MEMORANDUM

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To: Shannon Nichols, Alex White

From: Scott Bender

Date: November 20, 2023

RE: Progress Groundwater Control Approach Memo

This memorandum presents the current results of the groundwater modeling calculations for construction of the subsurface structures at the proposed Arco Station in Puyallup, Washington. We also request some guidance for additional monitoring scenarios, as discussed below. You may wish to send this memo to your geotechnical engineer for comment as well.

The first phase of our scope of work is to predict the amount of groundwater drawdown that may occur outside the limits of your property. We understand that groundwater drawdown is a concern due to the susceptibility of some of the shallower soils to settle under a lowered water table condition (groundwater drawdown induced ground surface settlement). The structures that will need to be dewatered during construction will be the stormwater vault with a base of excavation elevation of about 36 feet, and the UST tank excavation with a base of subgrade elevation of about 31.6 feet.

I have constructed a groundwater model with an areas of 3,000 by 3,000 feet. Based on the project CPTs the model assigned soils to a depth of about 20 feet were a slightly silty sand with a permeability of 0.01 feet per minute (ft/min). Soil between 20 and 33 feet were coded in as gravelly sands with a permeability of 0.03 ft/min. Soil below 33 feet were coded as silt with low permeability. It is important to note that there is no permeability information in the geotechnical report (such as grain size analyses or any site testing); as such, the assigned permeabilities are based on our experience. It is possible that I have underestimated the permeability of the deeper gravelly sands.

At this stage of the evaluation I assumed that the excavations will be shored with soldier pile and lagging and both excavations will be open and dewatered at once. I have assumed that the excavations would be open for 5 months. I need some direction from you for both of these items. The geotechnical report actually recommends that the UST excavation should be shored with sheet piles. The two excavations can be performed and dewatered separately (assuming no sheet piles), but this would not be as efficient from a dewatering perspective; I also suspect having the water table going up and down two times could cause more settlement, but your geotechnical engineer would need to comment on that. A 5 month construction/dewatering window may be too long, please provide your estimate.

For now I believe the best method to dewater the site would be to install deep dewatering wells outside of the excavation limits. The UST excavation is likely too deep for use of well points,

and if the deep wells are carefully monitored and operated they should not cause excess drawdown. 12 wells were used in the simulation.

Figure 1 shows a groundwater elevation contour map of the site and vicinity at the end of the 5 month dewatering period. This simulation was run at the high permeability estimate of 0.03 ft/min. Note that the higher the permeability the higher the dewatering rates will be, and in addition, the greater the area of groundwater drawdown (the system will have a larger radius of influence). After a 5 month period most of the site drew down to 28 to 29.5 feet, the required elevation for the UST tanks but well below the vault excavation; this is a function of a high permeability soil, where it can be very difficult to fine tune drawdown to the requirements of each individual excavation. The total flow rate from this system, after 5 months of dewatering was 175 gpm; analytical calculations indicate that the required total dewatering rate to lower water levels down below the excavations within a period of one week would be about 300 gpm.

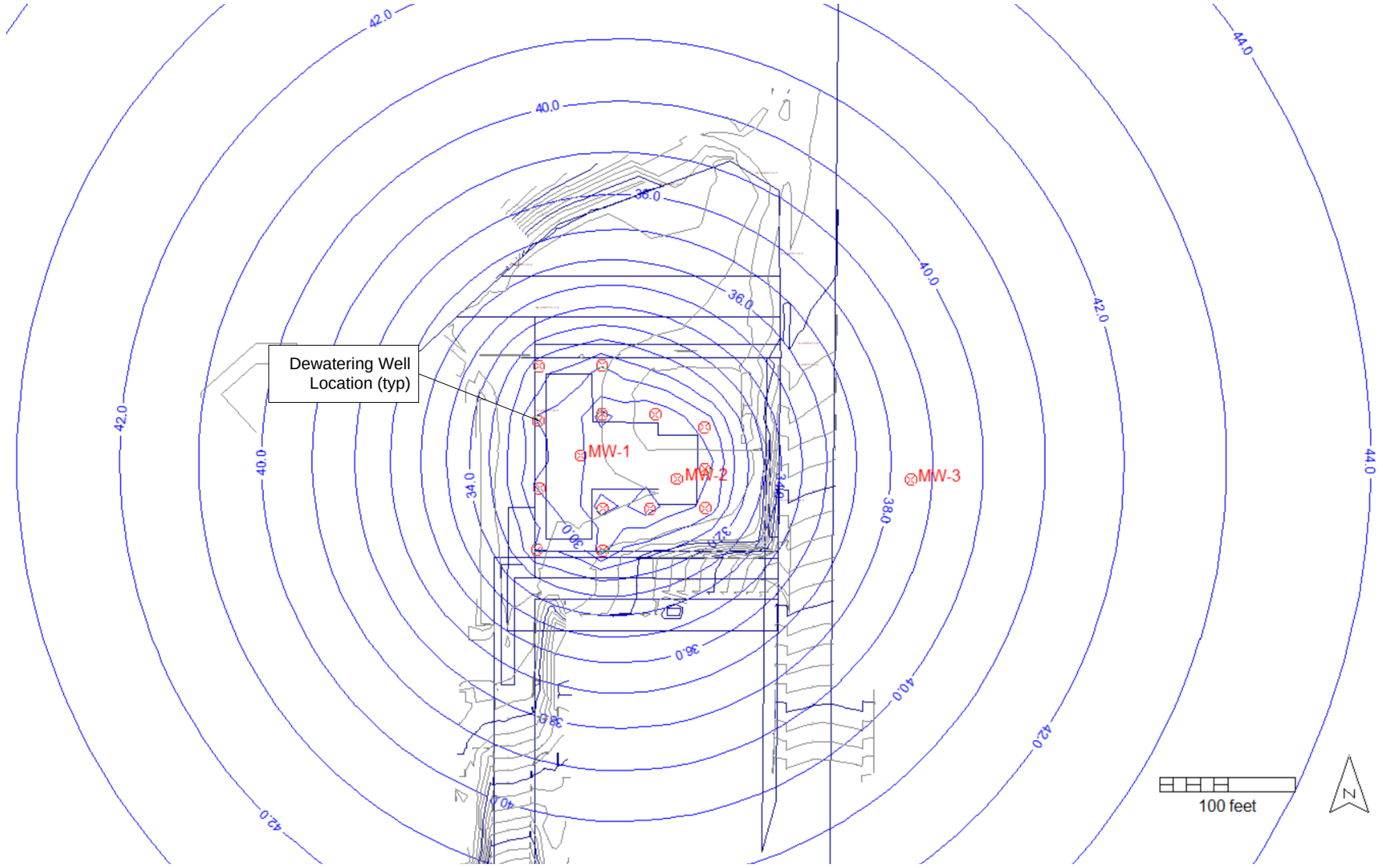
Figure 1 shows the locations of three simulated monitoring wells. The drawdown with time for each of these wells is shown in Figure 2. Note that drawdown increases with time, and does not achieve a steady state. Note that the dewatering wells were installed in Layers 6 and 7, flat lines represent where model soil layers become dry.

To provide additional analyses to meet the project objectives please provide the following:

1) The shoring methods proposed for the site (we understand that a few more iterations of this original model may be required before that decision is made)
2) Whether both excavations can be dewatered simultaneously
3) The anticipated duration that dewatering will be required
4) Presentation requirements required by your geotechnical engineer. The plots can be as in Figures 1 and 2, contours of drawdown can also be provided rather than groundwater elevation. We can also provide x,y,z values in Excel spreadsheet format.
5) Given an understanding that initial dewatering rates can be above 300 gpm, it may be worthwhile at this point to determine if there is adequate capacity in nearby storm sewer or sewer utilities; this can also drive the shoring options.

Please let me know if you have any questions or comments.

Provide revised dewatering report based on the additional information requested by Bender Consulting.
[dewatering plan, pg 2]



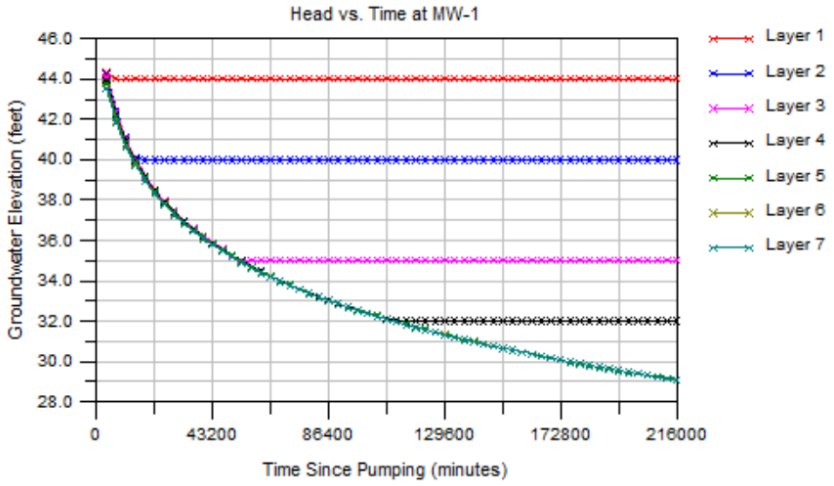
BENDER CONSULTING, LLC
Applied Groundwater Solutions

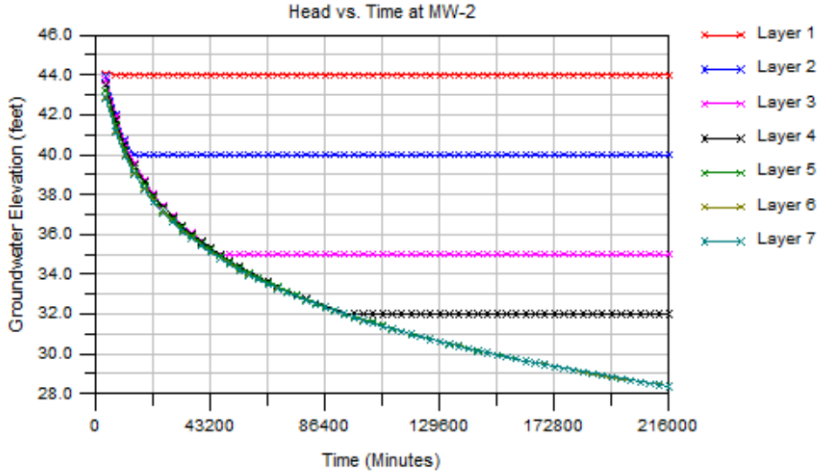
Puyallup Arco
Dewatering Analyses
BP North American Products, Inc.

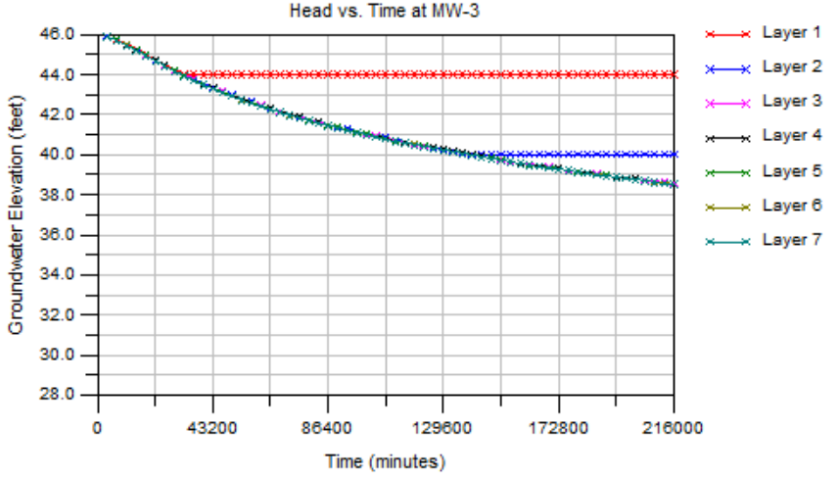
Calculated Dewatering Groundwater Elevation Contours
(high permeability estimate)

Project Number
2336-01

Figure 1







BENDER CONSULTING, LLC *Applied Groundwater Solutions*	Puyallup Arco Dewatering Analyses BP North American Products, Inc.	Simulated Monitoring Well Water Levels with Time (high permeability estimate)	Project Number 2336-01 Figure 2