Engineers, Surveyors, Planners, Scientists

MEMO

Date: October 28, 2021

To: Matt McQuade

From: Mike Keller, PE

Subject: Groundwater Well Permitting (non-potable) and Area 1 Capacity Testing

Copies: Jennifer Chrysler, City of New Albany

The requirements associated with developing and maintaining a groundwater well in Ohio for non-potable usages has less regulatory restrictions and permitting than a potable water well. Wells for non-potable supply must be constructed in accordance with Ohio EPA and ODNR requirements, but Ohio EPA well site acceptance is not required. Additionally, a non-potable water supply well will not have the applicable well and water quality testing, and source-water protection requirements as required for potable wells. The following are the anticipated key regulatory activities associated with the proposed non-potable groundwater well for Area 1.

- **Water withdrawal registration with the ODNR Division of Water will be required in accordance with ORC 1521.16**. Annual water withdrawal submittals to ODNR will also be required. Depending on location, permits for construction in a floodway could be necessary.

- Depending on use/fate of the water, **permitting in accordance with Ohio Department of Natural Resources consumptive use regulations may be required**.

- Locations of wetlands and potential impacts to wetlands have not been evaluated at this time. **Wetland impacts due to groundwater withdrawal could necessitate hydrologic and biological studies and permitting from various agencies, including ODNR, the U.S. Army Corps of Engineers (USACE) and the U.S. Fish and Wildlife Service (USFWS).**

- Development of a high-capacity groundwater supply in any area could cause impacts to surrounding residential wells or surface-water bodies (i.e., ponds) resulting from drawdown caused by pumping. **The owner/operator of the project's water supply will be responsible for remediation of any such impacts.**

Team Ohio is currently conducting a testing on Area 1 well site which will have the potential to produce a capacity of approximately capacity of 4.5 MGD. It is noted that groundwater withdrawal in excess of 3.0 MGD will likely necessitate additional residential well and pond mitigation efforts.

The current Investigation Plan for the Phase 2 Process Water Supply (Groundwater) includes the following tasks:

1. Test Drilling – evaluate test bore information to evaluate well locations on Area 1. These test bores will allow for maximum sample recovery and collection of soil samples to be analyzed for grain-size distribution

2. Aquifer Testing
   - Install and develop the test well and additional observation well

   - Perform stepped-rate and constant-rate pumping tests.
     - The stepped-rate pumping test will provide data on well performance and will be conducted by pumping the well at a minimum of three consecutively increasing rates for a minimum of 45 minutes at each rate. The results of the stepped-rate pumping test will be used to select a rate for the constant-rate pumping test. The pumping rate for the constant rate test will be high enough to adequately stress the Aquifer and thereby provide the data needed to evaluate well and well-field capacity.

     - The constant-rate pumping test will be 72-hours in duration. Pressure transducers and data loggers will be installed in all observation wells, the north quarry pit and Raccoon Creek to facilitate data collection before, during and after the pumping tests. Background (i.e., non-pumping) data will also be useful in evaluating hydraulic interconnections between the aquifer, the quarry pit and Raccoon Creek.

   - Water samples will be collected near the conclusion of the constant-rate pumping test for analysis of parameters as specified by the client.

2. Aquifer Test Data Analysis and Groundwater Flow Modeling
   - The aquifer test data will be analyzed to determine aquifer characteristics (i.e., transmissivity/hydraulic conductivity and storativity) using time and distance drawdown analytical methods.

   - Groundwater flow modeling using site-specific data will be advantageous for determining the groundwater capacity that can be developed at any site and the type and number of wells that will be required. Groundwater flow modeling may also be required by ODNR under the consumptive use regulations and/or in response to potential opposition from neighboring riparian users.

     - The groundwater flow model will be used to simulate various pumping scenarios to determine the optimal number of wells and pumping rates for each well that will be

required to maximize the sustainable groundwater withdrawal capacity that can be developed at Site 1.

- The groundwater flow model will also provide data on anticipated drawdown throughout the area that will be used to evaluate potential residential well and private pond impacts.

Attachment: Memo - Site 1 Capacity Estimate and Exploration and Testing Plan, One Columbus/Licking County Project, Dated October 1, 2021

PROJECT MEMORANDUM

DATE: October 1, 2021

TO: Mike Keller, EMH&T

FROM: Steve Champa, Chris Cobel and Mike Gibson, Eagon & Associates, Inc.

SUBJECT: Site 1 Capacity Estimate and Exploration and Testing Plan
One Columbus/Licking County Project

General:

This memo is provided to expand on the groundwater capacity estimate for Site 1 provided in the September 17, 2021 memo to EMH&T and identified on the Aquifer Mapping and Water Supply Alternatives map dated September 15, 2021 (Plate 1). Also described in this memo is our plan for exploration and testing at Site 1 to verify the presence of suitable aquifer materials at likely well sites and to refine the groundwater capacity estimate. Plate 2 is a map of Site 1 showing property boundaries, the 100-year flood zone and floodway mapping based on data from the Federal Emergency Management Agency (FEMA). The only potential contaminant source identified on the property is the hazardous fluid pipeline that traverses the property from the southeast to the northwest south of Raccoon Creek.

Site 1 is an active sand and gravel extraction operation. The property owner and parcel number are shown on Plate 2. Eagon & Associates have been involved with water-level monitoring and complaint resolution for the quarry operator since dewatering of the north quarry pit was initiated in 2016. Pumping for dewatering of the north pit ended in 2021. The objective of quarry dewatering was to lower water levels to elevation 925 feet, above mean sea level (feet, msl). The ground elevation around the pit is approximately 955 feet, msl and the non-pumping (static) groundwater level is about 950 feet, msl. The average pumping rate for dewatering was about 2,100 gpm (3.0 MGD) to maintain about 25 feet of drawdown in the quarry pit.

Test borings at Site 1 (locations shown on Plate 2) indicate that the sand and gravel aquifer extends to a depth of at least 80 feet at the north quarry pit. Materials were excavated from the north pit to a depth of as much as approximately 60 feet below ground level (bgl). Anecdotal reports from the quarry operator indicate that the best sand and gravel resources were encountered in the southwest and northern parts of the north pit. Test-boring data from south of Raccoon Creek show the unconsolidated materials to be more stratified with layers of clay interbedded with the sand and gravel. The available data indicate that the area north of Raccoon Creek has the best potential for water supply development. The area proposed for well-field development north of Raccoon Creek around the north pit (outlined on Plate 2) is approximately 28.5 acres.

Locating wells around the north pit to meet Ohio EPA requirements for potable wells would be difficult. Ohio EPA regulations for high-capacity public water supply wells for potable

use require that the owner maintain control through ownership or lease of a sanitary setback area with a radius of 300 feet from the well. The well must also be located at least 50 feet from any surface water body to avoid being classified as under the direct influence of surface water thereby incurring the necessity of treatment of the groundwater as surface water. These setback requirements are not applicable to location of wells for a nonpotable water supply. Any wells installed in the floodway of Raccoon Creek will require permitting for construction in the floodway.

Plate 3 is a map showing water-level change around the north quarry pit between pre-quarry water levels in September 2015 and water levels in September 2020 prior to the cessation of pumping for dewatering of the north pit in January 2021. Drawdown from dewatering of the north pit impacted 21 residential wells and five surface ponds. Mitigation of the residential well impacts was successfully performed by replacement of wells or connection to the Granville public water supply system which serves most of Alexandria.

Water-level data collected between February and April 2021 show recovery of water levels to at or near pre-dewatering water levels by April 2021. The relatively limited extent of drawdown from five years of quarry dewatering and rapid recovery of aquifer water levels post-dewatering demonstrate that recharge to the aquifer is available to support long-term groundwater withdrawals of at least 3.0 MGD. Groundwater withdrawal in excess of 3.0 MGD will likely necessitate additional residential well and pond mitigation efforts. The new groundwater withdrawal facility will need to be registered with ODNR in accordance with ORC 1521.16 and will need to report groundwater withdrawal to ODNR on an annual basis.

Based on our current knowledge of the site from test borings, the water withdrawal history from the quarry and resulting drawdown and recovery, if suitable aquifer materials are present at potential well sites, we estimate that an eventual capacity of approximately 4.5 MGD can be developed at Site 1.

Investigation Plan:

In order to further define aquifer thickness, extent and groundwater capacity, the following plan for further investigation is recommended.

1) Test Drilling

    a. Drill test borings at four to six potential well locations around the north quarry pit using Rotosonic methods to allow for maximum sample recovery and collection of soil samples to be analyzed for grain-size distribution.
    b. Install piezometers at suitable boring locations to be used as observation wells during aquifer testing.

2) Aquifer Testing

    a. Select a location and develop construction design specifications for an aquifer test well, based on review of the test boring logs and grain-size analyses. The test well

diameter will be in the range of 16 to 24 inches and will be designed to maximize well capacity based on well screen transmitting capacity, aquifer thickness and available drawdown. The test well will be designed and constructed to Ohio EPA standards and will be suitable for eventual use as a production well.

b. Install and develop the test well and additional observation wells. At least two additional observation wells will be installed to facilitate design of the aquifer pumping test to provide sufficient data to analyze the hydraulic interconnection between the aquifer, Raccoon Creek and the quarry pit.
c. Perform stepped-rate and constant-rate pumping tests. The stepped-rate pumping test will provide data on well performance and will be conducted by pumping the well at a minimum of three consecutively increasing rates for a minimum of 45 minutes at each rate. The results of the stepped-rate pumping test will be used to select a rate for the constant-rate pumping test. The pumping rate for the constant-rate test will be high enough to adequately stress the aquifer and thereby provide the data needed to evaluate well and well-field capacity. The constant-rate pumping test will be 72-hours in duration. Pressure transducers and data loggers will be installed in all observation wells, the north quarry pit and Raccoon Creek to facilitate data collection before, during and after the pumping tests. Background (i.e., non-pumping) data will also be useful in evaluating hydraulic interconnections between the aquifer, the quarry pit and Raccoon Creek.
d. Water samples will be collected near the conclusion of the constant-rate pumping test for analysis of parameters as specified by the client.

3) Aquifer Test Data Analysis and Groundwater Flow Modeling

a. The aquifer test data will be analyzed to determine aquifer characteristics (i.e., transmissivity/hydraulic conductivity and storativity) using time and distance drawdown analytical methods. The pumping test data will also be used to estimate the streambed hydraulic conductivity of Raccoon Creek.
b. The aquifer and streambed parameters will be used as inputs for a groundwater flow model of the area. The groundwater flow model will be calibrated to the drawdown data observed during quarry dewatering and to the results of the constant-rate pumping test.
c. After calibration, the groundwater flow model will be used to simulate various pumping scenarios to determine the optimal number of wells and pumping rates for each well that will be required to maximize the sustainable groundwater withdrawal capacity that can be developed at Site 1.
d. The groundwater flow model will also provide data on anticipated drawdown throughout the area that will be used to evaluate potential residential well and private pond impacts. The impact of groundwater withdrawal on flow in Raccoon Creek will also be evaluated.


Service Layer Credits: Topographic: West Virginia GIS, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
USGSTopo: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed August, 2021.
Source Water Protection Areas (SWPA) were filtered to only show "Community" systems.
Significant Water Withdrawal Facilities within the study area were manually filtered to remove all inactive facilities, golf courses, and facilities suspected to have low groundwater withdrawal.
Area 1 3-6 MGD
Area 2 3-6 MGD
Area 3 5-10 MGD
Area 4 3 MGD
Area 5 2-3 MGD
Area 6 3-5 MGD
Area 7 ~20 MGD
Area 8 10+ MGD
Area 9 10-20 MGD
Area 10 2-3 MGD
5-Miles
10-Miles
15-Miles
20-Miles
25-Miles
30-Miles
35-Miles
40-Miles
45-Miles
Map Features
Site Location
Public Water Supply Wells
Significant Water Withdrawal Facilities
Concentric 5-Mile Buffers on Site Location
Areas of Interest (with Production Potential)
Source Water Protection Areas
ODNR Statewide Aquifers
Yield (GPM)
> 500
100 - 500
0 10,000 20,000
Feet
Compiled By: CPG
Created By: CPG
Checked By: SJC
Approved By: SJC
Date: 9/15/21
Title: Aquifer Mapping and Water Supply Alternatives
Project Title: ONE COLUMBUS
Prepared By: EAGON & ASSOCIATES, INC.
Plate: 1

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FEMA Flood Hazard Layer
NPMS USDOT
ODNR Water Wells

JUG STREET RD
JERSEY MILL RD
JOHNSTOWN-ALEXANDRIA RD
NORTHRIDGE RD
KERR ST
MOUNTS RD
DRIVEWAY
COLLEGE ST
MAPLE ST
CHURCH ST
MAIN ST
LIBERTY ST
BEECHWOOD DR
MALLARD DR
DEPOT ST
GRANVILLE ST
MILL ST

Total Acreage: 28.6

T-1
T-2
T-4
T-5
T-7
T-8
T-9
RS-6

Raccoon Creek

HARMONY REALTY II LTD,
Parcel No. 066-317574-00.000
Total Acreage: 236.36

N

0 500 1,000
Feet

- Test Boring
- ODNR Residential Well
- Gas Transmission Pipeline
- Hazardous Transmission Pipeline
- Potential Well Field Area
- Site 1 Property Boundaries
- Regulatory Floodway
- 1% Annual Chance Flood Hazard

Compiled By: MAM	Title: Site 1 Map	
Created By: MAM	Project Title: ONE COLUMBUS	
Checked By: SJC	Prepared By: EAGON & ASSOCIATES, INC.	Plate: 2
Approved By: SJC		
Date: 9/30/21		

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FEMA Flood Hazard Layer
NPMS USDOT
ODNR Water Wells

N

JOHNSTOWN-ALEXANDRIA RD
NORTHRIDGE RD
MOUNTS RD
LOBDELL RD
JUG STREET RD
JERSEY MILL RD
MAIN ST
LIBERTY ST
RACCOON VALLEY RD
Raccoon Creek
JOHNSTOWN-ALEXANDRIA RD

62 2.05
82
64 5.6
133 -0.32
66 7.2
67 -2.16
60 1.65
75
55 2.11
51 2.02
124R 14.3
52R 14.6
132 -0.31
179 13.7
138 13.05
148 -0.14
161 14.2
4 12.62
110 7.05
158 4.75
166 2.61*
203 -0.35
205

0
5
10
15

0 1,000 2,000
Feet

Residential Wells (by Aquifer)
- Bedrock
- Sand & Gravel
- Unknown
- 179 (Map Number) / 13.7 (Water Level Changed)
- Water Level Change Contour
- Inferred Water Level Change Contour
- Site 1 Property Boundaries
- Regulatory Floodway
- 1% Annual Chance Flood Hazard

*Initial Water Level Collected 3/2015.

Note: Positive number represents downward change, Negative number represents upward change.

Compiled By: CPG	Title: Water Level Change from 9/2015 to 9/3/2020	
Created By: MAM	Project Title: ONE COLUMBUS	
Checked By: SJC	Prepared By: EAGON & ASSOCIATES, INC.	Plate: 3
Approved By: SJC		
Date: 10/1/21		

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