Massachusetts Military Reservation Cleanup Team
Building 1805
Camp Edwards, MA
March 14, 2012
6:00 – 8:15 p.m.

Meeting Minutes

Member:	**Organization:**	**Telephone:**	**E-mail:**
Jon Davis	AFCEE/MMR	508-968-4670	jonathan.davis.2@us.af.mil
Shawn Cody	MANG	508-233-6520	Shawn.cody@us.army.mil
Ben Gregson	IAGWSP	508-968-5821	Benjamin.p.gregson@us.army.mil
Lynne Jennings	US EPA	617-918-1210	Jennings.lynne@epa.gov
Len Pinaud	MassDEP	508-946-2871	Leonard.pinaud@state.ma.us
Scott Michaud	MMRCT/CCC	508-362-3828	smichaud@capecodcommission.org
Dan Dinardo	MMRCT/Falmouth	508-547-1659	ravensnests1@live.com
Greg Taylor	MMRCT/Sandwich	508-790-4686	Taylordesign1@yahoo.com
Wade Saucier	MMRCT/Sandwich	508-833-6002	wdjsaucier@aol.com
Facilitator:	**Organization:**	**Telephone:**	**E-mail:**
Ellie Donovan	MassDEP	508-946-2866	ellie.donovan@state.ma.us
Attendee:	**Organization:**	**Telephone:**	**E-mail:**
Doug Karson	AFCEE/MMR	808-968-4670	Douglas.karson@us.af.mil
Pam Richardson	IAGWSP	508-968-5630	Pamela.j.richardson@us.army.mil
Lori Boghdan	IAGWSP	508-968-5635	Lori.boghdan1@us.army.mil
Karen Wilson	IAGWSP	508-968-5624	Karen.ann.wilson@us.army.mil
Mike Ciaranca	E&RC	508-968-5121	Michael.ciaranca@us.army.mil
Desiree Moyer	US EPA	617-918-1257	Moyer.desiree@epa.gov
Jeanethe Falvey	US EPA	617-918-1020	Falvey.jeanethe@epa.gov
Mark Begley	EMC	508-968-5127	Mark.begley@state.ma.us
Elliott Jacobs	MassDEP	508-946-2768	Elliot.jacobs@state.ma.us
Diana Barth	Enterprise	508-548-4700	barth@capenews.net
Jane Gasper	Innovar Environmental	508-759-9114	jgasper@innovar-env.com

Handouts Distributed at Meeting:

1. Presentation handout: J-2 Range Remedial Investigation/Feasibility Study Part II
2. Presentation handout: Sierra/Tango Range and the M855A1 Enhanced Performance Round
3. Presentation handout: Sierra Range Soil and Groundwater Investigation Report Summary
4. Central Impact Area Decision Document
5. Presentation handout: Alkaline Hydrolysis
6. Figure: L Range Soil Treatment Layout
7. MMR Cleanup Team Meeting Evaluation form

Agenda Item #1. Introductions, Agenda Review, Approval of January 11, 2012 MMRCT Meeting Minutes

Ms. Donovan convened the meeting of the Massachusetts Military Reservation Cleanup Team (MMRCT) at 6:02 p.m., reviewed the agenda, and asked if there were any changes or additions to the

January 11, 2012 MMRCT meeting minutes. No changes were offered and the minutes were approved as written.

Agenda Item #2. J-2 Draft RI/FS Overview – Part II Groundwater

Mr. Gregson showed a map and pointed out the MMR boundary, the Southeast Ranges area, the Forestdale neighborhood of Sandwich, the J-2 Range, and the Impact Area. He noted that both the J-2 Northern and J-2 Eastern groundwater plumes have treatment system in place that were installed as part of a Rapid Response Action (RRA) and seem to be working well.

Mr. Gregson stated that the J-2 Range was used for military training from 1935 to 1980s, but the primary source of groundwater contamination was its use as a contractor testing range from the 1950s to 1980s. He also noted that most of the information about the range comes from interviews and field data. The munitions testing conducted at the range included artillery, 37mm, 57mm, 105mm, fuzes, and rockets. The most likely cause of contamination, however, was disposal activities such as open burning/open detonation (OB/OD) conducted by explosive ordnance detonation (EOD) officials and law enforcement.

Mr. Gregson reminded the group that the J-2 Range soil characterization activities included soil sampling, geophysics work, an investigation using explosives detection dogs, and aerial photo assessment – all of which led to the removal of 7,600 cubic yards (cy) of soil from various source areas at the range. He noted that the Impact Area Groundwater Study Program (IAGWSP) believes that no additional source work is needed to complete the remedy. He further noted that the J-2 Northern plume has 76 monitoring wells in 36 locations and the J-2 Eastern plume has 107 monitoring wells in 44 locations.

Mr. Gregson then displayed a figure showing the J-2 Range layout with the groundwater plumes superimposed. He pointed out the base boundary, the entrance to the range, test activity areas, disposal areas, the perchlorate and RDX contamination, Disposal Area 2 (the source of the J-2 Northern plume), and the direction of groundwater flow (south to north/northeast). He also displayed a figure depicting the treatment systems and pointed out the three extraction wells, the two mobile treatment units (MTUs), and the small treatment plant for the J-2 Northern plume, and the three extraction wells and four MTUs for the J-2 Eastern plume.

Mr. Gregson stated that the contaminants of concern (COCs) at the J-2 Northern plume are perchlorate greater than 2 parts per billion (ppb) and RDX greater than 0.6 ppb. The perchlorate portion is more than a mile long and about 650 feet wide, while the RDX portion is about 3,000 feet long and 200 feet wide. The J-2 Northern system, which started up in September 2006, operates at 375 gallons per minute (gpm), has treated more than 1 billion gallons of groundwater to date, and is resulting in the plume becoming segmented in response to pumping. Mr. Gregson also reported that near extraction well 1 (EW-1) some additional perchlorate mass has been detected deeper than initially assumed. Consequently, the IAGWSP is putting together an investigation response plan to determine if flow rates need to be adjusted.

Mr. Gregson then showed a cross-section of the J-2 Northern perchlorate plume and pointed out the Upper Cape Water Cooperative supply wells downgradient, which, he noted, made it important to begin treatment quickly under an RRA. He also pointed out the dark gray area that represents the zone of contribution (ZOC) for the supply wells under normal pumping conditions, the lighter gray area that represents the ZOC under maximum pumping conditions, the relatively high perchlorate concentrations (200 ppb) upgradient, and the well where higher-than-anticipated perchlorate concentrations were recently detected in a deep screen. Mr. Gregson then showed a cross-section of the J-2 Northern RDX plume and noted that EW-1 appears to be capturing most of the RDX mass, which is upgradient.

Mr. Gregson stated that the COCs at the J-2 Eastern plume are also perchlorate and RDX. The perchlorate portion is a little less than a mile long and about 1,100 feet wide, while the RDX portion is about 3,000 feet long and 900 feet wide. The J-2 Eastern system, which started up in September 2008, operates at 425 gpm and has treated more than 760 million gallons of groundwater to date. The perchlorate core is split (or bifurcated) in the area of EW-5, and it appears that segmentation of the plume is beginning to develop due to pumping.

Mr. Gregson showed a cross-section of the J-2 Eastern perchlorate plume, pointed out where it is bifurcating, and noted that extraction wells are located downgradient of both the upper and lower parts of the plume. He also showed the cross-section for RDX contamination and noted that it is being capture at all three extraction wells.

Mr. Gregson reported that the FS evaluated four potential response actions for each plume: No Further Action; Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs); Focused Extraction (three wells) with MNA and LUCs (the current systems); and a required 10-year alternative, Focused Extraction (five or six wells) with MNA and LUCs.

Mr. Gregson noted that for Alternative 1 (No Further Action), the cost for well abandonment and documentation for the J-2 Northern and J-2 Eastern treatment systems would be about $380,000. For Alternative 2 (MNA and LUCs), where the treatment systems would be shut down and groundwater contamination would be reduced through natural processes, at the J-2 Northern plume perchlorate is predicted to dissipate below the U.S. Environmental Protection Agency (EPA) health advisory of 15 ppb by 2060 and below the Massachusetts Maximum Contaminant Level (MMCL) of 2 ppb by 2091. RDX is predicted to dissipate below 2 ppb health advisory by 2015 and below the 0.6 ppb 10^{-6} cancer risk by 2032. At the J-2 Eastern plume, perchlorate is predicted to dissipate below 15 ppb by 2050 and below 2 ppb by 2075, while RDX is predicted to dissipate below 2 ppb by 2041 and below 0.6 ppb by 2061. The cost for groundwater monitoring, well abandonment, and closeout documentation for the two plumes would be $3.6 million.

Mr. Gregson further noted that under the current alternative, Alternative 3 (Focused Extraction with Three Wells), perchlorate at the J-2 Northern plume is predicted to dissipate below 15 ppb by 2018 and below 2 ppb by 2030, while RDX is predicted to dissipate below 2 ppb by 2015 and below 0.6 ppb by 2023, with a cost of $9.6 million. At the J-2 Eastern plume, perchlorate is predicted to dissipate below 15 ppb by 2022 and below 2 ppb by 2027, while RDX is predicted to dissipate below 2 ppb by 2027 and below 0.6 ppb by 2028, with a cost of $10.3 million. Under Alternate 4 (Focused Extraction with Additional Wells), five extraction wells would be pumping at the J-2 Northern plume and perchlorate is predicted to dissipate below 15 ppb by 2013 and below 2 ppb by 2021, while RDX is predicted to dissipate below 2 ppb by 2011 (based on modeling done several years ago) and below 0.6 ppb by 2019, with a cost of $11.6 million. Also under Alternative 4, six extraction wells would be pumping at the J-2 Eastern plume and perchlorate is predicted to dissipate below 15 ppb by 2014 and below 2 ppb by 2021, while RDX is predicted to dissipate below 2 ppb by 2019 and below 0.6 ppb by 2021, with a cost of $13.8 million. Mr. Gregson then showed figures depicting the layouts of Alternatives 3 and 4 and pointed out where additional wells would be installed, and he showed a table entitled "Comparison of Alternatives."

Mr. Gregson reiterated that recent sampling at the J-2 Northern plume indicates perchlorate mass near EW-1 at higher concentrations and a deeper depth than expected. He said that this summer the IAGWSP is going to conduct additional investigations to determine whether system optimization is needed to address that area of contamination. He also noted that the likely response will be to increase the pumping rate at the upgradient well (EW-1) and decrease the pumping rate at the downgradient well (EW-2).

Mr. Gregson displayed another J-2 Northern cross-section figure for perchlorate and pointed out the well where higher concentrations were detected, the capture zone for EW-1, and the capture zone for the downgradient extraction well. He noted that the higher perchlorate concentrations outside the EW-1 capture zone would likely be captured by the downgradient well. He also showed another J-2 Northern cross-section figure for RDX.

Mr. Gregson stated that the draft J-2 Range RI/FS is currently under review by the regulators. After regulator comments are resolved a Remedy Selection Plan (RSP) will be prepared and put out for public comment. The next step will be to prepare a Decision Document (DD) and responses to public comments. Mr. Gregson noted that the goal is to issue the RI/FS and complete the DD by September 2012.

Mr. Dinardo asked if the need for optimization due to the perchlorate concentrations near EW-1 at the J-2 Northern plume is expected to affect predicted cleanup times or costs. Mr. Gregson replied that the IAGWSP expects to handle that deeper contamination as part of the optimization of the system once the RI/FS is complete and the DD is in place. Ms. Jennings clarified that the DD will call for achievement of cleanup timeframes in the FS, so the IAGWSP will have to optimize the system. She further noted that the only other way to deal with the situation would be to have the IAGWSP rerun the FS now and select a different alternative, but she believes the goal is to select the timeframes in the existing FS as the required timeframes. And if modeling ends up indicating otherwise, the IAGWSP will have to augment the system by installing another extraction well. Mr. Dinardo then asked if it's correct that the cost could be affected. Ms. Jennings confirmed that it could. Mr. Gregson added that the results of this summer's investigation will provide more information.

Mr. Michaud referred to the inclusion of capture zones in the cross-section figures and noted that the last one that Mr. Gregson showed suggested that more groundwater was being pumped than may be necessary. He then asked if the capture zones are being examined for purposes of optimization. Mr. Gregson replied that it does appear that "you're going outside your known area of the plume to make sure that you've got everything" and downgradient "this capture zone envelops the one upgradient." He also said that part of optimization going forward will be to look at influent concentrations and the modeled capture zone to ensure that the systems are operating efficiently.

Mr. Jacobs noted that the cross-section figures included in the presentation are based on older data that don't show the deeper perchlorate concentrations, although cross-sections based on more recent data are available. He also said that the problem right now is that the bottom of the plume is unknown, with the deepest well screen showing perchlorate concentrations of almost 200 ppb, or 100 times the standard. He noted that this is why more investigation is needed, and depending on what's found, cleanup times could be altered significantly. Mr. Jacobs also remarked that the one of the Massachusetts Department of Environmental Protection (MassDEP) comments on the RI/FS is for the IAGWSP to update the model and run it with the most recent concentrations in order to arrive at a more realistic evaluation of cleanup times and determine whether the deeper perchlorate (and RDX) contamination can be captured. He further noted that the actual depth of the plume must be known before it can be determined whether the existing downgradient extraction wells can capture the deeper contamination. Mr. Gregson confirmed that this summer's investigation will seek to answer the questions that Mr. Jacobs is raising. He also said that he doesn't expect the cleanup timeframe to be affected, but the upcoming investigation will confirm whether or not that's the case.

Mr. Taylor remarked that he thinks Alternative 4 would be more beneficial, since Alternative 3 would take eight more years and the cost of electricity is only going to go up, and especially since there might be more contamination than originally thought.

Mr. Dinardo asked if the benefit of wind generation is calculated into the cost numbers. Mr. Gregson replied that it is not.

Agenda Item #3. Sierra Range Update

Sierra/Tango Range & the M855A1 Enhanced Performance Round (Copper)

Dr. Ciaranca stated that Tango Range was used for live-fire training at Camp Edwards (using lead, then steel, and then tungsten ammunition) from the 1980s through 2006. Currently there's a STAPP system on Tango Range, which is being used for lead fire, and the plan is to begin using Tango Range as a zeroing range for copper ammunition. Sierra Range was formerly two ranges known as Sierra East and Sierra West that were 800-meter pop-up ranges used for firing lead and then tungsten from 1985 through 2005. In 2006, Sierra East and Sierra West were altered to become a single Modified Record of Fire (MRF) qualification range to be used for tungsten – required for all soldiers to qualify and required for deployment. Dr. Ciaranca showed a 2007 aerial photo of Tango Range and pointed out the STAPP system, the earthen berm, and the firing line. He also showed two aerial photos of the current Sierra Range 300-meter MRF and pointed out the firing line and Gibbs Road.

Dr. Ciaranca reviewed the Army National Guard's primary guiding laws and regulations, beginning with EPA Administrative Order 2 (AO2), which banned all live fire using lead and calls for specific pollution prevention measures to be in place in order to go back to live firing, one of which is the use of non-toxic lead-free combat ammunition. He then spoke about the Environmental Management Commission (EMC), which is made up of the three state environmental commissioners and receives recommendations from two advisory bodies – the Scientific Advisory Council (SAC) and the Citizens Advisory Council (CAC). Dr. Ciaranca stated that the Army National Guard has presented to the SAC, CAC, and the EMC, and he noted that the guiding regulation is Chapter 47, the Acts of 2002, and the Environmental Performance Standards (EPS). He noted that ESP 19, the guiding EPS for range use at Camp Edwards, requires minimization of any release to the environment, including metals.

Dr. Ciaranca then stated that the alternative combat ammunition (M855A1) is copper and is referred to as the Enhanced Performance Round (EPR). The original round had a lead core with a copper jacket and a small steel tip, while the EPR has a larger steel penetrator, is galvanized, and has a copper alloy jacket (95% copper, 5% tin) bonded to a copper core. He also displayed slides that showed how non-energetic items and materials and energetics compare in the two types of rounds, and mentioned the new ingredients for the M855A1 propellant: potassium salt, ethyl centralite (a deterrent that slow the burn rate of energetic material), and bismuth (a decoppering agent). Dr. Ciaranca also reported that lead styphnate, which is a substance of concern, is still in the primer of the new round. However, the military is working on getting lead styphnate out of the primer, and that's expected to happen within the year but will require retooling the factories where the round is manufactured.

Dr. Ciaranca stated that the new round has bronze for corrosion protection, zinc sachem (which is essentially galvanization), a copper slug, and a steel arrowhead for a penetrator, and is somewhat larger than the original. He also mentioned the benefits associated with the performance of the new round: greater consistency, travels longer distances, and is more effective against hard and soft targets. He noted that military bases in the states have had to review their ranges to determine if they need to be altered in order to handle the impact of the round. He further noted that because the round is stronger, it has a greater impact on ranges and therefore range maintenance costs increase, although overall the costs are less. Environmental benefits of the new round are: it's a lead-free projectile; it allows the use of training ranges with lead restrictions; it removes the lead hazard from the manufacturing environment; and it eliminates (nationally) about 2,000 metric tons of lead from the environment per year.

Dr. Ciaranca explained that although the cost per round is more expensive, the cost in management overall and environmental monitoring would be greatly reduced in using the copper round – so in the long run it's cheaper to use. He also noted that the required Range Monitoring & Maintenance plan will include baseline monitoring, groundwater monitoring, soils monitoring, and recovery and recycling of the steel and copper. A draft plan is currently being reviewed by the EMC and coordinated through the Small Arms Range Working Group, which consists of EPA, MassDEP, the EMC, and the Army National Guard. Dr. Ciaranca also displayed some maps that showed the proximity of the ranges to public water supply wells.

Dr. Ciaranca reviewed the slide entitled "The Way Forward" by noting the following: EPA has been petitioned under AO2 to allow the Guard to return to live firing on Sierra Range, using copper rounds, and has responded that doing so would not violate the order; the EMC has been petitioned under the General EPSs and EPS 19 and has given its tentative approval based on the completion of the Range Management Plan and the design of the range; information on the copper round has been presented to the SAC, CAC, EMC, and now the MMRCT; the Guard submitted a Request for Advisory Opinion through the Massachusetts Environmental Policy Act (MEPA) to determine whether it was necessary to file a Notice of Project Change to the 2001 Final Environmental Impact Report (FEIR) that addressed the ranges, and the response was that a Supplemental EIR was not needed; the Range Management Plan is in process; the Range Design is about 95% complete; and the Guard is awaiting approval of the EMC Environmental Officer on the reconstruction of the ranges (improvements to the berm at Sierra Range and removal of the STAPP system and improvements to the berm at Tango Range). Dr. Ciaranca then showed an aerial photo of Sierra Range and explained improvements to be made in order to avoid range floor strikes that make it more difficult to harvest the metals.

Sierra Range Soil & Groundwater Investigation Summary

Mr. Gregson stated that Sierra Range was two adjacent ranges (Sierra East and Sierra West) constructed in the mid-1980s for rifle and machinegun training. As part of the 1998 Berm Maintenance Program, lead from the ranges was excavated and treated. Between 2002 and 2006 the ranges were used for firing 5.56mm tungsten-nylon projectiles. During that time period, about 91,000 rounds were fired in total, which was moderate compared to the most heavily used range (B Range), where more than 300,000 tungsten-nylon rounds were fired. When the cease fire for tungsten occurred in 2006, the ranges were screened for tungsten with an X-ray fluorescence (XRF) device and no readings above the action level were found. The range was also reconfigured and modernized in 2006 but has been unused since then. The environmental setting at Sierra Range is a mixed pine and oak forest located on the Mashpee Pitted Plain and groundwater flow is to the north, with groundwater at a depth of approximately 150 feet.

Mr. Gregson reported that in 2000 the IAGWSP conducted soil sampling at the range after a firing event to see what kind of contamination might have been deposited on the soil from propellants. In 2002, as part of the Phase IIb investigation, additional soil sampling was conducted. In 2005, multi-point sampling was conducted to learn more about the Phase IIb sampling results. In 2006, a multi-point sampling investigation was conducted across both ranges from the firing point to the 800-meter berm. Recently, in 2012, the IAGWSP has been conducting additional multi-point sampling that relies primarily on XRF screening, but includes some lab analysis as well. Two groundwater monitoring wells were installed as part of the program (MW-465 and MW-466) and they have been sampled from 2006 through the present. Mr. Gregson also mentioned that the 2006 multi-point sampling effort was part of a larger effort being conducted at the time in order to allow the Guard to go back to firing at Tango, Juliet, and Echo, and Kilo Ranges. He further noted that the 2000 effort involved collecting soil samples in front of the firing point and on the sides and analyzing them for semi-volatile organic compounds (SVOCs) and metals. The Phase IIb sampling involved setting up five-point grids at the firing points and analyzing them for SVOCs and metals.

Mr. Gregson reviewed results from the various soil investigations. Investigation results 2000-2002, live fire: propellant-related SVOCs were detected (n-nitrosodiphenylamine, di-n-butylphthalate, and 2,4-DNT); nitroglycerine (NG) was not a target analyte at the time; and low levels of metals were detected (antimony, barium, calcium, cobalt, copper, and nickel). Investigation results 2000-2002, Phase IIb:

propellant-related SVOCs were detected (2,4-DNT, n-nitrosodiphenylamine, and di-n-butyl phthalate); low levels of metals were detected (antimony, barium, calcium, chromium, cobalt, copper, lead, and zinc; and slightly higher concentrations of propellants were seen at grids 127D and 127F.

Mr. Gregson stated that the 2005 soil investigation was a multi-point composite effort to look for propellants around grid 127D. The 2006 investigation was an expansion of that and involved multi-point composites across the entire range to look for metals (including tungsten), explosives, and SVOCs. The range was divided into sampling areas based on past use and range conditions. Mr. Gregson then displayed a figure showing the sampling areas for each range: Areas 1 and 2, near the firing points; Area 3, extending about 50 meters from the firing point; Area 4a, up to the 300-meter berm; and Area 4b, including the area from 300 meters to 800 meters. He also mentioned that this early multi-increment sampling approach established rather large decision units, which time and experience have shown should probably have been smaller.

Mr. Gregson then reviewed the 2005 investigation results: 2,4-DNT and NG were detected in three of four multi-point composites; 2,4-DNT ranged from 0.18 to 0.55 milligrams per kilogram (mg/Kg) with the state standard being 0.7 mg/Kg; NG ranged from 11 to 41 mg/Kg; and there is no state cleanup standard for NG.

Mr. Gregson also reviewed the 2006 investigation results for Sierra East: 2,4-DNT and NG were detected at the firing point; low levels of other propellant-related compounds were also detected (2-nitrodiphenylamine, n-nitrosodiphenylamine, 1,3-diethyl-1,3-diphenyl urea, and di-n-butyl phthalate); and selected metals were detected in most samples (antimony, arsenic, copper, lead, and tungsten). Mr. Gregson noted that antimony was near background level, as was arsenic. Copper was detected at levels up to 55.2 mg/Kg. Lead was detected in all samples, with the maximum concentration being 710 mg/Kg, in the target berm areas. The highest tungsten detection (13 mg/Kg) occurred in the target berm sample. He also reviewed the 2006 investigation results for Sierra West: NG was detected in Ares 1 and 2, at a maximum of 16 mg/Kg; other propellant-related compounds were detected at low levels (2-nitrodiphenylamine, n-nitrosodiphenylamine, di-n-butyl phthalate, and 1,3-diethyl-1,3-diphenyl urea); selected metals were detected in most samples (antimony, arsenic, copper, lead, and tungsten). Lead was detected in all samples, with the highest concentration being 624 mg/Kg and tungsten was detected up to 9.2 mg/Kg.

Mr. Gregson explained that because of issues with the size of the decision units, it was recommended that the IAGWSP collect additional samples from smaller decision units, which is the work that began this past January. Composite samples were collected for field screening (XRF) and laboratory analysis for lead and tungsten. Samples were collected from: berms – six-point composites collected from the face of each berm from the firing point to 800 meters; the range floor (0 to 300 meters) – two lanes of 100 x 100 foot sampling grids between the firing point and 300 meters; and the range floor (300 to 800 meters) – one lane of 100 x 100 foot sampling grids at the center of the range between 300 and 800 meters.

Mr. Gregson then showed a figure, pointed out the sampling grid arrangement, and reviewed the 2012 investigation results: all detection of lead and tungsten were below action levels; the higher detection of tungsten on the range floor was 1.7 mg/Kg, with the action level being 14 mg/Kg; the highest detection of tungsten at the berms was 6.1 mg/Kg, with the action level being 37 mg/Kg; and the highest detection of lead on the range floor was 344 mg/Kg, and the highest in the berms was 734 mg/Kg, with the action level being 3,000 mg/Kg. He also explained that the different action levels for tungsten at the range floor and the berms takes into account the size of the decision unit; range floor decision units were 100 x 100 feet, while berm decision units were about 10 x 10 feet.

Mr. Gregson then reported that MW-465 and MW-466 have been sampled eight times throughout the history of the project, with no detections of lead, 2,4-DNT, or NG. There have been occasional low level detections of metals (arsenic, barium, cadmium, chromium, copper, iron, mercury, selenium, tungsten, zinc, di-n-butyl phthalate, and di-n-octylphthalate), with the only above-MCL detection having been chromium, which has not been detected at all since then and so may have been due to sediment in the sample.

Mr. Gregson further noted that in the past the IAGWSP worked with EPA, MassDEP and the US Army Corps of Engineers on the development of a tungsten analytical method. This effort led to the determination that some of the initial tungsten detections in groundwater were probably false positives. In addition, several propellant leaching studies were undertaken that showed that propellant components such as NG and 2,4-DNT are bound in a nitrocellulose matrix and are not available to leach to groundwater. Mr. Gregson then reviewed the "Conceptual Site Model" slide, which noted the following: residues from nitrocellulose based propellants were deposited on the ground at the firing points; residues from projectiles (antimony, lead, copper, and tungsten) were deposited at the target berms; the residues are relatively immobile; tungsten has complex fate and transport, but is believed to become less mobile over time; and high explosives munitions (UXO) are not expected on the range, where historically only one 40mm round has been found.

Mr. Gregson reviewed risk screening for groundwater: all metals were below screening criteria or infrequently detected above screening criteria (chromium, once); propellants were nondetect or detected only once (di-n-butyl phthalate and di-n-octyl phthalate); and no COCs were identified. He also reviewed risk screening for soil: most metals were below screening criteria and are relatively immobile; propellants and explosives were mostly below screening criteria and were not detected in groundwater (bound in a nitrocellulose matrix); and no COCs have been identified to date. He then mentioned that some deeper hand auger soil borings were taken from some of the berms this past week, with XRF screening results all nondetect.

Mr. Gregson also reviewed the "Conclusions" slide: past activities at the Sierra Range do not appear to have impacted groundwater; no future source of groundwater contamination was identified; no additional site characterization is needed in order for the Guard to go forward with its project; and results are consistent with the conceptual site model and findings from other Small Arms Ranges (Tango, Juliet, Kilo, and Echo). Next steps are to look at the lab results from the soil borings (expected next week), finalize the investigation report, and obtain regulatory approval to fire copper bullets on the range.

Ms. Donovan took a moment to inform the group that Harold Foster has resigned from the MMRCT and team members are invited to sign a groundwater findings map to be presented to Mr. Foster to thank him for his service.

Agenda Item #4. Central Impact Area Decision Document

Ms. Jennings stated that the Central Impact Area DD, which was signed last Friday, involves two primary components – a groundwater component and a source control component. The groundwater component consists of three extraction wells located on Burgoyne Road, pumping at a capacity of about 550 gpm. The extracted water will be pumped to the Demolition Area 1 (Demo 1) plume treatment plant, which has available capacity now as the Demo 1 plume cleanup is progressing. The pipeline from the extraction wells to the Demo 1 plant will be constructed with extra capacity in case the system ever needs to be augmented in the future. Ms. Jennings noted that the system, which will be designed and operated to contain the plume at Burgoyne Road, will include options to modify, optimize, or expand the system if necessary. She also noted that the portion of the plume downgradient of Burgoyne Road will naturally attenuate.

Ms. Jennings stated that the groundwater component is essentially a containment system, designed serve to cut off migration of the plume until the source work is complete. She also noted that it will include an enhanced long-term monitoring network (meaning more wells will be added) to: evaluate the performance of the groundwater treatment system; evaluate downgradient impacts; and evaluate impacts from the remaining source. She further noted that, according to modeling, RDX cleanup to 2 ppb will be achieved by 2047 and to 0.6 ppb by 2055. The cost of the groundwater component is about $18.2 million, which includes about $5 million in capital costs and about $12 million in long-term operations and maintenance.

Ms. Jennings showed a map of the Central Impact Area and pointed out the primary source area, the plume, and the three extraction well locations on Burgoyne Road. She noted that the portion of the plume downgradient of the wells is predicted to restore itself to less than 2 ppb before it migrates off base, and added that if that does not occur, however, the system will have to be augmented.

Ms. Jennings described the source component of the DD as a long-term plan to deal with the remaining UXO at the Central Impact Area, which is estimated to be about 4,000 to 9,000 items. She noted that the DD calls for the source work to be implemented in a phased approach. Phase 1 will address 30 acres over three years and Phase 2 will address an additional 20 acres over two years. She explained that the idea is to evaluate the source work conducted during the first phase and use knowledge learned about new technologies, density assessments, and so forth to determine how best to tackle the second phase. The end of the second phase will occur at the Five-Year Review time, when a more thorough evaluation of the effectiveness of the remedy will be done before making additional decisions about new technologies, whether it makes sense to continue the source work, and so forth. Ms. Jennings noted that the source component will focus on high density areas and will seek to minimize habitat destruction while maximizing mass removal. The cost of the first two phases is estimated to be $30 million (based on what's been done thus far), but the agencies are quite hopeful that that cost will come down, as it will depend on the density that's found and the techniques that are used.

Ms. Jennings then showed a map that identified areas where removal has already taken place (primarily as part of investigations and new technology demonstrations), Phase 1 areas (high density areas near known targets), and potential Phase 2 areas (subject to change, depending on Phase 2 results). She also mentioned that additional components of the DD are: Five-Year Reviews (to evaluate the effectiveness of groundwater treatment, the effectiveness of source control measures, and new technologies for UXO removal) and LUCs to protect against the use of the groundwater until it's cleaned up. She further noted that next steps are to develop the Phase I work plan, which is due within 60 days of issuing the DD, and designing the groundwater treatment system, which generally takes about 15 months. Ms. Jennings also mentioned that there's a statutory requirement for federal facilities to begin construction of treatment systems within 15 months of issuing a DD.

Mr. Dinardo inquired about the likelihood that the portion of the plume downgradient of Burgoyne Road would dissipate to below 2 ppb before reaching the base boundary within the Five-Year Review period. Ms. Jennings replied that she thinks it would take longer for the plume to make it that far, but also noted that monitoring along the base boundary will be enhanced between now and the next five years to ensure that the plume does not travel off base. She added that she doesn't think there's currently enough monitoring along the boundary.

Mr. Saucier expressed curiosity about the proposed locations of the three extraction wells, questioning why the middle one wouldn't be situated on Avery Road, and why the northern one doesn't seem to have much mass heading towards it and the southern one seems to miss quite a bit of mass. Ms. Jennings replied that the locations shown on the figure are a "rough guesstimate." She also explained that two wells will be installed and operated initially, with modeling indicating that one of them will become ineffective once the plume migrates a certain distance and "actually heads more towards this direction." At that point, the well be shut down and the third extraction well will be installed and begin operating in order to capture "what's going to be coming down here." Ms. Jennings described the current well layout as "pretty conceptual" and added that if the system doesn't end up performing as expected, monitoring will verify that and modifications will have to be made.

Mr. Saucier noted that the plume outline shown this evening is dated 2010 and asked how much of a difference there would be in today's plume outline. Ms. Jennings replied "not much" and noted that she's more concerned with obtaining better characterization "right in here" where there aren't a lot of monitoring wells and, more importantly, along the base boundary.

Mr. Gregson reminded the group that the pipeline from the extraction wells to the treatment system will be oversized in order to accommodate additional extraction wells if needed. Ms. Jennings explained that as part of investigations, monitoring wells were often installed along roads, away from difficult terrain, sensitive habitats, and areas that would require the removal of UXO. Therefore, much of the understanding of the plume between monitoring wells is based on interpretation and interpolation. She also said that she thinks Burgoyne Road is a good place to contain the plume. Mr. Saucier added that it provides good access too, and Ms. Jennings agreed.

Agenda Item #5. CIA Alkaline Hydrolysis Soil Treatment

Mr. Gregson stated that two batches of soil have been treated using alkaline hydrolysis: the first batch was L Range soil and the second batch was Southeast Ranges soil. The third batch is soil from the Central Impact Area. Mr. Gregson then reminded the group that the alkaline hydrolysis approach is a chemical treatment technique that involves adding amendments to soil to raise the pH to 11 or 12. The amendments that area added are hydrolyzed lime and water, which mineralizes the explosives and breaks them down into inorganic nitrogen and CO_2.

Mr. Gregson reviewed the advantage of alkaline hydrolysis soil treatment: it's an on-site process, with no issues pertaining to transportation of contaminated soil; it's relatively rapid; it can deal with heterogeneities and varying particle size; it's energy efficient (unlike low temperature thermal desorption, which requires a tremendous amount of energy); and it's cost competitive. He also noted that a couple of years ago a robotics crew helped remove soil from two concentrated source areas at the Central Impact area – robotically operated bulldozers scraped the soil down about two or three feet, and then the soil was run through a sifter to remove munitions and large rocks.

Mr. Gregson also discussed the bench-scale studies conducted at Boston College before the IAGWSP embarked on using the alkaline hydrolysis technique. He noted that the studies involved a soil gradation/sieve test analysis to determine the elements of the soil and also looked at percent moisture (water holding capacity) and soil saturation tests and pH analysis. The studies also determined what needed to be done to adjust the pH to 12 by adding lime to the soil/water mixture in 0.5 gram increments until a pH of 12.96 was achieved. From an analytical standpoint, it was also considered whether cementation might be an issue – some samples were air dried, and it was found that cementation was in fact not an issue. Conclusions from the bench test were: natural clay content will help retain moisture; the estimated water volume needed to reach 90% saturation; and 2% addition of lime should raise the pH to 12.

Mr. Gregson stated that the alkaline hydrolysis treatment cell was constructed of pre-cast concrete blocks. The structure is 80 feet wide, 280 feet long, and 4 feet deep, with a 40-mil HDPE liner in the bottom. The treatment cell has a 3,000 cy capacity and a 1,000 gallon leachate collection vault and associated plumbing. Mr. Gregson then showed several photographs, including the treatment cell being built and the cell being loaded with soil. He explained that soil, lime, and water are mixed in a pug-mill and then placed in the treatment cell. To achieve moisture at 30% and pH at 11, twenty-eight gallons of water and 38 pounds of lime are added per ton of soil, which is then spread with stick excavators.

Mr. Gregson reported that 7,300 cy of soil from two areas in the Central Impact Area was excavated, screened, and stockpiled. The stockpiled soil was sampled and 1,500 cy were found to have elevated detections of explosives. The 1,500 cy were moved to L Range for alkaline hydrolysis treatment, where they were staged and covered with plastic. Later, they were loaded into the pug mill and put into the treatment cell. Mr. Gregson then showed several photos of the treatment cell operations. He also noted that during treatment the soil is covered with poly, and pH and moisture are monitored and maintained; sufficient hydrolyzed lime is applied to drive pH conditions to between 11 and 12 and the water content to 90% saturation. Mr. Gregson further noted that the stockpiled soil was processed through the pug mill at a rate of 450 cy per day, so it took about three to four days.

Mr. Gregson then reviewed a slide entitled “Soil Treatment Summary,” which noted the following: the desired pH and moisture levels were maintained; the treated soil was organized into 250 cy increments; and on sample per grid was dried and sent to an off-site lab. Lab results showed the following: 1,500 cy were treated; pre-treatment concentrations of RDX (in the stockpiles) were 328 to 824 ppb; and the most recent post-treatment concentrations were 11 to 100 ppb. Mr. Gregson said that the IAGWSP would like to see those concentrations get down toward nondetect, and added that the longer the soil sits in the treatment cell the better it gets. He also noted that the IAGWSP will be providing the regulators with a project note that details how the soil will be removed from the cell and backfilled at L Range. He further noted that post-treatment ph monitoring of the treated soil and the groundwater will be conducted.

Mr. Gregson reviewed conclusions: the approach resulted in successful treatment of RDX-contaminated soil; maintaining adequate soil moisture is key to process function; pH of treated soil takes some time (a number of months) to return to normal levels; and cell construction cost was $50,000, while soil treatment costs are $80 per cubic yard. Mr. Gregson noted that the next step is to remove the treated soil from the cell and move it to L Range. He also said that the treatment cell might be used for additional soil from the Central Impact Area.

Mr. Dinardo asked how long it took RDX concentrations to get down to 11 to 100 ppb. Mr. Gregson replied that those levels were reached several weeks after treatment began.

Mr. Saucier asked if the soil was stockpiled when it was moved to L Range. Mr. Gregson replied that the soil was spread out. He explained that the treatment cell is located at L Range, where there’s a lot of square footage to spread out the soil and there are monitoring wells already in place to watch the pH as it drops.

Agenda Item #6. Next Meeting Schedule and Adjourn

Mr. Saucier asked if the wind turbines on the base are connected to serving MMR or if they are on the grid. Mr. Davis replied that the wind turbines are all on the NStar grid, but the Installation Restoration Program (IRP) receives the money. Mr. Saucier suggested that the cost of electricity for the base is being lowered in that way. Mr. Davis agreed, but clarified that the money only offsets the IRP cleanup program’s electricity costs and can’t be used to offset the IAGWSP costs because it’s a different stream of money.

Ms. Donovan announced that the MMRCT is tentatively scheduled to meet next on April 11, 2012. She then adjourned the meeting at 7:41p.m.

(Note: the next MMRCT meeting was since rescheduled for May 9, 2012.)