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NAVY RESPONSE TO U S EPA REGION V COMMENTS ON DESIGN CONSIDERATIONS
FOR EXTRACTION WELLS AT-11, AT-12 AND AR-13 NIROP FRIDLEY MN
2/18/2011
NAVFAC MIDWEST

**Response to EPA Comments on the Design Considerations for Extraction Wells AT-11, AT-12, AND AT-13
DATED FEBRUARY 18, 2011
NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT (NIROP), FRIDLEY, MINNESOTA**

GENERAL COMMENTS

- ✓ 1. **Comment:** A schedule for the completion of the replacement extraction wells is not provided in the Design Proposal. Please submit a proposed schedule showing the timing and duration of the preparation steps, drilling activities, and post-drilling activities.

Response: No revision to the document is required at this time. A schedule of activities will be provided by the Navy's selected contractor. The Design Consideration document was intended to be the basis for the well design that is being used to procure the contractor for the actual work. The selected contractor is required to submit a detailed schedule for the well installation and connection to the system. This information will be provided once the contract is placed.

- ✓ 2. **Comment:** The containerizing and disposal of wastes produced during well installation, step drawdown and pump testing (e.g., drill cuttings, purge water and groundwater from drilling development) are not discussed in the Design Proposal. Please revise proposal to include information on the planned methods to containerize, store and dispose of soil and water resulting from the proposed well installation and testing activities.

Response: This information was not intended to be part of the Design Consideration document. A sentence will be added to the design document stating "The Navy's remedial action contractor (RAC) will generate a waste management plan to address handling of all waste materials generated".

3. **Comment:** It is noted that during extraction well installation a split barrel sampler will be advanced ahead of the drill casing and used to collect samples to support an assessment of lithology. However, it is unclear whether the use of a cable tool drill will provide samples sufficient for determining the lithology at each of the proposed extraction well locations. It is also unclear whether the efficiency of repeatedly entering the borehole to obtain split spoon samples while advancing the borehole using cable tool drill was considered. An accurate and timely assessment of the lithology is crucial to the success of the proposed extraction well installation activities. Please revise the Design Proposal to clarify that the planned method will provide sufficiently representative samples in an efficient manner that supports and accurate and timely assessment of lithology.

Response: Advancing pilot borings will be evaluated with the proposal based on information from the RAC contractor and local drilling subcontractors.

It should be noted that the proposed extraction well locations are in an area where a significant number of shallow, intermediate, and deep monitoring wells, as well as extraction wells, are already located. It is unlikely that unexpected subsurface conditions will be encountered, given that an extensive amount of subsurface and hydrogeologic information is available. During the design process, other methods were evaluated and rejected for various reasons. For example, using hollow-stem auger or Direct Push Technology (DPT) was evaluated for collection of soil samples, but it should be noted that when drilling AT-5A and AT-5B, there was considerable difficulty in collecting samples using a hollow-stem auger. It should also be noted that large cobbles are numerous below a depth of 45 feet below ground surface, which may cause difficulty in using DPT to advance a pilot hole for collection of samples. Can the EPA please clarify if they have a preferred sampling method the Navy should evaluate?

If the Navy decides to collect samples using cable tool drilling instead of advancing pilot holes and representative soil samples cannot be collected for any reason during cable tool drilling, then an alternative method will be used to collect soil samples. The Navy realizes the importance of the soil samples in determining the screen slot and filter pack sizes.

No revision of the design document is required at this time.

4. **Comment:** It is unclear whether the uncertainty associated with the identification of lithology appropriate for the installation of the proposed extraction wells was considered in the development of the proposed activities. To ensure that the anticipated lithology is present at each of the proposed extraction well locations, an approach such as the installation of pilot borings prior to completing the full-scale boring using the cable tool method should be considered. The use of pilot borings may reduce the time and expense associated with the installation of a full-scale boring in materials inappropriate for completing an extraction well. The collection of soil samples using a pilot boring approach may also expedite the design and installation of the well screen and gravel pack after completion of the boring.

Response: Please see the response to U.S. EPA General Comment #3.

5. **Comment:** The Design Proposal does not include language indicating that the proposed activities will be completed in compliance with applicable regulations. Please revise the Design Proposal to clarify that all drilling, development, and construction procedures will be completed in compliance with applicable state and federal regulations.

✓ **Response:** Comment noted; a generic statement can be added to the document stating that all applicable regulations for the work being performed, will be followed. The Navy requests clarification if there is a concern regarding compliance with a specific regulation. The Navy requires that their contractor be in compliance with all applicable regulations and policies for the work being performed.

SPECIFIC COMMENTS

1. **Comment:** Section 2.0, Extraction Well Locations, Page 1 - The last sentence in the first paragraph states that the locations of the new extraction wells will be moved, as necessary, to avoid utilities. EPA believes that adjusting the locations by approximately 10 feet in any direction would not be significant. If, however, utilities or other obstructions require further movement, the new locations should be discussed with the Partnering Team to ensure that the ability of the expanded extraction system to provide hydraulic capture of the contaminant plume is not compromised. Please revise Section 2.0 to clarify that the Partnering Team will be consulted if the proposed extraction well locations require adjustment greater than 10 feet from the anticipated locations.

✓ **Response:** Comment noted. A sentence will be added to the design document stating that the wells may be moved up to 10 radial feet from the design location without notifying the Partnering Team.

2. **Comment:** Section 3.0, Drilling and Sampling Methodology, Page 1 - The first sentence states that "Cable tool drilling is recommended...however, other methods may be reviewed and approved." Please revise the Design Proposal to discuss the other methods which may be reviewed and approved and to define the circumstances under which these methods may be considered. If other methods have been reviewed and rejected, such as sonic drilling, revise the Design Proposal to include an evaluation of available drilling options.

Response: The purpose of this text is to ensure that the reader knows that it is highly preferred that the selected method of drilling can be conducted without using drilling fluids (excepting potable water), because this could potentially cause difficulty in thoroughly developing the well. Other methods, such as sonic or reverse circulation, would be acceptable if a significant cost savings would result and if it can be demonstrated that the drilling can be conducted effectively according to the design, preferably without drilling fluids other than potable water. If the contractor selected proposes and alternate method that would prove effective safe and provide a time/cost savings; the Navy would forward the recommendation to the EPA and MPCA for review. However, at this time, based on Team discussions, no other method is being considered. If the EPA (or MPCA) believes that using the cable tool method is the only reliable and viable method, please inform the Navy.

3. **Comment:** Section 3.0, Drilling and Sampling Methodology, Page 2 - Due to the variable nature of the lithology in the proposed extraction well installation locations, heaving sands may be encountered. However, the Design Proposal does not include a contingency plan to address the potential for encountering heaving sands and associated schedule delays. Please revise the Design Proposal to include a contingency plan to address heaving sands should they be encountered.

✓ **Response:** If heaving sands are encountered, then field personnel would work with subcontractors to continue borehole advancement to the desired depth. No revision to the design document is required at this time.

4. **Comment:** Section 4.0, Extraction Well Construction, Page 2 - The Design Proposal does not include hydraulic analyses to demonstrate that, based on the proposed design and pumping rates, drawdown in the proposed extraction wells will be acceptable. Please revise Section 4.0 to include information on hydraulic analyses or calculations that were done to support the expected interference between the three proposed extraction wells.

✓ **Response:** The theoretical projected drawdown in AT-11 and AT-13 is 8.5 feet, and 8.9 feet in AT-12. The following calculation was used to estimate drawdown curves for each new extraction well:

$$s = (2.3Q/4\pi T) \times \log(2.25Tt/r2S)$$

Where: Q = 200 gpm or 38,502 ft³/day

T = 12,000 ft²/day

t = 30 days

S = 0.01

5. **Comment:** Section 4.0, Extraction Well Construction, Page 2 - This section discusses a well casing diameter of 12 inches. However, a well diameter of 10 inches was previously proposed. Please revise the Design Proposal to clarify why the well casing diameter has been increased.
Response: While not a significant increase in theoretical well yield, a larger diameter well offers a slight advantage in well yield which could be used for increased withdrawal of groundwater or to limit drawdown. Additionally, the 12-inch diameter screen has 40 percent more surface area than a 10-inch diameter screen. The additional surface area could be advantageous, given the history of iron fouling in NIROP extraction wells. It has also been mentioned in Partnering Meetings that there is generally a nominal cost increase between 10- and 12-inch diameter pipes.
6. **Comment:** Section 4.0, Extraction Well Construction, Page 2 - It is noted that Johnson Division Screen produces a free-flow and a high-flow version of their screens. The high-flow screen has a smaller amount of surface area which may be an advantage considering the history of fouling of the historical extraction well screens in the area. Please revise the Design Proposal to discuss which screen, free-flow or high-flow, will be used in the construction of the wells and why. Also, prior approval from EPA on the selection of screen size and filter pack material will only be required if the decisions differ considerably from those recommended by the well screen manufacturer.
Response: Comment noted. It is recommended that free-flow versus high-flow screen be evaluated following Johnson Well Screen's recommendation for screen design. Please provide clarification if the EPA or MPCA has a preference for a free-flow or high flow screen.
7. **Comment:** Section 5.0, Extraction Well Development, Page 3 - The section states that the proposed extraction wells will be "pre-developed immediately after drilling and installing the filter pack. Please revise the Design Proposal to indicate that all pre-development procedures will be in compliance with state and federal regulations. An indicator constituent, such as chlorine, should also be considered for use during well development to ensure that all drilling fluids have been flushed from the well. EPA assumes that the Navy plans to do further well development after the pre-development is complete. Please clarify the plans for additional well development.
Response: Comment noted – additional information has been requested from MPCA to determine what design elements are not consistent with MDH Well Code. The well should also be developed after the well is completed and the text will be modified to state this; however, pre-development is highly recommended. The Navy will be using standard water quality indicators (such as pH, temperature, conductivity, etc.) during development, and at this time is not considering chlorine as an indicator to indicate when development is completed.
8. **Comment:** Section 7.0, Extraction Well Hydraulic Testing, Page 4 - It is unclear from this section whether well AT-3A will be shut down prior to and during any hydraulic well testing. Due to the potential impact of pumping from the new extraction wells on the shallow zone, it is recommended that existing extraction wells in the shallow zone be shut down prior to and during hydraulic well testing.
Response: Comment noted, AT-3A will be shut down prior to and during testing.
9. **Comment:** Section 7.1, Step Drawdown Testing, Page 4 - It is unclear whether drawdowns and pumping rates will be monitored during step drawdown testing. Such testing should be performed to ensure that the drawdown does not extend below 10 feet above the top of the well screen. Revise the Design Proposal to include monitoring of drawdowns and pumping rates during step drawdown testing.
Response: It is standard procedure to monitor drawdown and pumping rates for pumping and observation wells during pumping tests. It is clearly stated in Section 7.1, first paragraph, last sentence, that "Pumping rates and drawdowns in the extraction wells will be closely monitored..." No revision to the design document is required at this time.
10. **Comment:** Section 7.2, Constant Rate Test, Page 5 - The Design Proposal includes plans to conduct

constant rate testing in each of the proposed extraction wells. This testing is expected to provide valuable data and support analysis of the hydraulic performance and impact of each of the completed wells. It may be useful to also conduct a test using simultaneous pumping from all three of the proposed wells. Such testing may provide valuable information regarding the hydraulic performance and impact of the three wells operated as a unit, which is the intended manner of operation. It is recommended that the Design Proposal be revised to include a constant rate test with the three proposed extraction wells operated as unit.

Response: Comment noted; the text will be revised to also conduct a constant rate test with all three new wells.

11. **Comment:** Section 7.2, Constant Rate Test, Page 6 - The text indicates that pre-pumping monitoring of water levels will be conducted for a four-hour period prior to start up of a pumping test. This duration may not be sufficient to identify any pre-existing water level trends or verify the stability of the recovery from a previous pump test with a duration of 36-48 hours. For these reasons, it is recommended that pre-pump testing water level monitoring be conducted for a period of at least 48 hours at 8 hour intervals.

Response: Using a 48 hour period will add at least 8 days to the schedule, possibly longer, depending on the available working hours/days at the facility. A subset of wells will have transducers to measure recovering water levels. Based on the USGS Report (Davis, 2007), water levels in the intermediate and deep zones, especially in areas where these zones are confined, appear to need more time than proposed for recovery.

However, to balance this with the need to complete the extraction well hookup to the treatment system in a timely manner, it will be recommended that the wells be monitored for at least 24 hours (preferably 48) between pump tests using both transducers and hand measurements. After each test is complete, it's estimated that the amount of time to move pumping equipment to the next well, move transducers in observation wells (as appropriate), and prepare for the next pump test is approximately 36 hours.

12. **Comment:** Section 7.2, Constant Rate Test, Page 7 - Table 2 identifies wells in the intermediate and deep groundwater flow zones in which groundwater levels will be monitored during the pumping tests. There is potential hydraulic interconnection between the shallow and intermediate zone in the area of the proposed extraction wells, particularly in the area immediately downgradient of the site boundary. As a result, it is possible that the high-volume, concentrated pumping, particularly during the recommended multi-well test, may hydraulically impact the shallow flow zone. For this reason, it is recommended that water levels in several shallow zone monitoring wells be monitored during the pump testing. The following wells are suggested for this purpose: MS-56S, MS-54S, MS-36S, MS-35S, MS-34S, MS-24S, and 6-S.

Response: As discussed in September and December 2010 Partnering Team meetings, the purpose of this design is to replace AT-3A, an intermediate zone extraction well, not to determine the impact of the intermediate zone extraction wells on shallow zone wells. The current pump test design is sufficient to establish boundary conditions from intermediate-zone pumping.