Massachusetts Military Reservation Cleanup Team (MMRCT)
Building 1805, Camp Edwards
July 8, 2009
6:00 – 8:20 p.m.

Meeting Minutes

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Action Items:

1. CI Staff will provide new MMRCT members with IAGWSP and IRP website URLs.
2. Mr. Goddard requests that future J-1 Range presentations include alternatives' figures that show contaminant concentration contours.
3. Ms. Rielinger requests that future J-1 Range plume presentations include information on mass estimates for plumes as well as mass capture estimates.
4. MassDEP will check on the status of the MDPH annual pond fact sheet and inform MMRCT members of same.
5. CI Staff will email the MMRCT regarding the orientation/tour for new members, to which all team members are invited.

Handouts Distributed at Meeting:

1. Letters of interest from new MMRCT members
2. Map: Massachusetts Military Reservation Groundwater Findings, November 2008
3. Table: Contaminants of Concern information
4. Presentation slide: Costs/Benefits
5. Presentation handout: J-1 Range Remedial Investigation/Feasibility Study, Part 1 – Groundwater
6. Presentation handout: Former K Range Update
7. Presentation handout: Gun Position 2 (GP-2) Soil and Groundwater Investigation Report
8. Presentation handout: Tungsten Investigation at MMR
9. Presentation handout: Testing of Private Wells, Ponds, Harbors
10. Presentation handout: AFCEE Wind Turbine Project
11. Presentation handout: Ashumet Valley Construction Update
12. IAGWSP fact sheet: Demolition Area 1 Decision Document Addendum
13. IAGWSP fact sheet: BA-4 Disposal Area No Further Action Decision Document
14. EPA Region 1 – Decision Document Addendum No. 1 Demolition Area 1 Source Area
15. EPA Region 1 – No Further Action Decision Document BA-4 Disposal Area
16. MMRCT Cleanup Team Meeting Evaluation form

Agenda Item #1. Introduction and Agenda Review

Mr. Field convened the meeting at 6:06 p.m. and reviewed the agenda, and the Massachusetts Military Reservation Cleanup Team (MMRCT) members introduced themselves.

Agenda Item #2. Brief Updates

Public Comment Periods Reminder

Mr. Gonser announced that the public comment period for the Demolition Area 1 (Demo 1) Decision Document (DD) Addendum and the BA-4 DD is ongoing and will close on July 17, 2009.

Discussion with Potential New Team Members

Mr. Field confirmed that potential new team members Dan Dinardo, Michael Martin, Ron Reif, and Wade Saucier were present at the meeting, and that potential new team member Ben Frothingham was not present. He also noted that the MMRCT meets about once a month and covers a range of issues pertaining to the Air Force Center for Engineering and the Environment (AFCEE) Installation Restoration Program (IRP), under the Superfund Program, and the Army Environmental Command

(AEC) Impact Area Groundwater Study Program (IAGWSP), under the Safe Drinking Water Act (SWDA). He said that tonight's meeting will include technical presentations, and that some meetings involve the solicitation of public comment on a particular decision. Mr. Field then invited the potential new team members to introduce themselves.

Mr. Dinardo, a resident of Falmouth, noted that he has more than 35 years worth of experience in industrial and facilities management, is a degreed civil engineer, and has been involved with numerous environmental remediation projects. He also said that he is currently a partner in a small residential property management business with his brother.

Mr. Martin, a resident of Mashpee, said that he is a graduate engineer at Tighe & Bond, has been working in the environmental assessment and remediation field for eight years, and has been involved with assessment and remediation projects for soil, groundwater, and indoor air contamination. Ms. Jennings asked if Mr. Martin has ever done any work for the base or for any of the contractors that have worked for the base. Mr. Martin replied that he has not.

Mr. Reif, a resident of Falmouth, noted that he is the environmental safety manager at Woods Hole Oceanographic Institute, with nearly 25 years experience in the field. He also mentioned that he's worked on large Superfund projects with the U.S. Department of Energy, and that he is a fisherman who has eaten some of the trout from local waters. Mr. Field noted that Steve Hurley of the Massachusetts Department of Fisheries & Wildlife (MDFW) is a member of the MMRCT, but is not at tonight's meeting.

Mr. Saucier, a resident of Sandwich, said that he has more than 21 years of experience in the public health field, has reviewed landfill monitoring results pertaining to air and water for many towns, and has responded to many small local hazardous waste spills, both commercial and residential. He also said that he's interested in learning about cleanups on a larger scale.

Mr. Field noted that the gentlemen were welcome to join the team and come to the table tonight, or they could observe as part of the audience for the time being and decide later whether they want to join the team. All four of the potential new members opted to join the team immediately and were welcomed with a round of applause.

Mr. Goddard said that for years the cleanup programs have been running ads to solicit new membership, but he can't recall when there's been this much interest, and he's curious as to why that is. Mr. Dinardo replied that while he's been a life-long visitor to Falmouth, he's been a resident for only about five years, recently saw the ad for the first time, now has more time available, and was interested in the process and sharing his expertise, background, and knowledge with the team. Mr. Martin, who noted that he's been living on the Cape for about two years, said that he also just recently saw the ad for the first time, when his boss forwarded it to him. Mr. Reif said that he also saw the ad for the first time, and although already quite busy, his interest in the cleanup had already begun when he submitted comments on a document during a public comment period. Mr. Saucier noted that he became interested in joining the team after reading a newspaper article in the Sandwich Enterprise. Mr. Goddard thanked the gentlemen for joining the team and noted that while the AFCEE side has nearly "reached conclusion," there's still a lot of work to be done.

Mr. Field informed the new members that they should raise their name-tents to indicate when they want to speak, that they should speak directly into the microphones so that meeting minutes can be recorded accurately, and that meeting evaluation forms are available at every meeting for members to submit comments. Ms. Richardson added that tonight's handout packets include a base-wide plume map and a list of contaminants of concern (COCs) and their maximum contaminants levels (MCLs) or health advisory levels.

Agenda Item #3. Approval of 6/10/09 MMRCT Meeting Minutes

Mr. Field asked if there were any changes or additions to the June 10, 2009 MMRCT meeting minutes. No changes were offered and the minutes were approved as written. Also at this time, Mr. Karson noted that there would be an orientation/tour for new (and existing) members the evening of Wednesday, August 12, 2009, and that a reminder email about this event would be sent to the team.

Agenda Item #4. Introduction to IAGWSP Presentations

Mr. Gonser said that although AFCEE's cleanup program is coming to a close, the IAGWSP still has a number of decisions to make, on which it will be seeking public input. He also noted that cleanup decisions for a number of IAGWSP sites had been somewhat obvious due to their potential for impact (the Demo 1, J-2 North, J-2 East, and J-3 Range plumes) or their lack of potential for impact (Western Boundary, Northwest Corner, and Demo 2) due to very low levels of contamination that were not expected to migrate very far. Decisions on the remaining sites (J-1 Range and Central Impact Area [CIA]), however, will be more difficult to make because they "almost aren't technical decisions as much as they are value decisions…" and therefore, public input is particularly important.

Mr. Gonser showed a slide with the headings "Costs" and "Benefits" and asked MMRCT members to keep those costs and benefits in mind during Mr. Hill's presentation this evening on the J-1 Range Remedial Investigation/Feasibility (RI/FS) and in the future when reviewing the Remedy Selection Plan (RSP). Note that "costs" listed on the slide included: risks to workers/others; economic cost, impacts to neighborhood; natural resource impacts; energy consumption; and greenhouse gas emissions. "Benefits" included: reduction of health risk; resource availability (cleanup time and plume migration); and contaminant removal.

Mr. Gonser then stated that a reduction of health risk is associated with any cleanup project, and added that at the J-1 Ranges plumes, the risk at J-1 North is minimal because the plume is basically contained in the Impact Area, while the risk at J-1 South is greater because the plume migrates into the community. He further noted, however, that there's really not a lot of potential for risk there because all of the residences in that area utilize town water and land-use controls (LUCs) are in place. With respect to resource availability, Mr. Gonser explained that cleanup time and plume migration affect whether a water supply resource will be available for use. He also noted that in the case of areas impacted by the J-1 Range plumes it's questionable whether anyone would ever want to access those parts of the aquifer as water resources. Mr. Gonser further noted that certain cleanup alternatives offer more contaminant removal than others, which is another factor to consider when looking at alternatives.

Mr. Gonser then spoke about risk to workers, noting that at J-1 North, which is located in the Impact Area, workers installing cleanup system piping would be at some risk, despite the numerous safety procedures and the expertise of the unexploded ordnance (UXO) personnel. He also mentioned that there are economic costs (or dollar values) associated with each of the J-1 Range alternatives, and he spoke about impacts to the neighborhood – in this case the densely-populated neighborhood of Forestdale in the town of Sandwich, which would be affected by the installation of a treatment system and/or pipeline associated with the J-1 South plume. Regarding natural resource impacts, Mr. Gonser noted that the J-1 North plume is located in the Impact Area, which is prime habitat for certain threatened species. He also said that the operation of treatment systems consumes a great deal of energy (electricity to run the pumps) and creates greenhouse gasses.

Mr. Gonser concluded by saying that all of the costs and benefits he'd discussed should be considered when looking at the various alternatives and trying to "balance the good things and the bad things." He urged MMRCT members to provide their input so that project managers understand what the public feels is important and unimportant. He also acknowledged that it's likely that individuals will value the costs/benefit factors differently, which is why he believes a variety of input is needed. In addition, Mr.

Gonser encouraged the formal submission of comments (written or verbal) during public comment periods on documents associated with upcoming IAGWSP cleanup decisions.

Mr. Goddard inquired about AFCEE and IAGWSP funding sources and their FY'10 budgets, adding that it's his understanding that the IAGWSP was being funded out of National Guard Bureau (NGB) operations money. He also said that although he doesn't require an answer to this question tonight, he would like it noted as an action item.

Mr. Gonser, however, provided an immediate answer to Mr. Goddard's question by explaining that, in response to a new Department of Defense (DoD) policy to expand eligibility for DERP (Defense Environmental Restoration Program) funds (which is what AFCEE uses it for its projects), the IAGWSP is in the process of developing a plan to begin moving sites over to ERA (Environmental Restoration Account) funding. He said that this year the program is using OMA (Operations & Maintenance, Army) funding, next year it would likely be using both OMA and ERA funding, and the following year it would be using all ERA funding. Mr. Gonser also said that he doesn't anticipate any funding problems for the IAGWSP or for AFCEE, as the overall DoD cleanup program budget "is in pretty good shape" because it's being found that cleanups are not costing as much as originally estimated. Mr. Goddard said that he no longer needs this issue to be noted as an action item. He also explained that his concern was that troops might not get the funding they need. Mr. Gonser acknowledged that operation & maintenance (O&M) funds have been used for both training and cleanups, and the IAGWSP has always tried to use its funds wisely.

Mr. Olson, who noted that it's his job to oversee all the military cleanups in New England for the U.S. Environmental Protection Agency (EPA), said that he wants to clarify that EPA doesn't have a choice as to whether or not groundwater plumes are cleaned up. Rather, the agency must ensure the development of a remedy that cleans up the plumes – whether it's an active "pump-and-treat" type of remedy, or a passive remedy that uses natural processes. He further explained that it's by statute that EPA must establish that the aquifer is going to be usable, whether or not it's currently being used for drinking water. He also said for each site, the question that needs to be answered is what is the difference in cleanup time between an active and a passive remedy, and is that cost worth it – also, whether a natural attenuation remedy would contaminate additional groundwater. Mr. Olson said that he thinks that Mr. Gonser covered a lot of these issues, but wanted to clarify that the sites must at some point reach a cleanup, and if the water is currently being used for drinking water, that cleanup had better happen quickly. Mr. Olson further noted that the energy consumption and greenhouse gas emissions issues are "a big deal at EPA and at DoD." He mentioned the wind turbine that AFCEE is in the process of constructing and added that EPA and the Army also have been looking at ways to reduce greenhouse gas emissions, as everyone agrees that this is an important issue that must be addressed.

Ms. Rielinger referred to Mr. Gonser's cost/benefits slide and suggested that another benefit of cleanup is public perception, which she believes has changed for the better over the years as cleanups have progressed.

Agenda Item #5. IAGWSP Updates

J-1 Range Remedial Investigation/Feasibility Study

Mr. Hill stated that the J-1 Range, which is located in the southeast portion of the Camp Edwards training ranges, is approximately 6,000 feet long and 600 feet wide at its widest point. The range has been broken into two operable units – J-1 South and J-1 North, each of which has been further broken into a soil operable unit and a groundwater operable unit – and tonight's presentation will focus on the J-1 North and J-1 South groundwater operable units. Mr. Hill noted that the J-1 Range was used for training from the early 1940s until 1957, after which it was used for defense contractor munitions testing until 1986.

Mr. Hill referred to a map and pointed out the areas of greatest environmental impact found at J-1 South and J-1 North (at the inter-berm area [IBA]) over the course of investigations there, which began in 1997. He also noted that groundwater investigations have involved the installation of 49 monitoring wells at 27 locations at J-1 North and the installation of 21 wells and drive-points at J-1 South. Mr. Hill described the investigation work as very much "model-driven," noting that a model was built using information obtained during the installation of the monitoring wells when the aquifer was sampled at ten-foot intervals to obtain profile data. He also mentioned that well screens were set where the highest contaminant levels were detected. Mr. Hill further noted that the apex of the Upper Cape's freshwater aquifer is located "in this portion of the J-1 Range," and as a result the J-1 North plume migrates to the northwest and the J-1 South plume migrates to the southeast. He also pointed out the J-2 Range to the north, the J-3 Range to the south, the Impact Area, and the Forestdale neighborhood of Sandwich.

Mr. Hill stated that the J-1 North plume, which contains both RDX and perchlorate, is about 4,600 feet long and 1,300 feet wide. The plume is generally detached from its source area (the IBA), and the RDX portion moves slightly more slowly than the perchlorate portion. The source area includes a large number of disposal pits, including a steel-lined pit where for decades munitions, propellants, and the like were burned. Mr. Hill also mentioned that there's a western lobe of RDX associated with the J-1 North plume. The western lobe, which was discovered during drilling in the 2,000-meter berm area, is not thought to come from the IBA, but is more likely the result of artillery practice that occurred in the Impact Area. Mr. Hill showed cross-section figures of the main body of the J-1 North plume (RDX and perchlorate) and of the western lobe. He also explained that due to the accretion of freshwater recharge, groundwater plumes are pushed deeper into the aquifer as they move away from their sources.

Mr. Hill then began reviewing the RI/FS alternatives for the J-1 North plume. He noted that Alternative 1, no further action, would involve discontinuing long-term groundwater monitoring, and not implementing LUCs, at a cost of approximately $144 thousand, for well abandonment and closeout documentation. Alternative 2, monitored natural attenuation (MNA), would involve continued long-term groundwater monitoring and monitoring of compliance with LUCs – with the military as decision-maker on who can access the aquifer, as the plume is located on the base and the military's current land lease doesn't expire until 2051. Mr. Hill then showed a computer modeling animation for Alternative 2 and noted that perchlorate is predicted to dissipate to below 15 ppb (parts per billion), which is EPA's lifetime health advisory (HA), by 2024, and to below 2 ppb (the Massachusetts maximum contaminant level [MMCL]) by 2080, and RDX is predicted to dissipate to below 2 ppb (EPA's lifetime HA) by 2053 and to below 0.6 ppb (the cancer risk level) sometime after 2109, which is the duration of the model run. He also mentioned that the estimated cost of Alternative 2, for groundwater monitoring, well abandonment, and closeout documentation, is $3.4 million.

Mr. Hill then began reviewing active RI/FS alternatives for the J-1 North plume by noting that the construction for all of them would occur within the Impact Area. He said that Alternative 3 involves one extraction well located in the mid-plume area, pumping at 125 gallons per minute (gpm), long-term monitoring, and LUCs. With Alternative 3a, the extraction well operates until influent concentrations decrease below the method detection limit, and with Alternative 3b, the well operates until 2030. Mr. Hill showed the animations for Alternative 3 and noted that for Alternative 3a, perchlorate is predicted to dissipate below 2 ppb by 2042 and below 15 ppb by 2018, and RDX is predicted to dissipate to below 2 ppb by 2038 and to below 0.6 ppb by 2048, at a cost of about $12 million. For Alternative 3b, perchlorate is predicted to dissipate to below 2 ppb by 2043 and below 15 ppb by 2018, and RDX to below 2 ppb by 2040 and below 0.6 ppb by 2051, at a cost of about $11 million.

Mr. Hill also discussed Alternative 4, which involves long-term monitoring and LUCs, two in-plume extraction wells with a total pumping rate of 250 gpm, and piping to treatment facilities on Chadwick Road (utilizing ion exchange resin to treat perchlorate and granular activated carbon to treat RDX). With Alternative 4a, the extraction wells operate until influent concentrations decrease below the

method detection limit, and with Alternative 4b, the upgradient well operates until 2015 and the downgradient well until 2023. He showed the animations for Alternative 4 and noted that for Alternative 4a, perchlorate is predicted to dissipate below 2 ppb by 2037 and below 15 ppb by 2023, and RDX is predicted to dissipate to below 2 ppb by 2027 and to below 0.6 ppb by 2035, at a cost of about $13 million. For Alternative 4b, perchlorate is predicted to dissipate to below 2 ppb by 2037 and below 15 ppb by 2024, and RDX to below 2 ppb by 2031 and below 0.6 ppb by 2050, at a cost of about $11.6 million.

Mr. Hill also showed animations for Alternative 5, which involves one in-plume extraction well and one leading edge extraction well (on Wood Road), and long-term monitoring and LUCs. He noted that under Alternative 5, perchlorate is predicted to dissipate to below 15 ppb by 2017 and to below 2 ppb by 2035, and RDX to below 2 ppb by 2037 and to below 0.6 ppb by 2047, at cost of about $14.6 million.

Mr. Hill then discussed Alternative 6, involving five in-plume extraction wells pumping at 625 gpm, and long-term monitoring and LUCs. He noted that there isn't an animation for this alternative, the estimated performance of which was based on observations of the three other active alternatives. He noted that under Alternative 6 perchlorate is predicted to dissipate to below 2 ppb by 2020 (about ten years after system startup) and to below 15 ppb by 2017, and RDX is predicted to dissipate to below 2 ppb by 2018 and to below 0.6 ppb by 2020, at a cost of about $19.7 million.

Mr. Goddard stated that the Massachusetts Contingency Plan (MCP) Groundwater-1 (GW-1) value for RDX is 1 ppb and EPA's HA for RDX is 2 ppb. He then asked which of these numbers is the IAGWSP's cleanup goal. Mr. Hill noted that RDX contaminant levels would not be below the risk-based standard until they're less than 0.6 ppb. Ms. Jennings acknowledged that it would be simpler to look just at 0.6 ppb for RDX and 2 ppb for perchlorate. Mr. Pinaud added that it is fine with the Massachusetts Department of Environmental Protection (MassDEP) that the IAGWSP is using EPA's 0.6 ppb value for perchlorate, since it's lower than the state's 1 ppb value. He also noted that the IAGWSP is using the MMCL for perchlorate. Mr. Goddard recommended drawing plume shells to the more conservative values, and clarifying that in public presentations.

Mr. Goddard then inquired about the decision timeline for the J-1 Range plumes. Mr. Hill replied that the regulators are still reviewing the RI/FS report, and the comment resolution process that follows will lead to an RSP sometime this fall. Mr. Goddard also asked if the J-1 Range groundwater decision would be separate from the J-1 Range source area decision. Ms. Jennings said that there will be a presentation on the J-1 Range source area at the next MMRCT meeting. She also noted that the preference is to issue one DD that covers both source and groundwater. She further noted, however, that the history of the source work for the J Ranges – particularly for the J-1 Range – is quite complex. Therefore it may take some extra time to sort through the source information and decide whether additional work is needed. And if it seems that it will take too long to do that, it may make sense to issue the groundwater decision while the source information continues to be deliberated.

Mr. Goddard noted that the J-1 North plumes seem to dissipate near Wood Road or Jefferson Road. He then asked where the plumes are in relation to the CIA plume. Mr. Gonser replied that they would be east of the CIA, in the Impact Area, just south of Tango Range and the other Small Arms Ranges (SARs) along Gibbs Road. Mr. Goddard explained that he's wondering whether it would be possible to utilize a CIA treatment system to treat J-1 Range contamination, but Mr. Gonser indicated that that would not be the case. Mr. Goddard also asked if there are any RDX or perchlorate daughter products that might be a concern under an MNA scenario. Mr. Hill replied that any daughter compounds tend to be so short-lived in the environment that he's not even sure that they've been measured. Mr. Goddard also asked if the natural attenuation processes are dilution and dispersion. Mr. Hill confirmed that they are.

Mr. Goddard then remarked that he doesn't understand why the "b" alternatives cost less but run longer than the "a" alternatives. Mr. Hill explained that the cost saving has to do with the shorter operational timeframe for the treatment systems, as they would cease operating when it appears that natural attenuation would take care of the plume within the timeframe of the current base lease. Mr. Goddard also asked if it's correct that, with the exception of Alternative 5, mobile treatment units (MTUs) would be used for all the active treatment alternatives. Mr. Hill replied that that could be the case, and acknowledged that the costs of the other active treatment alternatives were based on the use of MTUs. Mr. Gonser added, in order to clarify the response to Mr. Goddard's question about cost/cleanup times, that cleanup times would be a little longer with the "b" alternatives because the treatment systems would be turned off and the remaining contamination would be allowed to attenuate naturally, before the base lease expires. Mr. Goddard suggested that this be clarified in future presentations.

Ms. Rielinger asked if it's correct that none of the alternatives address the western lobe of J-1 North. Mr. Hill replied that that it is correct; the alternatives pertain to just the main lobe of the plume. Ms. Rielinger also asked if it's correct that none of the J-1 North alternatives would impact the CIA plume, given the distance between the plumes. Mr. Hill confirmed that that's correct.

Mr. Reif asked what is meant by "below detectable levels." Mr. Hill replied that the reference is to the analytical method detection limit. Mr. Reif asked if that is below the regulatory action level, and Mr. Hill confirmed that it is.

Mr. Reif then inquired about validation of the model. Mr. Goydas noted that the basic plume model has been used in the AFCEE program for about 12 years, and both the IAGWSP and AFCEE programs have undergone third-party and agency review. He also said that information about the most rigorous assessments of model validation can be found in the performance evaluation reports, such as the J-3 Range Annual Report, or any of AFCEE's annual reports. Mr. Goydas said that these reports would provide Mr. Reif with a "better feel for model goodness-of-fit and validation." Mr. Reif asked if these reports are available on line. Mr. Goydas confirmed that they are, and Mr. Field noted that new MMRCT members would be provided with website URLs for the two cleanup programs.

Mr. Davis clarified that AFCEE uses a standard groundwater flow model known as MODFLOW-SURFACT, and the elements put into the model began with the U.S. Geological Survey (USGS) regional model that AFCEE updated with lithological and localized groundwater information, which pertains to the "flow" part. Then the plume shell is built, with the specific contaminant concentrations put into the model to develop animations, like those seen tonight. Mr. Davis also said that Kriging techniques are used to develop the plume shell, and that information about assumptions on dispersivity numbers, different coefficients, and the like can be found in reports. He further clarified that the model itself is not something AFCEE created; rather, an off-the-shelf model was used.

Mr. Reif then noted that he doesn't get a sense of error bars for any of the model projections. Mr. Hill replied that what's being shown is "the boiled-down version" of the specific testing that was done for the cleanup scenarios. He also said that environmental monitoring reports are issued every year to track the progress of the plumes, and in that fashion the accuracy of the model is somewhat validated. He further noted that the models are continuously updated as new information becomes available. Mr. Goydas added that generally "in the FS we don't go through a rigorous uncertainty or sensitivity"; instead, that's addressed as part of design. He explained that the FS is more of a comparative analysis in that each of the alternatives might be slightly under- or over-predicted, but across the board should be similarly under- or over-predicted. He added that it's in the design phase that the uncertainty of input parameters and the effect on ultimate performance are evaluated.

Mr. Dinardo asked if 125 gpm is the maximum efficiency of a single extraction well. Mr. Hill replied that it's possible to build an extraction well that pumps thousands of gallons per minute. However, the maximum throughput that's been achieved through the MTUs (which are basically a shipping container

outfitted with carbon and ion exchange vessels) is about 125 gpm. Therefore, the tendency is to link each extraction well with an individual MTU and work in multiples of 125. Mr. Dinardo questioned whether it might be more cost efficient to operate one higher-volumetric well rather than multiple wells. He also asked whether the cost estimates take into account any impact from renewable energy sources, such as wind turbines. Mr. Hill replied that costs were based on getting electricity from the grid, although there is a wind power effort under way to reduce the amount of electricity that must be purchased from the grid. He also told Mr. Dinardo that very high extraction rates tend to require larger treatment facilities, for which costs can be quite high.

Mr. Gonser added that even if one well is pumping very hard, it won't pull the contamination back toward it. Therefore, it makes sense to have another well downgradient to catch the contamination that's gone by. Also, it would take a very long time to wait for contamination at the source to migrate down to just one well at the leading edge – but with two wells, "you sort of split the difference in the timeframe in half." Mr. Dinardo acknowledged that this makes sense, but also said that he'd thought that recent hydraulic studies have shown that pumping wells can actually retract a plume or change its direction. Mr. Goydas stated that while pumping can be used to change the direction of a small plume such as one associated with a dry-cleaning facility or gas station cleanup, at MMR the aquifer is so prolific that the gradient can't really be reversed more than 10 or 20 feet downgradient of an extraction well.

Mr. Dow inquired about plans to re-infiltrate the treated water in order to steer the plume and maintain the hydraulic balance and prevent the plume from moving in an unanticipated direction. Mr. Hill referred to a slide showing the conceptual designs for Alternatives 3 through 6 and pointed out the location of two infiltration trenches where the treated water would be allowed to percolate into the aquifer. He also explained that any influence on plume migration from the reintroduction of treated water would not be expected because the plume is already 20 feet below the water table as it crosses into the Impact Area. Mr. Dow then asked how hydraulic balance would be maintained under an alternative that involves four or five extraction wells upgradient of the infiltration trenches. Mr. Hill replied that splitting the flow on either side of the plume would channel it toward the middle, which should have a positive impact on pumping efficiency. He also assured Mr. Dow that according to the modeling that's been done, this would not cause the plume to smear and prevent capture. Mr. Dow noted that in addition to the removal of contaminants, he's also always concerned about hydraulic balance – either mounding or drawdown of the groundwater.

Mr. Dow noted that some of the predicted cleanup dates extend beyond 2051 and then inquired about the military's responsibility for cleanup when a base goes from being an active base to a Formerly Used Defense Site (FUDS). Mr. Gonser noted that although the expectation is that the MMR lease would be renewed after it expires in 2051, if at some point the lease it terminated, the site would probably become a Base Realignment and Closure (BRAC) site and would be evaluated by base-closure military personnel who would ensure that any needed additional cleanup work would be done before the base is transferred over to another party. Mr. Dow noted that the Sierra Club is concerned that there will be an increase in civilian activities after the lease is terminated and wants to ensure that civilians utilizing the base in the future have potable water that doesn't require extensive treatment. Mr. Gonser noted that "this whole area" is designated as a wildlife reserve, and therefore there would have to be a change in state law before the land could be developed. He also said that, either way, such issues would have to be addressed before the military would turn it over. Mr. Olson added that the northern portion of the base is different in that the cleanup is being done in response to an enforcement order under the SDWA, and therefore "has to be funded one way or the other." Mr. Dow noted that he learned from his experience as a member of the Community Working Group that there's a great deal of interest in using the base for civilian activities in the future, which he's afraid could be worse than the status quo of compatible military training. Mr. Olson said that in any case EPA wants to ensure that the groundwater can be used for drinking water both on base and off base.

Mr. Jacobs referred to a cross-section figure of the J-1 North plume and explained to the new MMRCT members that plume cross-sections do not show the plume's true orientation in the aquifer. He said that it's necessary to compress the horizontal scale in order to avoid having figures that are eight times larger than the ones being shown, and therefore the plumes appear to be much thicker relative to their length than they actually are. Mr. Jacobs added that there's an 8.25 times vertical exaggeration of the plumes in cross-section figures.

Mr. Hill continued his presentation by discussing the J-1 South plume, which, he noted, contains no perchlorate, only RDX and some HMX, and was discovered while drilling drive-points along the base boundary as part of a data gap investigation in 2005. He noted that an RDX concentration of 290 ppb was detected in one of the drive-points, which launched a fairly vigorous investigative effort that was complicated by the fact that the plume was headed off base and into an area of private roads, to which the IAGWSP needed to obtain access. He then reported that a well fence was drilled on Little Acorn Lane in 2005, with all of those wells in place by 2006, when they tested nondetect. He also pointed out the location of a monitoring well where the plume was found at about 20 feet below the water table, and said that the plume continues to dive downward as it migrates off the base. Mr. Hill then pointed out monitoring well 381 (MW-381), on Windsong Road, where the most recent detection of RDX was about 15 ppb, but was 20 ppb earlier this month. He further noted that although nothing like the 290-ppb detection at the base boundary has been seen again, the mass that's represented by that high detection continues to be carried in the groundwater model, and that mass drives the plume some distance downgradient in the model projections. In addition, Mr. Hill reported that in response to the first detection at Little Acorn Lane, which occurred in 2008, the IAGWSP installed a number of drive-points and determined that the plume was taking a more southerly bend than initially thought. He also noted that it's believed that this might be due to some influence from pumping of the Fuel Spill 12 (FS-12) treatment system.

Ms. Richardson said that it's important to note that all of the residences in the vicinity of the J-1 South plume are on Sandwich town water; there are no private wells in that area. Mr. Hill agreed and then began reviewing the J-1 South RI/FS alternatives: Alternative 1, no further action, in which the existing extraction well at the base boundary would be shut off, long-term groundwater monitoring would be discontinued, and LUCs would not be implemented, at a cost of about $107 thousand for well abandonment and closeout documentation; and Alternative 2, MNA, in which contamination would be reduced through natural processes, the existing extraction well at the base boundary would be shut off, and long-term monitoring and the implementation of LUCs would continue, at a cost of about $1.8 million. Mr. Hill showed the animation for Alternative 2 and noted that the RDX is predicted to dissipate to below 2 ppb by 2041 and to below 0.6 ppb by about 2068, just beyond Route 130.

Mr. Hill stated that all of the active alternatives utilize the existing extraction well, and for those with additional downgradient wells, the infrastructure would be situated along town roads or on town-owned property, given that a mailing that was sent to residents regarding the possibility of obtaining access to private property yielded not one positive response.

Mr. Hill then noted that Alternative 3 involves long-term monitoring, LUCs, and continuing to operate the existing extraction well at the base border, but, at the decision point, reducing the current pumping rate of 75 gpm, which is more than adequate to capture the upgradient portion of the plume, to 45 gpm. Pumping of the existing extraction well would continue until about 2014, at which time it's predicted that influent concentrations would be below detection limits. The remainder of the plume would attenuate naturally, with RDX concentrations expected to dissipate to below 2 ppb by 2036 and to below 0.6 ppb by 2058, at a cost of about $3.2 million.

Mr. Hill also reported that Alternative 4 involves long-term monitoring and LUCs, and utilizes the existing extraction well plus a downgradient extraction well, at a total pumping rate of 125 gpm. The wells would be pumped until 2021, at which time influent concentrations are predicted to be below

detection limits, with RDX concentrations expected to dissipate to below 2 ppb by 2021 and to below 0.6 ppb by 2033, at a cost of about $5.5 million. Alternative 5, which involves long-term monitoring and LUCs, and a total of three extraction wells pumping at 250 gpm, would entail an additional MTU located on the base, and discharge of the treated water through laterally-located infiltration trenches. The extraction wells would be pumped until 2016, at which time influent concentrations are predicted to be below detection limits, with RDX concentrations predicted to dissipate to below 2 ppb by 2017 and to below 0.6 ppb by 2021, at a cost of about $6.5 million. Mr. Hill also mentioned that Alternative 5 would be much more efficient if it's possible to install an extraction well on private property.

Mr. Hill concluded his presentation by reviewing a "Next Steps" slide: MMRCT presentation on J-1 Soil/Source Investigations/Findings in September 2009; prepare Remedy Selection Plan; public comment period in fall 2009; and prepare DD/Response to Comments.

Mr. Goddard questioned how it's possible to select the right groundwater remedy if the source area decision isn't known. Mr. Hill referred to a map and pointed out an area of RDX in soil in front of the firing berm for the J-1 South area. He also noted that the records indicate that munitions contractors used a water saw to cut large blocks of explosives, and a drainage structure that may have been associated with the use of the water saw was found – although no contaminated soil was found there, it's possible that dissolved contaminant was introduced "right at that point, directly into the ground," which could be another contributing source. He then reported that the drainage structure has been removed. Mr. Gonser added that all known source areas for the J-1 Range plumes have been removed, so the understanding is that there's no continuing source. He further noted, however, that the point of the additional source work is to review all the data to make sure that there aren't any other little sources. Mr. Goddard asked if there's any additional soil that needs to be removed. Mr. Gonser replied that the soil response action plan for this summer involves removing a small amount of soil with detections above cleanup levels. Mr. Goddard concluded that by the time the groundwater remedy decision is being made the worst of the soils will have been removed and there should be no contributing sources. Mr. Gonser confirmed that that is correct, and agreed that otherwise it would be difficult to consider the alternatives.

Mr. Goddard then requested that future J-1 Range presentations include figures for each alternative that show contaminant concentration contours so that the public will know, for example, if extraction wells are being installed in "hot zones."

Mr. Jacobs indicated that the MNA alternatives for J-1 North and J-1 South include costs for additional monitoring wells. Mr. Hill agreed that as the plumes migrate downgradient, additional monitoring wells would be installed. Mr. Jacobs said that he thinks it's important for the public to understand that an MNA alternative has a cost and a community impact associated with it in that it requires a more extensive monitoring network to track plume migration than does an active remedial alternative. Mr. Hill noted that the cost for the MNA alternative for J-1 South includes at least one well fence along Grandwood Road.

Ms. Rielinger requested that future J-1 Range plume presentations include information on mass estimates for plumes as well as mass capture estimates.

Mr. Foster asked for an explanation of the cost difference between Alternatives 3 and 4. Mr. Gonser replied that the one extraction well associated with Alternative 3 is already in place, having been installed as part of a Rapid Response Action (RRA), while Alternative 4 adds the cost of installing, operating, and maintaining a whole new extraction well.

Mr. Saucier asked for clarification as to the current activities happening at J-1 North and J-1 South. Mr. Hill clarified that at J-1 South a one-extraction-well RRA system is currently operating (at 75 gpm) at the base boundary, and the J-1 North plume, where there is no system in place at this time, is being

monitored. Mr. Gonser added that an RRA was implemented at J-1 South because the plume migrates off base and the IAGWSP wanted to take action immediately.

Mr. Saucier then asked if higher-cost projects affect other plume projects on the base. Mr. Gonser noted that the federal budgeting process takes two to four years, and by and large the IAGWSP programs money for middle-of-the-road alternatives. He also said that it's possible that if a project turns out to be bigger than expected, it could cause some other projects to be delayed – however, it wouldn't be a tradeoff situation where one project isn't undertaken because of another one. Rather, there might just be some schedule slippage, although that isn't really anticipated. Mr. Field added that each project is based on cost/benefit for a particular plume.

Mr. Saucier noted that the J-2 South plume extends into private property, where all of the residences are on town water. He then asked what is being done to prevent residents from installing wells on their property for watering lawns, washing cars, and so forth. Mr. Gonser replied that all of the alternatives include implementation of LUCs. He also mentioned that AFCEE has undertaken an active program to identify any private wells. Ms. Richardson added that when the J-1 South investigation began in 2005, the IAGWSP conducted a fairly extensive canvassing of the neighborhood to determine whether there were any private wells in the area. Only one irrigation well was identified, which was sampled and tested nondetect. She also noted that the AFCEE effort pertains to all of the communities that abut the base, and she reported that the Town of Sandwich has a moratorium on the installation of private wells downgradient of a known contaminant plume.

Mr. Davis explained that AFCEE is in the process of validating whether any residents who have town water hookups are using their old private wells for other purposes. He also said that the Boards of Health in all four towns that surround the base have promulgated various levels of controls and will not approve a drilling permit in those locations. Mr. Saucier said that he is concerned about public safety, and noted that it's possible for a person who is unaware of his home's location in relation to a plume to put in a well himself. He then asked if there's anything being done to inform buyers that the water underneath the home they're purchasing is contaminated.

Mr. Davis replied that the idea of deed restrictions has been discussed; however, such an effort would probably involve about 1,900 separate deed restrictions or notifications, and most people probably would not want any mention of contamination in their deed. For the purpose of protectiveness, however, AFCEE is contacting each homeowner to find out if there's a private well on the property, and if so, whether the homeowner wants the well abandoned. AFCEE also has a process in place to determine whether a well intercepts a plume. Mr. Davis further noted that risk calculations assume a lifetime exposure, which is prevented by going out and asking homeowners if they have a private well and by the amount of time that the plume will actually exist in their area; the risk assessment process is very conservative. He also said that there's never been any discussion about homeowners privately installing an irrigation well without a driller, but he would guess that the way to prevent that is by every five years asking the question – is there a well on your property? Mr. Hill added that it seems very unlikely that someone would rent a drilling equipment to put in his own well, given that the water table here is nearly 100 feet below ground surface and most residential wells are about 30 to 50 feet into the groundwater table. He also said that the plumes tend to migrate much deeper than that, and added that the J-1 South plume would probably be considerably more than 100 feet below the water table by the time it reached Route 130. Mr. Saucier noted that there must be some type of risk or the Boards of Health wouldn't have issued moratoriums on private wells.

Ms. Jennings stated that EPA's experience shows that LUCs may not always be effective (which is why the agency has asked AFCEE to step up its monitoring of how people are using their residential wells) and therefore, in many cases, EPA wants to ensure quicker restoration because it's not possible to fully rely on LUCs. She also noted that her father, who doesn't live on the Cape, is someone who drove his own well, by hand, for irrigation purposes, without getting a permit or renting a drill rig. She

also said that plumes that have traveled off base are different than ones contained on the base, in that there's more control because the military is using the base. Ms. Jennings remarked that Mr. Saucier has a valid point, and she also noted that she thinks AFCEE is doing a very good job at trying to identify private wells in plume areas, although homeowners are not always responsive. She noted, for example, that out of approximately 300 notices sent to homeowners associated with the Landfill 1 (LF-1) plume area, 100 still have not responded. She added that this type of response is something that EPA takes into consideration when making decisions about actively restoring plumes or letting them attenuate.

Mr. Saucier then questioned why the animations seem to show that the leading edge of the J-1 South plume evaporates in place, never reaching the downgradient ponds, even though groundwater is constantly moving. Mr. Hill replied that as the plume mass starts to dilute, the plume loses its momentum because it doesn't have enough mass to continue to drive it forward. Mr. Saucier asked if it's correct then that the J-1 South plume will never reach the two downgradient ponds. Mr. Hill replied, "Not that we can tell." Mr. Goydas then clarified that in reality the mass doesn't go away; rather, the concentrations become lower and lower. He then offered the example of adding a cup of blue dye into the water in a swimming pool, noting how the color fades as it becomes increasingly dispersed and diluted to the point where it can no longer be seen. Mr. Goydas also said that no degradation of the plume contamination is being assumed, but it does dilute and disperse to the point were it can no longer be measured.

Mr. Reif asked if the costs shown for the alternatives are present value costs. Mr. Hill confirmed that they are present value costs over the lifetime of the alternative.

Mr. Jacobs said that it was noted that the plumes tend to dive deeper into the aquifer as they migrate, but he thinks it should also be mentioned that the plumes rise in the aquifer as they approach major water bodies, such as ponds, and, in some cases, discharge into a water body. He noted that it's possible that a plume could run into a private well if it's near one of these ponds.

Ms. Richardson made a point of noting that the IAGWSP has conducted quite extensive outreach to the nearby neighborhoods since the J-1 South plume was discovered, including mailings and a public meeting. She also said that just today a mailing was sent out to all the residents to let them know that the RI/FS report was available. She assured the team that the IAGWSP is reaching out to members of the public, beyond the MMRCT table, and hopes to have dialogue with them as the decisions move forward.

Tungsten Update

Ms. Jennings, who introduced herself as EPA's team leader for the MMR project, indicated that she is making tonight's presentation in order to explain the tungsten issue in a different way than the IAGWSP explained it in the past. She also noted that, for the benefit of the new MMRCT members, she would be providing a good deal of background information.

Ms. Jennings stated that due to impacts to the soil-source aquifer, in 1997 EPA issued to the military two Administrative Orders (AOs) under the SDWA for cleanup of the northern part of MMR. The AOs required investigation and cleanup of contamination, as well as limiting training activities, including stopping the use of explosives and lead munitions. She explained that EPA didn't think it was appropriate to continue to exacerbate a potential problem before that problem was understood, and added that MMR is the only site in the country where EPA has issued enforcement orders of this nature. Ms. Jennings also reported that in 1998 the Army responded by substituting lead bullets with what were believed to be "green" tungsten-nylon bullets, so that small arms training could continue. At that time, when the Army approached EPA about using tungsten-nylon ammunition, EPA felt that there wasn't enough information to prohibit its use, but also cautioned that the information about whether or not tungsten was mobile was inadequate.

Ms. Jennings stated that due to growing concerns about the mobility of tungsten (it was observed that the bullets fragmented and turned to powder when they hit the dirt), in July 2005 the Army initiated an investigation to try to understand whether or not tungsten was mobile in the environment. In late 2005, as part of the investigation, tungsten was detected in a groundwater well near B Range on the base – initially at a concentration of about 22 ppb, which quickly jumped to about 500 ppb. In February 2006, after that detection was validated by another sample, the governor of Massachusetts suspended the use of tungsten-nylon bullets at MMR.

Ms. Jennings reported that the investigation that started in 2005 and ran through July 2006 (the Phase I investigation) focused on three ranges – B Range, C Range, and I Range, as they had undergone the highest use of tungsten-nylon bullets. The Phase I investigation found: tungsten in soil at concentrations as high as 7,600 parts per million (ppm); tungsten in pore water (through lysimeter sampling) at concentrations as high as 400 ppm; and tungsten in groundwater at 560 ppb in one particular monitoring well. Ms. Jennings noted that other groundwater wells had low detections of tungsten that were later confirmed as probable false positives. She also said that the conclusion of the Phase I investigation was that tungsten is soluble and mobile to groundwater under the conditions (soil/precipitation) at MMR.

Ms. Jennings then displayed a figure and pointed out the Impact Area, and the surrounding B, C, G, H, I, J, K, KD, Sierra East and Sierra West, T, and IBC Ranges, noting that tungsten-nylon bullets were fired at all of these ranges. She also showed a close-up of B Range and pointed out the firing line, target area, the backstop berm, bullet pockets (where soil is worn away) on the berm, and MW-72, where tungsten was detected in groundwater.

Ms. Jennings reported that while the Phase I investigation was ongoing, the Massachusetts Army National Guard (the Guard) decided to excavate the most heavily contaminated soils (in the bullet pockets) at all 11 of the SARs, and in May 2006 approximately 7,500 tons of soil was excavated and stockpiled at two of the ranges – C and KD Range. She noted that the Guard used an action level of 150 ppm (the detection limit of the instrument that was used), and while it wasn't certain that that was the right number, there wasn't enough information to develop a different number at that time. Ms. Jennings said that the Guard has been doing a good job of maintaining and monitoring the stockpiles, which are on liners and covered with additional plastic liners to protect them from water infiltration. She also noted that the Guard recently reviewed options for removal of the stockpiles – the Bourne landfill, which is a permitted, lined, solid waste landfill, and the Turnkey landfill in New Hampshire, which is a permitted hazardous waste landfill – and, due to outstanding questions about whether the soil would be accepted at a solid waste landfill, decided just today to transport the stockpiled soil to the hazardous waste landfill in New Hampshire.

Ms. Jennings then stated that the Phase II investigation has been "particularly frustrating" in that it's taken so long to "get to a certain point" and now that there is a draft report, there's disagreement about the conclusions in it. She displayed a slide entitled "Phase II Investigation Highlights," which noted: the investigation took place from September 2006 to December 2008; further investigation was conducted to determine the extent of tungsten contamination in the groundwater (eight drive-points and six monitoring wells were installed); lab experiments were conducted to determine how tungsten moves from soil to groundwater (column, batch, and drip tests); modeling (based on lab test results) was to be done to predict the movement of tungsten in the environment; and lab speciation tests were to be conducted to determine the form of tungsten in various stages in the environment (in soil versus groundwater). Ms. Jennings also showed a photograph of some column and batch tests and explained that the testing involved dripping clean water through contaminated soil, dripping contaminated water (at known concentrations) through clean soil, dripping water on a tungsten bullet, and measuring the outcomes.

Ms. Jennings then spoke about the current status of the Phase II investigation: the speciation tests (to determine if the tungsten is a salt, and how much of it in the water is a salt versus a more complex version) are still under way; the draft report on completed tests (which had to be requested fairly aggressively from the Army) has been reviewed by the regulators; the regulators had significant comments on the draft report, and the Army had many comments as well; and the parties are currently working on resolving comments. Ms. Jennings also said that the Phase II investigation has produced some interesting data, although not enough to answer all questions. She then reviewed the preliminary conclusions: a mappable tungsten plume has not been found, although tungsten has been detected consistently in one well; the behavior and mobility of tungsten is very complex; tungsten, in certain forms, is highly soluble; tungsten appears to change form readily; and the mobility of tungsten varies depending on the form. She mentioned that EPA had identified as an issue the fact that the experiments didn't reach a steady state, when conclusions can be drawn. She also noted that EPA scientists believe that tungsten is very mobile at high concentrations and not as mobile at lower concentrations.

Ms. Jennings reviewed a slide entitled "Phase II Investigation – Outstanding Issues": there isn't agreement on how to carry the experiment results into the transport model, and without agreement on the model, a soil cleanup level can't be calculated; reaction mechanisms are unknown, but results from the speciation work should be helpful in this regard; and associated contamination, such as chromium, which is found in the presence of high concentrations of tungsten, has not yet been explained.

Ms. Jennings then stated that multiple tungsten toxicity studies have been done, primarily by the Army and Navy. She also said that the interpretation of the results varies widely, with the Army coming up with a cleanup number of 525 ppb, the Navy with 35 ppb, and EPA's risk assessor with as low as 2 ppb and as high as 334 ppb, depending on the study, the endpoint, and the safety factor placed on that information. She further noted, however, that everyone has agreed to the idea of forwarding all of the information to EPA's Office of Research & Standards to calculate a preliminary health advisory number. Ms. Jennings explained that this number is needed in order to determine if the tungsten soil cleanup that's already been conducted is sufficient.

Ms. Jennings summarized EPA's current concerns pertaining to tungsten: tungsten concentrations in soil around the bullet pockets are about 35 ppm (and EPA thinks more comprehensive soil sampling should be conducted to confirm what was left behind); tungsten concentrations in pore water were originally as high as 400 ppm, and are now being seen at 1.4 ppm (still well above what EPA's toxicologist says might be a problem); tungsten concentrations in groundwater are at 1.7 ppb (in MW-72), with EPA's estimated health advisory range being from 2 ppb to 334 ppb; the fate & transport work indicates that tungsten can be mobile; and the question of whether 35 ppm in soil is protective of groundwater over the long term must be answered. Ms. Jennings also indicted that she thinks it would be unwise to wait until there's a plume, and she said that it's important to answer the question of why the tungsten in pore water isn't making it to the groundwater. In addition she noted that, although the regulators have been frustrated by the amount of time it's taken to address the tungsten issue, the work is now moving much faster and EPA is much more satisfied with the progress the Army has made and the Guard has made to remove the stockpiles.

Ms. Jennings then reviewed next steps: the Guard will remove the soil stockpiles at C and KD Ranges and transport them to a hazardous waste landfill; comments on the Phase II investigation report will be discussed, and, it is hoped, resolved; EPA Headquarters will weigh in on the tungsten toxicity information (but it could take up to two years before a regulatory cleanup number is developed); and additional investigation will be conducted (three new monitoring wells to verify results at MW-72, soil profile samples through the berms to evaluate how contamination has migrated with depth, and new lysimeters to replace ones that were previously destroyed so that additional pore water data can be collected). Ms. Jennings noted that the scope of this new work is still being negotiated with the Army.

Ms. Jennings then showed a map of B Range, and pointed out the location, right near MW-72, where a new monitored well is proposed. She said that many of the scientists looking at the tungsten issue believe that the detection at MW-72 is not real; rather, they think the contamination short-circuited the well (fell into the well from above), and the new well near MW-72 should help answer the question of whether that is true. Another one of the new wells would be situated right next to the berm, or possibly right in the berm, and the third new well would be located to see if tungsten contamination has moved downgradient. Ms. Jennings then noted that the Army believes that the chromium was not a true detection, but was the result of using a grinder that contains chromium to grind the soil samples before testing. She further noted that EPA has not accepted that argument, given that the chromium found in pore water hasn't yet been explained. She also mentioned that she believes that zinc has been found at elevated levels as well.

Mr. Goddard, speaking as the environmental manager for Bourne's Integrated Solid Waste Management facility (at the landfill), explained that the landfill defers to guidance from MassDEP when taking soils that contain various levels of contamination, and to date, the landfill has not taken any soils from the base, from either the AFCEE or IAGWSP cleanup programs. He added that right now state standards for use of contaminated soils at lined or unlined landfills do not address RDX, HMX, perchlorate, tungsten, and the like, and the Bourne landfill is "reluctant to take anything unless the state's comfortable." He also said that he thinks the Turnkey landfill is a good waste-management landfill.

Mr. Pinaud noted that a multi-agency team of toxicologists and chemists is working on the tungsten issue, and all of the parties are communicating with each other. He also said, regarding the specific issue of disposal of tungsten-contaminated soil at the Bourne landfill, that at a recent Command Group meeting Brigadier General Sellers requested MassDEP's assistance in finding a disposal outlet for the tungsten-contaminated soil. Personnel from MassDEP's Southeast Region were helping to run the numbers, and although it was learned yesterday that the Guard had made a decision to transport the soil to an out-of-state landfill, MassDEP is still happy to help the Guard "find a home for the soil wherever that may be."

Mr. Goddard asked if the use of tungsten-nylon ammunition has been banned or suspended nationally, or just at MMR. Mr. Gonser replied that quite some time ago the Army sent out guidance that prohibited the use of tungsten, although at one point there was some talk about an Air Force base where tungsten might have been used on a couple of occasions. Mr. Goddard then asked if bullets are ground up "as they would present themselves in the soil" for the batch and column tests. Ms. Jennings clarified that the tests utilize soil that's already contaminated, and they use rainwater rather than distilled water. Mr. Goddard also noted that it would be helpful if references to contaminant concentrations were kept on the same scale – either ppb (parts per billion) or ppm (parts per million). Mr. Gonser said that it's important to be careful when comparing soil concentrations (generally presented in ppm) with groundwater concentrations (generally presented in ppb). Ms. Jennings added that pore water concentrations are generally presented in ppm.

Mr. Foster asked if it's possible to quantify the amount of tungsten contamination, since it's known when the use of tungsten ammunition was initiated and when it was terminated. Ms. Jennings replied estimates of the number of bullets that were fired are available, but it's very difficult to determine what that means in terms of mass and mobility in the environment. She also said that although she's sure that that calculation could be done, she doesn't know how helpful it would be. She then indicated that she thinks it will be more helpful to sample the soil that was left behind after the initial removal effort. Mr. Foster also asked if there's a plan to retain samples from the stockpiles before they're moved off site, to help understand what's happening with tungsten in the soil. Ms. Jennings replied that this idea was discussed, but agreement hasn't been reached. She also said that she's not certain how much valuable information would be provided by keeping samples, given that a lot of clean soil was removed along with the tungsten-contaminated soil, making it difficult to sample the piles. Mr. Nixon noted that five

composite samples from the KD Range soil pile were taken, and the maximum tungsten concentration was 53 ppm. Mr. Pinaud mentioned that the State of the Reservation report includes information on the number of tungsten-nylon projectiles fired over the years, separated by range.

Regarding the fate & transport studies, Mr. Reif asked if a standardized method, such as ASTM (American Society for Testing and Materials), was used. Ms. Jennings replied that no, SESOIL was used, which she thinks is part of the problem. She then explained that as the experimental data are plotted out, they don't actually make a linear fit, but instead more of a curved fit. If there were a linear fit, it would be possible to take the slope of that line – the Kd constant – and put it into the SESOIL model and calculate whether or not the tungsten is going to move. She noted that EPA's initial comments included that because there isn't a linear fit, a different model has to be used, and EPA had recommended the Freundlich model, as "the equation isn't just a slope for the Kd, it's a constant kind of variable to a power." However, in the response to comments, the Army "pulled that constant out" and "put that in SESOIL," thereby "ignoring the equation itself." Ms. Jennings said that one of EPA's comments on the report right now is that the data must be fit to a curve, and the model that can handle that is not SESOIL, but the Freundlich interpretation. She further noted that when plotted asymptotically at very high concentrations, the indication is that tungsten is very mobile and moves very quickly. She added that early on, when the 550 ppb detection of tungsten was seen in the monitoring well, there was also a deluge of rain – so "It's very possible we had the right conditions – high concentrations, lots of rain – to drive it into the groundwater." The SESOIL approach, however, indicates that tungsten won't move at all for a thousand years, which is the preliminary conclusion in the fate & transport report – and EPA does not believe to be the case, "if you map it correctly." Ms. Jennings said that EPA believes that tungsten "may be highly mobile at higher concentrations" and seeks to answer the question of whether 35 ppb is the right number or whether another number would be appropriate.

Mr. Reif said that before even talking about the number, it's necessary to have a standardized process that produces quality data, and ASTM is an example of that kind of standardized process. He remarked that it's difficult to understand the data and talk about an endpoint if there wasn't a validated, standardized process used to arrive at the data. He said that in the absence of that, the 35 ppm number doesn't mean anything to him, and he again mentioned his concern about error bars. Ms. Jennings indicated an understanding that Mr. Reif was referring to the analytical work, and noted that when tungsten concentrations first started to be seen in some of the other monitoring wells, three different labs came up with three different results, and there was no standardized process (which may have led to some false positives). However, the labs were brought together and worked on standardizing their analytical methods so they all could have reproducible results, which "solved the problem." Ms. Jennings also said that she isn't really certain whether there would be a standardized process for the batch and column tests, but added that all of the scientists at the table were in agreement about the scope of work that was outlined, including that the tests would reach equilibrium, which did not turn out to be the case – although this doesn't mean that the data aren't usable at all. She then clarified that there are standardized analytical procedures for the analytical work.

Mr. Olson added that in terms of the tungsten work, the explosives work, and so forth, new ground is being broken, and therefore standardized processes don't necessarily work. He also said that there's probably more data at MMR than anywhere else in the country, making it "actually better than the standardized tests would be," and that some of the work that's been done at MMR has resulted in the development of standardized tests. He also said that the problem is that it's not possible to wait for the perfect answer – rather, decisions need to be made as quickly as they can be, based on the information that's available – and therefore it's important to be as conservative as possible – understanding that decisions can be adjusted later, when the "right answer" becomes known. Mr. Reif remarked that perhaps a standardized process isn't applicable, but knowing that there's a consensus-based process, where there's agreement at the table, makes him feel better. Ms. Jennings clarified that so far agreement has been reached on some, but not all parts of the issue.

Mr. Gonser explained that normally a soil concentration is put into a model to see how it travels to groundwater, and there's a risk-based level of the contaminant for groundwater. In the case of tungsten, however, there really isn't a known health standard, and while a few studies have been done, most were inconclusive and need to be done again. And it's not understood how tungsten travels through the unsaturated zone because it behaves differently. Mr. Gonser noted that one of the researchers, who has been doing work on metals for decades, said that he has never before seen a metal behave the way tungsten does – known to be insoluble as tungsten, then changing as it weathers, picking up oxygen and turning into tungstate and becoming very mobile, or if it stays in the environment, changing into poly-tungstate, adsorbing to the soil and not going anywhere. Mr. Gonser said that pieces of information are missing, and, as Mr. Olson said, nobody else has done this kind of work before so it's not even possible to ask someone or view a study – therefore, Mr. Gonser thinks that ultimately consensus will have to be reached on the "best guess that's reasonable" so that it's possible to move forward.

Mr. Dow noted that he had submitted comments to the regulators that suggested the use of a dynamic model. He said that since there's not a good relationship between the tungsten and the pore water that ends up in the groundwater, plus the fact that tungsten takes multiple chemical forms (only some of which adsorb to the soil), it seems to him that the soil bacteria or micro-fauna might play a relevant transport role, as well as the movement of pore water through the vadose zone. Mr. Dow noted that the first thing he would say is that a different conceptual approach is probably needed, and the second thing is that if the micro-fauna play a role in the transport, a chemostat system should probably be used to examine the transport, and not a batch test. In addition, Mr. Dow also referred to Ms. Jennings' comments about the soil data not having a linear fit, but some kind of hyperbola. He then noted that in such a situation it's common in biology not to use straight lines, but instead a Michaelis-Menten kinetics to explain the transport.

Agenda Item #6. IRP Updates

Residential Wells/Ponds/Harbors Sampling Results

Mr. Karson stated that the private well sampling program, which has been in existence since the 1980s, was operating at its peak in the late 1990s, when more than 400 private wells were being sampled – some weekly, some monthly, some semiannually, and some annually. Currently, AFCEE continues to offer private well testing to about 20 properties, 10 of which (in Falmouth and Mashpee) have been tested so far this spring (April/May), with nondetect results for plume-related contaminants, but some detections of chloroform, which is typical in Cape Cod groundwater. Mr. Karson also noted that some late-opening seasonal rentals will be sampled in July, and another sampling event will be conducted later this summer. He further stated that the private well sampling program is going to be merged into the LUCs program, which is likely to mean that the testing of these properties will cease unless they fall within the footprint of a groundwater plume or within a two-year travel time of a plume. He explained that most of the properties are located on the far side of Johns Pond, and are not presently above a groundwater plume. He also said that residents will be notified in the event that their homes are dropped from the sampling program, and added that there will be an in-depth presentation on LUCs at the September MMRCT meeting.

Mr. Karson also spoke about recreational ponds monitoring, which, he noted, occurs twice a year, in May and July. He reported that in May of this year Coonamessett, Jenkins, Deep, Round, and Snake Ponds were all tested for ethylene dibromide (EDB), with nondetect results. He also reported that Ashumet, Johns, Deep, and Coonamessett Ponds were all tested for plume-related volatile organic compounds (VOCs), again with nondetect results. Mr. Karson said that a news release to announce the ponds testing results will be issued within the next week. He also mentioned that the IAGWSP conducts testing for perchlorate and RDX at Snake Pond, with historically nondetect results.

Mr. Karson then discussed the surface water and seep sampling conducted at Red Brook and Squeteague Harbors for LF-1 plume contaminants. He noted that in May 2009 the groundwater seep at Red Brook Harbor tested nondetect for VOCs. At Squeteague Harbor the groundwater seep had a PCE detection of 1.8 micrograms per liter (µg/L), down from 2.8 µg/L last year, and fairly consistent with what's been seen over the years (1 to 3 µg/L range, below the drinking water standard, which is 5 µg/L, and well below any standard of concern for the marine environment). For the surface water testing at Squeteague Harbor, both PCE and TCE were below reporting limit (BRL), and low levels of chloroform were detected.

Mr. Karson said that overall the private well, ponds, and harbors test results are consistent with what's been seen in the past, with the good news being that the level of PCE detected at Red Brook Harbor has decreased.

Mr. Goddard informed the new MMRCT members that in the past some studies were conducted in response to Bourne's concerns about plume contaminants bio-accumulating in shellfish at Red Brook and Squeteague Harbors, and it was found that VOCs do not bio-accumulate in the shellfish. Mr. Karson confirmed that VOCs tend not to bio-accumulate in shellfish, and would not be expected to at the levels within the plume. Mr. Goddard also asked whether the Massachusetts Department of Public Health (MDPH) annual fact sheet about ponds in and around MMR is still being produced. Mr. Pinaud confirmed that the fact sheets are still being produced, and agreed to look into the release date of this year's version. Mr. Goddard noted that both cleanup programs' websites should include a link to the ponds fact sheet, and Mr. Karson noted that the 2008 version in on AFCEE's site.

Mr. Foster asked if samples taken from the ponds were surface water samples. Mr. Karson replied that they were, and he noted that the samples were collected from public swimming areas.

Wind Turbine Update

Ms. Forbes reported that the AFCEE cleanup program operates eight pump-and-treat systems to remediate around 15 million gallons of groundwater per day (at one point the systems were pumping 16 million gallons per day). The systems use electricity from conventional power plants and in 2008 AFCEE spent about $2.2 million on electricity. The purpose of putting up a wind turbine is to reduce energy costs and reduce the air emissions associated with the fossil-fuel-based power plants used to power the treatment systems.

Ms. Forbes stated that the AFCEE wind turbine will be located in the southwest corner of MMR, behind the LF-1 treatment plant. She also reported that a $4.6 million-dollar wind turbine contract was awarded in September 2007 for a 1.5 megawatt turbine that's expected to produce a little less than 4,000 megawatt hours annually, based on a 29% capacity factor. She then noted that the turbine is expected to generate around 30% of AFCEE's total electrical requirement, thereby reducing energy costs and air emissions by 30% as well. She also reported that payback on the wind turbine is anticipated in six to eight years, depending on what the RECs (Renewable Energy Credits) are worth and on what the O&M costs turn out to be. Ms. Forbes then mentioned that the Massachusetts Technology Collaborative had awarded a grant of $300 thousand to AFCEE for use on the wind turbine project.

Ms. Forbes then reviewed the wind turbine project schedule: the tower insert was delivered in November 2008; the foundation (which is 57 feet in diameter, up to 8 feet high, and required 600 yards of concrete) was constructed in March 2009; delivery of the tower, which will occur in sections and due to its weight will require special permits for moving over bridges in Massachusetts, is expected at the end of July; and delivery of the blades, which will be a long load, is expected in early August. Ms. Forbes noted that transportation companies moving the tower, blades, and nacelle are driving the route ahead of time to ensure that there won't be any issues and look at turning radiuses, heights, and the like. She also said that in mid-August a special 500-ton crane to put up the wind turbine will be

arriving on 18 flatbeds; the crane will take a week to assemble (while it takes only three days to assemble the turbine). The nacelle (which houses the generator) was expected to arrive in New Jersey on August 18 and arrive at MMR on August 21 – however, this may be delayed by a number of days due to an issue with the U.S. flagship that AFCEE is currently working to resolve. Nevertheless the goal remains to complete assembly of the wind turbine sometime in September 2009. Ms. Forbes concluded her presentation by showing a photo of the Schnabel trailer, which will be used to transport the tower sections, and has articulating axles so it can go in multiple directions to handle tight curves. She also showed a photo of the generator (under construction) and the nacelle that houses the generator, noting that that the generator is being built at the Fuhrlaender facility in Germany.

Mr. Marchessault inquired about the total height of the wind turbine. Ms. Forbes replied that that the hub height is 80 meters, and the height from the ground to the tip of the blade is 389 feet, with each blade being 35 meters long.

Mr. Goddard asked if at night the light on the wind turbine would glow red, rather than white, as was initially the case with the base water tower. Ms. Forbes confirmed that the wind turbine light would glow red at night. Mr. Goddard also inquired about plans for the All-Remedies-in-Place ceremony. Mr. Davis replied that AFCEE's All-Remedies-in-Place ceremony will be combined with the ribbon-cutting for the wind turbine. He noted that once the wind turbine startup date is more definitively known, a date for the ceremony will be set and MMRCT members will be notified, probably before the next MMRCT meeting, which will occur in September. He added that the ceremony will probably take place sometime in late September.

Ashumet Valley Construction Update

Ms. Forbes stated that the source areas for the Ashumet Valley plume (which is located entirely off base, in Falmouth) were a firefighter-training area, which contributed chlorinated solvents, and a wastewater treatment plant, which contributed nitrates and phosphates. She also noted that the remediation being discussed tonight focuses on the solvent plume, where the contaminants of concern are PCE and TCE, both of which have an MCL of 5 µg/L.

Ms. Forbes noted that in 1999 AFCEE installed a treatment system to address the northern portion of the Ashumet Valley plume. That system included three extraction wells operating at 1,200 gpm, two infiltration trenches, and two treatment plants along Sandwich Road. In May 2007 the system was optimized by shutting off two of the extraction wells, leaving the remaining well to remediate what was left of the northern portion of the plume. As part of the Record of Decision (ROD) process, however, the southern portion of the plume had to be addressed, and that is the subject of this construction update.

Ms. Forbes reported that in looking at the downgradient portion (or leading edge) of the plume, AFCEE conducted a drive-point investigation to help draw a plume shell and identify where to locate an extraction well, which, she noted, would not be a cutoff well, but a mass removal well. She also referred to the map of the southern part of the plume and pointed out the area of higher contaminant concentrations (about 30 µg/L, although about 50 µg/L was seen "in a thin section down in that area"). Ms. Forbes said that the extraction well location was based on the higher-concentration area. She then pointed out the proposed pipeline run, the MTU location on private property, and the discharge bubbler in the Backus River, also on private property.

Ms. Forbes further noted that due to the need to cut down trees the Falmouth Conservation Commission was opposed to locating the system components on the private property, as proposed. In addition, some abutters expressed concern about noise and interference with their daily lives. AFCEE then worked with the property owner and came up with alternative locations on his property for the MTU and the discharge bubbler – which didn't require cutting down any trees and provided a good buffer for the neighbors. Ms. Forbes then stated that the Ashumet Valley ROD, which was signed in

June 2009, calls for continued operation of the existing, northern treatment system plus installation of the new extraction well in the southern portion. She also reported that: the extraction well has been completed; the Falmouth Conservation Commission has approved the revised location for the treatment unit; a revised easement has been signed by the property owner; construction began in June and the piping and electrical lines beneath Old Meeting House Road and Old Barnstable Road have been completed; the MTU is expected to arrive this Friday; and the MTU and bubbler will be installed this month. Ms. Forbes noted that the system, which should be operational by the end of this month, is expected to operate for 10 to 12 years. She also showed several photos of the construction work, including the installation of a silt fence and a road cut under Old Barnstable Road, and a photo of the MTU at Demo 1.

Mr. Goddard asked if it's correct that the cost of the extra pipeline was nominal. Ms. Forbes replied that in fact it was almost off set by not having to do clearing and restoration.

Agenda Item #7. Next Meeting Schedule and Adjourn

Mr. Goddard inquired about the status of community involvement products in development. Mr. Karson replied that he met with Kris Curley of the IAGWSP and the graphics person regarding the groundwater findings document. He said that this document will have a new name and will be about 8 to 12 pages long, and he hopes to be able to submit a draft to the regulators for their review by late July/early August, and to the MMRCT for their review sometime later in August. He also noted that he has been working on AFCEE's Community Involvement Plan (CIP) Addendum and knows that the IAGWSP has been working on its CIP as well. He said that the CIPs will go through regulatory review, and the MMRCT should have the opportunity to review them in the next month or so. Mr. Karson also said that his goal is to have the groundwater findings document out by Labor Day. Mr. Goddard asked if there's a deadline associated with the CIP. Mr. Karson replied that there is not, but he expects that it could be discussed at the October MMRCT meeting, although members may receive it before then.

Mr. Field stated that the MMRCT would meet next, in combination with the Senior Management Board (SMB), at the Quality Inn in Bourne, on Wednesday, September 9, 2009 (*note: this meeting has since been rescheduled to September 16, 2009*). He then adjourned the meeting at 9:09 p.m.