bus and can analyze and detect two analytes at a time with a hose that can be used to sample discrete areas. TCE was detected within five of the eight school buildings sampled. The maximum TCE concentration was 3.85 ppbv. Although the EPA vapor intrusion screening level for TCE of 0.22 ppbv was exceeded, the adjusted screening level of 6.6 ppbv for student/teacher exposure was not. Additionally, all the TCE detections were located within cleaning supply lockers (cabinets) or the boiler room where cleaning solvents are likely stored and used. PCE was also detected within two of eight buildings sampled. The maximum PCE concentration was 0.42 ppbv, and well below the vapor intrusion screening level of 8.1 ppbv. Based on the results of the vapor intrusion sampling data obtained by both the EPA and the Base, there is no indication that the ABC Cleaners VOC plume extends beneath the Tarawa Terrace Elementary School or nearby Base Housing and is therefore not generating a vapor intrusion concern. Indoor air samples were collected as a conservative measure to confirm facilities were safe for occupancy.

Mr. Powers asked if the indoor air samples were collected in the old housing or the new housing. Mr. Lowder stated that he was unsure but it was most likely the new housing.

Mr. Ensminger noted that historically, the VOC plume was shown south of water supply well TT-23, constructed in 1984. Current plume maps do not show contamination in this area but the historic contamination could have been caused by a cone of depression from pumping in the well field and impacted the groundwater flow gradient. Although he did indicate that the 1985 well construction diagram indicated that contamination was discovered during construction so it may not have been a result of the pumping. He expressed concern that there was a nine year lapse (from the time the ROD was signed and the groundwater remedy in operation at the site) in time where contamination could have spread and caused concerns and there is no data beyond TT-23. The RAB reviewed the figures to identify where recent groundwater samples were collected in relation to TT-23. Mr. McElveen asked what concentration and depth the contamination was detected at. Mr. Ensminger noted that the concentrations were low, below 20 ppb and the well was installed to less than 100 ft bgs.

Mr. Lowder indicated that based on current data, the gradient is towards the river. Although contamination was previously present in these areas it does not indicate there is a

concern from vapor intrusion. Based on this new data collected, there are no vapor intrusion concerns.

Lastly, Mr. Lowder informed the RAB that the Base is conducting a Base-wide vapor intrusion investigation at buildings within 100 ft horizontally and vertically of VOC plumes and will present results as new data is collected and evaluated.

IV. IR Site 89 Treatability Studies

Objective: The purpose of this agenda item was to provide an update on the status of the treatability studies conducted at Site 89 (the former Defense Reutilization and Marketing Office (DRMO)) and an update on non-time critical removal action (NTCRA) for source removal. This discussion was led by CH2M HILL representative, Mr. Bozzini.

Overview: The CH2M HILL representative briefly reviewed the site background. Site 89 is the 13-acre former DRMO located at Camp Geiger that was used until 2000. The base motor pool also operated at the site until 1988, where various chlorinated solvents were used. The site is currently vacant and unoccupied. The RAB reviewed a figure of the site layout.

The remedial investigations at Site 89 were conducted in 1990s/2000s. A time critical removal action (TCRA) was completed in 2000 (low temperature thermal desorption) and a NTCRA was completed in 2005 (electric resistive heating) to begin treating site contaminants. The feasibility study is currently being prepared to address the remaining source areas, the high concentration dissolved plume, and the low concentration dissolved plume. The specific contaminants of concern (COCs) at the site are 1,1,2,2-tetrachloroethane (PCA), 1,1,2-trichloroethane (TCA), TCE, cis-1,2-dichloroethene (DCE), and vinyl chloride (VC). These COCs are present at concentrations exceeding state groundwater standards over approximately 37 acres. Based on the elevated concentrations in the source area (greater than 5% of the solubility), there is the potential for dense non-aqueous phase liquid (DNAPL) to be present over approximately 0.9 acres, identified as the source areas, which can present a challenge for treatment. The RAB reviewed a figure of the distribution of contaminants in the source areas and dissolved plumes.

Due to the large volume of contaminated groundwater and the potentially high remedial cost, the Partnering Team decided to evaluate several technologies for addressing the dissolved phase plume cost-effectively. The technologies chosen for evaluation at Site 89 as part of a treatability study were:

- Enhanced Reductive Dechlorination (ERD) (injection of lactate/oil mixture)
- Ferox (pneumatic injection of zero valent iron (ZVI))
- Air sparging with horizontal well
- Permeable Reactive Barrier (PRB)

The results of these studies will be evaluated based on contaminant reduction and reagent distribution/influence zone and will be used to better refine the design parameters and potential costs for evaluation in the feasibility study. The RAB reviewed a figure showing the four different treatment areas and photos taken during implementation of each technology.

The CH2M HILL representative reviewed each technology implemented and the results.

ERD: Injection of a lactate/oil mixture provides for an anaerobic biodegradation pathway for reductive dechlorination of chlorinated ethenes. Essentially, replacing a chlorine atom with a hydrogen atom to breakdown the contaminants as follows:

PCE → TCE → DCE → VC → ethene

This technology basically provides food for bacteria so they can degrade solvents. The field activities included the installation of three monitoring wells, injecting the substrate blend (3,300 pounds of sodium lactate and 3,050 pounds emulsified oil) at four locations to a depth of 10 to 25 ft bgs at 25-ft spacings using Geoprobe followed by water flush. A bromide tracer was also injected and confirmation sampling was conducted to confirm distribution of the reagent. Six months of follow-up monitoring was conducted and TCE concentrations were reduced by 94 to 99% in groundwater. The concentrations of the breakdown products increased over time as expected. Based on the results, reductive dechlorination occurred at the site and this approach was found to be effective.

Ferox: Injection of ZVI is an in situ chemical reduction technology. ZVI consists of pure iron metal granules or powder that are specially manufactured and packaged to prevent premature corrosion. Pneumatic fracturing was used to inject ZVI to promote reducing conditions and abiotic destruction of chlorinated solvents. Pneumatic fracturing enhances subsurface permeability; includes addition of nitrogen gas injected into the subsurface at pressures that cause small fractures in the soil, while not affecting the surface; and the fracturing extends and enlarges existing fissures and introduces new fractures, primarily in the horizontal direction. The field activities included the installation of three monitoring wells, injecting the Ferox (11,600 pounds of ZVI) at four locations to a depth of 12.5 to 25 ft bgs at 25-ft spacings. Confirmation sampling and six months of follow-up monitoring was conducted and no significant contaminant reduction was observed in groundwater. ZVI was not observed in the monitoring wells or post-injection soil samples indicating there was poor distribution. There fore, this approach was found to be not effective.

Air sparging: Injection of air through a horizontal well beneath the contamination is an in situ technology that has bee applied successfully to other sites on-Base (Site 86). As the air mixes and rises, VOCs are stripped from the water into the air. The field activities included the installation of the horizontal directionally drilled sparge well (approximately 600 ft long, with 240 ft of screen at 40 ft bgs), installation of five groundwater monitoring wells and three soil vapor wells, air sparging and monitoring for three months, and three months of follow-up monitoring. Average TCE concentrations in groundwater were reduced by 91 to 96% and this approach was found to be effective. There is an unoccupied building on-site so soil vapor samples were collected adjacent to the building to monitor for potential vapor intrusion concerns in the event that this technology is implemented and the building is reoccupied. There was one well with concentrations approaching those that would pose a potential risk but the concentrations were reduced over time. If this technology was selected, monitoring and controls would be considered.

Mr. Ensminger questioned whether there would be a mechanism to capture emissions to prevent releasing contaminants into the atmosphere if air sparging was implemented. Mr. Lowder indicated that this would be evaluated based on current regulations. Ms. Buchinger noted that North Carolina has an air toxics program and if a chemical is listed then there are

ambient limits that must be met. Although CERCLA sites have exemptions from permitting requirements, the intent must be evaluated and any limits met. Catalytic Oxidizer (CatOx) and carbon units have been implemented at other sites during remediation. Mr. Lowder noted that the sites where this technology has been implemented it has been in open fields where there were no workers or residents so no exposure pathways existed.

PRB: A PRB is a constructed subsurface "barrier" containing a reactive material that is installed perpendicular to the flow path of a contaminated groundwater plume. This produces treatment zones that allow the passage of water while treating contaminants and treatment can occur through physical, chemical, or biological processes. The RAB reviewed a figure of a standard PRB application. The media used as the barrier at Site 89 was mulch taken from the Base recycling area. Mulch was chosen because it acts as a carbon source for aerobic bacteria and anaerobic conditions develop in the wall and the groundwater that passes through the wall. The field activities included the installation of the PRB containing compost and aggregate (40/60 mix) to approximately 210 ft long, 2 ft wide, 25 ft deep, installation of a horizontal pipe along the bottom for future injections of substrate if desired, installation of seven monitoring wells in and around wall, and follow-up six month monitoring. Average TCE concentrations in groundwater were reduced by 97% and the concentrations of the breakdown products increased over time as expected. Although this is a passive containment technology, this approach was found to be effective.

Mr. Ensminger noted that there are not many places on Base where the gradient to steep enough to employ a PRB. The CH2M HILL representative noted that PRBs may work at this or other sites to protect a water body from contamination, for example.

A comparative summary of the alternatives based on TCE reduction, the radius of influence, and cost was provided indicating that ERD, air sparging, and PRB were effective technologies for consideration.

The schedule is as follows:

- Treatability Study Completed - July 2007
- Draft Treatability Study Report – October 2007
- Final Treatability Study Report – February 2008
- NTCRA Implementation – April 2008
- Feasibility Study – December 2008
- Proposed Remedial Action Plan/Record of Decision – Spring 2009

V. Additional Topics

During the RAB meeting, Base representative Mr. Lowder informed the RAB that the Range Environmental Vulnerability Assessment (REVA) update that was planned for discussion at this meeting was not provided because the data is not back yet. Therefore, an update can be provided at the next meeting.

Mr. Ensminger requested a status update on Site 69. CH2M HILL representative, Mr. Louth, indicated that the remedial investigation is being planned to delineate the

chlorinated solvent contamination. Mr. Lowder indicated that the Army Corps of Engineers (ACOE) completed as assessment on suspected CWM dump sites for clean up. Site 69 and closed Sites 41 and 74 were assessed. The costs ranged from 3 to 4 million for capping and 40 to 60 million for removal. The ACOE is the agency handling CWM clean up and is working on development of new technologies. If implemented at the Base, the Army conducts the action with Navy funding. Currently, the Base is looking at revisiting the sites to ensure remedies and existing land use controls are protective.

Mr. Mattison asked about the archaeological Site 95 where tick treatment took place. Mr. Lowder indicated that arsenic contamination was found at one of the locations, Magnolia Road, and the contamination will be removed.

Mr. Lowder notified the RAB that the Base will be placing an ad to solicit new members and that the RAB web site will be removed soon due to the Navy's conversion to a new system.

VI. Next RAB Meeting

The next RAB Meeting will be **Tuesday, April 29, 2008 6:00 PM – 8:00 PM**. Mr. Bob Lowder will secure a location for the meeting and send the information to the RAB members. Agenda topics for the April RAB meeting will include a REVA update.