

North Pole Refinery Technical Project Team
March 7, 2011
DHSS Anchorage Offices – 3rd Floor Conference Room
Anchorage, AK
Summary Comments

Technical Project Team Members in Attendance

Dr. Dave Barnes	UAF, Civil and Environmental Engineering, Department Chair
Cindy Christian	DEC, Drinking Water Compliance Manager (Via telecon)
Ann Farris	DEC, Contaminated Sites Program, Project Manager
Loren Garner	FHRA Groundwater Program, Project Manager
Nim Ha	DHSS, Acting Program Manager,
Elizabeth Page	Koch Remediation Services

Support Personnel in attendance

Rebecca Andresen	Arcadis
Brian Angerman	Barr Engineering (via telecon)
Dr. Mary Beth	UAF, Assistant Professor (via telecon)
Steve Bainbridge	DEC Contaminated Sites Program, Director
Stephanie Buss	SPB Consulting, Toxicologist
Todd Dejournett	Barr Engineering (via telecon)
Denise Elston	DEC, SPR-Contaminated Sites, Program Specialist (via telecon)
Jim Fish	DEC, SPR-Contaminated Sites, Program Specialist (via telecon)
JoAnn Grady	Grady and Associates, Team Facilitator
Ty Keltner	DEC, Commissioner's Office, Information Officer (via telecon)
Kimberly Lake	Johnson and Wright (via telecon)
Mark Lockwood	Shannon & Wilson (via telecon)
Andrew Ohrt	Barr Engineering (via telecon)
Shannon Price	FHRA
Phil Roberts	Williams (via telecon)
Gary Remple	Barr Engineering (via telecon)
Max Schwenne	OASIS Environmental
Jeanne Swartz	DEC, Spill Prevention and Response Program
Eric Zentner	Boreal Communications Strategies

INTRODUCTIONS AND ACTION ITEM REVIEW

The meeting began at 9:00 AM Alaska time as team members introduced themselves and reviewed the action items from the previous meeting. The team discussed the first action item. Ms. Elston said that she was still looking for an opportunity to schedule a meeting with Mr. Jones to discuss the

development of the new project data base. The team agreed that all other action items from the previous meeting had been completed. The team reviewed and approved the agenda of the meeting.

NOMINATION OF SULFOLANE TO THE NATIONAL TOXICOLOGY PROGRAM

Dr. Lori Haws presented her impressions of the meeting held by the board of scientific counselors of the National Toxicology Board (NTP) which was held December 15th, 2012, in which they considered various research proposals on performing additional toxicological research on sulfolane. The board recommended that the NTP proceed with the initial phases of the research by designing the protocol for the preliminary studies. Dr. Haws explained that the NTP typically performs a series of short-term studies to determine the toxicological endpoint and dosing levels for a given substance before they proceed with the long-term chronic biological assays.

The team discussed the timeframe for the NTP research project. Ms. Farris commented that she is often asked what the final cleanup level for sulfolane will be and how it will be established. She said that the question is largely dependent on whether new research will be conducted on the toxicity of sulfolane and, if so, it will depend on the timeline of the research involved. Ms. Farris remarked that the Alaska Department of Environmental Conservation (ADEC) and Flint Hills Resources Alaska (FHRA) would greatly appreciate any updates on the timeline of the research and any developments that would make them more confident in an assessment of that timeline. Ms. Grady added that this would also likely be appreciated by various members of the community.

ACTION ITEM: Ms. Buss will consult with Dr. Maston and Ms. Grady in order to determine how to best explain to the community the timeline of the preliminary studies that the NTP will conduct on sulfolane toxicity and the possible implications that NTP research may have for the project.

CHEMISTRY SUBGROUP

Ms. Buss updated the team on recent developments within the Chemistry subgroup. She said that she was notified by Ms. Michell that there were a few minor issues that should be discussed during the next subgroup meeting before the key elements document is finalized. Ms. Michell also mentioned that there were a few samples which were still awaiting validation due to contaminant interference. Ms. Buss said that the next meeting of the Chemistry subgroup would be devoted to discussions on soil validation, key criteria documents, the sampling of private wells, and the level 4 data packages

ACTION ITEM: Dr. Barnes will contact Shane Billings of the University of Alaska Fairbanks (UAF) and ask whether he would like to share any of his insights on project methodology with the members of the Chemistry subgroup.

PPRTV UPDATE

Ms. Buss provided a summary of the PPRTV that was released on January 31, 2012. The PPRTV is issued by the EPA. In EPA's hierarchy, it is a step below the IRIS values that are used at Superfund sites and it is often used by states for toxicology values. EPA provided a PPRTV for sulfolane for both chronic and sub-chronic oral ingestion. The reference doses are based on the Huntingdon Life Sciences study. EPA also

set a sub chronic inhalation value for sulfolane. EPA showed low confidence for the sub-chronic inhalation value, so a chronic inhalation value was not set. For our purposes, the oral chronic reference dose is the most important and can be used for an evaluating consumption of drinking water in a residential scenario.

The oral reference dose was derived from the Huntingdon Life Sciences study. Previously, this study was available but not peer reviewed. EPA had the study peer reviewed. EPA used no observable adverse effect levels (NOAELs) to derive a reference dose. As a comparison, ATSDR used a benchmark dose modeling approach to derive its oral reference dose. For the PPRTV, the reference dose is derived from the NOAEL, a concentration that the animals were dosed and showed no adverse effects. The calculated reference dose, the highest dose that showed no effects was divided by a series of uncertainty factors. The uncertainty factors for the sulfolane chronic reference dose are relatively high, with a cumulative uncertainty factor of 3000.

Dr. Barnes asked what is a typical uncertainty factor was. Ms. Buss indicated the uncertainty factors can range between 100 to 3000. When it goes above 3000, the confidence goes down. Dr. Barnes asked how the uncertainty factor was calculated. Ms. Buss indicated it is derived by multiplying all the individual uncertainty factor together to get the cumulative value. The uncertainty factors of sulfolane are standard EPA uncertainty factors.

Ms. Buss indicated there are criteria for setting the uncertainty factors

The uncertainties add protectiveness and the RfD is set by dividing the NOAEL by the uncertainty factors

Ann indicated that ATSDR's uncertainty factors could go higher than the 100, as were shown in 2010. The UFs went to 1000 in the 2011 draft of the health consultation.

ACTION ITEM: Stephanie will investigate how uncertainty factors were applied by The Canadian Council of Ministers, and ATSDR in their development of a reference dose on sulfolane.

Ms. Buss also highlighted that EPA identifies the confidence in the reference dose. For the sulfolane oral RfD, the confidence is set at a medium level based on the fact there is an acceptable developmental study but no two-generational study. The confidence in the Huntingdon study is from a GLP compliant lab and it was peer-reviewed. The overall confidence is medium.

Ms. Buss showed an update of a table that has been shown in a number of TPT meetings with the reference doses from a number of agencies and organizations. Ms. Buss stated that the PPRTV reference dose is 0.001 mg/kg/day; which is one-half of the ATSDR 2011 value of 0.002 mg/kg/day and that for reference doses these values are fairly close. The values from the Texas Commission on Environmental Quality and the Canadian Council of Ministers values were also shown.

Ms. Farris asked if there were differences in cleanup or action levels separate from the toxicology and the reference dose numbers. Ms. Buss indicated there are huge differences in calculating the criteria based on exposure assumptions. Mr. Roberts asked if the State had determined an acceptable exposure level. The State's hierarchy is to use IRIS data first and if that is not available then use PPRTV's.

Ms. Buss presented ground water concentration using reference doses and standard groundwater ingestion equations so the values could be compared. It was stressed that these values are not cleanup levels.

Dr. Barnes asked that with all the variation in uncertainty, if the state would use the most restrictive value. Ms. Buss indicated the general criteria that EPA and DEC provide is to pick the reference dose based on the hierarchy with IRIS first, then the PPRTV, then other assessments which includes ATSDR values.

Ms. Farris stated that for the State, the hierarchy is based on the level of confidence in the toxicology value for setting regulatory cleanup levels. Ms. Farris emphasized the distinction between the toxicology values and the cleanup criteria.

RECENT SITE CHARACTERIZATION EFFORTS

Mr. Schwenne, Mr. Garner, and Mr. Lockwood updated the team on the status of recent site characterization efforts. Mr. Schwenne briefly summarized the last seven meetings of the Site Characterization subgroup and the comment resolution meeting that was recently held in Boulder, Colorado on the development of the site model. The subgroup meetings have been mainly focused on identifying data gaps and addressing them with proposals to establish new monitoring wells and to equip new and proposed wells with pressure transducers. Mr. Schwenne remarked that the current version of the groundwater model will prove useful for identifying data gaps evaluating onsite remedial alternatives, and estimating remediation time frames. Ms. Farris clarified that while she agreed with Mr. Schwenne on most of those aspects, collection of additional site data will be necessary before the site model can be used to make detailed predictions of the movement of contamination in the site area. Ms. Farris clarified that while she agreed with Mr. Schwenne on most of those aspects, collection of additional site data will be necessary before the model can be used to make detailed predictions of the movement of contamination. She indicated the basic construct of the model (i.e. type of model, boundary conditions, area of concern and number of layers, etc.) is good, but additional refinement and field confirmation was necessary to determine its accuracy in predicting sulfolane concentrations.

PROPOSED MONITORING WELLS AND TRANSDUCERS

Mr. Garner and Mr. Lockwood gave an overview of the development of the transducer network within the monitoring wells system. Mr. Garner presented a slide of the site area and pointed out the locations of the 16 existing transducers as well as locations where an additional 42 transducers are to be installed during the upcoming field season. Dr. Barnes added that UAF intends to place a number of its own transducers at the project site, but it has not yet determined the locations where they will be installed.

Mr. Garner pointed out the locations where FHRA has proposed to install additional monitoring wells. He said that, basically, FHRA has proposed these wells in response to comments on the Site Characterization Report (SCR) which identify data gaps. Mr. Garner pointed out the locations where FHRA will establish well nests to monitor water level changes in the Tanana River and the Chena River as well as a shallower well located further inland to assess the possible dampening effect the aquifer has

on changes in the stage of the Tanana River. In order to define the bottom of the contamination in the onsite vertical transect, FHRA will add three 95-foot wells to accompany three of the existing 80-foot wells along the transect line. He pointed out the locations where new monitoring wells will be placed next to existing recovery wells to better document the capture zone. Mr. Garner identified the locations of monitoring wells that will be installed in the western portion of the plume to define the permafrost and the boundary of the plume in that area. He added that some of the new wells will be devoted to clarifying the relationship between ground water contamination and the contamination that was found in the soil samples.

The team discussed Mr. Garner's presentation on the proposed new monitoring wells and transducers. Ms. Farris said that she feels that, for the present time, the proposal to install the additional transducers and monitoring wells is a great start. She added that while the department has approved the proposal, it may require the placement of additional monitoring wells and transducers to address any data gaps that may emerge as the project proceeds. Mr. Roberts inquired about the timing of installation of the wells and the use of each. Mr. Garner replied that the wells will be installed over the summer construction season in a prioritized fashion so that as many wells as possible providing the most data can be installed. Ms. Farris then asked Mr. Roberts if Williams had a hydrogeologist reviewing the data and if so did that person have any thoughts on the data collected to date. Mr. Roberts replied that they did have a hydrogeologist reviewing the information but they had no thoughts on the data.

ACTION ITEM: Mr. Lockwood will look into a recommendation by Dr. Barnes to program the project data loggers to start at the same time.

CONTAMINATION IN THE SUB-PERMAFROST

The team discussed various way of assessing the extent of the sulfolane contamination located in sub-permafrost areas. Several team members emphasized the importance of understanding the extent of the sub-permafrost contamination for the purposes of predicting plume movement and assessing remediation options. Mr. Schwenne remarked that characterization of the sub-permafrost is particularly important since most of the characterization efforts to date have been focused on the upper 30 to 40 foot region of the water table despite the fact that contamination has been found at much deeper depths. Mr. Garner pointed out that the focus on this portion of the water table has been driven by the available data suggesting that the majority of contamination is located in the upper portion of the aquifer. The team discussed some of the major challenges associated with placing a monitoring well beneath the permafrost layer. Among challenges the team identified were difficulties associated with thawing the line, sealing the well in such a way as to prevent the spread of contamination between the sub-permafrost and super-permafrost, and the logistical challenges that are generally associated with drilling deeper wells. Several team members suggested that, given these challenges, it is important that the team carefully weigh the expected benefits of placing such wells against the considerable costs and potential risks that may be associated. The team agreed to take up further discussion of drilling through permafrost during the future meetings of the Site Characterization subgroup.

The team took up consideration of other possible ways to sample for sub-permafrost contamination without piercing the permafrost layer. FHRA will continue its efforts to further characterize the extent of the sub-permafrost contamination by reviewing data from existing residential wells that were drilled through the permafrost layer. The team discussed various ways to increase its confidence in the data from existing sub-permafrost wells. Dr. Barnes suggested that it may be possible to statistically establish confidence levels in the data from the sub-permafrost wells by comparing the levels of corroboration between the monitoring wells and the residential wells throughout the site. Ms. Farris stressed that it will be important to thoroughly understand the reliability of data from the existing sub-permafrost wells before making a decision on whether it is appropriate to use the wells for anything other than an indicator of the presence of contamination.

ACTION ITEM: Dr. Barnes will contact Dr. Reynolds and Dr. Wagner of the Fairbanks' Cold Regions Research and Engineering laboratory (CRREL) office for discussions regarding thoroughly understand the reliability of data from the existing sub-permafrost wells before making a decision on whether it is appropriate to use the wells for anything other than an indicator of the presence of contamination.

CROSS SECTIONS

Mr. Garner presented a series of slides on the ongoing efforts to compile and interpret cross-sectional data from project monitoring wells. He pointed out the locations of the 7 Series wells which have been proposed to address data gaps in the eastern region of the plume where deep permafrost has been encountered. Mr. Garner pointed out the locations of additional wells that FHRA has proposed to install in the vicinity of Rossen's Cross. They are hoping these wells will better characterize the highly variable depths of permafrost in that area. The team discussed Mr. Garner's presentation on cross sections. Ms. Farris asked Mr. Garner whether FHRA intends to sample the 7 Series wells in addition to logging them and measuring them for gradients. Mr. Garner replied that FHRA will initially sample all of them and then likely exclude some which do not provide pertinent data. He said that FHRA will coordinate with ADEC on any decision to exclude wells from future sampling.

PRELIMINARY ANALYSIS OF THE SPATIAL VARIABILITY OF GROUNDWATER FLOW IN THE PROJECT AREA

Dr. Barnes described the results of an analysis that he recently performed on the spatial variability of the groundwater flow in the project area. He advised the team that since he has only been able to review project data from March 2011, the analysis should be considered to be in its most preliminary phase. Dr. Barnes said that the analysis was conducted as an attempt to understand the atypical bulbous section protruding from the otherwise normally shaped plume. He compared the results of vector analysis performed on two sets of monitoring wells and found that the direction of the groundwater flow in the second set deviated as much as 90 degrees from the direction of the isoconcentration lines, which is the direction where the flow would have been expected. The deviation in the flow gradient was likely caused by permafrost, or by channelization, or the flow of the Tanana River. He added that since it contradicts expectations it raises doubts about the interpretations of the data underlying the characterization of these factors. He added that, consequently, it also raises questions about the

suitability of the groundwater model to predict contaminant flow at the residential level since it was constructed and calibrated according to these interpretations. Dr. Barnes informed the team that he will continue to expand his analysis on the variability of ground flow to include the data that is available from all of the relevant project wells.

Dr. Barnes presented slides summarizing the recent work that was done on a contaminated site located in the vicinity of Peger Road in Fairbanks. He said that researchers involved in this project found similar deviations in ground water flow which they believe is being caused by movement of the ground water from a sub-permafrost region to a super-permafrost region within the aquifer. Dr. Barnes suggested that it is likely that a similar process is occurring at the North Pole site given that it is also located within the Tanana-Chena system and has many similarities to the Peger project.

The team discussed Dr. Barnes presentation. Ms. Farris expressed concern that the aforementioned deviation in the groundwater flow may be directing undetected contamination beyond the predicted boundaries of the plume in areas where monitoring wells are sparsely placed or placed according to assumptions that such deviation would not occur. She said that she was particularly concerned about the northwestern region of the site where there are significant gaps in the monitoring well network due to the extensive shallow permafrost in the area. The team discussed Mr. Farris' concern and its implications for the project. The team agreed on the importance of the concerns given that the plume must be properly defined in order to effectively evaluate any future remediation system and to assure that human health is protected. Discussions will continue during the Site Characterization subgroup meetings on the topic.

SULFOLANE BIODEGRADATION EVALUATION

Mr. Ohrt updated the team on the status of a study being conducted to evaluate the biodegradation of sulfolane under site conditions. Mr. Ohrt said that his team recently completed the first phase of the two-phase study during which they analyzed samples to determine whether the preliminary results were promising enough to proceed with the second phase. He said that preliminary results from the analysis of the first set of samples show a shift in isotropic concentrations which suggests that biodegradation is occurring in the plume. Furthermore, the initial tests indicate that the oxygen levels within the plume are rather limited and thus the biodegradation processes occurring within the plume are typically either anaerobic or anoxic.

Mr. Ohrt further described the results of the first phase of the degradation study. His team determined that sulfolane could be fed onto biotrap and that the desorption rate of sulfolane from the biotrap indicates that they are suitable for a 60-day timeframe in the second phase of the study. The analysis of the biotrap deployed during the first phase indicates that microbial populations in the plume are measurable and that they are large enough to allow the team to confidently proceed with the second phase.

Mr. Ohrt briefly described the second phase of the biodegradation study. The study would be expanded to include a total of 20 wells to determine if patterns of degradation vary with depth and to collect samples from the groundwater treatment system to see if there are changes in isoconcentration

between various points within the system. The second phase of the study will further assess the biodegradability of sulfolane under site conditions and whether certain conditions are conducive to degradation at the site.

The team discussed the proposed second phase of the biodegradation study. Dr. Barnes asked whether the team was able to isolate certain possible degraders among the general microbial population. Mr. Ohrt replied that, at this point, they have only had a chance to look for iron and sulfate reducers and to perform a total count of the general microbial population.

SOIL CHARACTERIZATION

Mr. Ohrt reviewed the results of the soil characterization efforts there were proposed in the SCR addendum. He said that in late 2011, 83 soil borings were advanced; and 24 observation and 7 monitoring wells were sampled to evaluate potential Contaminants of Concern (COCs) in Crude Units 1 and 2, the Extraction Unit, the current and former truck and rail loading areas, and the areas around the lagoons. With the exception of arsenic and other metals usually associated, the COC impacts were located in the footprint of the LNAPL plume and the dissolved benzene plume. Mr. Garner said that the metal exceedances, including arsenic, did not correlate with the petroleum releases and are believed to have originated from geological formations in the site area.

The team discussed the results of the soil characterization efforts. Ms. Buss asked whether the metal concentrations are within the background levels. Ms. Andresen replied that they are still evaluating the concentrations of metals in soil samples by comparing them to the state-specific background concentrations outlined in various documents. According to one document published by the Army Corps of Engineers, there are four samples which are above the state-specific background concentrations. According to another document, there is only one sample that is above the expected background range. The team discussed the possibility of conducting a study to evaluate the background concentrations of these metals at the site. Ms. Farris said that ADEC will soon determine whether the study is warranted.

UPDATE ON THE STATUS OF THE SITE WITHIN EPA'S SUPERFUND ASSESSMENT PROGRAM

Ms. Farris updated the team on the current status of the site within the EPA's Superfund Assessment Program. She said that Mr. Bainbridge and Mr. Dietrick spoke with Mr. Dan Opalski of the US EPA's Region 10 office. Mr. Opalski said that the department has delayed, for one month, the establishment of a benchmark screening value for sulfolane. Mr. Farris reiterated that the EPA will use the benchmark screening value for sulfolane to calculate its hazard ranking score for the site, which, in turn, is used to determine whether the site will qualify for possible designation as a Superfund site. The team discussed the possibility of the site being nominated to the program. Several members commented that even if the site qualifies for inclusion into the Superfund program; it is still possible, and even likely, given the agency's history of involvement with other contaminated sites with the state, that it will defer the administration of the site to ADEC and participate in its management in an advisory role.

RISK COMMUNICATION UPDATE

Ms. Grady updated the team on recent developments within the Risk Communication subgroup. She said that the subgroup met on February 16th to discuss the format of the upcoming open house and the content of the next project newsletter. Ms. Grady said that the open house will be held on May 1st at the Gavora Mall. The subgroup suggested that the format of the open house be similar to the previous public events that were held at the mall in which information was presented at kiosks and members of the public were given the opportunity to present questions to team members on a one-on-one basis. The subgroup would like members of the city offices to be present at the meeting if possible to answer questions outside the purview of the DEC, such as questions regarding property values. Ms. Grady reported that Ms. Sharrah agreed to contact the offices of Mayor Isaacson and Mayor Hopkins and ask if they can make available a designated individual to attend and answer those questions.

ACTION ITEM: Ms. Sharrah will contact the office of the borough mayor and inquire whether representatives of the office would be willing to participate in the upcoming open house meeting.

Ms. Grady said that the next project newsletter will be published on April 25th so as to have it available for distribution at the open house. All draft articles must be presented to the subgroup by April 2nd. The subgroup suggested that the next newsletter feature updates on project sampling and source control as well as updates on the status of various elements within the overall project schedule. She said that the subgroup also recommends that the newsletter feature an article explaining the establishment of the PPRTV and the process by which the department may use the value to establish a cleanup level for the site. Ms. Ha said that, in light of the approaching gardening season, the subgroup feels that the next newsletter should also contain a summary of the results of the garden project from the previous year as well as information on the bulk water tanks that FHRA is providing to gardeners living in the affected area. Ms. Grady said that the newsletter will also include a resource list with contact information for the office of the borough mayor as well as other organizations that are able to answer questions that are outside of the purview of the technical project team.

SUMMARY OF PRESENTATIONS AT THE INTERIOR HEALTH SUMMIT

Ms. Ha briefly summarized a presentation she made with Ms. Farris and Ms. Christian at the health summit held in Fairbanks on February 1st. She said Ms. Farris gave a general overview of the major elements within the project and the project timeline. Ms. Christian discussed the city's new drinking water wells and the long-term treatment option that have been offered to residents. Ms. Ha said that the presentation covered the conclusions and recommendations of the health consult that was recently issued by DHSS. She remarked that the audience asked several questions and that there seemed to be a lot of interest in the presentations.

DRINKING WATER SUBGROUP

Ms. Christian and Mr. Price updated the team on recent developments within the Drinking Water subgroup. Ms. Christian said that the department has shifted the sampling of the new city wells from a monthly to a quarterly basis since there has not been a single detection of sulfolane during the past year of monthly sampling events. Mr. Price said that FHRA recently finalized the last round of home sampling. He said that, with the exception of a few home owners that FHRA has been unable to contact,

everyone in the plume area with an impacted well, or with a well that could be reasonably expected to be impacted in the near future, has been provided with an alternative water source. Mr. Price said that a number of residents are being provided with bottled water as they decide among the long-term alternative sources that are available. He said that at this point, among the 292 residences with detections, FHRA has installed 240 long-term solutions.

Mr. Garner said that, as soon the weather permits, FHRA intends to sample the old city drinking water wells and some of the deeper fire wells that are located in the plume area. FHRA hopes to use the fire wells as an additional monitoring point and to use the city drinking water wells to determine whether contamination is present in order to further clarify the edge of the plume in that area. The team discussed the possibility of sampling the aforementioned wells. Dr. Barnes reiterated that while the wells may be suitable for monitoring the presence of sulfolane, it would be inappropriate, given the length of their screens, to use them to establish defined concentrations.

DELIVERABLES AND UPCOMING MEETINGS

The team discussed the schedule for the upcoming meetings of the Technical Project Team (TPT). The team confirmed that the next meeting will be held in the ADEC office in Fairbanks on May 1st. The team tentatively agreed to meet on June 13th, July 25th, and September 19th in the ADEC office in Fairbanks. The team agreed that it may schedule additional in-person or teleconference meetings to be held between the aforementioned TPT meetings.

The meeting adjourned at 2:27 PM Alaska Time.