Massachusetts Military Reservation Cleanup Team
Building 1805
Camp Edwards, MA
April 20, 2013
6:00 – 8:00 p.m.

***Draft* Meeting Minutes**

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Action Item:

1. Mr. Saucier requested specs, including the withdrawal rate, on the commercial irrigation well in the vicinity of the Demolition Area 1 plume area.

Handouts Distributed at Meeting:

1. Responses to Action Items from the January 9, 2013 MMRCT Meeting
2. Presentation handout: Demolition Area 1 Update
3. Presentation handout: J-1 North and Central Impact Area Construction Update
4. Presentation handout: Central Impact Area Source Work
5. Presentation handout: CS-10 Plume Update
6. MMR Cleanup Team Meeting Evaluation form

Agenda Item #1. Introductions, Agenda Review, Approval of January 9, 2013 MMRCT Meeting Minutes, Late-Breaking News

Ms. Donovan convened the meeting of the Massachusetts Military Reservation Cleanup Team (MMRCT) at 6:02 p.m. and asked if there were any changes or additions to the January 9, 2013 MMRCT meeting minutes. No comments were offered and the minutes were approved as written. Ms. Donovan then referred to the action items from the January meeting and noted that the project managers had agreed that mailings and published notices will include an invitation for community members to become part of the MMRCT.

Ms. Donovan also announced two potential base tour dates for MMRCT members: Wednesday, June 12, 2013, or Thursday, June 27, 2013. She explained that weekdays were selected because of the busy training schedule on weekends and mentioned possible tour site options/groupings that included bog areas, the Sandwich Road treatment system, the Central Impact Area, the J-1 treatment system, Small Arms Ranges, and Operations & Maintenance field services. MMRCT members expressed a general preference for the June 12 date and it was agreed that tour details would be decided via email.

Ms. Jennings reported that the U.S. Environmental Protection Agency (EPA) recently concluded a comment period on an amendment to the Administrative Orders (AOs) that came about in response to the Massachusetts Army National Guard's (the Guard) request to be allowed to use a new training device (an M-69 hand-grenade simulator) at MMR. Ms. Jennings explained that the device is considered a pyrotechnic, which is one of the restricted training items under the AOs. She also noted that after evaluating the device, EPA determined, based on what the device contains and the manner in which it would be used, that it would not impact groundwater. The 30-day public comment period on the amendment ran from March 11 through April 9, 2012 and no comments have been received.

Mr. Dinardo asked if this is the same simulator that was presented to the MMRCT some time ago. Ms. Jennings clarified that EPA had already approved use of that simulator, but this is a different one. She noted that, unlike the one that was presented to the MMRCT at a previous meeting, this simulator does not contain perchlorate and is actually of less concern in terms of its environmental constituents. Mr. Dinardo then asked if the use of the new simulator is restricted in terms of volume or area. Ms. Jennings mentioned that pre-testing of the new simulator wasn't conducted because it doesn't really contain anything of concern, and then noted that the Guard has been authorized to use 4,300 per year but only expects to use about 1,600 per year. Major Cody added that the simulators will be used to enhance the realism of training. He also noted that soldiers are required to be qualified on throwing hand-grenades.

Agenda Item #2. Demolition Area 1 Investigation Update

Mr. Gregson reminded the group that Demolition Area 1 (Demo 1) was used from the mid-1970s to 1997 for demolition training and disposal of munitions, fireworks, and explosives. He referred to a figure of the plume, pointed out the source area, the base boundary, and the treatment systems, and noted that recent work at Demo 1 has been focused on the downgradient portion of the plume.

Mr. Gregson reported that to date the Demo 1 treatment systems have treated 2 billion gallons of groundwater, and the base boundary system that was installed in 2010 is cutting off the contamination as intended. The downgradient portion of the plume, which is about 3,700 feet long, is now believed to be fairly well defined. Mr. Gregson referred to the figure again and noted points of reference including Route 28, the Bourne entrance to the base, and the Monument Beach, Pocasset, and Cataumet areas in Bourne.

Mr. Gregson also noted that the current maximum detection of perchlorate in the off-base portion of the plume is 5.7 parts per billion (ppb); the historic maximum was 13 ppb. Drilling was recently done on County Road where a monitoring well was installed in the northbound travel lane. That well showed

a perchlorate detection at 1.1 ppb, and the state health advisory for perchlorate is 2 ppb. Currently the Impact Area Groundwater Study Program (IAGWSP) is working on converting three temporary drive-points on private property in the area into permanent monitoring wells – at locations where perchlorate was detected at 2.46 ppb, 3.4 ppb, and 1.92 ppb.

Mr. Gregson then reviewed next steps associated with the Demo 1 plume: evaluate results from recently completed wells; drill additional locations on County Road to ensure nothing was missed; present new modeling results to the regulatory agencies (done); continue modeling work and determine whether additional treatment is needed or if the plume will naturally attenuate within a reasonable amount of time; hold a public comment period on the Proposed Remedy in summer 2013; and issue a Remedy Selection and Decision Document Addendum by the end of September 2013.

Mr. Saucier expressed concern about the commercial well that's being used for irrigation purposes in the Demo 1 plume area. He said that he doesn't think the well has been tested thoroughly enough and he is worried about the risk that it could draw up the plume. Mr. Gregson replied that some additional monitoring of that well was conducted a couple of years ago when the investigation began, and no perchlorate levels of concern were found. He also noted that the well is shallow and the plume is traveling underneath it; however, the IAGWSP could look at the withdrawal rate from the well to confirm that there's no possibility that the well could pull up any plume contaminant.

Ms. Jennings mentioned that there is a Land Use Control (LUC) program in place that requires periodic evaluation of private wells in plume areas, including wells being used for irrigation purposes. She also noted that the Decision Document (DD) that's issued for this part of the Demo 1 plume will formalize the process of periodically going back to recheck the well. Ms. Jennings also noted that there are two ways to check a well – evaluate the depth of the well in relation to the plume, and, if the depth information/relationship is questionable, sample the well.

Mr. Saucier said that he's never seen any specs for the irrigation well. He also explained that he thinks it's important to draw out a greater quantity of water from the well, over a period of about four hours – then sample the well. And if it's contaminated, that could be reported to the local authorities, who could shut the well down, and ensure that it's noted on the deed property. Ms. Jennings noted that specs are available, and the general cone of influences for an irrigation well are understood. She said that this could all be reviewed at the next MMRCT meeting. Mr. Saucier said that he doesn't know that the whole group would want to spend time on that, but he would like to have the information for himself. Ms. Jennings said that this request would be noted as an action item.

Mr. Gregson mentioned that there's a monitoring well on the property where that irrigation well is located, and the monitoring well showed perchlorate at 0.63 ppb, which is below the 2 ppb standard. Mr. Saucier said that a 10-minute draw from the well still isn't sufficient; he is looking for a major draw. Mr. Davis said that the wells are allowed to run "a good long time" before they're tested – for thousands of gallons if they are irrigation wells. He also explained that the first place the water comes from is top down, because pumping creates a cone of depression and "it's not going to pull up from the bottom until it evacuates that water."

Mr. Dinardo said that he thinks it would be valuable for the team to see, in cross-section, the relationship between the plume and the irrigation well, and the potential for even higher draws, "instead of it being an unknown." He also indicated that he thinks that would be a good thing in terms of "the whole public sentiment of it." Mr. Dinardo further noted that he appreciates that there's a monitoring well close by that provides good data to support that the irrigation well isn't in danger of being contaminated, "but anything else just takes it off the table."

Agenda Item #3. J-1 North and Central Impact Area Design/Construction Update

Mr. Gregson stated that the J-1 Range was used for military training from the 1930s to the 1970s, and was used by defense contractors from 1957 to the 1980s for burning and burial of excess propellants, explosives, and munitions. He reported that 5,700 tons of soil was removed from the range and treated, and 3,300 munitions were removed. He also noted that the J-1 Northern plume is migrating in a northwesterly direction from a testing/disposal area in the middle of the range. The current maximum RDX detection in the plume is 55 ppb, and the RDX standard the IAGWSP uses is 0.6 ppb. The current maximum perchlorate detection in the plume is 56 ppb. The J-1 Northern DD, which was issued in May 2011, called for two-well treatment system pumping at a total rate of 250 gpm, to be constructed by September 2013.

Mr. Gregson reported that data gap investigations were conducted in the area between monitoring well 370 (MW-370) and Wood Road to help determine optimal locations for the extraction wells. Based on historical and recent profiles, borings, and monitoring wells samples through August 2012, the RDX and perchlorate plume shells were revised and the groundwater modeling updated. Then the updated model was used to select the final locations for the two extraction wells.

Mr. Gregson showed a figure that was included in the final J-1 Northern DD and pointed out the conceptual extraction well locations, then showed a newer figure depicting the recently determined extraction well locations. He mentioned that locating one of the wells farther downgradient, near Wood Road, is expected to capture more of the downgradient portion. He also noted that water from both the extraction wells will be pumped to a treatment plant on Wood Road and then to an infiltration gallery to the west. He then reported that contracting for construction of the treatment system is under way, and pilot borings at the extraction well locations are being completed to collect chemical and geological data to help in design of the extraction well screens. Construction is anticipated to start in late June, with a system startup date of September 30, 2013.

Mr. Gregson showed a map of the Impact Area, pointed out what's known as the Central Impact Area, and referred to the general area where most of the Central Impact Area plumes are believed to have originated. He reported that to date 50 acres of source area have been cleared, with 15,000 tons of soil excavated and treated onsite or disposed offsite. Plumes of RDX are heading toward the base boundary and the Cape Cod Canal, and the small amount of perchlorate in the Central Impact Area plumes are entirely contained within the RDX footprint. The current maximum RDX concentration is 15 ppb and the current maximum perchlorate concentration is 10 ppb.

Mr. Gregson stated that the Central Impact Area DD, signed in March 2012, called for the installation of a three-well treatment system for groundwater, and clearance of 75% to 95% of unexploded ordnance (UXO) in the 58-acre source area. The first phase of the source area removal work, which is under way, involves clearance of 30 acres and the use of an innovative technology called Metal Mapper (a modified EM-61 metal detector).

Mr. Gregson noted that the IAGWSP has been updating the groundwater treatment system design with the goal of getting the system operational by December 2013. He displayed a figure, pointed out two planned extraction well locations, and noted that there is a provision in the DD for a third extraction well to be installed on Burgoyne Road around 2035 to catch a portion of the plume "that went by in this direction." Based on an update of the plume shell and the model, it's now thought that the two extraction wells will be able to capture the upgradient portion of the plume.

Mr. Gregson showed a couple cross-section figures of the plume, and then ran through a time series of slides illustrating how the plume was expected to behave once treatment begins. He noted that modeling conducted during the Feasibility Study (FS) indicated that concentrations greater than 2 ppb would not migrate past the base; he then pointed out the 0.6 ppb contour and the inner 2 ppb contour and showed slides depicting conditions in 2017, 2022, 2027, 2032, 2042, and 2052. When he showed

the 2052 figure, Mr. Gregson remarked that "things are looking great in the Impact Area, but there's a little bit more off base" so it was determined that more data are needed to confirm the model and decide if additional extraction is required in order to meet the goal of preventing off-base migration.

Mr. Gregson stated that the IAGWSP is currently working with the regulatory agencies in reviewing existing downgradient data, and the IAGWSP has determined the first three additional drilling locations – two on Avery Road and one on Wood Road. He said that the IAGWSP will keep the team updated and as more data become available and when any decisions are made about additional treatment at the downgradient portion of the plume.

Mr. Dinardo questioned the statement that 15,000 tons of soil was removed and disposed of elsewhere. Mr. Gregson clarified that it was removed and treated onsite *or* disposed of offsite. Mr. Dinardo then asked why soil would be disposed of offsite, which seems less cost effective and leaves excavated areas barren. Mr. Gregson mentioned economy of scale and explained that for 10,000 cubic yards of soil it makes economic sense to bring a thermal treatment unit on site or set up an alkaline hydrolysis treatment cell, but for 100 yards of soil here and there, it's far more cost effective to take it off site. With regard to restoration of the soil removal areas, Mr. Gregson noted that about four or five acres were excavated to a depth of two or three feet and are now bare and open areas. For the time being, the plan is to leave those acres like that and use them for equipment laydown or storage area while the source work is ongoing. He also said that future UXO removal work will involve "less brute force" and thereby more vegetation will be retained so restoration can occur.

Mr. Goddard asked if it's correct that the potential third extraction well would address "that other detached" lobe. Mr. Gregson replied if another well had to be installed based on what's currently known, he would recommend putting that third well there.

Mr. Saucier inquired about plans to notify the town or property owners that the plume is headed in their direction so that land use can be planned accordingly. Mr. Gregson replied that the IAGWSP certainly will implement its LUC process, identify private wells in the area, and notify residents about what's happening with the plume. Mr. Saucier asked who owns the "big area (of property) where the tip is." Mr. Gregson said that he's not sure, but he believes that it is private property.

Agenda Item #4. Central Impact Area Source Work in 2013

Mr. Gregson reminded the group that: the Central Impact Area DD called for clearance of 75% to 95% of UXO over 58 acres; that the Environmental Security Technology Certification Program (ESTCP) conducted a Metal-Mapper/TEMTADS (fancy metal detectors) demonstration project at MMR in summer 2012, the results of which the IAGWSP has been evaluating; and that the goal of Phase I of the source removal work is to clear a 30-acre area over a period of three years.

Mr. Gregson then showed a color-coded figure entitled "Source Clearance and Excavation Areas" and noted that the various colors represent the following: investigation and excavation areas where it's believed that essentially 100% of UXO has already been removed; access and traffic clearance areas (including well pads) where it's believed that about 85% of UXO has been removed; anomaly and surface clearance areas where it's believed that about 75% of UXO has been removed; and surface clearance areas where it's believed about 25% of UXO had been removed.

Mr. Gregson reviewed UXO removal activities planned for 2013, starting with returning to an 8-acre area (right in the center of the source area) to remove additional UXO in order to achieve approximately 85% removal and then perform a second EM-61 survey and dig additional anomalies in an effort to achieve 95% removal. The IAGWSP will also complete work at the ESTCP demonstration areas (northern and southern), and will use robotics to cut vegetation in an additional 16-acre area, then perform an EM-61 survey and ultimately begin excavating anomalies there. Mr. Gregson remarked that the IAGWSP anticipates being able to complete a great deal of the Phase I work in the first year.

Mr. Goddard asked how close to the 75% to 95% removal the IAGWSP anticipates being after completion of Phase I. Mr. Gregson clarified that the plan is to look at 58 acres in total, and within each specific area remove 75% to 95% of the UXO. Ms. Jennings further noted that the DD states that the source removal work will begin with two phases – a 30-acre phase (Phase I) and a 20-acre phase (Phase II), to be followed by an evaluation to decide what subsequent phases are required. She also said that the goal, trying different technologies, will be to achieve 95% UXO removal at each area. She further noted that the Metal Mapper seems very promising. Mr. Goddard said that his understanding was the entire boundary was defined, and the goal was to "get 95% of it." He said that he thinks it's important to explain the goal clearly for the public.

Mr. Goddard also asked if the IAGWSP plans to use a contained detonation chamber (CDC) to deal with dangerous items that are found. Mr. Gregson replied that a 105mm shell or smaller that potentially contains high explosives can be disposed of in the CDC, if it's safe to move. If it's unsafe to move, or a large item, it will either be blown in place (followed by some soil removal) or moved to a central location to be blown in place there. Mr. Goddard then asked if this UXO removal effort is setting a precedent nationally, and Ms. Jennings indicated that it is.

Mr. Dinardo asked why there hasn't already been 100% UXO removal at access and traffic areas. Mr. Gregson explained that this is because the requirement for travel lanes, drill pads, and the like is clearance to two feet, which works to make those areas safe for travel.

Agenda Item #5. CS-10 Plume Update

Ms. O'Reilly stated that the majority of the Chemical Spill 10 (CS-10) plume is located in the southeast portion of MMR, with a small portion of the leading edge extending into the towns of Mashpee and Falmouth. She then reviewed the CS-10 treatment systems that are in place: the In-Plume system, which is comprised of nine extraction wells, two infiltration trenches, and a treatment plant; the Sandwich Road extraction fence, which is comprise of eight extraction wells, six reinjection wells, and a treatment plant; and the Northern Lobe extraction well, which is connected to the Sandwich Road treatment plant.

Ms. O'Reilly reported the following: the CS-10 contaminants of concern (COCs) are TCE and PCE, but primarily TCE; the Sandwich Road system began operation in May 1999 and the current flow rate is 635 gallons per minute (gpm); the In-Plume system began operation in June 1999 and the current flow rate is 2,290 gpm; and the Northern Lobe extraction well began operation in 2002 and is pumping at 210 gpm. The total mass of COCs removed through December 2012 is 6,363 pounds. Ms. O'Reilly mentioned that Northern Lobe is the only leading edge lobe with active treatment; the others are in long-term monitoring.

Ms. O'Reilly reported that the CS-10 In-Plume system was the primary focus of the recently-completed data gap investigation. The system was meeting design goals, but the actual restoration timeframe in the CS-10 Record of Decision (ROD) was 2094. The Installation Restoration Program (IRP) hoped to be able to reduce that timeframe, and the System Performance and Ecological Impact Monitoring (SPEIM) data being collected indicated a potential for optimization – but first a data gap investigation was needed.

Ms. O'Reilly displayed a figure entitled "TCE Concentration Trends in CS-10 In-Plume Extraction Wells" and noted that in most of the extraction wells, influent TCE concentrations had dropped off over time. She also noted, however, that influent concentrations at extraction well 2 (EW-2) ranged from 80 ppb to 100 ppb, which was not something the monitoring network had indicated.

Ms. O'Reilly showed a slide that listed the data gap objectives: to evaluate the nature and extent of contamination in the CS-10 In-Plume area, primarily north of the southern trench and EW-9 areas,

expanded to include the area of CS-10 Sandwich Road wells EW-2176 and EW-2177 (which had a detection of 9 ppb after having been nondetect for years); to collect lithologic and hydraulic data to support and update to the CS-10 groundwater flow model; to update the 2007 TCE and PCE plume shells for the CS-10 plume; and to simulate migration of the CS-10 plume under current operating conditions with the updated groundwater flow model and plume shells to identify optimization opportunities. Ms. O'Reilly also noted that the draft data gap report was submitted to the regulatory agencies in August 2012 and the final was submitted in January 2013.

Ms. O'Reilly stated that the data gap field program, which was conducted from June 2008 through June 2012, included 95 direct-push borings, 31 rotosonic borings, the installation of 86 monitoring wells, numerous groundwater sampling events, and a synoptic water level survey. She showed a figure entitled "CS-10 In-Plume Direct-Push Drilling Locations," pointed out EW-2, and noted that the majority of the direct push location were in this area upgradient of EW 2 and the investigation went outside the 2007 plume boundary. She also displayed figures that showed sonic drilling locations and newly installed monitoring wells in the In-Plume and Sandwich Road areas.

Ms. O'Reilly displayed a slide entitled "In-Plume Data Gap Results Summary," which noted the following: the highest TCE concentrations are located to the north and upgradient of EW-2, several distinct lobes were identified, and contamination is up to 180 feet thick with a maximum TCE concentration of 3,880 ppb; the identification and delineation of these areas of TCE contamination to the north of EW-2 give an explanation for the sustained high influent concentrations observed in the extraction well; contamination in the EW-4 area is up to 150 feet thick with the highest concentrations (greater than 100 ppb) located between -90 and -120 feet mean sea level (msl), and a portion of this deep contamination is not captured by EW-4 under current operating conditions; and a zone of TCE contamination detected northeast of EW-7 is outside the model-predicted capture zone for EW-7 under current operating conditions, and contamination there is up to 40 feet thick with a maximum TCE concentration of 240 ppb.

Ms. O'Reilly displayed a figure entitled "Revised CS-10 Plume Boundary," noted that the boundary is based on the maximum contaminant level for TCE, which is 5 ppb, and pointed out the interior concentration contours (50 to 100 ppb, 100 to 500 ppb, 500 to 1,000 ppb, and greater than 1,000 ppb). She then pointed out the distinct high-concentration areas near EW-2 and EW-4. Ms. O'Reilly also showed a CS-10 In-Plume cross-section figure, pointed out EW-4, which she noted had a 150-foot screen that was packered off in order to focus stress in a certain portion of the aquifer. She further noted that in 2000 the bottom of the screen was packered off, when the deeper contamination was still unknown, and in October 2012 that packer was repositioned to capture the deeper contamination.

Ms. O'Reilly then discussed the slide entitled "CS-10 In-Plume Western Area," which noted the following: the CS-10 plume boundary was extended approximately 800 feet to the west to include newly-delineated contamination previously located between the CS-10 and Landfill 1 (LF-1) plume boundaries; this area of contamination is approximately 1,400 feet long and up to 60 feet thick with a maximum TCE concentration of 42 ppb; MCL exceedances of carbon tetrachloride (CCl_4) – up to 17.1 ppb – and detections of other LF-1 COCs were observed in several borings located within this western area; and modeling conducted during system design in 1999 indicated that operation of CS-10 In-Plume extraction wells EW-2, EW-4, and EW-7 would redirect groundwater flow in the eastern edge of the LF-1 plume to the west toward CS-10. Ms. O'Reilly displayed a figure depicting the 2007 plume boundary and the current plume boundary and noted that it was extended about 800 feet to the west and about 1,500 feet at the eastern portion.

Ms. O'Reilly then spoke about the slide entitled "CS-10 In-Plume Eastern Area," which noted the following: the eastern zone of contamination is approximately 5,000 feet long, between 500 and 950 feet wide, and up to 35 feet thick; the maximum TCE concentrations in the eastern area were detected at monitoring well 2116A (MW-2116A), where concentrations decreased from 792 ppb in June 2011 to

586 ppb in January 2012; MCL exceedances of PCE (51.2 ppb) and cis-1,2-DCE (87.8 ppb) were also detected at MW-2116A; the CS-10 plume boundary was extended approximately 1,500 feet to the east to include this newly delineated zone of contamination; and groundwater modeling results indicate that the eastern lobe of contamination is likely being contained at Sandwich Road under current system operating conditions, but it will extend operation of the Sandwich Road remedial system.

Ms. O'Reilly then reviewed the slide entitled "CS-10 Sandwich Road Area," which noted the following: two off-line extraction wells (EW-2167 and EW-2177) were turned back on line in 2011 after MCL exceedances were observed in EW-2177; the zone of TCE contamination, delineated to the east of the Sandwich Road lobe, is approximately 1,200 feet long, 550 feet wide, and up to 40 feet thick with a maximum TCE concentrations of 86 ppb at MW-1087B; a small portion of the this contamination migrated past the eastern edge of the Sandwich Road extraction fence when EW-2176 and EW-2177 were off line; and groundwater modeling results indicate that contamination located north of the extraction fence in this area is likely being contained at Sandwich Road under current system operating conditions. Ms. O'Reilly then showed some cross-section figures of the eastern lobe of the Sandwich Road fence and pointed out that the contamination is located deep in the aquifer, about 150 to 200 feet below the water table.

Ms. O'Reilly reviewed the slide entitled "2012 Groundwater Flow Model and TCE Plume Shell," which noted: the 2012 TCE plume was updated with the data gap investigation results and is an improved representation from the 2007 plume shell; major revisions included expansion of the plume footprint, improved delineation of high concentration areas in the interior of the plume, improved delineation of the vertical extent of contamination (particularly deeper in the aquifer), and has approximately 103% more mass (2,270 pounds) and 36% more volume (6.0 billion gallons) than the December 2007 plume shell (1,121 pounds and 4.4 billion gallons); and modifications made to the 2007 flow model based on the extensive set of lithologic data collected from recently completed soil borings included the addition of 25 fine-sand and silty-sand lenses in areas where CS-10 TCE contamination is located, a reduction in hydraulic conductivity values in these areas (ranging from 40% to 85% lower than represented in the 2007 model), and overall transmissivity of the simulated aquifer was reduced, particularly deeper in the aquifer.

Ms. O'Reilly showed a figure depicting the 2007 plume shell, pointed out a small zone of contamination over 300 ppb, and noted that there really wasn't any deep contamination located in the northern portion of the plume as shown on the cross section portion of the figure. She then showed the current plume shell, pointed out where contamination "goes right down to bedrock" in the cross section portion of this figure, and also referred to red high concentration zones where contamination exceeds 300 ppb. She also mentioned that the highest concentration in the 2012 plume shell was 3,880 ppb.

Ms. O'Reilly reviewed the slide entitled "2012 Transport Modeling Results," which noted the following: some areas of the CS-10 plume shell are located outside the model-predicted capture zone under current operating conditions; the most notable area of TCE contamination that isn't captured is located in the western area of the plume and is predicted to migrate to the west and south of EW-7 but dos not migrate off base; contamination located in the vicinity of EW-2, EW-4, and EW-7 persists the longest and dictates the aquifer restoration timeframe under current operating conditions; the recently delineated eastern lobe of contamination extends the operational timeframe for the Sandwich Road extraction well fence; and past contaminant transport simulations show high concentration areas of the plume dissipating relatively quickly, and this may have been because many of the newly delineated fine sand lenses (with lower hydraulic conductivities) were not represented in the 2007 model.

Ms. O'Reilly then showed the current operating conditions transport animation and pointed out that even after 100 years there would still be some deep mass migrating another seven years before going below the MCL; and this is due to the deep contamination located outside the capture zone.

Mr. Dinardo said that is appears that the data gaps allowed for misinterpretation of the depth and breadth of the original plume, and he wonders if anything has been learned from the process, and whether monitoring is occurring frequently enough. Ms. O'Reilly noted that although it seems alarming because there's so much more mass, most of it is still within the capture zone, with a small portion of previously unknown contamination located outside the capture zone. She also said that the reason for the data gap investigation was to gather data to decide how to optimize wells that weren't operating efficiently to improve the aquifer restoration timeframe. Mr. Dinardo said that his question is whether something's been learned in the general analyses of the data, that monitoring wasn't done frequently enough or deep enough – or was it expected that this would happen and so you just changed the packering of the well. Ms. O'Reilly said that modifying the packering at this one location was a preliminary action to get some immediate improvement. However, the IRP is looking at a total system optimization evaluation to improve capture and the restoration timeframe, which she'll discuss later in her presentation.

Ms. Jennings told Mr. Dinardo, "We're absolutely learning." She also said that when characterizing a plume in order to make the original decision, one can only poke so many holes in the ground and then make a best guess – but there are still unknowns in between. And when higher concentrations than expected are seen once a system is operating, the response is likely to poke more holes to get a better understanding and conform the capture zone. Ms. Jennings said that the entire data gap investigation is about confirming the capture zone and deciding if more extraction wells are need or if existing wells need to be optimized. She added that "it is a do-and-learn" and the idea is to work with the best information available to get a treatment system installed as quickly as possible, and then tweak it – which is what's happening in this case.

Ms. Jennings then referred to the animation and inquired about a piece of the plume (around 59 ppb) that's beyond the capture zone, and seems to disappear into the pond. She asked if that's because of the model boundary, or if the contamination goes under the pond. Ms. O'Reilly replied that it appears in the transport model animation that it just reaches the pond and then attenuate below the MCL. Ms. Jennings said that 59 ppb wouldn't attenuate that quickly right there. Ms. O'Reilly replied that it's already gone down to about 15 ppb. Ms. Jennings expressed some skepticism and asked if there are any wells to evaluate that part of the plume. Ms. O'Reilly said that there was one well where an MCL exceedance was previously detected, and a couple additional wells that showed no contamination. Ms. Jennings asked what exists on the other side of the pond, should the contamination undershoot it. Ms. O'Reilly referred to the Northern Lobe extraction well. Mr. Davis added that velocities increase significantly near a pond, so he doesn't think it's unreasonable for that 59 ppb to attenuate over a six- or seven-year timeframe. Ms. Jennings replied, "Other plumes are seeing less than that," and it's just something that should be watched. Mr. Michaud said that if the lobe on the left side is any indication of the draw on the pond, conceivable there'd be a similar situation on the other side. Ms. O'Reilly replied that the "elevation of this contamination is shallow" but if it didn't attenuate by the time it reached the pond boundary it would attenuate somewhere underneath the pond, before reaching the other side.

Mr. Saucier said that the southern trench lobe appears to be pulling the plume away from the boundary and into a residential area, and he wonders whether there are any private wells there and if the residents know about the plume beneath their property. Ms. O'Reilly replied that that area is part of the LUC process. Mr. Karson added that all of those property owners have been contacted and any private wells have been identified, whether active or inactive, and the active wells go through a well determination process.

Mr. Jacobs stated that the CS-10 plume is by far the largest and most complex plume at MMR; ten times more contaminant mass has been removed from CS-10 than any other plume. He also noted that CS-10 is likely not a single plume, but multiple plumes from multiple source areas, and does have a tendency to "throw us some surprises" like the well that went from below 5 ppb to almost 700 ppb after

two or three years of not testing it. He said that he thinks Mr. Dinardo's point is well taken, that perhaps CS-10 wells should be monitored more frequently, given the nature of that particular plume.

Mr. Dinardo said that he didn't intend to indicate in any way that everyone isn't doing a great job, but he does think it might be wise to increase monitoring in areas near the base boundary, near downgradient wells, and in public-use areas, like ponds.

Ms. O'Reilly continued her presentation by reviewing the optimizations that were completed during the data gap investigation: the effective screen interval at EW-10 was adjusted with a packer (July 2009), due to its very limited efficiency EW-6 was taken out of operation (February 2010), and the two Sandwich Road extraction wells discussed earlier (EW-2177 and EW-2176) were restarted, in January 2011 and June 2011 respectively. Most recently, the effective screen interval at EW-4 was adjusted by repositioning the packer (October 2012).

Ms. O'Reilly reviewed the slide entitled "2013 Optimization Objectives and Approach," which noted the following: the goal of the CS-10 remedial system optimization effort is to reduce restoration timeframe and improve plume capture; Phase I included an evaluation of revisions to current infrastructure (such as flow rates and effective screen interval); Phase II included an evaluation of additional infrastructure (such as extraction wells and pipeline); and metrics evaluated included aquifer restoration timeframe, remedial system shutdown year, TCE plume mass and volume located outside model-predicted capture zone at initial time step and at system shutdown year, and mass removed at system shutdown.

Ms. O'Reilly reported that Phase I looked at four different optimization scenarios that included screen revisions and changes to flow rates at the Sandwich Road and In-Plume systems. She also showed charts detailing the universal revisions in every extraction and every reinjection well in each Phase I scenario. Ms. O'Reilly noted that all four scenarios involved varying changes to flow rates at EW-2, EW-4, and EW-7, and Scenario 4 had the highest flow rates for all three wells, and was the optimal Phase I scenario. She also noted that each scenario involved pump and motor changes, and for Scenario 4 specifically – seven pump/motor changes and a major electrical upgrade at EW-4 was required.

Ms. O'Reilly showed the optimized Scenario 4 transport animation, noting that it showed a side by side comparison of both the current operating conditions and optimized Scenario 4 conditions. She talked the group through the animation and pointed out the improvements under Scenario 4. She then noted that Phase II evaluation retained benefits from Phase I, such as different flow rates and packering in individual extraction well, but also included two new extraction wells – EW-2113, a deep well in the EW-2/EW-4 area, and one in the eastern In-Plume lobe called EW-2114. The three Phase II scenarios were Scenario 5 – with EW-2113, Scenario 6 – with EW-2114, and Scenario 7 – with both EW-2113 and EW-2114.

Ms. O'Reilly displayed a figure depicting proposed locations for the new extraction wells. She also reported on infrastructure modifications required to meet flow rates for the Phase II scenarios: Scenario 5 would require one new extraction well and pipeline; Scenario 6 would require one new extraction well, pipeline, an infiltration trench, and an MTU; and Scenario 7 would require two new extraction wells, pipeline, an infiltration trench, and an MTU.

Ms. O'Reilly showed the optimized Scenario 7 transport animation, pointed out the new extraction wells, and noted that aquifer restoration would be achieved around 2035 at Sandwich Road and around 2056 at CS-10 In-Plume.

Mr. Goddard observed that it would be 2040 before concentrations go below 100 ppb, and said that his point is that the system would operate up to 20 years longer just to get "this really tiny section" and therefore he questions whether it might be more efficient to put another MTU farther upgradient. Ms. O'Reilly noted that with this type of in-plume system, it's not just one extraction fence, but there are

also competing hydraulic gradients to consider, which is why the layout Mr. Goddard suggested might not reduce restoration timeframe.

Mr. Saucier remarked that EW-2112 appears to be drawing contamination off base. Ms. O'Reilly clarified that that well was installed in 2009 because contamination had traveled off base; its purpose was to keep contamination from migrating farther downgradient.

Ms. O'Reilly briefly reviewed the table entitled "Restoration Timeframes and Remedial System Mass Removal Estimates," and noted that mass removal estimates for Scenarios 4, 5, 6, and 7 are fairly consistent with between 2312 and 2341 pounds removed, and all these scenarios are a big improvement, with about 300 pounds more mass removed, than that predicted under current operating conditions. She also showed a graph entitled "CS-10 Remedial System Optimization – Cumulative TCE Mass Removed" and noted the difference in mass removal under current and optimized conditions. Ms. O'Reilly then reported that the model in the ROD predicted that 639 pounds of TCE mass would be removed between January 2008 and December 2012, and that 1,191 pounds would be removed over the life of the system. However, actual TCE mass removed from January 2008 through December 2012 was 1,366 pounds – so most of the newly delineated mass is located inside the capture zone under current operating conditions. Ms. O'Reilly then showed a graph entitled "CS-10 Remedial System Optimization – TCE Mass Reduction Comparison," which she noted normalized the predicted mass removed in the ROD with the modeling completed with the new plume shell by presenting mass removal as a percent. She also displayed a table that showed TCE plume hydraulic capture statistics and noted that under the ROD alternative 55 pounds of mass was located outside the capture zone, under current operating conditions 472 pounds was located outside the capture zone, and under the optimized scenarios about 40 to 50 pounds was located outside the capture zone. In addition, she displayed a table entitled "TCE Mass and Plume Volume Remaining After 2055" and noted that under the ROD alternative about 5.4 pounds would be left after system shutdown, under current operating conditions about 128 pounds would remain, 16.7 pounds would remain under optimized Scenario 4, and under optimized Scenarios 5 and 7, only 0.2 to 1.5 pounds remain after system shutdown.

Ms. O'Reilly stated that Phase I's Scenario 4 had the highest flow rates and greatest mass removal, and statistics were relatively consistent with what was presented in the ROD in terms of system operation timeframe, remaining mass, and restoration timeframe (2094 versus 2106). She also said that Scenario 7 was the optimal Phase II scenario and the optimal scenario overall because it reduced aquifer restoration timeframe and system operation timeframe. Finally, Ms. O'Reilly reviewed the path forward: the "Draft CS-10 2012 Technical Memorandum: Focused Feasibility Study for Remedial System Optimization" is scheduled to submittal in May 2013; the IRP is requesting funding needed to implement the selected remedial system optimization; a direct-push drilling program has begun to collect data needed to select optimal locations for additional infrastructure.

Mr. Goddard asked about the possibility of using reactive wall technology at CS-10 In-Plume. Mr. Davis indicated that the depth required would be prohibitive.

Mr. Dinardo said that he's interested in the idea of self-sustaining treatment systems, and inquired about the possibility of a future update on the wind turbines and the energy situation. Mr. Goddard mentioned the planned solar farm at the landfill and suggested that that could be part of the update. Mr. Karson noted that the solar farm is not part of the IRP. Mr. Davis added that right now the IRP is generating more power than it's using. He also noted however, that the IRP is involved with solar farm project, which is Air National Guard sponsored project, only from the standpoint of ensuring that it doesn't impact the landfill cap.

Agenda Item #6. Review Meeting Schedule and Topics

Mr. Karson stated that the MMRCT is schedule to meet next on Wednesday, July 10, 2013. He also encouraged team members to reply to their forthcoming emailed tour invitations as definitively and as

quickly as possible. Mr. Dinardo suggested expanding the list of invitees to include local public officials.

Mr. Goddard asked if the Massachusetts Department of Public Health (MDPH) still issues its annual ponds fact sheet. Mr. Karson replied that the last one issued was in summer of 2010. He also noted that the IRP provides pond testing data to MDPH and the local Boards of Health annually. Mr. Goddard then asked if the ponds are still posted. Mr. Karson replied that they are not. Mr. Goddard also inquired about the status of the Natural Resource Trustee Council (NRTC). Mr. Davis said that there have been discussions about getting things started again, but the Air Force has changed trustees again, and now he (Mr. Davis) must brief the new trustee and ideally something will happen before another change in trustees two or three years down the road.

Agenda Item #7. Adjourn

Mr. Karson adjourned the meeting at 8:14 pm.