MINUTES

INSTALLATION RESTORATION PROGRAM

RESTORATION ADVISORY BOARD MEETING

ABERDEEN PROVING GROUND, MARYLAND

THURSDAY, 31 JULY 2003

7:00 p.m. – 8:50 p.m.

EDGEWOOD SENIOR CENTER

RESTORATION ADVISORY BOARD MEMBERS PRESENT AT THIS MEETING:

Dr. Nasrin Begum
Ms. Mandi Elliott-Bird
Ms. Glenda Bowling
Mr. Roy Dietz
Mr. Karl Kalbacher (Maryland Department of the Environment)
Mr. Greg Kappler
Mr. Thomas McWilliams, Jr.
Mr. Doug Richmond (Harford County Emergency Operations Center)
Mr. Ken Stachiw (Army Co-Chair)
Mr. Frank Vavra (U.S. Environmental Protection Agency)
Mr. Dennis Warwick
Ms. Ruth Ann Young

RESTORATION ADVISORY BOARD MEMBERS NOT PRESENT AT THIS MEETING:

Mr. Kevin Barnaba
Mr. Arlen Crabb
Ms. Christine Grochowski (Community Co-Chair)
Mr. Ted Henry
Ms. Loretta McCullah
Mr. Dan Pazdersky

ENCLOSURES TO THESE MINUTES:

1: Roster of Meeting Attendees
2: Agenda
3: August 2003 Calendar of Events
4: Unexploded Ordnance (UXO) Incident Reports
5: Perchlorate Sampling Update Fact Sheet
6: Lauderick Creek Study Area Update Presentation Materials

I. EXECUTIVE SUMMARY

Administrative Comments

Mr. Ken Stachiw (Chief, Directorate of Safety, Health and Environment (DSHE) Environmental Conservation and Restoration Division (ECRD)) informed the RAB Members that, pending committee member availability, a task-group meeting for OPSEC issues will be held on Tuesday, 5 August 2003. The Non-Stockpile Chemical Materiel program is holding a mobile systems demonstration on Wednesday, 20 August 2003. Anyone interested in attending should contact Ms. Karen Jobes (IRP Manager Assistant) for details about the event. Mr. Frank Vavra (U.S. Environmental Protection Agency (EPA)) provided administrative comments regarding several outstanding issues including EPA criteria for the RAD Yard cleanup, APG boundary survey, public outreach for the Aberdeen Area 5-Year Review, and Operations Security (OPSEC) issues.

Perchlorate Detections Update

Mr. Stachiw provided an update on the perchlorate detections in the Aberdeen Area of APG. The 15 July 2003 sampling of the City of Aberdeen production (CAP) wells detected perchlorate at 1.0 and 2.2 parts per billion (ppb) in CAP wells 8 and 9, respectively. The remaining CAP wells had detections ranging from less than 0.2 to 0.5 ppb. The reporting limit for the CAP wells was 0.4 ppb. Perchlorate was detected in the finished water at a concentration less than the reporting limit of 0.5 ppb on 15 July 2003 and at a concentration of 0.5 ppb on 29 July 2003.

Lauderick Creek Study Area Presentation

Mr. Don Green (DSHE ECRD Project Officer) provided an update on the Lauderick Creek Study Area. Topics included Cluster 13 Focused Feasibility Study, Cluster 9 additional groundwater investigation, Lauderick Creek Study Area Perchlorate Groundwater Sampling, Nike Site Groundwater Remediation Update, and the Nike Southwest Landfill Cap Operations and Maintenance.

Cluster 13 Sediment and Water Column Toxicity Evaluation

Dr. Dennis Burton (University of Maryland Wye Research and Education Center) identified four main source areas of Volatile Organic Compound (VOC) contamination within Cluster 13: Northern Source, Eastern Source, Primary Source, and Southern Source. The highest levels of VOCs (greater than 10,000 ppb) were found discharging towards the south tributary creek leading into Lauderick Creek. The Baseline Ecological Risk Assessment (ERA) completed for the South Branch of Lauderick Creek found that, based on the highest concentration of each VOC in sediment, there are no adverse effects to benthic life. The ERA also found that, based on the highest concentration of each VOC in surface water, there are no adverse effects to aquatic life. Uncertainty remains for risks associated with the mixture of VOCs in both sediment and surface water, and for a mixture of VOCs and other contaminants in sediment pore water.

A sediment pore water study was completed with five sediment pore water stations established within the wetlands of the South Branch of Lauderick Creek. The stations were located in the areas that receive the highest VOCs. The data was used to synthesize pore water of known composition that was used as overlying water in sediment toxicity tests. Total VOC results from the sediment pore water studies ranged from non-detect (ND) to 954 ppb. The highest VOC concentrations were observed at Station 4. *Hyalella azteca* and *Leptocheirus plumulosus* were used for 28-day survival, growth, and reproduction tests. Sediment was used from the five sampling stations combined for the chemical analysis and exposure sediments. The sediments were exposed to 100 ppb, 1,000 ppb, 10,000 ppb, and 100,000 ppb. Toxicity affecting survival, growth, and reproduction began at the 1,000 ppb VOC exposure.

Water column tests were performed to determine if VOCs in the sediment may be toxic as they enter the water column. The tests were completed with the same ratio of VOCs as was used for the sediment studies. Seven-day Cladoceran, seven-day fathead minnow, and 96-hour frog tests were completed. Toxic effects were observed for the Cladoceran and fathead minnow at 100,000 ppb VOC exposure. The frog test observed toxic effects beginning with the 1,000 ppb VOC exposure.

Cluster 13 Thermal Infrared Imagery and Wetland Characterization Study

Dr. Michelle Lorah (U.S. Geological Survey (USGS)) provided an update on the Cluster 13 Thermal Infrared (TIR) Imagery and wetland characterization study. The objective of the study was to better define the shallow groundwater flow and water quality in the wetland sediments at Cluster 13. The approach involved winter TIR surveys and passive diffusion sampling for seep delineation and characterization. Piezometers were installed in wetland sediments along a transect to calculate pore water velocity. Peepers were also installed along two transects in two seasons to determine biodegradation. A total of 11 consistent seep areas were identified in the South Branch of Lauderick Creek. The preliminary seep data from the Spring 2003 sampling event detected total VOC concentrations ranging from 178 ppb to over 19,400 ppb.

Bimetallic Nanoscale Particles Treatability Study

Mr. Green reported that the bimetallic nanoscale particles (BNP) technology has potential to treat chlorinated VOCs with particles 10 to 100 nanometers in size of zero valent iron, with a trace coating of palladium. The treatability was completed to determine whether the BNP technology could reduce dense non-aqueous phase liquid (DNAPL) consisting of 1,1,2,2-tetrachloroethane (1,1,2,2-TeCA) and residual product concentrations in the surficial aquifer. Preliminary results indicated a 90% reduction of 1,1,2,2-TeCA to degradation products within 48-hours. Additional studies will be completed to determine kinetic degradation rates, dispersion characteristics by column tests, and degradation products and concentrations.

Cluster 9 Additional Groundwater Investigation

Mr. Green reported that the Remedial Investigation (RI) risk assessment for Cluster 9 indicated an acceptable industrial use risk level from worker ingestion of groundwater; however, trichloroethene (TCE) and 1,1-dichloroethene (1,1-DCE) concentrations are greater than the maximum contaminant levels (MCLs). Therefore, the EPA indicated the need for further evaluation. The objective of the groundwater investigation was to obtain VOC distribution data in the unsaturated (vadose) zone and surficial aquifer to delineate a potential VOC source. Sampling included 75 soil gas locations, 16 direct push technology (DPT) locations, and the sampling of three monitoring wells for natural attenuation parameters. The highest VOC concentrations were detected at well location DPT-04 including TCE at 550 ppb, 1,1,1-trichloroethane (TCA) at 86 ppb, and 1,1-DCE at 33 ppb. Phase II fieldwork was conducted to gather additional data of VOC distribution. Phase II fieldwork completed in July 2003 included collection of 12 vadose zone soil samples for VOC analysis at four locations and additional electronic logging and DPT groundwater sampling at 12 locations. Proposed fieldwork includes installation and sampling of one monitoring well.

Perchlorate Groundwater Sampling

Mr. Green reported that the perchlorate sampling was planned and performed in accordance with the September 2002 Interim Department of Defense (DoD) Guidance. A total of 28 groundwater samples and two soil samples were collected in March 2003. Perchlorate was detected in 12 of the 28 samples collected with concentrations ranging from 0.23 to 9.1 ppb. The maximum detection of perchlorate, 9.1 ppb, was detected at monitoring well location WLC-45.

Former Nike Site Groundwater Plume Long-Term Monitoring and Treatment System Update

Mr. Green reported that, since January 2000, the Treatment System has 28,385 hours total run time at 93% efficiency. The 4,000-pounds of activated carbon have been replaced, with 2,000 pounds replaced in January 2002 and 2,000 pounds replaced in January 2003. The long-term monitoring program involves groundwater samples being collected quarterly at six sentry wells and eight extraction wells. Sampling results indicate a generally decreasing trend of TCE concentrations. Groundwater level measurements are taken quarterly at 67 wells. Levels indicate that the extraction well network is effectively containing the plume.

Nike Southwest Landfill Cap Operations and Maintenance

Mr. Green reported that groundwater samples were collected from three monitoring wells in April 2002. One monitoring well was located upgradient of the Landfill and two wells were located downgradient of the Landfill. The results did not show any groundwater contamination resulting from the Southwest Landfill. Vent gas samples were collected from two vents on 18 September 2002. The results did not indicate a release of landfill gases to the atmosphere. Spring and Fall inspections of the landfill cap were completed in June and October 2002 and April 2003, with no deficiencies identified. Maintenance performed in 2002 included mowing of the vegetative cover, removal of trees near the perimeter fence, removal of vegetation from the stone drain, and repairs of inactive groundhog burrows. A fall inspection and additional vent gas monitoring is scheduled for October 2003. A naturalization of the vegetative cover was completed in 2003 by means of mowing the cover, applying three herbicide applications, and tilling and seeding of native species.

II. OPENING REMARKS AND ADMINISTRATIVE COMMENTS

The July 2003 U.S. Army Garrison Aberdeen Proving Ground (APG) Installation Restoration Program (IRP) Restoration Advisory Board (RAB) meeting was called to order by Mr. Kenneth Stachiw (Chief, Directorate of Safety, Health and Environment (DSHE) Environmental Conservation and Restoration Division (ECRD); Army Co-Chair) at 7:00 p.m. on Thursday, 31 July 2003. The meeting took place at the Edgewood Senior Center located at 1000 Gateway Road in Edgewood, Maryland.

Enclosure 1 to these minutes is a meeting attendance list. RAB Members in attendance received an agenda (Enclosure 2), a RAB calendar of events for August 2003 (Enclosure 3), Unexploded Ordnance (UXO) Incident Reports (Enclosure 4), a copy of the Perchlorate Sampling Update Fact Sheet (Enclosure 5), and a copy of the Lauderick Creek Study Area presentation (Enclosure 6).

Ms. Karen Jobes (IRP Assistant Manager) informed the RAB Members that the Non-Stockpile Chemical Materiel Program is hosting a Mobile Systems Demonstration on Wednesday, 20 August 2003. Anyone interested in attending was asked to contact Ms. Jobes for additional details about the event.

Mr. Stachiw introduced Mr. Frank Vavra (U.S. Environmental Protection Agency (EPA)) to make several administrative comments. Mr. Vavra stated that, with regards to an e-mail circulating about the RAD Yard cleanup levels, confusion exists regarding the U.S. Nuclear Regulatory Agency (NRC) and EPA criteria. Mr. Vavra explained that, at a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site, the EPA risk criteria are used to establish cleanup levels. The NRC levels are above the EPA criteria, thus making the NRC levels inapplicable.

Mr. Vavra stated that the Aberdeen Proving Ground Superfund Citizens Coalition (APGSCC) had expressed concerns that APG was going to change the Environmental Impact Statement (EIS) being prepared for one of the APG ranges into a less detailed Environmental Assessment (EA). Mr. Vavra assured the RAB Members that APG has decided to continue preparing the EIS, and not changing the

document to an EA. The APGSCC had also expressed concerns regarding a boundary survey being completed at APG. Mr. Vavra reported that EPIC, the EPA's aerial photographic analysis system team will be conducting a boundary study of the Aberdeen Area, similar to the survey completed at the Edgewood Area of APG. The boundary survey will be completed within six to eight months, after the paperwork submitted by Mr. Vavra has been returned. Mr. Vavra reported that he will be attending a meeting with the Deputy Regional Administrator to discuss the necessity of recommending that APG conduct limited walk-throughs along the Aberdeen Area boundary with a Schonstedt to identify ordnance related items along the boundary.

Mr. Vavra stated that, with regards to Operations Security (OPSEC) issues, a security concern arose over an Edgewood Area document that contained aerial photography. The document has been released by OPSEC for distribution with certain pictures removed. A copy of the document was forwarded to APGSCC containing the information for the Edgewood Area boundary. Mr. Vavra stated that, with respect to the OPSEC issue regarding the amount of detail included on the maps in reports, a meeting was held with Mr. Stachiw during a Federal Facilities Leadership Council trip. Mr. Vavra reported that Mr. Stachiw agreed, for important documents, a second set of fully detailed maps will be prepared for access by EPA, Maryland Department of the Environment (MDE) and other citizens group to access when necessary.

Mr. Vavra reported that the Aberdeen Area 5-Year Review did not go through the same public review process that was completed for the Edgewood Area 5-Year Review. APG will place a notice in the newspapers regarding the Aberdeen Area 5-Year review to solicit public comment. Anyone wishing to participate by submitting to an interview or providing comments will have an opportunity to do so. The Aberdeen Area 5-Year Review is planned for completion by the end of 2003.

Mr. Stachiw asked for the status of the Technical Assistance Grant (TAG) and how the APGSCC will move forward after the 31 July 2003 end date. Ms. Glenda Bowling (RAB Member, APGSCC) stated that the 31 July 2003 RAB Meeting will be Dr. Cal Baier-Anderson's (TAG Consultant) last official RAB meeting. Dr. Baier-Anderson added that she will continue working with the APGSCC as a technical advisor at a much reduced capacity, focusing only on specific issues. Mr. Stachiw thanked Dr. Baier-Anderson for the support and input she provided over the years while serving as the TAG Consultant.

After confirming the RAB Members had no further comments, Mr. Stachiw provided an update on the perchlorate detections.

III. PERCHLORATE DETECTIONS UPDATE

Mr. Stachiw provided an update on the perchlorate detections in the Aberdeen Area of APG. The 15 July 2003 sampling of the City of Aberdeen production (CAP) wells detected perchlorate at 1.0 and 2.2 parts per billion (ppb) in CAP wells 8 and 9, respectively. The remaining CAP wells had detections ranging from less than 0.2 to 0.5 ppb. The reporting limit for the CAP wells was 0.4 ppb. Perchlorate was detected in the finished water at a concentration less than the reporting limit of 0.5 ppb on 15 July 2003 and at a concentration of 0.5 ppb on 29 July 2003.

Mr. Stachiw stated that Mr. Naren Desai (DSHE ECRD Project Officer) will be investigating to determine if the levels are increasing in CAP wells 7, 8, 9, and 10. Mr. Stachiw stated that it appears that the plume is moving to the southwest towards those CAP wells. Dr. Baier-Anderson added that the concentrations in wells near the boundary are also increasing, such as CAP well 3 with a detection of 2 ppb.

Ms. Bowling asked why a decision had been made to only collect samples twice each month instead of four times each month. Mr. Stachiw explained that no decision has been made to decrease the amount of monthly sampling. Mr. Stachiw stressed that, while he cannot speak for the City of Aberdeen, APG would like to review the data, look for trends in perchlorate detections, and ensure that the public is safe before any decisions are made to adjust sampling frequencies. Mr. Stachiw added that no new decisions have been made by the Department of Defense (DoD) regarding any future actions to deal with the perchlorate detections. Dr. Baier-Anderson stated that the DoD signed a memorandum in California agreeing to some action to be taken regarding perchlorate. No specific planned actions were noted in the memorandum.

Mr. Roy Dietz (RAB Member) asked if the perchlorate detections in CAP wells further on-post (wells 7, 8, 9, and 10) were increasing while the detections in the CAP wells along the boundary (wells 1 through 6 and 11) were decreasing. Mr. Stachiw explained that the perchlorate detections in all the wells appear to be increasing. In the past, the CAP wells near the boundary were pumping while the CAP wells further on-post were shut off. Mr. Stachiw stated that all wells are now operational. In general, if no pumping was occurring, the plume would move in a southwesterly direction. With all wells pumping the plume seems to be moving towards both sets of wells.

Mr. Vavra informed the RAB Members that the EPA is continuing to assess the perchlorate situation. At this time, an EPA group of cartographers in Ada, Oklahoma are working with Ms. Kathy Davies (EPA Region III) to construct a map model of the perchlorate aquifer. The model will allow the group to determine the effects of different pumping rates on the plume. After the information is gathered, a meeting can be held with the Deputy Regional Administrator to determine further actions.

Mr. Stachiw reported that, pending committee member availability, a task-group meeting for OPSEC issues will be held on Tuesday, 5 August 2003. A final decision will be made and forwarded to the committee members on Friday, 1 August 2003. Mr. Stachiw stated that Ms. Christine Grochowski RAB Community Co-Chair, Foster Branch Homeowners Association; APGSCC) had noted at the last RAB Meeting that the slides from the Other Edgewood Areas June 2003 RAB presentation included less information in maps than had been included in past RAB presentations. Mr. Stachiw added that Ms. Ruth Golding (DSHE ECRD Project Officer) and Mr. Bob Larson (Waterways Experiment Station) reviewed the slides and agreed that the maps were less detailed than in the past. Mr. Stachiw added that the OPSEC committee will have to address the issue of the maps in presentations to determine what should be included to make the maps useful, and what frames of reference should be incorporated. Ultimately the slides should be useful and in the quality as have been presented in the past, while still adhering to the security concerns.

Mr. Vavra asked where the OPSEC committee meeting will be held. Mr. Stachiw explained that a location had not been chosen, but the meeting would likely take place at the General Physics Corporation building or in the DSHE conference room. Mr. Stachiw stated that the first OPSEC committee meeting will likely be a priority setting meeting to identify issues and set an agenda for future meetings.

Mr. Stachiw stated that Mr. Joe Kaffl (OPSEC) reviewed the Lauderick Creek Study Area presentation and found that several maps were lacking permissible information such as a scale and road names. If anyone would like copies of the slides with additional information, the modified slides can be sent to the interested persons in the mail.

After confirming the RAB Members had no further comments, Mr. Stachiw introduced Mr. Don Green (DSHE ECRD Project Officer) to provide an update on the Lauderick Creek Study Area.

IV. LAUDERICK CREEK STUDY AREA UPDATE

Mr. Green displayed the presentation agenda covering topics including Cluster 13 Focused Feasibility Study, Cluster 9 additional groundwater investigation, Lauderick Creek Study Area Perchlorate Groundwater Sampling, Nike Site Groundwater Remediation Update, and the Nike Southwest Landfill Cap Operations and Maintenance.

Mr. Green presented a map depicting the location of the Lauderick Creek Study Area. The area is approximately 1,300 acres in size, and is bounded by the Amtrak right of way and Bush River to the east, and Lauderick Creek to the South. The study area is divided into two general areas including an area leased by the National Guard for training, and the Cluster 13 area that is currently being used by the Army Test Center (ATC) in support of the IRP.

Mr. Green introduced Dr. Dennis Burton (University of Maryland Wye Research and Education Center) to provide a presentation on the Cluster 13 Sediment and Water Column Toxicity Evaluation.

Cluster 13 Sediment and Water Column Toxicity Evaluation

Dr. Burton displayed a map showing the location of Cluster 13 along the installation boundary, pointing out the South and North tributary creeks leading into Lauderick Creek. A slide was displayed depicting the Volatile Organic Compound (VOC) source areas in Cluster 13. Four main source areas identified during the preliminary Remedial Investigation (RI) work in Cluster 13 include: Northern Source, Eastern Source, Primary Source, and Southern Source. Dr. Burton pointed out several areas of the highest VOC contamination (greater than 10,000 ppb) along the south tributary creek leading into Lauderick Creek.

Dr. Burton displayed maps showing the RI pore water and surface water sampling locations with associated VOC concentrations. The pore water sampling locations detected concentrations ranging from non-detect (ND) to 2,212 ppb. VOCs were also detected at several surface water locations at concentrations up to 70.5 ppb.

Dr. Burton informed the RAB Members that, based on the original RI detections, a Baseline Ecological Risk Assessment (ERA) was completed for the South Branch of Lauderick Creek. The ERA found that based on the highest concentration of each VOC in sediment, there are no adverse effects to benthic life. The ERA also found that, based on the highest concentration of each VOC in surface water, there are no adverse effects to aquatic life. Uncertainty remains for risks associated with the mixture of VOCs in both sediment and surface water, and for a mixture of VOCs and other contaminants (i.e., DDTr and metals) in sediment pore water.

Dr. Burton stated that, based on the remaining uncertainty of the effects of the mixture of VOCs in the sediment and surface water, the EPA, the Biological Technical Assistance Group (BTAG), and other stakeholders requested that further studies be completed to determine the effects. A sediment pore water study was completed with five sediment pore water stations established within the wetlands of the South Branch of Lauderick Creek. The stations were located in the areas that receive the highest VOCs. The VOC concentrations were determined at each station with U.S. Geological Survey (USGS) peepers at depths of 12, 24, and 36 inches. The data was used to synthesize pore water of known composition that was used as overlying water in sediment toxicity tests.

Dr. Burton displayed a picture of the installation of the pore water sampling stations during August 2002. A photograph was also displayed depicting an example of a pore water sampling station. The stations were sampled during the first week of September 2002. A map was displayed showing the total VOC results from the pore water sampling. Detected concentrations ranged from ND to 954 ppb, with the

highest concentrations observed at Station 4. Dr. Burton presented a chart showing the range of VOC concentrations found at Cluster 13, broken down into individual VOCs. The chart also showed the percentage of each individual VOC in the total VOC mixture. The VOCs with highest percentages in the mixture included cis-1,2-Dichloroethene (1,2-DCE) at 34%, 1,1,2,2-Tetrachloroethane (1,1,2,2-TeCA) at 20%, and vinyl chloride at 20%.

Dr. Burton reported that at a total VOC degradation study was completed for the southern tributary of Lauderick Creek. Mr. Karl Kalbacher (MDE) asked for the purpose of completion the degradation study. Dr. Burton explained that the highest concentration of each VOC present was used to synthesize pore water of known composition, which overlaid the sediment containing the test organisms. Because of the potential volatility of the VOCs in the overlying pore water, the stability of the VOCs in the synthetic pore water under static conditions needed to be known prior to conducting the toxicity tests. In order to prevent a significant loss of VOCs during the toxicity tests, a total VOC degradation study was performed to determine how often the VOC concentrations had to be renewed to the overlying synthetic pore water. Water was first aerated and then mixed with sediment. A known VOC mixture (containing each established VOC percentage) was then added to this material. Samples for VOCs were obtained at 0, 6, 12, and 24 hours. Approximately 25 to 35 percent of the VOCs degraded after 12 hours. After 24 hours, approximately two-thirds of the VOCs had volatilized. Based on this total VOC degradation study, the synthetic pore water solutions had to be renewed with "fresh" VOCs approximately every 12 hours in order to maintain the desired VOC concentrations. Dr. Burton displayed an example of the preliminary total VOC degradation study was displayed to show how the VOC concentrations degraded over time.

Dr. Begum asked how the sampling stations were chosen for the study. Dr. Burton explained that the samples were taken from the locations where the highest concentrations of VOCs were detected.

Dr. Burton reported that 28-day survival, growth, and reproduction tests were conducted with *Hyalella azteca* and *Leptocheirus plumulosus*. Sediment was used from the five sampling stations combined for the chemical analysis and exposure sediments. The sediments were exposed to 100 ppb, 1,000 ppb, 10,000 ppb, and 100,000 ppb. Toxicity affecting survival, growth, and reproduction began at the 1,000 ppb VOC exposure. Five sediment replicates were completed for each total VOC concentration. A fresh total VOC stock solution was prepared and renewed every 12 hours during the 28-day test. Overlying water samples were taken at time zero (T_0), when VOC solution is added, and at time-12 (T_{12}) every three days for VOC analysis. A Cluster 13 control sediment and Wye River reference sediment were also used for 28-day tests as reference criteria.

Dr. Burton displayed graphs showing changes in total VOC exposure over time for the 100 ppb, 1,000 ppb, 10,000 ppb, and 100,000 ppb exposures. The black dots on the graphs represents the concentrations measured at T_0, and the blue dots represent the concentrations measured at T_{12}. The average total VOC concentrations for the 100 ppb exposure were 218 ppb for T_0 and 119 ppb for T_{12}. The average total VOC concentrations for the 1,000 ppb exposure were 823 ppb for T_0 and 552 ppb for T_{12}. The average total VOC concentrations for the 10,000 ppb exposure were 9,742 ppb for T_0 and 6,687 ppb for T_{12}. The average total VOC concentrations for the 10,000 ppb exposure were 113,414 ppb for T_0 and 83,181 ppb for T_{12}. Dr. Burton suggested that, based on the linear curves observed for the total VOC concentrations, for further analysis, the average concentration between T_0 and T_{12} will be used. Dr. Burton encouraged anyone with comments regarding using the average concentration to contact him.

Dr. Burton presented a chart showing the total VOC endpoint effects for both *Hyalella* and *Leptocheirus*. For the *Hyalella*, a significant reduction in reproduction for the was observed beginning at the 1,000 ppb total VOC exposure, and a reduction in survival and growth was observed beginning at the 10,000 ppb total VOC exposure. Significant reductions in survival, growth, and reproduction for *Leptocheirus* were

observed beginning at the 1,000 ppb total VOC exposure. No effects were seen for either species during the 100 ppb exposure.

Dr. Burton informed the RAB Members that water column tests were performed to determine if VOCs in the sediment may be toxic as they enter the water column. The tests were completed with the same ratio of VOCs as was used for the sediment studies. Three different trophic tests were completed including 7-day Cladoceran (*Ceriodaphnia dubia*), 7-day fathead minnow (*Pimephales promelas*), and 96-hour frog (*Xenopus laevis*). The VOCs were quantified at days 0,3, and 6 for cladoceran and minnows, and at days 0, 2, and 3 for frogs. The VOCs were quantified at T_0 and T_{12} hours.

Dr. Burton presented charts depicting the survival and reproduction results for cladoceran; survival and growth for the fathead minnows; and survival and malformation for the frogs. Toxic effects were observed for the cladoceran and fathead minnow at 100,000 ppb VOC exposure. The frog test observed malformation beginning with the 1,000 ppb VOC exposure, and a reduction of survival beginning with the 100,000 ppb VOC exposure.

Mr. Kalbacher asked for an explanation regarding the differences in the numbers of days tested for the *Hyalella* and *Leptocheirus* compared to the cladoceran, minnows, and frogs. Dr. Burton explained that the first two sediment tests (*Hyalella* and *Leptocheirus*) were run for 28-days, and the water column tests for the cladoceran, minnows run as 7-day short-term chronic tests. The frog assays were run for a 96-hour test. The tests are run from fertilization through metamorphosis when limb buds are actually formed. Malformations are evaluated at the time of the limb bud formation. The observed malformations seen in the frog tests included misshapen limb buds and water retention in the cranial cavity.

Dr. Nasrin Begum (RAB Member) questioned if the 96-hour frog test included any lag time. Dr. Burton explained that the tests are run from when the embryos begin to develop until they are completely metamorphosed and turn into a tadpole. The entire process takes approximately 96 hours.

Dr. Baier-Anderson asked for an explanation of water retention in the cranial cavity. Dr. Burton explained that the water retention causes swelling of the brain. The report for the study is being prepared and a draft should be completed in approximately two to three weeks.

Mr. Kalbacher stated that, at the beginning of the discussion, it was reported that the baseline ERA concluded that there was no risk as a result of each individual VOC contaminant and that uncertainty exists with a lack of ability to analyze the risk of the VOC mixture collectively. Mr. Green added that the baseline ERA evaluated VOC concentrations from the original RI, while the more recently the VOCs have been detected at much higher concentrations. Mr. Kalbacher commended the work done to evaluate the toxic effect of the mixture of VOCs in the sediment and water column. Mr. Kalbacher expressed concern that a process that went forward with a baseline ERA that concluded that no risk exists but uncertainty remains and therefore no more investigation should be completed in the area. Mr. Kalbacher questioned whether changes should be made to the baseline assessments to ensure that more studies would be completed in an attempt to eliminate uncertainties. Mr. Green explained that the baseline ERA was completed in accordance with BTAG guidance 10 years ago, and BTAG has since completely changed the approach used for baseline ERAs. Dr. Baier-Anderson expressed her opinion that data gaps remain within ERAs due to the large number of species that may be affected, and no formal structure exists, leaving room for improvement.

Mr. Green summarized, stating that toxicity effects become evident beginning at a 1,000 ppb VOC exposure. After confirming the RAB Members had no further questions, Mr. Green introduced Dr.

Michelle Lorah (USGS) to provide an update on the Cluster 13 Thermal Infrared (TIR) Imagery and wetland characterization study.

Cluster 13 Thermal Infrared Imagery and Wetland Characterization Study

Dr. Lorah reported that the objective of the study was to better define the shallow groundwater flow and water quality in the wetland sediments at Cluster 13. The study involved the identification of preferential contaminant discharge areas (seeps), determination of vertical flow rates through the wetland sediments, and characterization of biodegradation in the wetland sediments along the vertical flow paths. Previous TIR surveys were completed for the West Branch Canal Creek.

Dr. Lorah informed the RAB Members that the approach involved winter TIR surveys and passive diffusion sampling for seep delineation and characterization. Piezometers were installed in wetland sediments along a transect to calculate pore water velocity and obtain water level measurements. Peepers (passive pore water sampling devices) were also installed along two transects in two seasons to determine biodegradation. The peepers collect a fine scale vertical delineation of pore water and during the study, concentrations were collected over a 2-inch vertical interval to a depth of approximately 4 feet. Six peepers were installed in the Spring 2003 along two different transects within the Cluster 13 wetland areas to determine biodegradation. The peepers will also be installed for a second sampling season in September 2003.

Dr. Begum asked if the seeps or fixed, or if the seeps would be found at a different location during different seasons. Dr. Lorah explained that only one seep delineation has been completed for the Lauderick Creek Area, during the winter 2003. The seep delineations for West Branch Canal Creek were completed during two years (winter 2002 and 2003), and the seeps were observed in the same areas during each season. A follow-up TIR and passive diffusion sampling will be completed at Lauderick Creek in a different season to confirm the identified seep locations.

Dr. Lorah reported that two, post-sunset surveys were conducted in the winter 2003 in collaboration with the Aberdeen Test Center (ATC) Imaging Center. A total of 11 consistent seep areas were identified in the South Branch of Lauderick Creek, with seven on the northern side of the creek and four on the southern side of the creek. The seeps are identified by observing a difference in water temperature between the surface water and groundwater, with the greatest difference in temperature occurring during the winter months. Groundwater discharge occurs throughout the entire wetland areas, but the temperature measurements obtained by the TIR show areas of preferential flow paths with maximum flow rates.

Dr. Lorah informed the RAB Members that the equipment used for the TIR included a FLIR SCR1000, fixed lens, TIR camera for TIR digital video and TIR still imaging. The equipment was provided courtesy of the ATC Imaging Center. A helicopter-mounted (courtesy of ATC) and hand-held Geographic Positioning Systems (GPS) were used in locating the seeps. A map was displayed showing the general locations of seep areas. Dr. Lorah pointed out two highly contaminated seep locations: 6N and 7N.

Dr. Lorah displayed TIR photographs and still photographs of seep locations 8N and 6N. The seeps appear as white (warm temperature) locations within the TIR photographs. The still photograph of seep location 8N was representative of the view from the floating dock, looking east (downstream). The still photograph of seep location 6N was representative of the view from the floating dock, looking west (upstream).

Dr. Lorah informed the RAB Members that the passive characterization of shallow groundwater seeps involved characterization of 11 seep sites, each with four to 29 pairs of samples. The hallow groundwater was sampled using passive diffusion samplers (PDS), and then analyzed for VOCs. A PDS consists of stainless steel mesh containing two polyethylene bags filled with deionized water. The bags are then inserted into the sediment and left for approximately two weeks for equilibration to occur between the deionized water and the VOC contaminants that collect in the pore water.

Mr. Green asked how deep the PDS were installed. Dr. Lorah stated that they were installed at depths of approximately 12 to 16 inches below ground surface.

Dr. Lorah displayed a map showing total VOC preliminary results of the seep investigation completed in the Spring 2003. The areas of highest contamination were location 6N and 7N, with concentrations ranging from 1,000 to 19,000 ppb. Several charts were displayed listing the specific VOC compounds and concentrations detected at each seep location. Individual identified compounds included 1,1,2,2-Tetrachloroethane (TeCA), vinyl chloride, trans-1,2-Dichloroethene (DCE), cis-1,2-DCE, and trichloroethene (TCE). Dr. Lorah stated that the TeCA concentration at seep location 7N was out of the calibration range of the equipment and will need to be resampled.

Dr. Lorah reported that piezometers were installed at three well clusters in the wetland sediments at existing sites PLC03 and PLC12, and at new site PLC25. The peepers were installed along two transects, with each transect consisting of three long peepers. The locations were sampled in the Spring 2003 and will be resampled during the Summer 2003.

Mr. Greg Kappler (RAB Member, various committees) asked for an explanation of a peeper. Dr. Lorah explained that a peeper consists of a plate of Plexiglas® that has chambers drilled into it at specified intervals, and two Plexiglas overlays. The chambers are filled with the deionized water and cover the chambers with the overlays of filter membrane paper to keep the deionized water in. The peeper is a much higher resolution passive diffusion sampling bag that creates cells for the diffusion to occur. The peepers allow for a very fine vertical scale measurement. Mr. Kappler asked if the peepers were reusable. Dr. Lorah stated that the peepers can be reused after cleaning, but must be reinstalled for each sampling event. Mr. Kappler asked for an explanation of where the term “peeper” originated. Dr. Lorah stated that the peepers were originally used for lake sediments, and the name “peeper” was first used in a published article in the 1970s, abbreviation for a porous membrane diffusion sampling device.

Dr. Baier-Anderson asked if an identified seep was plugged-up, if a new seep would be created elsewhere. Dr. Lorah stated that it is possible that the seep would move to another location, and with enough information and groundwater modeling, a prediction could be made as to where the new seep would occur. Mr. Stachiw asked if the goal would be to treat the contamination as opposed to slowing down the flow rate. Dr. Lorah stated that the study at the West Branch Canal Creek is evaluating ways to slow the flow rate down somewhat, but not enough that it would cause the seep to find another flow path.

Bimetallic Nanoscale Particles Treatability Study

Mr. Green stated that the reason for completing a number of treatability studies at different sites is to address the issue of TeCA contamination. TeCA is unique contaminant to military sites and the studies are being conducted in an attempt to identify potential innovative technologies to effectively treat the contamination in a cost efficient manner. The Graces Quarters studies found that the Vitamin B_{12} and titanium citrate is effective. Follow-up studies at Graces Quarters are being considered using B_{12} and molasses as a more cost effective technology.

Mr. Green reported that the bimetallic nanoscale particles (BNP) technology has potential to treat chlorinated VOCs with particles 10 to 100 nanometers in size of zero valent iron, with a trace coating of palladium. The treatability was completed to determine whether the BNP technology could reduce dense non-aqueous phase liquid (DNAPL) consisting of TeCA and residual product concentrations in the surficial aquifer.

Mr. Green informed the RAB Members that the bench scale approach involved laboratory verification on feasibility of 2,500 parts per million (ppm) BNP to reduce 5 ppm of TeCA. Preliminary results indicated a 90% reduction of TeCA to degradation products within 48-hours. Additional studies will be completed to determine kinetic degradation rates, dispersion characteristics by column tests, and degradation products and concentrations. Follow up studies will be completed to determine degradation rates and dispersion effects throughout the aquifer using column tests.

Mr. Green displayed graphs depicting the results of the three batches of the BNP treatability tests. Triplicate tests were completed on the 5 ppm of TeCA mixed with the BNP. For Batch 1, the test started with 5 ppm TeCA, after 24 hours 1.3 ppm was present, and after 48 hours only 0.32 ppm was present. Similar results were observed in Batches 2 and 3, with Batch 3 analyzing the TeCA only after 48 hours.

Mr. Green reported that the schedule for Cluster 13 includes the completion of the Feasibility Study (FS) in Fiscal Year (FY) 2003. The Proposed Plan, Record of Decision (ROD), and Remedial Design are planned for completion in FY 2004.

Mr. Vavra stated that the biometallic technologies are effective on compounds that are hard to biodegrade, but the effects do not last for an extended period of time. Mr. Vavra questioned if any time studies will be completed to evaluate the long-term effectiveness of the technologies. Mr. Green stated that kinetic degradation studies will be completed. Groundwater modeling will be conducted to evaluate the effectiveness of injecting the BNP, recovering it, and then recirculating the BNP. Studies will also be completed to determine the cost effectiveness of the BNP technology.

V. INTERMISSION

At 8:15 p.m. Mr. Stachiw announced a brief intermission. At 8:25 p.m., the meeting resumed, with the conclusion of the Lauderick Creek Study Area Update.

VI. LAUDERICK CREEK STUDY AREA UPDATE CONTINUED

Cluster 9 Additional Groundwater Investigation

Mr. Green displayed graphics depicting the location and sites and features of Cluster 9. Mr. Green stated that Cluster 9 is located on a different peninsula than Cluster 13. Cluster 9 includes the location of the Old Nike Control Area. TCE contamination was identified in the Nike Control Area and in the vicinity of historic silos. Old buildings remain on site that were historically used as cleaning facilities for electronic components for the Nike Missile Control. Mr. Green pointed out the main sites and features of Cluster 9 including the Site 12 Dry Well Site, Site 13 Septic Tank Site, Site 14 Underground Storage Tank (UST) Site, and Site 15 East Woods Site.

Mr. Green reported that the RI risk assessment for Cluster 9 indicated an acceptable industrial use risk level from worker ingestion of groundwater; however, TCE and 1,1-DCE concentrations are greater than the maximum contaminant levels (MCLs). Therefore, the EPA indicated the need for further evaluation.

The objective of the groundwater investigation was to obtain VOC distribution data in the unsaturated (vadose) zone and surficial aquifer to delineate a potential VOC source.

Mr. Green displayed a map showing the total VOC concentrations in the monitoring wells identified during the RI. The highest detected VOC was identified at Well 11A, with a TCE concentration of 66 ppb. The upgradient well, Well 10A, detected TCE at a much lower concentration of approximately 3 to 5 ppb.

Mr. Green reported that fieldwork was completed to further delineate the plume and to evaluate natural attenuation parameters. Completed actions included completion of a soil gas survey over a 3.5 acre area with 75 total points, collection of an additional round of water level measurements, completion of stratigraphic electronic logging and direct push technology (DPT) groundwater sampling at 16 locations, and the sampling of existing monitoring wells for natural attenuation parameters.

Mr. Green displayed a map depicting the sampling locations within Cluster 9. Sampling included 75 soil gas locations, 16 DPT locations, and the sampling of three monitoring wells for natural attenuation parameters. The DPT locations were chosen based on the results of the soil gas survey results. Mr. Green displayed graphics depicting results from the soil gas surveys for compounds including TCE, 1,1,1-trichloroethane (1,1,1-TCA), and 1,1-DCE. The highest levels of all three compounds were located along the road and fence line, but not as far south as the Dry Well Site. Mr. Green displayed a map depicting the total VOC results detected in the Cluster 19 groundwater. The highest VOC concentrations were detected at well location DPT-04 including TCE at 550 ppb, 1,1,1-TCA at 86 ppb, and 1,1-DCE at 33 ppb.

Mr. Green reported that Phase II fieldwork was conducted to gather additional data of VOC distribution. Phase II fieldwork completed in July 2003 included collection of 12 vadose (unsaturated) zone soil samples for VOC analysis at four locations and additional electronic logging and DPT groundwater sampling at 12 locations. Proposed fieldwork includes installation and sampling of one monitoring well. Based on guidance from the Army Environmental Center (AEC) the pilot scale treatability study will not be completed because TCE is a highly characterized contaminant. Instead of the treatability study, vapor extraction tests will be completed to determine if the technology would be applicable at Cluster 9.

Mr. Green displayed a map depicting the Cluster 9 Phase II sampling locations. The soil samples and DPT samples have been collected. While no official results have been reported, preliminary results have detected TCE contamination in the vadose zone and in the groundwater.

Perchlorate Groundwater Sampling

Mr. Green reported that MDE had submitted a memorandum requesting that APG sample for perchlorate in the Lauderick Creek Study Area due to the close proximity of the area to off-post residences. Also, historically, the site was extensively used for testing and development of smoke and incendiary munitions.

Mr. Green stated that the perchlorate sampling was planned and performed in accordance with the September 2002 DoD Guidance. A total of 28 groundwater samples and two soil samples were collected in March 2003. A map was displayed showing the groundwater and soil sampling locations. Groundwater samples were taken within Clusters 1, 5, 9, 13, and 20, with the soil samples being collected within Cluster 5.

Mr. Green informed the RAB Members that perchlorate was detected in 12 of the 28 samples collected with concentrations ranging from 0.23 to 9.1 ppb. Five of the 12 samples detected perchlorate at levels

exceeding 1 ppb. Perchlorate was detected in Clusters 5, 9, 13, and 20. No perchlorate was detected in Cluster 1. The maximum detection of perchlorate, 9.1 ppb, was detected at monitoring well location WLC-45. Mr. Green displayed a map depicting the sampling locations with the detected perchlorate concentrations.

Dr. Baier-Anderson questioned the location of the blast slab at Cluster 5. Mr. Green pointed out the location of the blast slab on the map, stating that the blast slab was located upgradient from the soil sample locations. No perchlorate was detected in the vicinity of the blast slap location. Dr. Baier-Anderson asked if the National Guard is conducting training in Cluster 13. Mr. Green explained that the National Guard performs training in Clusters 5 and 9, no training occurs in Cluster 13. The ATC support facilities are located in Cluster 13.

Mr. Kappler asked if the National Guard completed past training exercised in the Nike Site Area. Mr. Green stated that, in the past, the National Guard used the entire area for training. There is no way to determine if the contamination is a result of current training activities as opposed to historic training activities. Mr. Green added that the perchlorate contamination is an outstanding issue, no decisions have been made as to how to address the situation.

Former Nike Site Groundwater Plume Long-Term Monitoring and Treatment System Update

Mr. Green displayed a plume map depicting the areas of TCE contamination in exceedance of 5 ppb before the system start-up. All areas exceeding 5 ppb are required for clean up according to the ROD for the site. Mr. Green displayed a graphic showing a diagram of the groundwater treatment system. Groundwater enters the treatment system from the extraction wells, passes through the equalization tank, duplex bag filters, and carbon adsorption vessels and is then discharged into Monks Creek.

Mr. Green reported that, since January 2000, the Treatment System has 28,385 hours total run time at 93% efficiency. A total of 4,000-pounds of activated carbon have been replaced, one unit at a time. A total of 2,000 pounds were replaced in January 2002 and 2,000 pounds replaced in January 2003. Carbon Vessel Unit #1 (R401) is currently in the lead position. The long-term monitoring program involves groundwater samples being collected quarterly at six sentry wells and eight extraction wells. Sampling results indicate a generally decreasing trend of TCE concentrations.

Mr. Green displayed a plume map showing the estimated area of TCE contamination in exceedance of 5 ppb for the 2002 operating year. In comparison to the pre-startup plume map, the areas of TCE contamination have gotten smaller. A chart was displayed detailing the detected TCE concentrations from June 1996 through May 2003. The results show a generally decreasing trend of TCE contamination.

Mr. Green stated that groundwater level measurements are taken quarterly at 67 wells. Levels indicate that the extraction well network is effectively containing the plume. Levels also indicate that the extraction wells along the Installation boundary are effectively pulling the plume back on-post. A map was displayed showing the detailed groundwater contours from March 2003. Original estimates anticipated that the system would have to run for a minimum of 15 years. Monitoring will continue to determine the effectiveness of the system.

Nike Southwest Landfill Cap Operations and Maintenance

Mr. Green displayed a map showing the location of the Nike Southwest Landfill. The landfill measures approximately 1.3 acres and is located along Belardi Road. The landfill has is covered by a Resource Conservation and Recovery Act (RCRA) cap.

Mr. Green reported that groundwater samples were collected from three monitoring wells in April 2002. One monitoring well was located upgradient of the Landfill and two wells were located downgradient of the Landfill. The results did not show any groundwater contamination resulting from the Southwest Landfill. Vent gas samples were collected from two vents on 18 September 2002. The results did not indicate a release of landfill gases to the atmosphere. Mr. Green displayed a chart detailing the vent gas monitoring results. The nitrogen content detected from both the East and West Vents was found to be 78%, equal to the nitrogen levels in ambient air. The non-methane gasses detected were 0.22 ppm from the East Vent and 0.17 U ppm from the West Vent.

Mr. Green informed the RAB Members that Spring and Fall inspections of the landfill cap were completed in June and October 2002 and April 2003, with no deficiencies identified. Maintenance performed in 2002 included mowing of the vegetative cover, removal of trees near the perimeter fence, removal of vegetation from the stone drain, and repairs of inactive groundhog burrows. A fall inspection and additional vent gas monitoring is scheduled for early October 2003.

Mr. Green stated that In conjunction with the EPA, the mowed grass cover is being restored with natural vegetative cover. A naturalization of the vegetative cover was completed in 2003 by means of mowing the cover (2 April 2003), applying three herbicide applications (12 April 2003, 2 May 2003, and 12 June 2003), and tilling and seeding of natural species of grasses and wildflowers (13 June 2003). Mr. Green displayed several pictures of the Nike Southwest Landfill Cap. Pictures included one photograph of the tilling and seeding on 13 June 2003, and three photographs of the natural vegetative cover on 22 July 2003.

VII. CLOSING REMARKS

At 8:50 p.m., after confirming that no one present had further questions, Mr. Stachiw adjourned the meeting. The next APG IRP RAB Meeting will be held on Thursday, 28 August 2003 at 7:00 pm in the Edgewood Senior Center. The tentative topic for discussion is the Westwood Study Area.