Impact Area Review Team
Bourne Best Western
December 5, 2006
6:00 – 9:00 p.m.

Meeting Minutes

Members:	**Organization:**
Ben Gregson	IAGWSP
Mike Minior	AFCEE/MMR
Lynne Jennings	US EPA
Bill Walsh-Rogalski	US EPA
Len Pinaud	MassDEP
Ellie Grillo	MassDEP
Tom Cambareri	IART/CCC
Peter Schlesinger	IART/Sandwich
Earl Lantery	IART/Sandwich
Ed Webb	IART/Sandwich
Richard Conron	IART/Bourne
Bob Mullennix	IART/Bourne
Facilitator:	**Organization:**
Jim Murphy	US EPA

Attendees:	**Organization:**
John McDonagh	IAGWSP
Lori Boghdan	IAGWSP
Pam Richardson	IAGWSP
Kris Curley	IAGWSP
Dave Hill	IAGWSP
COL Bill FitzPatrick	E&RC
Bill Sullivan	E&RC
Jane Dolan	US EPA
Mark Begley	EMC
Kevin Hood	UCONN/TOSC
David Dow	Sierra Club
Shouvik Gangopadhyay	ECC
Mike Goydas	ECC
Rick Carr	ATL
Jane Shea Moran	e^2M

Agenda Item #1. Welcome, Agenda Review, Approval of 10/24/06 IART Meeting Minutes

Mr. Murphy convened the meeting at 6:02 p.m., the Impact Area Review Team (IART) members introduced themselves, and Mr. Murphy reviewed the agenda. He then asked if there were any changes to the October 24, 2006 IART meeting minutes. No changes were offered and the minutes were approved as written.

Agenda Item #2. Late-Breaking News, Responses to Action Items from 10/24/06 IART

Mr. Conron asked when the team could expect an update on the Impact Area Groundwater Study Program's (IAGWSP's) activities and budget, which he had requested at the October IART meeting. Mr. Gregson informed him that that item would be included on the January IART meeting agenda.

Mr. Murphy confirmed that there was no late-breaking news to report at this time. He then asked if there were any other questions or comments on the responses to action items from the October 24, 2006 IART meeting. Mr. Conron referred to Action Item #4 (his request for the Environmental & Readiness Center [E&RC] to provide him with a list of weapons to be used for training with lead ammunition at the Small Arms Ranges) and noted that the list he received was not what he'd requested, but pertained to past rather than future use. Mr. Conron also mentioned that Ms. Curley of the IAGWSP had failed to reply to his e-mails regarding this issue. Ms. Curley apologized for not having responded, but noted that she had not received his e-mails and would consult with him later to ensure that he receives the information that he requested.

Agenda Item #3. J-1 Range Soil Update

Mr. Gangopadhyay stated that for the J-1 Range soil investigation, the J-1 Range, which is part of the Southeast Ranges, was broken up into three portions: J-1 Impact Area, J-1 Interberm Area (IBA), and J-1 South. He also referred to the map and pointed out the locations of the 100-meter berm, the 1,000-meter berm, the 2,000 meter berm, and some tunnel berms through which projectiles were fired as part of testing.

Mr. Gangopadhyay stated that the J-1 Range was used for a number of purposes over time, including small arms firing training, defense contractor testing (mostly on inert items), and a variety of disposal activities such as burning of excess propellant, burning of explosives debris, a one-time wastewater disposal, and other miscellaneous disposal. He also noted that the current investigation focused on site features and other locations of interest based on witness interviews, aerial photographs, geophysical signals, site recon, groundwater modeling, and data from previous investigations. He then reminded the group that all items found by unexploded ordnance (UXO) personnel at the Massachusetts Military Reservation (MMR) are classified as either munitions & explosives of concern (MEC), which are items that contain or potentially could contain an explosive compound, or as munitions debris/range-related debris (MD/RRD), which are inert items resulting from munitions or other scrap. He further noted that MEC clearance at the J-1 Range was conducted during the Munitions Survey Program (a geophysical investigation), well pad and road clearance for monitoring well installations, and supplemental geophysical investigations.

Mr. Gangopadhyay explained that MEC information was used to establish a pattern of distribution. He then showed, as an example, a slide pertaining to the MEC items distribution at the J-1 IBA area: three hundred and seventy-one 105mm projectiles detected in 18 locations, with one cluster of 344 items found in a burial pit at grid location J-40; two hundred and sixty-one 81mm items found in 54 locations, with one cluster of 210 items found in a burial pit at grid location H-37; one hundred and fifty-eight 60mm items detected in six locations, with one cluster of 153 items found at grid location H-37; and 197 not-otherwise-specified (NOS) objects found in four locations, with most (175 items) found in pits at grid locations K-36 and K-38. Mr. Gangopadhyay showed a map depicting locations of J-1 IBA MEC items and also mentioned that a burn kettle was found in the center of the J-1 IBA area. He further noted that the MEC discoveries indicate burial/burning in the IBA and scattered items from firing. Mr. Gangopadhyay then showed a map depicting locations of J-1 South MEC items.

Ms. Jennings observed that the geophysical signal at H-37 in the IBA doesn't seem significant enough to correlate to the large discovery of items in a burial pit there. Mr. Gangopadhyay replied that it could be that the signal is obscured by the black dots that appear on the map. He also noted that sometimes a burial pit doesn't' necessarily show a large response and could be just a portion of a signal that was investigated. Ms. Jennings asked Mr. Gangopadhyay to talk about how it's known that all the burial pits have been found. Mr. Gangopadhyay spoke of: the Munitions Survey Project (which involved the investigation of significant signal responses that reflected many burn/burial pits that corresponded to information provided in witness interviews); other investigations that occurred in the recent past, including the Priority 1 Grid investigation; and other lines of evidence such as samples collected over time, groundwater modeling, and backtracks to potential sources. He also noted that remaining responses that were not investigated were analyzed based on their amplitude and size to ensure that no other cache was left on the ground, and that the IAGWSP is conducting a survey over several parts of the area to ensure that no burn/burial pits are left. Ms. Jennings explained that she is surprised to learn about a burial pit at H-37 when the signal response doesn't seem to be very large at all. Mr. Gangopadhyay replied that he thinks that zooming in on that spot would show that there are certain signals that led to the investigation there.

Mr. Schlesinger expressed concern about the need for investigating beyond the artificial boundary lines shown on the map. Mr. Gangopadhyay explained that the straight lines were drawn to establish a grid system; however, the EM-61 (geophysical survey tool) doesn't always go up to the red line, and sometimes forms curves – much of which is based on the actual surface terrain, where field recon has been conducted. He also noted that additional field recon along the edges of the study area is planned to determine whether the artificial boundaries could extend farther.

He also noted, for example, that a burial pit that extended beyond the EM-61 response was traced to where it ended.

Ms. Grillo asked whether the boundary is considered sufficient or if it might be expanded. Mr. Gangopadhyay replied that the assessment of data will cover data gaps and look at areas both inside of and outside of the study area, primarily using aerial photographs, but also other lines of evidence. Ms. Grillo then asked how the width of the burial pit at H-37 is known. Mr. Gangopadhyay replied that he doesn't remember the details about the pit offhand. He also noted, however, that in addition to the EM-61 work, hand-held detectors are used to gauge the extent of investigation, and anything that warrants going farther out will be assessed during the remedial investigation (RI) and conducted either now or in the future.

Mr. Gangopadhyay continued with his presentation by showing a map depicting MEC items at the J-1 Impact Area, which he noted falls within the Central Impact Area boundary. He then reviewed the slide listing conclusions regarding the MEC discoveries, as follows: MEC clearance was targeted at locations identified through background information and witness interviews, site recon, geophysical signals, modeling, and previous investigations; EM-61 signal responses are reflective of range activity; disposal practices are evident from identification of burial/burn locations in J-1 IBA and J-1 South; a large proportion of items reflective of disposal (such as propellants) have been found in the IBA; large mortar disposal areas were found (1,100 – 81mm); scattered objects were detected throughout the range, indicating firing activity; and less than 1% of items showed signs of filler leakage, and their distribution suggests that they are not source of groundwater contamination.

Mr. Gangopadhyay then showed a map depicting J-1 IBA soil sample locations, many of which he noted were geared toward where MEC items were found. He also noted that samples were collected to investigate range features, such as the berms and the burn kettle, and based on past workplans, witness interviews, site recon, and previous sampling. He then showed a map depicting J-1 Impact Area soil sample locations and another depicting J-1 South soil sample locations. He also showed an analytical data table and noted that surface samples were collected from a depth of less than 1 foot, and subsurface samples from a depth greater than 1 foot. He also pointed out that the table lists the analytes and the number of samples collected, that both discrete and composite samples were tested, that as expected a very high RDX value was detected in the composite sample from inside the burn kettle, and that the relatively low maximum perchlorate value was detected in a discrete sample from the J-1 Impact Area. In addition, Mr. Gangopadhyay showed another analytical data summary, but one pertaining to samples reflective of current in-situ conditions, which he noted would be used to support the risk assessment and leaching determination.

Mr. Walsh-Rogalski asked if it's correct that Mr. Gangopadhyay had said that many of the munitions were found in burial pits and that many were inert items. Mr. Gangopadhyay replied that it is. Mr. Walsh-Rogalski then asked if it's also true that most items found in disposal pits were inert. Mr. Gangopadhyay replied that a lot of the items were inert. He also clarified that from a safety perspective, many items that may be inert are classified as MEC. Mr. Gangopadhyay also said that both inert items and those that probably contain explosive residue, as well as propellants and the like, which could contribute to groundwater contamination, have been found in the burial/burn pits.

Mr. Walsh-Rogalski stated that one of the conclusions being drawn seems to be that the disposal pits, rather than other areas, tend to be the source of contamination. Mr. Gangopadhyay replied that that's correct. He also noted, however, that not all of the scattered items found throughout the area were inert – some were MEC items, but didn't show any signs of leakage and therefore don't seem to be causing contamination that could affect groundwater.

Mr. Walsh-Rogalski asked again if it's correct that most of the munitions found in the disposal pit were inert. Mr. Gangopadhyay replied, "A lot of them, yes." Mr. Walsh-Rogalski then asked, "Nonetheless, you found these disposal pits to be a major source of contamination?" Mr. Gangopadhyay started to respond but was twice interrupted by Mr. Walsh-Rogalski asking him to answer the question. Mr. McDonagh, who was in the audience, asked Mr. Walsh-Rogalski to allow Mr. Gangopadhyay to answer. Mr. Gangopadhyay stated that the disposal pits are considered sources of contamination, and there's a major line of evidence that supports that hypothesis, which Mr. Goydas would discuss later in the presentation.

Mr. Walsh-Rogalski said that he can't figure out how the disposal pits could become the source of contamination if the munitions found there were inert, except for perhaps the fuzes. Mr. Gangopadhyay replied that munitions were not the only things found in the disposal pits, and he noted that witnesses spoke of excess propellant being burned there, and melt/pour wastewater being dumped there. He also said that not that much contamination has been found in-situ at the J-1 Range, which indicates that a lot of it has been relics. He further noted that looking at activities believed to have happened in the past and linking it to groundwater contamination shows that the source areas do corroborate what the MEC distribution suggested.

Mr. Walsh-Rogalski said that Mr. Gangopadhyay seems to be saying that it was not the munitions in the disposal pits, but other items that were the source of groundwater contamination. Mr. Gangopadhyay clarified that not 100% of the munitions were inert. Mr. Walsh-Rogalski also inquired about the nature and amount of the wastewater disposal. Mr. Gangopadhyay replied that it was a one-time wastewater disposal that came from the J-3 Range melt/pour area, although he doesn't recall the exact number of gallons. Mr. Walsh-Rogalski said that he believes the amount was 1,200 gallons, and the contaminants were Octol and propellant. He also said that he thinks that the associated groundwater is "very, very low in those two contaminants" and he would suggest "that that be put in context of the other contamination" that was found.

Mr. Walsh-Rogalski then asked if the tendency was to find that any cracked/leaking items were those that had been fired, rather than those that had been disposed of in burial pits. Mr. Gangopadhyay replied that cracked/leaking items could potentially be found in a burn pit, and added that "if there were more inert items being disposed of they could potentially have ripped open." Mr. Walsh-Rogalski asked if records were kept of the number of inert and non-inert items found in the pits. Mr. Gangopadhyay said that those data do exist. Mr. Walsh-Rogalski noted that his point is that if the majority of the munitions found were in burial pits, and most of them were inert, it seems to make sense that very few of the found munitions would be cracked/leaking. Mr. Gangopadhyay said that that's true. Mr. Walsh-Rogalski then said that if another thousand munitions that were fired on the range were found, "the proportion of munitions that were cracked or leaking would be much higher than what you're presenting here, in all likelihood." Mr. Gangopadhyay replied, "Could be, yes."

Mr. Mullennix commented that it seems to him that Mr. Walsh-Rogalski was "leading the witness, and this isn't a court of law," and he would prefer to see the presentation move along without that happening. Mr. Walsh-Rogalski said that he apologizes if his line of questioning was too aggressive, and added that it's difficult to make points without asking questions. Mr. Murphy suggested holding further questions until the end of the presentation. He also said that he thinks that for the most part any question is appropriate here.

Mr. Gangopadhyay then continued with his presentation by displaying a slide that showed preliminary screening information for the soil samples that were collected, which he noted were run against a list of applicable standards. He also made a point of noting that the screening was just preliminary, and that as part of the risk assessment a hard action level would be determined for each of the analytes and decisions would be made as to whether further action is needed.

Mr. Gangopadhyay also showed a map depicting soil sampling results for lead at the J-1 Range, as items containing lead azide were known to have been used there. He pointed out the area in the middle of the IBA where a number of detections occurred, and explained that the investigation is looking at lead results because lead azide itself does not persist in the environment and total lead is an indicator of where such items would have been disposed of. He also said that it will be assessed as to whether any further action is warranted based on the results.

Mr. Gangopadhyay then showed a slide with the following analytical data conclusions: sample locations at J-1 are co-located with areas of interest defined by witness interviews, site recon, geophysical signals, MEC discoveries, and site features; sample results from burn/burial pits indicate low or no detection of explosives or perchlorate, and this may indicate that contamination stemming from disposal activities has dissipated over time; lead azide is not likely to persist in the environment, and total lead will be used as an indicator; sample collection in these areas is adequate to describe nature and extent, define the source areas, and initiate the RI; analytical results define the vertical extent of contamination; and the quantity of samples and the suite of analytes are sufficient to support risk and leaching assessments.

Mr. Walsh-Rogalski asked Mr. Gangopadhyay to explain what total lead results are expected to indicate. Mr. Gangopadhyay replied that total lead is an indicator of total lead azide. He also explained that because witness interviews spoke of the use of items containing lead azide, the investigation is trying to determine where those items would have potentially impacted the ground, and because there's no sampling for lead azide, total lead results are being used.

Mr. Schlesinger remarked that the presentation is lacking an overlay to show the connection between MEC discoveries, contaminant detections in soil, and groundwater contamination. Mr. Gangopadhyay noted that that question would be answered in the next piece of the presentation, given by Mr. Goydas. Mr. Schlesinger maintained that joining the two pieces together in one slide would be helpful.

Mr. Goydas showed maps of the J-1 North RDX and J-1 North perchlorate plumes, which he noted would be tonight's focus of his presentation, the purpose of which is to provide a general understanding of the existing data and how it's being assessed while entering into the RI. He also noted that final conclusions won't be made until the RI/Feasibility Study (FS) stage.

Mr. Goydas stated that the J-1 North perchlorate plume (shown to 1 part per billion [ppb]) is approximately 4,000 feet long and 1,000 feet wide, while the RDX plume (shown to 2 ppb) is somewhat wider but about the same length. He also noted that the plumes are more than 150 feet thick, primarily because they are so close to the top of the groundwater mound. Mr. Goydas stated that the similar length of the plumes indicates that they are about the same age; however, the perchlorate plume tends to have tighter concentration gradients, while the RDX plume is more diffuse and has multiple lobes, indicating slightly lower concentrations in the sources that created it.

Mr. Goydas showed a 3-D animation of the RDX plume and pointed out that there are a couple of different vertical lobes in the zones of higher concentrations, which are "relatively tight, compact, but not a nice single teardrop release," which would indicate a single one-time source. He also showed a 3-D animation of the perchlorate plume, which he described as "a little bit tighter" with "fewer lobes," and believed to have had fewer sources, or at least fewer sources that resulted in groundwater contamination.

Mr. Goydas reported that generally declining concentrations are seen in the source area monitoring wells, with the highest mass being seen downgradient of the sources. This indicates that the plumes are approximately 20 to 30 years old, based on their evolution and the time of travel. Also, because the mass is downgradient and concentrations are declining in the trailing

edge monitoring wells, the data indicate that the maximum loading to the aquifer occurred about a decade ago.

Mr. Goydas then showed a slide listing the J-1 North plume source characteristics inferred from the plume characteristics, as follows: there are several source locations – the sources are tightly clustered and the RDX distribution is more heterogeneous than the perchlorate; the RDX and perchlorate releases likely occurred around the same time (about 10 to 30 years ago, but more likely 20 to 30 years ago); and there's been little continued release of RDX and perchlorate over the past few years, as monitoring well data indicate.

Mr. Walsh-Rogalski asked what conclusions are drawn from the fact that there are "fairly tightly clusters of plume constituents." Mr. Goydas replied that the indication is that it's likely that a couple of smaller sources resulted in the groundwater contamination that's being seen. Mr. Walsh-Rogalski suggested that it couldn't be concluded then whether the sources were disposal that occurred in a number of locations in close proximity or munitions that leaked in close proximity. Mr. Goydas clarified that such a conclusion could not be made from the data alone. However, the way to arrive at a conclusion is to look at the distribution and mass loading of an individual item – for example, taking one type of found item and releasing it into a footprint the size of the meeting room and determining whether it would result in the contamination being seen in groundwater today, versus taking 100 of those items and releasing it into a smaller footprint, like the size of the head table. Mr. Goydas stated that intuitively the data suggest that "it's not one item and many footprints the size of this room; it's likely a handful of locations that are the size of the table or slightly larger."

Mr. Goydas also referred to Mr. Walsh-Rogalski's questions to Mr. Gangopadhyay, and clarified that it's not being suggested that every burial was a source or that nondescript firing could not a be source – rather, that the available data, which hasn't yet been fully evaluated, indicate that there are probably several locations of more significant contamination, but there could also be lesser contamination in other areas.

Mr. Goydas continued his presentation by noting that the tools used to evaluate the data set include the saturated transport model (to understand how contaminants move through groundwater) and the vadose zone model (to understand how a source release to the ground surface migrates to the groundwater table). He also noted that the groundwater flow model indicates approximately 30 to 35 years of travel time from the source area to the toe of the plume, while the saturated transport model indicates a slightly faster travel time of 25 to 30 years. The vadose zone transit time evaluation suggests a travel time of two to five years, depending on the contaminant, with perchlorate less likely than RDX to be retarded by sediments. Mr. Goydas also noted that there would be a trailing edge, meaning that not all the contaminant will arrive at the water table at the same time, with the arrival of the trailing edge taking as long as 10 years. He further stated that the examination of aerial photographs and site records indicates that the area was used for a period of about 50 years, and groundwater data suggest a release that occurred about 35 years ago. Also, that taking into account the two-year travel time through the vadose zone suggests loading at the water table around 34 or 35 years ago. He also made a point of noting that this doesn't mean that there couldn't have been prior releases, only that they hadn't resulted in groundwater contamination.

Mr. Goydas also discussed the source area evaluation that was conducted, which used source area simulations to see if the groundwater plume being seen today could be developed based on the source footprints (soil contamination, burn/burial pits, MEC items) mapped in the field. He noted that the objective of this evaluation is to understand how well the source contamination and MEC items match with the groundwater contamination, to help with the conceptual understanding of

the trailing edges of the plume, and help determine whether all the sources have been identified and the ground characterization is complete.

Mr. Goydas showed the initial 2004 source area simulation, which he noted was run in an effort to determine appropriate monitoring well locations early in the investigation. The current evaluation, however, involves loading the mass into the soil contamination footprints that Mr. Gangopadhyay discussed, in order to obtain a general understanding of the RDX mass that had to be released at the water table to create the plume. Mr. Goydas noted that the result was "a fairly good general distribution map of the overall geometry of the plume, based on these particular source areas." The next step was to take the soil data (not the hypothetical mass loading as in 2004), map the footprint and vertical thickness of soil contamination, and let it migrate into the future in the model. Mr. Goydas showed the simulation for this and pointed out that contamination is not immediately visible because it takes about six years for the RDX to migrate from the ground surface to the water table. He also noted that the contamination doesn't develop into the plume that's being seen, which indicates that the RDX source contamination currently in the field could not have been the source of the plume that developed 10 to 30 years ago. In addition it suggests that the current RDX contamination is not a significant continuing source in that there isn't enough mass to allow the plume to continue to migrate, which is supported by the generally declining concentrations in the trailing edge monitoring wells.

Ms. Jennings asked if the RDX loaded into the model corresponds to areas where there were disposal pits. Mr. Goydas replied that it isn't necessarily always related to disposal pits, but also to other areas identified during site recon, for example, or to soil contamination associated with pre- and post-Blow-in-Place (BIP) locations. Ms. Jennings said that generally the theory seems to be that the disposal pits are the likely source areas, and it appears to her that the model could have been loaded in areas close to the disposal pits and probably result in the same shaped plume – which raises the question of whether the disposal pits are truly the source or if it's just the general areas that include disposal pits plus other leaking/cracked items.

Mr. Goydas said that undoubtedly there are areas of low-level diffuse concentrations. He also noted that as part of the RI an evaluation will be done of the contribution from non-point distribution of MEC items and the associated contamination versus the additive contribution of burial/burn pits, in order to ensure that plumes like J-1 didn't develop from non-significant soil contamination, i.e., scattered items. Mr. Goydas then said that it's extremely unlikely that scattered items could have created the plume, which is not to say that they could not contribute to groundwater.

Mr. Goydas then talked about relic sources, noting demonstration of them at J-2 North and J-2 East where burn/burial pits containing RDX, but no perchlorate, have been seen upgradient of groundwater with both contaminants. He said that in these instances it's believed that the perchlorate has winnowed out through the vadose zone and entered the groundwater. He also said that there are examples like this at J-1 North. Mr. Goydas then stated that some other burn/burial pits where soil contamination wasn't necessarily found were evaluated for their potential contribution. He showed figures for RDX and perchlorate titled "Burn/Burial Pit Tracks and Soil Source Area Plume Transport" and explained that the outlines reflect the transport model of source release. He also pointed out the groundwater flow line particle tracks, which reflect the movement of groundwater in the aquifer, and are superimposed over the transport model. He noted that the particle tracks "basically flow right down the core of the plume," which suggests that those burn/burial pits cannot be ruled out as potential past source areas.

Mr. Goydas then reviewed the slide pertaining to soil source loading observations, which listed the following statements: plume calibration simulations suggest minor ongoing source loading (groundwater data support this finding); soil contaminant footprint results in fair match with

observed plume (model can't confirm source conceptual model – sources too small and heterogeneous); particle tracks from burn pits indicate potential contribution to plume evolution (no way to quantify historic significance); contaminated soil mass is not sufficient to maintain the plume: and pits/burials/wastewater discharge represent relic sources of the plume.

Mr. Goydas then stated that the program is moving into the real "nuts and bolts" of the RI evaluation, and one of the pieces of that will be density/mass loading of MEC, which relates to Mr. Walsh-Rogalski's question regarding distribution of MEC and its likely contribution to groundwater contamination. He also said that this, along with the remaining soil contamination, will be evaluated to determine potential future impacts on groundwater. Mr. Goydas then completed his presentation by reviewing the slide listing upcoming tasks to be undertaken: assess leaching potential of existing soil contamination; predict mass density from MEC items and evaluate potential impact on groundwater; conduct risk assessment to assess site conditions; identify potential data gaps based on available data (e.g. review of aerial photographs): and assess aerial photographs from 1943, 1955, 1966, 1986, and 1991.

Mr. Schlesinger remarked that the timing doesn't make sense to him, referred to a map that was distributed with the monthly progress report, pointed out some red dots representing wells, and said that it couldn't have taken 34 years for contamination to have reached that area. Mr. Goydas agreed, and explained that Mr. Schlesinger was referring to wells directly below the source, and added that the farther downgradient the location, the longer it takes for the plume to migrate there. Mr. Schlesinger said that he doesn't understand how the source material that created the validated detections in those wells could be gone. Mr. Goydas replied that migration through the vadose zone is a key concept in that it's like a parabolic curve – he explained that it takes a couple years for the contaminant to arrive at the water table, a couple more years for the maximum concentrations to arrive, and many more years of continued contaminant mass loading, "but the bulk of the contaminants are ready to migrate at the water table." He added that this is why there's at least a 10-year window between the release to the ground surface and when contamination is likely to be seen in the groundwater. Mr. Schlesinger asked if Mr. Goydas is saying that the sources for the contamination in those three wells are at least ten years old. Mr. Goydas replied, "no, not necessarily," and clarified that the first arrival might be as young as two years, but the last might be 10 to 14. He also made a point of noting that the highest concentrations are thousands of feet downgradient of the source area, but added that long-term monitoring is really the only way to determine whether what's being seen in the trailing edge wells is really the trailing edge or just a different source – by continuing to collect data over time it can be verified that trends are declining and the source is dissipated.

Mr. Schlesinger inquired about the age of the burn pits. Mr. Goydas replied that the available lines of evidence suggest that some activities that contributed to groundwater probably occurred about 35 years ago. However, the trailing edge indicates that activities that may have contributed to a source of groundwater contamination might have occurred as recently as 10 years ago or less. He added that it seems there's still a small amount of contamination in the vadose zone that's presumably migrating to the water table. Mr. Schlesinger said that he now understands that Mr. Goydas is saying that the remaining contamination that's contributing to the groundwater is below the nondetects in soil but still above the water table. Mr. Goydas confirmed that that's correct.

Mr. Cambareri noted that he's been part of the IART since the team was established and has occasionally witnessed aggressive questioning, but thinks that the questioning sometimes needs to be aggressive and has helped get to the underpinning of some major differences of opinion, which has allowed for moving forward. Therefore he thinks that a law-like atmosphere is okay, but finds that "locker room catcalls from the audience" denigrate the formality of the IART, and he considers such actions to be inappropriate and offensive as be believes that the team "has done a

good job policing itself for its entire existence." Mr. McDonagh said that he'd like to respond to Mr. Cambareri's remarks, but Mr. Murphy told him to wait until others had asked their questions.

Mr. Cambareri said that he thought the presentation was very good and he's appreciative of the conceptual work that was done and the tools used to illustrate it. He also said that it seems that the IAGWSP is saying that the disposal pits are a major piece of the source material, but there could have been other little pieces as well. Mr. Cambareri then noted that he would describe it as an "intermittent, but chronic" source. He also asked how the contaminant mass currently in the soil compares with the mass within the plume.

Mr. Goydas referred to Mr. Cambareri's comment about localized pinpoint sources versus perhaps a larger, more chronic source, and assured him that not any one particular line of evidence (groundwater data) is being used. Rather, all available lines of evidence are being taken into account (site recon, geophysical information, and the like) to reach the conclusion that it's probably not a chronic source. He then explained that this is based primarily on mass distribution and the amount of mass that's downgradient of the source areas, and intuitively knowing that sources deplete with time as they move on. Mr. Goydas further noted that he doesn't think the sources are chronic because of the generally declining concentrations seen in the trailing edge wells, which are significantly lower than those seen in the core of the plume and also generally declining. He added that "while there may be this dull roar of low-level inputs" from other potential sources, they're relatively on the decline – otherwise the groundwater data would be "all over" and higher concentrations would be detected. With respect to comparing mass, Mr. Goydas stated that generally the mass seen from the source loadings is less than one-tenth of what's in the plume shell. And had that amount been greater, the plume shown in the last animation would have grown and migrated downgradient.

Mr. Murphy told Mr. McDonagh that he could speak after everyone at the table had asked their questions; however, those at the table in line to speak deferred to Mr. McDonagh. Mr. McDonagh said that he thinks Mr. Cambareri's comment "goes to the heart" of the long struggle that's gone on in terms of how to handle the question of having the IAGWSP's attorney (himself) at the table, where the U.S. Environmental Protection Agency (EPA) has a very aggressive, experienced, and competent attorney, Mr. Walsh-Rogalski, for whom he has the greatest respect. Mr. McDonagh noted that this puts the IAGWSP in a very difficult position, but for the most part he's kept quiet over the past couple of years. However, if EPA chooses to have enforcement counsel at the table and then lets that counsel ask leading questions, particularly without allowing the presenter to answer, he feels he has no choice but to raise that as an issue and request that the presenter be allowed to speak. Mr. McDonagh further stated that alternate ways to handle this situation are: to have two lawyers at the table, which would allow him the opportunity to cross-examine those speaking on behalf of EPA; or to stop the leading questions and simply ask the kind of open-ended questions that get at the truth without trying to depose the presenter, who is attempting to "illuminate the rest of the folks," and should be allowed to say what needs to be said in a way that person needs to say it. Mr. McDonagh then closed by saying that as long as those speaking on behalf of the IAGWSP continue to be cross-examined, he will continue to speak up from the audience unless he's told by "somebody higher up than anybody" at the meeting to stop doing so.

Mr. Cambareri said that he has "some trouble" with Mr. McDonagh's response to his comments.

Mr. Murphy said that if the Army decides that Mr. McDonagh should be at the table he thinks that's "certainly an appropriate thing." He also said that for years IART meetings have been open to "different people with different styles of asking questions" and there have been "different presenters with different ways of addressing the questions." Mr. Murphy added that he thinks this calls for patience, he doesn't think someone's disagreeing with a questioning style makes it

invalid, and he believes that there's been ongoing effort to accommodate everyone's style, which should continue.

Mr. Lantery noted that many individuals at the table and at the meeting are paid to be there, but he is a volunteer, who participates in order to be informed. He said that he senses "hostility and aggression underlying the presentations, doesn't appreciate it, and will stop coming to IART meetings if it continues. Mr. Lantery added that he doesn't come to IART meeting to "get upset" and he recommended that everyone at the table leave their "animosity and hostilities at the door" if they want volunteer participation to continue.

Mr. Walsh-Rogalski said that he wanted to apologize to Mr. Gangopadhyay "if it was offensive" and added, "It wasn't meant to be personal at all."

Ms. Grillo remarked that she found it "a little disappointing" and "very distracting" to have someone from the audience insist on being heard first, before the people at the table. She also said that like Mr. Dow, who always patiently waits for his turn to speak, Mr. McDonagh should have done the same, because he does "speak out a lot," which isn't very helpful and tonight's meeting is now "way off track."

Mr. Schlesinger said that he considers "heated moments" such as these (which used to occur far more often) to be "key" in that he, as a citizen, learns from them, and so he looks forward to more of them.

Mr. McDonagh explained to Ms. Grillo that allowing someone to pursue a line of questioning without interruption, and waiting until later to respond, is "entirely meaningless" as the damage has already been done at that point. He also said that he's "quite happy to hold all his questions until the end" if he's allowed to use whatever courtroom techniques he wants and cross-examine individuals for as long as he likes, as Mr. Walsh-Rogalski was allowed to do. He further noted, however, that he doesn't think that's what anyone wants, and personally feels that it would be better if there were no lawyers in the room. But since that is not the case, until "there's an equal playing field" he will continue to respond, because the regulators are not facing what the IAGWSP is facing. Mr. Murphy said that no one is asking Mr. McDonagh not to respond, only to wait his turn to speak into the audience microphone. He also said that it would be fine if the Army wants him to sit at the table. Mr. McDonagh recommended just discontinuing the leading questions.

Mr. Cambareri remarked that in some cases he thinks the questioning needs to be aggressive in this forum. He also said that when the IART first started meeting there were a number of Department of Defense (DoD) lawyers at the table "and you wouldn't believe the line of questions that was going on back then." Mr. Cambareri also referred to Mr. McDonagh's "threat of continuing to disrupt the meetings" and said he's not certain that's something he can live with.

Mr. Murphy spoke of moving on to technical questions and called on Ms. Jennings to speak. Ms. Jennings said that with respect to the conceptual model she's heard the IAGWSP say many times that the disposal pits are the suspected source areas, and those that are going to be remediated. Also, that the many other areas where UXO are present are not considered a continuous source and therefore don't need to be addressed as a future source. Ms. Jennings stated that at some point the program is going to have to wrestle with the issue of what to do with all the remaining UXO on the base. She also referred to the central area of the J-1 Range in particular, and said that while there appears to have been a significant source from the disposal pits related to a "very intense part of the plume that's migrated away," a portion of the plume remains connected to that area. And although concentrations might be decreasing because the activities have ceased, she's not convinced that the "stuff that's still left behind" is not a continuous source. She noted that

complete plume separation has not occurred and she believes that this should be considered when drafting the RI.

Mr. Goydas said that it's absolutely correct that there could be other sources there, and reminded the group that the MEC density piece will be part of the RI. He said that a rigorous assessment is being done of the type of rounds, the distribution, and density, and potential mass flux.

Mr. Conron asked if it's possible to determine the amount of explosives that were used to result in the perchlorate and RDX contamination that's in the plumes. Mr. Goydas replied that that piece of the puzzle has been worked (to try to evaluate the likely magnitude of mass loading that created the plume) and that information will be used when looking at the mass that remains "and how those might relate." Mr. Conron asked if the amount of explosives used on the range over a certain number of years can actually be calculated. Mr. Goydas replied "well, that's more a jump," but what can be figured is the likely mass that was released to the ground surface, because as was noted earlier in the presentation, the vast majority of items were inert and in most cases the rounds were not cracked or leaking. Mr. Conron said that he's still having difficulty relating what happened on the ground to the size of the plume. Mr. Goydas replied that, for example, the study looked at how many 105mm items in a particular area would be necessary to release enough mass to create a groundwater plume – however, what's more difficult is relating the mass in groundwater to the total cumulative use, as many of the rounds were inert, which creates a whole other level of uncertainty. He added that the IAGWSP is "really trying to look at the munitions mass loading."

Mr. Gregson reminded the group that the J-1 Range is one of the more complicated areas in terms of understanding the source history, given the different types of activities that happened, and the various features there, including the IBA, an area where burning and testing of munitions were reported to have occurred, a location where a buried Sherman tank was found, the popper kettle that was used for munitions disposal, a trench area where buried paint cans were found, and so forth. He said that everyone is trying to understand what's at the J-1 Range and any potential future problems for that area, and added that going through the RI report will include looking at all of the possible sources there, and then focusing on whether there's anything left that needs to be cleaned up, or just something that needs to be monitored.

Mr. Dow asked if there's been any effort to examine the distribution of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and heavy metals found in soil and in the plume in order to compare them to the distribution of RDX and perchlorate. Mr. Goydas replied that this is part of the analysis; however, it hasn't shown a "great one-for-one match." He also noted that there are relatively few SVOCs and VOCs detected in both soil and groundwater, and where they have been detected, they weren't necessarily spatially biased. Rather, it's the perchlorate and RDX, and to a lesser degree the HMX, that really drive the understanding of the plume evolution. Mr. Dow explained that he was suggesting using those compounds as tracers to differentiate between point and non-point source areas. Mr. Goydas replied that along those lines, the IAGWSP has looked at ancillary explosive types, such as DNT, to try to see if a pattern exists. However, to date that exercise hasn't really provided any major insights in terms of the evolution of the plume or discriminating between sources. He also noted that the ratio of one contaminant to the other, as well as any other ancillary contaminants that might be mixed in, is also considered.

Mr. Dow then mentioned age dating of water molecules as a way to correlate the time of transport. Mr. Goydas said that the U.S. Geological Survey (USGS) has done a fair amount of that type of work both in the Impact Area and to the south, the results of which have been applied as secondary calibration targets for the groundwater flow model.

Mr. Dow then inquired about the level of uncertainty associated with predictions pertaining to contaminant travel through the vadose zone. Mr. Goydas replied that in short, predictions pertaining to the vadose zone are less certain that those pertaining to the saturated zone. He said that this is because of the number of inputs and kinetics that drive the solution of contaminant on the surface, and because there are very few calibration targets. Mr. Dow said that this would have been his assumption, and added that it seems that the sandy soil, acid rain, and pine trees and the like that produce humic substances would influence the rate at which contaminant travels from surface sediments to the saturated zone. Mr. Goydas agreed that soil pH is a consideration, and also noted that the bigger uncertainty lies with transport from MEC items. He noted that there's an entire continuum from bare exposal on the ground surface to a fully intact shell, and "in terms of mass loading and mass flux because of the timing issue." He also said that it could be a matter of decades to hundreds of years with regard to the dissolution and perforation of fully intact shells. Mr. Dow suggested that it would useful to know the percent of MEC items that are still intact. Mr. Goydas replied that, as Mr. Gangopadhyay had mentioned, that type of information is being tracked. Mr. Dow said that it seems that most of the items being tracked are those that are concentrated in disposal pits, whereas the more intact MEC items are perhaps more widely distributed, and could be a continuous source over a long period of time. He also remarked that he'd rather remove that contamination now and clean up the plume more quickly.

Mr. Schlesinger asked for clarification as to whether an inert round is one that doesn't contain explosives now or one that never contained explosives. Mr. Gangopadhyay replied that an inert round is one that did not contain explosive filler at any point of time, although the fuze itself would have. Mr. Schlesinger asked if the amount of explosive in the fuzes could have caused the groundwater contamination. Mr. Gangopadhyay replied that while fuzes can be "very strong," they contained grains of explosive as opposed to grams of explosive filler in a regular MEC round. He also noted that the MEC density component will look at everything from completely cracked-open items exposed to the ground all the way to sealed items that could take hundreds of years to break down, and try to predict the kind of impact it would have on groundwater over time.

Mr. Schlesinger also asked about the effect on the plume due to its location near the top of the groundwater mound. Mr. Goydas replied that the effect on the J-1 and J-2 Range plumes, and to a lesser extent, the J-3 Range plume, is splaying in both the horizontal and the vertical; whereas the same releases farther away from the top of the mound would produce narrower plumes. Mr. Schlesinger surmised that it won't ever be possible then to pinpoint a source for the J-1 plume. Mr. Goydas replied that the idea is to look at all the lines of evidence (past investigations, site walks, record reviews, witness interviews, and so forth) and through the RI process "go where we think that there's an issue." He also noted that it's possible that data gaps will be identified through the RI process, and added that the current effort is to try to come to consensus that it's appropriate to move to analysis of the data and present it in a report.

Mr. Pinaud commented that tonight's presentation was a very good summary of a years' worth of soil and groundwater investigation. He also said that it's important to note that the conceptual site models for both soil and groundwater are evolving and iterative, and everyone is eager to see the process move toward the RI and possibly toward feasibility studies for soil and groundwater.

Agenda Item #4. J-3 Range Groundwater Feasibility Study Results

Mr. Gregson reminded the group that the J-3 Range is a test range that was last used by Textron, and where a Rapid Response Action (RRA) groundwater treatment system consisting of three extraction wells has been operating since September 2006, and an RRA source area removal was previously conducted. Mr. Gregson also noted that the IAGWSP and EPA are currently in the process of working through EPA's comment on the J-3 Soil RI Report, which unfortunately the

agency had disapproved. And while going through the comment resolution process, there will be a focus on trying to understand if most of the source area of the plume has been removed or if there's an ongoing source that needs to be addressed in the future.

Mr. Gregson then stated that the J-3 Range Groundwater FS is looking at a number of alternatives in order to determine a final remedy for the plume, which would be monitored into the future and modified if needed. He also noted that tonight Mr. Goydas would present the various FS alternatives, that the J-3 Range Groundwater RI/FS Report has been submitted, and that the next step will be to draft a remedy selection plan, which will later be presented to the IART.

Mr. Goydas noted that an FS is essentially a comparative analysis of different conceptual approaches to addressing a problem. He then showed a slide listing the Remedial Action Objectives (RAOs) for J-3 Range groundwater: restore the useable groundwater to its beneficial uses within a reasonable timeframe; prevent or reduce potential residential exposure to J-3 Range groundwater with perchlorate concentrations greater than the Massachusetts maximum contaminant level (MMCL) of 2 ppb; prevent or reduce residential exposure to J-3 Range study area groundwater with RDX concentrations greater than the lifetime health advisory (HA) of 2 ppb; and prevent potential ingestion, inhalation, and dermal contact with groundwater containing contaminants of concern (COCs) in excess of federal maximum contaminant levels (MCLs), HAs, Drinking Water Equivalent Levels (DWELs), applicable state standards, and/or an unacceptable excess lifetime cancer risk or non-cancer hazard index.

Mr. Goydas then reviewed the J-3 Range groundwater FS alternatives: Alternative 1, no action; Alternative 2, long-term monitoring; Alternative 3, status quo, which is continued operation of the current RRA system (three extraction wells, 175 gallons per minute [gpm]); Alternative 4, status quo plus additional pumping (three extraction wells, 215 gpm); Alternative 5, status quo plus an additional downgradient extraction well (four extraction wells, 235 gpm); Alternative 6, status quo plus an additional in-plume extraction well (four extraction wells, 240 gpm); and Alternative 7, status quo plus an additional in-plume extraction well and additional pumping (four extraction wells, 445 gpm).

Mr. Goydas noted that with the exception of Alternative 1, all the alternatives include the implementation of institutional controls (ICs), and with the exception of Alternatives 1 and 2, all of them utilize the current RRA system. The most aggressive alternative is Alternative 7, which would require the installation of a new treatment facility to handle the additional flow. Mr. Goydas then showed a series of model animations to illustrate predicted performance of the various alternatives, and noted that all of them simulate the performance of the nearby Fuel Spill 12 (FS-12) plume treatment system that the Air Force Center for Environmental Excellence (AFCEE) installed several years ago to address that plume, and is anticipated to operate until about 2030. He noted that the plume (which consists of RDX and perchlorate) is approximately 4,000 feet long and 1,250 feet wide, with the highest concentration being perchlorate at about 770 ppb.

Mr. Goydas ran the animation for Alternatives 1 and 2 for perchlorate and pointed out that: the plume evolves and grows in volume; there's some discharge to Snake Pond; there's some attenuation and stagnation beneath the pond; there's some capture by the FS-12 system; and the perchlorate contamination at the bottom of the aquifer tends to become entrained in some low-conductivity deposits there, and takes a long time to remediate. Mr. Gregson made a point of noting that the cross-section view in the animation shows where the plume discharges into Snake Pond. Mr. Conron asked if it's correct that it would take about 100 years for the plume to attenuate naturally, and Mr. Goydas confirmed that it is. He then ran the same animation, but for RDX, which he noted attenuates more quickly, and therefore doesn't drive the aquifer restoration

timeframe. He also pointed out that the RDX is shallower and migrates above the low-conductivity units, and said that the remaining animations he shows will be for perchlorate only.

Mr. Goydas then showed the animation for Alternative 3 and noted that the easternmost extraction well was installed by AFCEE for the FS-12 plume, but never used for that purpose. He also pointed out that the shallower portion of the plume remediates more quickly than the deeper portion. He also showed the animation for Alternative 4 and noted that the northern extraction well does a better job of cutting off the plume, without the small amount of bleeding to the westernmost well, as seen with Alternative 3, and added that the restoration timeframe for this alternative is shorter.

Mr. Goydas showed the Alternative 5 animation, with downgradient extraction, and said that the estimated startup date for this system would be 2009. He noted that upgradient system performance is identical to that of Alternative 3, that Alternative 5 is designed to capture the mass downgradient of wells 90EW0001 and J3EW0032, and that a small amount of mass would already have reached the area beneath the pond by 2009, but only about 0.6 kilograms (kg). Mr. Goydas then showed the Alternative 6 animation, with additional in-plume extraction located in what's understood to be the area of highest mass. He also noted that the flow in the eastern well (90EW001) would be reduced from 50 gpm to 30 gpm, as the simulations indicate that it becomes very ineffective after a few years of operation. Mr. Goydas again mentioned an improved aquifer restoration timeframe and said that in general the greater number of wells, the more pumping, and the more extensive the capital costs, the greater the reduction in cleanup time.

Finally, Mr. Goydas showed the Alternative 7 animation and noted that the well layout is the same as Alternative 6, but with increased flow rates, and because of that this option includes a new treatment plant, and again results in improved restoration timeframe. He also mentioned that Alternatives 3 through 7 all utilize AFCEE's FS-12 reinjection wellfield.

Mr. Goydas also displayed a summary table that showed the following for each of the alternatives: total flow rate, estimated year when cleanup is achieved (inside and outside the base boundary), mass removed during anticipated system operation (perchlorate and RDX), and mass discharged to Snake Pond (perchlorate and RDX). He pointed out that the restoration timeframes improve with the more aggressive alternatives, but also noted that this factor has to be weighed along with other issues, such as construction impacts and cost. He also reported that Alternatives 1 and 2 capture about 2.5 kg of the approximately 18 kg of perchlorate mass in the plume, whereas Alternatives 3 through 8 capture 16.9 to 17.3 kg of perchlorate and 2.7 to 2.8 kg of the approximately 3 kg of RDX mass. Mr. Goydas then mentioned again that about 0.6 kg would go uncaptured under the leading edge alternative (Alternative 5). Mr. Schlesinger questioned the wisdom of spending "extra millions" to capture such a small amount of mass.

Mr. Goydas then showed a line graph depicting perchlorate mass capture for each of the alternatives and noted that the most aggressive alternative has the steepest curve, and that Alternatives 3 through 7 capture the same general amount of mass, but vary in terms of how quickly they reach that "asymptotic flat-line."

Mr. Goydas showed a summary table entitled "J-3 Alternatives Performance Perchlorate" which included the following: flow rate, restoration year (when 2 ppb is achieved), mass removed in kg, year all extraction well concentrations are below the method detection limit (MDL), percent of volume remaining at 2022, and the area in acres impacted at 2022. He explained that the year when the wells reach below the MDL is important because it pertains to when the wells might actually be shut off. He also explained that the year 2022 was chosen because that's the cleanup timeframe associated with the most aggressive alternative, Alternative 7. Mr. Goydas also noted that the volume remaining at 2022 for Alternatives 1 and 2 is 159% because the plume would continue to grow if left unabated and would impact a greater volume of the aquifer. He also

reviewed the percent of volume remaining at 2022 for the other alternatives (Alternative 3 – 19%; Alternative 4 – 5%; Alternative 5 – 19%; Alternative 6 – 1%; and Alternative 7 – 0%), and the area in acres impacted at 2022 for each alternative (Alternatives 1 and 2 – 80 acres; Alternative 3 – 13 acres; Alternative 4 – 3 acres; Alternative 5 – 12 acres; Alternative 6 – 0.5 acres; and Alternative 7 – 0 acres). Mr. Schlesinger asked if the 80 acres refers to the land area under which there would still be a plume. Mr. Goydas confirmed that it does, and relates to ICs, the ability to site wells, and the like. Mr. Minior asked if the concentrations beneath the land would be 2 ppb. Mr. Goydas replied that concentrations would be above 2 ppb.

Mr. Goydas then displayed a table showing timeframes associated with perchlorate plume volume reduction percentages for each alternative, and noted that 99% of the mass is predicted to be reduced under Alternative 4 by 2022, and it would take another 20 years of pumping to remove that last 1% (which is located in low-conductivity silts, and probably wouldn't be used for water supply in the future). He also noted that 99% reduction is predicted to be reached in 2035 for Alternative 3, in 2033 for Alternative 5, and in 2019 for Alternatives 6 and 7.

Mr. Schlesinger asked if the IAGWSP had looked at alternatives that reach 75% plume volume reduction and allow the remaining volume to attenuate naturally. Mr. Goydas replied that it had not; however, that is something that would be evaluated when deciding when the wells should be shut off, but is thought of as the time when it's no longer feasible to continue pumping rather than as natural attenuation.

Mr. Goydas continued with his presentation by showing plan views of each modeled alternative at 2022. He pointed out the plume footprints that would remain at that time under each alternative and noted that no footprint is shown for Alternative 7, as 2022 is the first year that the model predicts the plume would reach below the MMCL. He also showed a summary slide entitled "J-3 Alternatives Performance RDX" and noted that RDX remediates more quickly than the perchlorate, except in the case of Alternative 7, due to the fact that the wells can't be optimally placed for both perchlorate and RDX, and so are optimally placed for perchlorate capture. He also said that at 2022 none of the active scenarios would have any remaining RDX contamination above 2 ppb.

Mr. Goydas then showed a slide comparing the alternatives against the criteria of short-term effectiveness, implementability, and cost. He noted that all of the alternatives would ultimately reach the perchlorate MMCL, although far out into the future for the no-action alternatives. He also said that there are moderate construction impacts associated with Alternatives 5 and 6, which involve installing additional extraction wells, and significant construction impacts associated with Alternative 7, which involves building a new treatment plant. Mr. Goydas noted that there are minor implementability issues associated with Alternative 2, as it involves gaining access to monitoring wells for sampling. For Alternatives 3 and 4 the process and procedures are already in to place to allow the status quo system to continue to operate. Alternative 5 implementability issues pertain to new construction in a residential area, Alternative 6 implementability issues pertain to on-base construction, and Alternative 7 implementability issues pertain to construction of a new treatment plant and, because of the increased flow rate, would very likely create drawdown on the J-3 Wetland that exceeds ecological thresholds set during a series of meetings held in 1996. Mr. Goydas also discussed the cost associated with each alternative, noting that they range from zero to 36 cents per square foot, or zero to $7.6 million total cost.

Mr. Mullennix asked if the costs shown include expenditures to date. Mr. Goydas replied that they do not. Ms. Jennings asked if it's correct then that to continue with Alternative 3 would cost an additional $5 million, apart from what was spent to build the RRA system. Mr. Goydas confirmed that that's correct.

Mr. Schlesinger inquired about any drinking water wells that could be affected if Alternative 2 were the selected remedy. Mr. Goydas mentioned the Weeks Pond well, which is south of Snake Pond and hasn't been operational for some time, and said that while it's unlikely that the plume would ever reach that well, it's not absolutely outside the realm of possibility. Mr. Schlesinger then asked about any concern pertaining to ecological or human health risk from the plume discharging into Snake Pond. Mr. Goydas replied that current data indicate no risk to the pond. He also said that it's very unlikely that if the plume were allowed to migrate and attenuate it would result in measurable concentrations in the pond, but monitoring would certainly have to be conducted to demonstrate that. Mr. Schlesinger said that he thinks it's important to question the appropriateness of spending millions of dollars to remediate the plume if it's not affecting public water supply or ecological receptors.

Mr. Mullennix agreed with Mr. Schlesinger's remark. He then thanked Mr. Goydas for an excellent presentation and said that right now he would go on record as saying that Alternative 4 is an attractive option because it does remediate to the perchlorate MMCL in a relatively brief period of time, the system is already in place, and the cost is the most modest of the active system alternatives.

Mr. Dow asked if the implementation of Alternative 5, which includes downgradient extraction, would affect the amount of plume discharge into Snake Pond if the pumping rate were increased. Mr. Goydas explained that because the aquifer is so prolific and the groundwater moves so rapidly it would be almost impossible to pull back contamination, and would require such aggressive pumping that it would be infeasible to do so.

Mr. Dow then asked Mr. Goydas to explain the discrepancy between the 6-to-1 ratio pertaining to the amount of perchlorate to RDX extracted versus the 2-to-1 ratio pertaining to the amount of perchlorate to RDX discharged into Snake Pond. Mr. Goydas explained that, as he mentioned earlier, the contaminants are at different spaces in the aquifer and not every well placement can be optimized for both contaminants. He also said that the focus is on perchlorate because it drives the restoration timeframe. To optimize for RDX would mean relocating the well and having thinner screens higher in the aquifer.

Mr. Dow referred to the concern about drawdown of the J-3 Wetland associated with Alternative 7 and asked whether the natural variation in water levels exceeds the drawdown criteria and ecological thresholds. Mr. Goydas replied that while that's often the case, it's not necessarily true of perched vernal pools. Mr. Dow asked if the J-3 Wetland is a perched vernal pool and Mr. Goydas replied, "It's so close that basically we've assumed that it's connected."

Mr. Pinaud asked what would happen in terms of discharge to Snake Pond if a downgradient well were installed earlier than 2009. Mr. Goydas replied that doing so would mean the difference between capturing approximately 0.45 kg and 0.3 kg – 0.15 kg.

Agenda Item #5. Massachusetts National Guard Small Arms Ranges Update

Because the meeting was running late, Mr. Murphy and the team decided to forego the Remediation & Investigation Update and asked COL FitzPatrick to provide an abbreviated version of the Small Arms Ranges Update.

COL FitzPatrick referred to the Massachusetts Environmental Policy Act (MEPA) process portion of the Massachusetts National Guard (the Mass Guard) effort to return to firing lead at the Small Arms Ranges (SAR) at MMR and reported that on November 9, 2006 the Secretary rendered her decision, which was to allow the Mass Guard to continue to pursue the use of lead to improve training, but to do so with some management techniques. The Secretary's decision also identified the Environmental Management Commission (EMC) and the SAR Working Group as the bodies from whom the Mass Guard must obtain permission to return to using lead

ammunition. COL FitzPatrick also noted that the SAR Working Group is made up of individuals from EPA, the Massachusetts Department of Environmental Protection (MassDEP), the EMC, the U. S. Army Environmental Command (AEC), and the Mass Guard. He also noted that the focus of the immediate effort is to return to using lead (with pistols, rifles, and machineguns) in late spring/early summer of 2007, beginning with Echo and Tango Ranges.

Ms. Jennings noted that some community involvement products pertaining to this issue are in the process of being developed and are expected to be distributed very soon. She also said that a full discussion about this topic will take place at the January IART meeting. COL FitzPatrick added that on February 28, 2007 the Mass Guard will host an open public forum about using lead for improved training, which will be chaired by MassDEP, EPA, and the EMC.

Mr. Dow asked if a comparable approval process relating to EPA's administrative order (AO) would be pursued, and if so, whether it would occur separately from the effort COL FitzPatrick discussed. Ms. Jennings clarified that the EPA piece is part of the entire process and much of it is occurring simultaneously. She also noted that the February meeting is intended to help fulfill public input responsibilities in amending the AO.

Agenda Item #6. Open Discussion

Mr. Gregson noted that at tonight's meeting IART members were provided with a tentative schedule for developing an IAGWSP plume booklet and fact sheet. He said that initial IART and regulator comments on these documents are due by January 9, 2007, to be submitted to Ms. Curley, who then distributed draft copies to the team. He also said that after revisions are made, final regulator copy review will occur in mid January, additional revisions will be made, and a discussion of the documents will be included on the January IART meeting agenda.

Ms. Curley noted that the draft documents being provided this evening are very preliminary in nature, and include a plume booklet, which contains more technical information, and a fact sheet, which provides a general overview of the cleanup program.

Mr. Minior asked if the team would have an opportunity to review and comment on the maps and figures that will be ultimately included in the documents. Ms. Curley replied that these items will be sent out to IART members as soon as they are available.

Agenda Item #7. Adjourn

Mr. Murphy noted that the IART would meet next on January 23, 2007 at the Bourne Best Western. He then adjourned the meeting at 9:04 p.m.

Potential Future Agenda Topics*:*

January 23, 2007:

- J-1 Range South Groundwater Rapid Response Action
- Gun & Mortar Positions Investigation Workplan & Groundwater Monitoring Plan

February 27, 2007:

- J-2 Range Groundwater Feasibility Study

Agenda Topics TBD:

- Wellhead Treatment vs. Aquifer Restoration
- Phase IIB Investigation

Handouts Distributed at the Meeting:

1. Responses to Action Items from the October 24, 2006 IART Meeting
2. Presentation handout: J-1 Range Data Assessment
3. Presentation handout: J-3 Rang Groundwater Feasibility Study Results
4. Tentative Schedule for Plume Book/Overview & Update
5. Presentation handout: Remediation & Investigation Update
6. Presentation handout: Massachusetts National Guard Small Arms Range Update
7. UXO Discoveries/Dispositions Since Last IART (Ending 11/30/06) All Awaiting CDC
8. News Releases, Neighborhood Notices, and Media Coverage 10/24/-6 – 12/1/06
9. Map Legends