RESPONSE TO COMMENTS

May 1, 2003 Dvirka and Bartilucci Letter

Comment

Groundwater Modeling

1. *It has been requested on numerous occasions (for example, correspondence to the New York State Department of Environmental Conservation (NYSDEC) dated July 15, 2003, and January 2, 2003, and verbally at the Technical Advisory Committee (TAC) meetings on June 27, 2002, and October 22, 2003) that a comprehensive report be prepared describing the groundwater modeling performed for this project, including the original modeling effort that was part of the Feasibility Study (FS) and the updated modeling performed in 2002. Since the locations and depths of outpost monitoring wells were selected based solely on the model results and the FS modeling results did not accurately delineate the extent of contamination, this report would allow technical review of the model and model results to evaluate whether the proposed outpost well locations will be protective of the public water supply wells. According to a letter from Arcadis Geraghty and Miller, Inc. (AG&M) to the NYSDEC dated August 15, 2002, AG&M was "currently preparing" a report for NGC documenting the changes in model construction and calibration from the original model. This document (dated October 30, 2002) was received on November 15, 2002, and comments were provided to the NYSDEC in correspondence dated January 2, 2003. In correspondence to the NYSDEC dated March 31, 2003, AG&M anticipates that a modeling report will be available for distribution in early April 2003. To date, no modeling report has been received. As a result, the appropriateness of the outpost well locations and depths cannot be evaluated until the final model results have been provided and reviewed.*

Response

The requested modeling report was distributed to D&B and others in May, 2003.

Comment

2. *Page 2 of the document states that the need for revision of the groundwater model will be evaluated annually based on the water districts' plans for*

expansion or modification of well field pumping rates, to determine whether such modifications may cause a public water supply well(s) to be impacted by the plume "within some reasonable timeframe." The timeframe for the potential impact should be specified (for example, within five years) so that there would be sufficient time to design, construct and sample additional outpost wells, as described in the PWSCP. In addition, documentation of the annual evaluation process should be prepared and provided to all interested parties so that independent review of the conclusions regarding the need for additional modeling and/or outpost wells can be conducted.

Response

The suggested changes to the PWSCP have been made on page 2 of the plan as follows:

Pumpage data and information related to the future plans of the water districts for expansion or modification of wellfield pumping rates (if any) will be requested from the potentially affected water districts and will be evaluated on an annual basis. This evaluation will determine whether an update to the existing model to reflect the modified pumping scheme and an additional modeling run(s) is required to assess the effect, if any, of the modified pumping scheme on contaminant flow paths. If such modeling efforts suggest that a water supply well may be impacted within five years and it has been further determined that the projected contaminant flow path will not intercept an existing outpost monitoring well, then an additional outpost monitoring well(s) would be designed, installed, and monitored.

The evaluation of the pumpage data, decision on remodeling, and any remodeling results will be presented in the annual groundwater monitoring report regularly submitted to the NYSDEC and TAC group.

Comment

Trigger Values

3. *According to page 2 of the PWSCP, trigger values developed for each outpost well are shown on Table A-3 in Appendix A. This table was not included in the document and should be provided for review.*

Response

Table A-3 was part of the PWSCP that was distributed for comment but apparently one or more copies of the document did not contain Table-A-3 as a result of binding or copying oversight – Table A-3 has been included in all the final versions of the PWSCP distributed with this letter.

Comment

Outpost Monitoring Wells

4. *Page 2 of the PWSC states that outpost monitoring wells "... will be installed generally south (downgradient) of the delineated TVOC groundwater plume attributable to the NGC and NWIRP sites." As has been expressed on numerous occasions, including the October 2002 TAC meeting and correspondence to you dated February 14, 2003, the vertical profile boring data show that the plume has not been delineated.*

Response

As has been stated on several occasions, the objectives of the vertical profile boring program were not to define the zero part per billion plume edge but rather to develop sufficient geologic and groundwater quality data so that the groundwater model could be updated and used in developing the GM38 area remedy and selecting locations and screen intervals for outpost wells.

In response to this comment, the PWSCP has been revised in two locations on page 3 as follows:

> Outpost (early warning) monitoring wells will be installed generally south (downgradient) of the delineated lower portion of the TVOC groundwater plume attributable to the NGC and NWIRP sites that is anticipated to impact public supply wells.
>
> and,
>
> By locating the outpost wells between the leading edge of the lower portion of the plume that is anticipated to impact

public supply wells and the downgradient public supply wells, regular sampling and analysis of these wells for VOCs will provide early warning of plume migration toward one or more of the public supply wells.

Comment

5. *According to the PWSCP, outpost wells will be located to provide a 5-year warning of threats to public water supply wells. However, according to information provided at the October 2002 TAC meeting and in Appendix A of the PWSCP, South Farmingdale Water District Well 6150 will be impacted within four years (as of October 2002). This information should be incorporated into the PWSCP.*

Response

This information is incorporated in the PWSCP on Table A-3.

Comment

6. *Figures A-2 through A-5, which are referenced as showing the proposed outpost well locations, do not clearly show roads in the vicinity of the wells. As a result, the specific well locations cannot be determined on these figures.*

Response

Please see the modified Figures A-2 through A-5.

Comment

7. *Page 3 of the PWSCP states that "...the plume's leading edge is currently located north of the well fields..." While the portion of the plume that is modeled to impact the supply wells may be currently north of the well fields, information presented by AG&M at the February 2002 TAC meeting showed that the plume has migrated downgradient of South Farmingdale Water District Well Fields No. 1 and No. 3, in a zone stratigraphically above the supply well screens and not influenced by the pumping of the wells. Based on this information, the referenced statement in the PWSCP may lead to the conclusion that the*

contamination has not migrated as far south as the vertical profile boring and model results show.

Response

The PWSCP has been revised on page 4 as follows:

The outpost wells are to be located generally north of the public supply well fields to be monitored, which is intuitive as the lower portion of the plume's leading edge that is anticipated to impact public supply wells is currently located north of the well fields and is migrating generally to the south/southeast (the regional groundwater flow direction).

Comment

Well Head Treatment

8. *Page 4 of the PWSCP states that wellhead treatment or comparable alternative measures will be provided if trigger values are met or exceeded (and confirmed), "and it appears reasonably certain that a public supply well will be impacted by VOCs attributable to the NGC and NWIRP sites." This statement suggests that meeting or exceeding a trigger value may not result in development of wellhead treatment or comparable alternative measures. However, since the outpost well locations and depths have been selected to detect site-related threats to specific supply wells, meeting or exceeding a trigger value means that the supply well is threatened by the contamination and, according to page 2 of the PWSCP, "...wellhead treatment, or comparable alternative measure, <u>is required</u>..." (emphasis added). Similarly, page 6 states that "...once the trigger value(s) has been reached and confirmed..., wellhead treatment or comparable alternative measure, <u>will be required</u>...") emphasis added). The referenced statement on page 4 should be revised to be consistent with the rest of the document.*

Response

The PWSCP has been revised on page 5 as follows:

Wellhead Treatment/Comparable Alternative Measures

Wellhead treatment, or comparable alternative measures, for a public supply well or well field will be required and provided if trigger values for individual site specific compounds (see Table 1) are reached (and confirmed as described in this plan – see Figure 1).

Comment

Plan Implementation

9. *Figure 1 (Flow Chart for Groundwater Monitoring and Reporting) shows a decision diamond labeled "Is Treatment Required?" Similar to comment 8 above, the confirmed meeting or exceedance of a trigger value means that wellhead treatment or comparable alternative measure is required. As a result, there will not be a decision and this diamond should be removed from Figure 1.*

Response

In the April 2003 Navy Record of Decision (ROD) for OU 2 in Section 8: Summary of the Selected Remedy, under the Public Water Supply Protection Program in item 8 it is stated that:

If VOC concentrations in the outpost well(s) meet or exceed the respective performance objectives, additional confirmatory samples will be collected, as specified in the Public Supply Well Contingency Plan, and the results evaluated by the Navy with consultation from NYSDEC and the State and County Health Departments. If triggered, this will alert the Navy to begin discussions with the appropriate water district regarding various treatment alternatives.

Therefore, the decision diamond in Figure 1 is a ROD requirement and will remain.

Comment

10. A site-related compound detected at a concentration at or above the trigger value will result in collection of two additional confirmatory samples from the affected outpost well. If the trigger value(s) is met or exceeded in all three samples and the same site-related compounds are detected in each sample, then negotiations with the impacted water district regarding wellhead treatment or comparable alternative measures will commence. This statement could be interpreted to mean that negotiations would not occur if one of the samples contains one or more site-related compounds that were not detected in the other samples, even if trigger values were exceeded in all three samples. Clarification of this statement should be provided.

Response

The PWSCP has been clarified in this regard on page 6 as follows:

- Based on the analytical results of the initial and confirmation samples described above, if all three samples indicate that the trigger value(s) has been reached for site specific compounds (as described below), then negotiations with the potentially affected water district(s) will commence.

Reaching or exceeding a trigger value is defined as follows:

- Only validated analytical results for site specific compounds (see Table 1) will be considered in the determination as to whether a trigger value has been reached or exceeded.

- Estimated values (i.e., "J" qualified data) will not be counted towards the trigger value.

- Site specific VOCs that individually equal or exceed a trigger value, will be confirmed to have met/exceeded the trigger value if, after two resamplings, site specific compounds individually equal/exceed the trigger value.

- The same compound must meet/exceed the trigger value in all three samples for the results to be confirmed.

Comment

Reporting

11. Special data reports (providing notice that trigger values have been reached or exceeded) should be transmitted to all interested parties, including TAC members and all water districts in the area, rather than just to the NYSDEC and the potentially impacted water district, to provide notice to all that trigger values have been reached or exceeded. In addition, regular quarterly reports (if all concentrations are below trigger values) should also be transmitted to all interested parties to allow independent evaluation of sample results and review of groundwater conditions.

Response

We believe that reporting/notification requirements outlined in the PWSCP are sufficient and appropriate.

However, the NYSDEC can distribute these reports to a wider audience if they so desire.

On page 6 of the draft PWSCP distributed for comment there is a discussion of distribution of regular quarterly reports (if trigger values are not reached), therefore, there is no need to revise the PWSCP in this regard.

Comment

Discussions/Negotiations with Potentially Affected Water District(s)

12. Negotiations with impacted water districts should be held by NGC and the Navy, not "NGC/NWIRP" as shown in the document.

Response

The PWSCP has been revised on page 7 as follows:

As indicated on Figure 1, once the trigger value(s) has been reached and confirmed (from three consecutive samples as described above), wellhead treatment or comparable alternative measures, will be required and pre-design

discussions/negotiations will commence between NAVY/Northrop Grumman and the potentially affected water district(s) so that funding for wellhead treatment or comparable alternative measures can be negotiated and provided to the water district(s).

Comment

Appendix A (Groundwater Modeling Memorandum Dated December 13, 2002)

13. According to page 2 of Appendix A, for well fields with more than one well, outpost well locations were developed to provide warning of threats to the well with the first model-predicted impact. Pages 2 and 4 of the PWSCP state that, if trigger values are reached or exceeded, wellhead treatment or other comparable measure will be developed for a supply well (emphasis added). This suggests that the threat to the other wells in that well field will be ignored. If trigger values are reached or exceeded in an outpost well constructed to protect a well field, then the plume will threaten all wells in that well field and wellhead treatment or other comparable measures must be developed for each well in the well field. Alternatively, outpost wells could be designed and monitored for each well in a well field. The PWSCP should include a plan to address this situation.

Response

The PWSCP has been revised on page 2 as follows:

If groundwater sampling indicates that a trigger value has been reached (and this result is confirmed, as defined in this plan), this signifies that wellhead treatment, or comparable alternative measures, is required and it is time to begin planning wellhead treatment or comparable alternative measures to address the potential for a specific public supply well or well field to be impacted. This process would not preclude the water district(s) from taking any action they deem appropriate.

and page 5 as follows:

Wellhead treatment, or comparable alternative measures, for a public supply well or well field will be required and provided if trigger values for individual site specific compounds (see Table 1) are reached (and confirmed as described in this plan – see Figure 1).

Comment

14. Page 3 of Appendix A states that the screen zones for outpost wells to be constructed upgradient of Town of Hempstead Well No. 13 (N-5303) will correspond to the screen zone of the supply well. The criteria for selection of these outpost well screen zones should be the same as for the other outpost wells, that is, to monitor the two fastest-moving portions of the plume. In addition, according to Table A-2, outpost well OW4-2 is to be screened from 730 to 770 feet below ground surface, which is mostly below the supply well screen zone (602 to 736 feet below ground surface).

Response

The methodology for selecting the outpost well screen zones for Well N5303 was the same as for the other public supply wells (the original text was incorrect). The PWSCP has been revised on page 3 in Appendix A as follows:

The results of the groundwater flow modeling with forward particle tracking discussed earlier were used to evaluate which portion of the plume moved fastest as it approached the municipal supply wells. The layer through which the fastest moving portion of the plume traveled as it approached the well was selected as the primary horizon to be monitored for advanced warning of the approaching plume. As a conservative approach, the layer through which the second fastest moving portion of the plume traveled as it approached the well was selected as the secondary horizon to be monitored. At South Farmingdale's Wellfield No. 1 there were two layers that contained the fastest moving portion of the plume, and so three outpost wells are proposed for this wellfield.

Comment

15. Figures A-1 and A-4 should show all four wells in New York Water Service well field (N-3780, N-3893, N-8480 and N-9338) rather than just the two wells (N-8480 and N-9338) that the model predicts may be threatened by the plume.

Response

Based on information provided to ARCADIS by the New York Water Service, Wells N-3780 and N-3893 are abandoned and out of service, respectively, and therefore,

were not used in the modeling analysis and correspondingly are not on Figures A-1 and A-4.

Comment

Appendix B (Work Plan Addendum, Revised April 2003)

16. According to page 2-2 of Appendix B, groundwater samples "may" be collected during drilling and Table 1 states that groundwater samples "will" be collected. This discrepancy should be addressed. If groundwater samples are to be collected, then the sample depths or process to field-determine sample depths, as well as the analyses to be performed on the samples, should be described in the Work Plan. In addition, the analyses to be performed on well samples that will be collected at the end of well development should be stated.

Response

The work plan will be revised as follows:

Since drilling techniques for the permanent monitoring wells are different than for profile borings, vertical profile boring-type groundwater samples will normally not be collected during the installation of the outpost monitoring wells. However, if based on the boring lithology data, a target screen interval is determined to consist primarily of fine-grained material not appropriate for setting a well screen, then groundwater samples will be collected, in accordance with the Outpost Monitoring Well Drilling Contingency Procedures presented in Attachment 1, to aid in the selection of an alternative screen zone.

A groundwater sample will be collected during the final purge of each outpost monitoring well. This sample will be collected by reducing the discharge rate of the submersible pump to a minimum and then directly filling sample vials from the tubing discharge. The sample will be analyzed for VOCs. This data is considered to be semi-quantitative and will only be used as an initial screen of the quality of the water in the well.

Table 1 will be revised as follows:

Groundwater samples will be collected during the final purge of each outpost monitoring well and analyzed for VOCs. In addition, groundwater samples may be

collected during drilling of the boring in accordance with Drilling Contingency Procedures.

Comment

17. Surveying of the newly constructed outpost wells should conducted by a New York State-licensed surveyor and this should be stated in the Work Plan.

Response

Since the survey will also be used as part of an easement agreement with property owners, Section 2.9 Surveying, will be modified as follows. "All newly installed monitoring wells will be surveyed by a New York State-licensed surveyor for both horizontal and vertical control.

Comment

18. Table 1 of Appendix B shows that outpost well clusters OW1 and OW3 will be constructed for multiple supply wells. As discussed in comment 13 above, this is inconsistent with the remainder of the document. This discrepancy should be corrected. In addition, outpost well clusters OW1 and OW2 should be shown as "South Farmingdale" rather than "South Farmington."

Response

Table 1 will be revised to South Farmingdale as indicated in the comment and the reference to multiple supply wells will also be revised.

Comment

19. Table 1 and Figures 1 through 3 list the outpost wells with a "BP-" prefix which is inconsistent with the remainder of the document.

Response

The document will be revised to eliminate the "BP-"reference.

Comment

20. The Work Plan does not describe reporting. A well construction report, including geologic logs, well construction diagrams, gamma logs, sample results and development data for each outpost well, should be prepared and distributed.

Response

The plan will be revised to state that a monitoring well installation summary report will be prepared and submitted as before. This report will include geologic logs, well construction diagrams, gamma logs, sample results and development data.

May 9, 2003 H2M Letter

Comment

Timeliness of submitting quarterly reports / Third Quarterly Report

We continue to be concerned with the time frame between when a sample is taken and when the water suppliers and our office receive the report. The third quarterly samples were taken during the first two weeks of October 2002, the data was validated by December 12, 2002 and the report not prepared and submitted to the water suppliers until the end of April. This time frame is unacceptable. At least, two additional samples (4 th-2002 and 1 st-2003 quarters) have been taken since that time and yet we will not have the data for months. Based on typical laboratory turn around time and validation protocols, the data should be available within 45 days after the last sample is taken, not seven months later. We recommend that the data be provided to the water suppliers within this time frame and then a thirty to sixty-day time frame be provided for the data to be evaluated and a report submitted. Monitoring Wells 34-D and 34-D2 were not samples during the third quarter due to "property redevelopment activities." As you are aware, these two wells are critical to providing information on the substantial groundwater plume that is south of the site and being monitored at GM-75D2. Were these wells sampled during the next two rounds and if not, what course of action is being taken to insure that we have data from this region?

Response

We recognize the importance of distributing the reports on a timely basis and while submittal of quarterly reports at present is on a voluntary basis and as such there is no specific time table that must be adhered to, we will work towards reducing the time between sample collection and report distribution.

Well Cluster 34 could not be accessed for sampling during the third quarter of 2002 but has been sampled every quarter since then.

Comment

Proposed Outpost Monitoring Wells

The proposed location of Outpost Monitoring Well (OW) 1-1, 1-2, and 1-3 is due west of the SFWD Plant 1 site. We request that an additional site be located due North of the plant site at least 1,000 feet away, to provide a five-year early warning time frame from the North. Screening of these wells should be similar to the OW 1 Wells. We also request that an additional well be installed at this northern location. The screened interval of the fourth well shall provide early warning for the eminent contamination of SFWD Well 1-4 (N07377). Screened approximately 541 to 691 feet below MSL.

The proposed location of Red Maple Drive East and Red Maple Drive North for Outpost Monitoring Wells (OW) 3-1 and 3-2 is northwest of the NYWS Plant site. We reiterate our request that the monitoring wells be installed more to the east than that proposed and directly upgradient of the plant site. Arcadis has illustrated that the southern boundary and leading edge of the plume is northeast of this well field, yet the proposed outpost monitoring wells are being located to the northwest.

Response

On May 20, 2003 representatives of Dvirka and Bartilucci (D&B) and H2M met with representatives of Northrop Grumman and ARCADIS to review in detail the modeling that was carried out to select outpost well locations and screen zones. Following the meeting we received a May 23, 2003 letter from H2M that stated the following regarding the proposed outpost well cluster for New York Water Service:

"Based on our meeting, a subsequent field check and discussions with NYWS, the proposed final location of Outpost Monitoring Wells (OW) 3-1 and 3-2 north of the NYWS Plant site at the intersection of Rib Lane, Red Maple Drive East and Red Maple Drive North is acceptable."

In regard to the location of Outpost Cluster 1 (Wells OW-1, OW-2, and OW-3), at the end of our May 20th meeting we requested that H2M evaluate the information presented at the meeting and reconsider their request for an additional well cluster north of South Farmingdale Well Field 1. In their May 23 letter to us they did not render an opinion regarding their original request for a northerly outpost well cluster but stated the following:

"Subsequent to our meeting, NYSDEC rendered a decision that is requiring the Navy to install outpost monitoring wells to the north in addition to the proposed outpost monitoring wells located to the west. In response to NYSDEC's letter, we would request that we be given the opportunity to review the proposed location of the additional outpost monitoring wells that will be installed north of plant 1, so that we can provide you comments in a timely manner."

Subsequent to these letters and meeting, we met with you on June 27, 2003 in our office in Melville to review in detail the modeling that was carried out to select outpost well locations and screen zones for South Farmingdale Well Field 1 (the same presentation given to H2M and D&B on May 20, 2003). Subsequent to this, on a July 2, 2003 telephone call between you and Carlo San Giovanni of ARCADIS, you indicated you were withdrawing your request for an outpost well cluster north of South Farmingdale Well Field 1 and instead would request that a two-well cluster (not an outpost cluster with trigger values) be installed by Northrop Grumman/Navy to monitor the eastern edge of the groundwater plume north of South Farmingdale Well Field 1.

Based on our modeling in the area of South Farmingdale Well Field 1, which takes into account the effects of local pumping on groundwater movement and the distribution of the plume in three dimensions, we are confident in the appropriateness of the location of the OW-1 cluster west of the wellfield and believe that a northern cluster location is not warranted.

Comment

Hot spot in the vicinity of Well 75D-2

The latest groundwater monitoring report continues to demonstrate concentrations of TCE and Total VOCs that are excessive. This data demonstrates the need for extraction and treatment in the vicinity of GW-75D2. We request that NYSDEC require Northrop-Grumman and the Navy to implement a remedy to minimize any further migration of this concentrated VOC plume to the south. Consideration should be given to pumping the extracted water back to the Grumman-Navy site where additional treatment facilities could be constructed adjacent to the on-site treatment system (ONCT).

Response

Implementation of a remedy at this point is premature and inappropriate as the size of the "Hot Spot" has not been determined through a field investigation. As has been stated at several TAC meetings relative to the 75D-2 area, such investigative work must be prioritized relative to the outpost well installations and construction of the GM-38 remedy.

May 20, 2003 NYSDEC Letter

Comment

1. *Page 3, Third Paragraph and Figures A1 and A2 of Appendix A: for South Farmingdale Water District (SFWD) Wellfield No. 1, or municipal wells 4043, 5148 and 7377, has outpost well OW-1 planned for this wellfield. Consistent with the comment from the SFWD, there needs to be an outpost well located to the north as well as to the west, located in the general flowpath of the Magothy aquifer. Though the groundwater model predicts that the contamination will reach the well screen from the west, the NYSDEC views models as a predictive tool used to confirm realtime groundwater flow. Given that the contamination to the municipal well 4043 cluster is as close as it is, it is prudent to place a monitoring well in the northern direction of the natural groundwater flow.*

Response

See response, starting on page 14 above, to H2M May 9, 2003 letter - Proposed Outpost Monitoring Wells item.

Comment

Given the proximity of the groundwater plume and, based on ARCADIS's own model prediction, there are less than four years until the SFWD municipal well 6150 is impacted by site related chlorinated organic compounds. The SFWD has stated at the May 15, 2003 TAC meeting that they have commenced remedial design of water treatment and Northrop Grumman and the Department of the Navy should plan on implementing the wellhead treatment contingency in the near future as well.

Response

The Navy plans on implementing the Wellhead Treatment Contingency in accordance with the ROD. Outpost monitoring wells are to be installed in the near future and this data will be used to determine the need to implement the Well Head Treatment contingency. The Navy's action should not preclude the water district(s) from taking actions that they believe are required to protect the public water supply.

Comment

2. *Page 4, Second Paragraph: The well completion data for the Massapequa Water District municipal wells need to be added to this plan. For example, a figure showing the locations of their wells, the screen zones and well depths, and even a preliminary location for possible future outpost well locations(s).*

Response

Figure A-1 in the PWSCP has been revised to show the locations of the Massapequa Water District's (MWD) Northwest and Northeast well fields. Screen intervals for these wells are given in Table A-2. MWD's Brooklyn Avenue well field is not shown on the map as it is outside of the modeled area and well south of the known plume.

A preliminary location for a possible future outpost well location(s) has not been given as our modeling does not predict an impact to these two well fields (NW and

NE well fields) in the next 30 years (modeled period) and therefore, selecting an outpost location(s) is very premature and also likely inappropriate.

Comment

3. ***Page 4, Third Paragraph:*** *The plan needs to give the details of how the need for out post wells for the Massapequa Water District will be assessed.*

Response

The PWSCP has been revised on page 4 as follows:

If the outpost monitoring wells and the wells/wellfields they will monitor become impacted by site-related VOCs, the need for MWD specific outpost monitoring wells will then be assessed. This assessment will be carried out by entering water quality data from the impacted outpost wells and public supply wells into the model and then carrying out model runs to determine if the MWD wells will be impacted. If an impact is predicted then locations and screen intervals for MWD specific outpost wells will be developed and the timing of outpost well installation will be determined.

Comment

4. ***Page 5, First Paragraph:*** *There will most likely be a need to run a groundwater model update in the future for the Massapequa Water District outpost wells. The plan needs to state this.*

Response

See response immediately above.

Comment

5. ***Table A-2:*** *The screen zones of the Massapequa Water District municipal wells need to be included on this table. The plan needs a figure showing the location of all the potentially impacted municipal wells.*

Response

See response to DEC comment # 2 above.

Comment

6. ***Table A-3:*** *For the Town of Hempstead municipal wells, add the language of the ROD for the trigger values.*

Response

We believe that the ROD trigger language for the Town of Hempstead well is not appropriate for a well that is not predicted to be impacted; see alternative trigger language in Table A-3 of the PWSCP.

Comment

7. ***Figure A-1:*** *This figure needs to include the Massapequa Water District municipal wells.*

Response

This figure has been revised to include MWD's Northwest and Northeast well fields as discussed in the response to DEC comment #2 above.

Comment

8. ***Figures A-2 through A-5:*** *The streets on these figures are illegible; please revise accordingly.*

Response

The figures have been revised to make the streets legible.

Comment

Work Plan Outpost Monitoring Well Installation

9. *Include a flowchart similar to the "Groundwater Monitoring and Reporting Chart" for the outpost monitoring well installation and drilling procedures and the contingency plan.*

Response

The decision tree for the drilling contingency is very simple with only three options. As such, a decision tree flow chart similar to the Groundwater Monitoring and Reporting Chart would not provide any benefit and will not be added.

Comment

10. *Add the Drilling Contingency Procedures faxed to the NYSDEC to the Outpost Monitoring Well Plan.*

Response

The Outpost Monitoring Well Drilling Contingency Procedures will be added to the Work Plan as Attachment 1.

Comment

11. ***Section 2.2.1 and 2.3:*** *The details of the mud rotary drilling state that a narrower pilot hole will be drilled in advance of the larger 8 inch auger for the 4 inch diameter monitoring wells. Also, the plan states that some water samples may be collected during drilling activities. This contradicts the reasons given to the NYSDEC as to why water samples won't be taken in discrete intervals of the aquifer. Therefore, water samples for discrete VOC water samples for at a minimum, outpost wells BPOW1-1, BPOW2-2 and BPOW 3-2 need to be added to the plan in the deeper segment of the aquifer.*

Response

As discussed, collecting water samples during the installation of the monitoring wells would require a major change to the drilling protocol and significantly extend the

project schedule. Since this data will not normally be required to set the outpost monitoring well and high quality data will be available in the near future, collection of this data is not planned. The work plan will be modified to clarify the groundwater sampling strategy as indicated under the response to D&B comment 16 (May 1, 2003 letter).

Also, based on experience drilling Outpost Monitoring Well OW 4-2, the Work Plan will be modified to reduce the number of split spoon samples being collected at depth. In particular, there has been trouble collecting representative soil samples in the larger diameter boring due to partial collapse during the sampling attempt. Up to 10 feet of side wall material has been commonly found in the bottom of the hole while attempting to collect a soil sample rending the data of little value and these attempts have already caused the drilling program schedule to slip by three weeks. Since the initial hole at each location will be geophysically logged and this logging has been demonstrated to be very effective for determining lithology in the area, the number of split spoon samples will be reduced to one sample every hundred feet, from a depth of 100 feet below ground surface to a maximum depth of 50 feet above the planned screen interval. The split spoons will only be collected in the first boring in each location.

Comment

12. ***Table 1:*** *Outpost well BPOW1-3(D) is listed as a deep well when the depth of the screen places it in the D2 zone.*

Response

The D2 zone starts at a depth of -365 feet msl. The ground surface elevation in this area is approximately +65 feet msl, indicating that the D2 zone starts at a depth of approximately 430 feet below ground surface. Monitoring well OW1-3(D) will be screened to a depth of only 409 feet below ground surface and therefore will be in the deep zone.

May 23, 2003 H2M Letter

Comment

Based on our meeting, a subsequent field check and discussions with NYWS, the proposed final location of Outpost Monitoring Wells (OW) 3-1 and 3-2 north of the

NYWS Plant site at the intersection of Rib Lane, Red Maple Drive East and Red Maple Drive North is acceptable. While installation of the wells on Seaman's Neck Road would have been preferable, the logistics associated with access and safety concerns over the increased amount of traffic on Seaman's Neck Road lends itself to drilling the wells one block west of Seaman's Neck Road and north of the plant site as now proposed.

The proposed location of the outpost monitoring well at SFWD well 3-1 is acceptable.

Response

Comments noted.

Comment

A great deal of discussion centered on the proposed location of the outpost monitoring wells for SFWD plant site 1, where the District has three wells. Arcadis indicated that the proposed descriptive location for Outpost Monitoring Wells (OW) 1-1, 1-2 and 1-3 was incorrect (intersection of Lawrence Street and Pine Tree Drive) in the reports, that it should be one block north at the intersection of Lawrence Street and Bruce Street, as illustrated in the Comprehensive Groundwater Report. The revised proposed location is primarily based on Arcadis's approximation of the eastern boundary of the groundwater plume, groundwater flow and pumping patterns at plant 1. During our meeting, we discussed the potential for contaminants from the north to impact the wells prior to the wells being impacted from the west. We performed additional particle tracking and performed field checks later that day to identify locations that tracked more to the north. In discussing the depths of the proposed monitoring wells and the depth of well 1-4, it was indicated that while the outpost monitoring wells were not geared to detect impacts to well 1-4, it was anticipated that if one well at plant 1 was impacted, treatment would ultimately be provided at all three wells. Subsequent to our meeting, NYSDEC rendered a decision that is requiring the Navy to install outpost monitoring wells to the north in addition to the proposed outpost monitoring wells located to the west. In response to NYSDEC's letter, we would request that we be given the opportunity to review the proposed location of the additional outpost monitoring wells that will be installed north of plant 1, so that we can provide you comments in a timely manner.

Response

See response, starting on page 14 above, to H2M May 9, 2003 letter – Proposed Outpost Monitoring Wells item.

May 29, 2003 H2M Letter

Comment

We have reviewed the following documents relative to the GM-38-off-site groundwater remedy on behalf of the South Farmingdale Water District (SFWD):

Arcadis report – GM-38 Design Simulation No. 1 – December 2, 2002
Arcadis report – GM-38 Design Simulation No. 2 – April 11, 2003
Arcadis report – GM-38 Design Simulation Results Comparison – May 5, 2003

We recognize that the proposed treatment system will have a beneficial impact by reducing the TVOC concentration in the groundwater in the vicinity of GM-38. However, we disagree that the proposed goal of the treatment system should be as restrictive as stated in the report. As you know, the underlying groundwater is a designated sole source aquifer that has been impacted by prior activities at the above referenced site. These impacts have resulted in significant off-site groundwater contamination requiring the PRPs to implement groundwater remediation. Since a treatment system is being proposed, it is prudent to design the contaminated groundwater pump and treatment system, so as to minimize any further impacts from the plume to downgradient water suppliers. Consequently, it is important that the off-site treatment system constructed at GM-38 minimize impacts to the affected Bethpage Water District well fields and downgradient water suppliers, including the SFWD. As previously indicated, the GM-38 area is upgradient of SFWD's largest well field (plant 1) where the SFWD has three of its eleven wells.

Response

The ROD requires that the GM-38 remedy extract contaminant mass and this is precisely what the proposed two well scenario accomplishes while the suggested third well provides no significant benefit. Figure 8 from the April 11, 2003 GM-38 Design Simulation No. 2 report indicates that the maximum concentration of TVOCs anticipated in Well RW-3 is 40 ug/L, which is a very small value for a well whose purpose is to extract contaminant mass from the aquifer, especially when compared

to the peak anticipated concentration in Wells RW-1 and RW-2 of approximately 1,000 ug/L. The lack of benefit provided by pumping of Well RW-3 is shown by Figures 9, 10, 11, 12, and 13 which compare TVOC concentrations in Bethpage Water District Wells 4-1(6915), 4-2(6916), 5(8004), and South Farmingdale Water District Wells 1-2(4043) and 3(6150), respectively, under the two and three well pumping scenarios. Review of these figures shows essentially no benefit derived from pumping Well RW-3; expected TVOC concentrations in the above named public supply wells remain essentially the same whether Well RW-3 is pumped or not. This fact is consistent with the low TVOC concentrations predicted by the model for Well RW-3 in that, if the contaminant mass removed by this well is limited, any benefits to downgradient public supply wells would be negligible.

Comment

The groundwater data provided to our office in the draft November 2000 Vertical Profile Boring Report indicates TVOC concentrations of approximately 125 ug/L in the VPB 77 at depths of 254 to 255 and 256 to 257 feet. The report did not include any data for elevations above this zone, however, this data suggests that the 100 ug/L and 50 ug//L contour lines in Model Layer 5 may be broader than that shown in Figure 1 of the Comparison Report. This in turn will increase the TVOC concentration in this area and thereby result in more significant TVOC removals as a result of installing a third recovery well as requested by H2M. It is also noted that there is limited data regarding the eastern boundary of the plume. This limitation further restricts the accuracy of relying solely on groundwater modeling to dictate decisions regarding treatment of the GM-38 "hotspot".

Response

The 100 ug/L and 50 ug/L contour lines in Model Layer 5 should not be broader than that shown in Figure 1 of the Comparison Report because of groundwater analytical results from two one-foot sample intervals from vertical profile boring (VPB) 77.

In the Comparison Report of May 2003 the sources of groundwater quality data and how they were incorporated in the model were explained. We have presented below key sections of that report to clarify this point and thoroughly respond to this comment.

Water quality data from groundwater monitoring wells, supply wells, and vertical profile borings were used to develop the contaminant mass distribution used in the model.

Groundwater monitoring well data is representative of water quality in a much smaller portion of the aquifer than supply wells, because monitoring well screens are typically between 10 and 20 feet long and monitoring wells do not impact a significant pumping stress on the aquifer that might tend to dilute concentrations coming from impacted aquifer segments. As such, groundwater quality data collected from monitoring wells is appropriately representative of a small vertical section of the aquifer. Groundwater monitoring well data was used in developing the contaminant contour maps that were used to define the distribution of contaminant mass in the model.

Vertical profile borings utilize a 1-ft long screen that is sampled at specific depth intervals within a vertical column of the aquifer. In most instances, the sampling takes place at 10 or 20-ft intervals. The results of this sampling provides the most detailed vertical distribution of groundwater quality in the groundwater system, at a given location. Results obtained from many vertical profile borings were used in conjunction with the monitoring well data to develop the contaminant distribution contour maps described above.

In general, supply wells have long screens and collect water from a large vertical section of the aquifer. As such, water quality results from supply wells tend to report concentrations that are lower than the peak concentration of contaminants within discrete segments of the aquifer. This is because water from the aquifer's cleaner zones mixes with water from impacted portions of the aquifer as the water is extracted by the well. For this reason, supply well water quality data was generally used in a qualitative manner to validate contaminant contouring.

The general methods used to represent contaminant mass in groundwater modeling are summarized immediately below. The specific approach used to represent mass in the Northrop Grumman model is described further below. Frequently, multiple (vertical) water quality data points will exist for a single model layer. When the distribution of contaminant mass is simulated in a model, the assignment of mass for a given layer must be representative of the real-world data collected throughout the entire vertical section of the aquifer represented by that layer. Spatially, in the horizontal direction, assigned concentrations within a single model layer may vary, however, a single appropriate value must be used to represent the vertical distribution

of concentrations within a single model layer and single model cell. Simply put, within a single model layer, every model cell can have a different value that is representative of contaminant mass, however, if multiple data points are available within a single model cell, a determination must be made to how best represent the mass within the single cell. Assignment of a concentration value to the model based on a single sample, without accounting for the range in concentration associated with samples collected above and below that sample (that were collected within the bounds of the same model layer and cell) could bias the model to over- or underestimate mass in the aquifer.

The Northrop Grumman groundwater model has been constructed with 11 layers, each approximately 100 ft thick. For the Northrop Grumman model, water quality data was evaluated by grouping the groundwater quality data that corresponded to the various model layers based upon the elevation from which the samples were collected. Monitoring well data collected between December 1999 and December 2001 were averaged; vertical profile boring data representative of a specific model layer were also averaged, to develop an average VOC concentration representative of the elevation range assigned to a given model layer. The averaged monitoring well and vertical profile boring data were then used to develop contour maps of specific model layers, as well as the model layers in between. As such, the concentration assigned to an individual model cell (when several vertical samples have been collected from the aquifer within the top and bottom elevations of the corresponding model cell), may have a lower concentration than the highest concentration detected in any of the individual groundwater samples representative of a particular model layer.

For example, five samples are collected at 20 foot intervals over a 100 foot vertical thickness of aquifer material. The 100 foot thick aquifer segment exactly corresponds to a 100-foot thick layer within the groundwater model. All five samples show VOCs at 10 ppb. The concentration value assigned to the model cell within the model layer that corresponds to this 100 foot thick aquifer horizon would be 10 ppb. However, if one of the samples showed a concentration of 20 ppb, the assigned concentration for the model cell would be 12 ppb (a straight average of concentrations when sampled intervals are evenly spaced throughout the vertical section). If the sample locations are not evenly distributed in the vertical section, then a weighted average is calculated with more weight assigned to those concentrations that represent thicker aquifer horizons. In this manner, the mass of contaminants within the entire 100 foot thick aquifer horizon is appropriately represented in the model and contaminant mass is conserved. Given all available

data, and the goals and objectives of the modeling effort, this approach to mass representation and level of vertical discretization is appropriate.

From the above discussion it is clear that all relevant data was appropriately used in the model to represent contaminant mass. As discussed in the response to the previous comments, a third recovery well would provide no significant mass removal nor would it provide any benefit at all to public supply wells in the area.

Comment

As discussed with representatives of Arcadis at a May 20 meeting at their offices, the figures in the comparison report are limited to the proposed two well system and TVOC concentrations in excess of 50 ug/L. It appears that the impacted areas downgradient of GM-38 as measured by 50, 25 and 5 ug/L TVOC contour lines south of Hempstead Turnpike would be substantially smaller if a third extraction well were located along Hempstead Turnpike, as opposed to just proceeding with the two well extraction system. Since the drinking water standard is 5 ug/L, this is an important measure in evaluating the desirability of installing a third extraction well.

In consideration of the above, we recommend that NYSDEC require that an additional extraction well (approximately 1000 gpm) be installed east of Mid-Island Hospital to minimize the size and concentration of the contaminant plume traveling south of Hempstead Turnpike beyond the proposed (RW1 and RW2) capture zone for GM-38. This additional extraction well (RW3) will optimize the effectiveness of the remedial action in removing contaminants in the GM-38 area and reduce the potential impact of the contaminant plume on downgradient water supply wells.

Response

In Section 1 of the ROD under Groundwater Remedial Program in the third bullet it is stated "mass contaminant removal through groundwater extraction and treatment in an off-site area near the GM38 Monitoring Well Cluster." Furthermore, in Section 7.1: Description of Alternatives in item E-Off-site GM38 Area Remedy it is stated "This remedial technology would address elevated concentrations of total volatile organic compounds (TVOCs) in groundwater because deep groundwater at the GM38 well area has been identified as an off-site "hotspot". It is clear that the NYSDEC intends for the GM38 area remedy to address elevated TVOC concentrations and not every detected value of VOCs. As explained above a third recovery well would provide no benefit in the context of the ROD's stated objectives.

Comment

Lastly, the performance of the treatment system will have to be demonstrated through the monitoring of the influent and effluent concentrations and the network of monitoring wells downgradient of the proposed treatment system. Since the proposed monitoring well network has yet to be proposed, it is premature to comment on whether ten years is a reasonable time frame for the proposed treatment system at GM-38 to operate.

Response

Comment noted.

The Navy will develop additional details as part of their design and O&M plan.