Enon Sand & Gravel
A JURGENSEN COMPANY

June 18, 2019

Bob Ostendorf, Jr.
Ohio EPA Southwest District Office
Division of Surface Water
401 East Fifth St.
Dayton, Ohio 45402-2911

Re: Enon Sand & Gravel, LLC
NPDES Application 1IJ00141

Dear Mr. Ostendorf:

This correspondence is in response to your latest letter about Enon Sand & Gravel's NPDES application. Please find the revised Work Plan attached.

Sincerely,

Cory Kiser

Cory Kiser
Enon Sand & Gravel

WORK PLAN FOR HYDROGEOLOGIC INVESTIGATION
(Revised June 13, 2019)
CULBERTSON FEN
ENON SAND & GRAVEL

Introduction

This document is a revised work plan for evaluation of the potential for a hydrogeologic interconnection between the subsurface materials at the Enon Sand & Gravel Phase I quarry area and the Culbertson Fen. Comments (dated May 17, 2019) on the original work plan were received from Ohio EPA. The objective of the work plan is to determine if there is a potential for impacts to the fen from quarry excavation and dewatering. The work plan is not intended to be a study of fen hydrology. The proposed scope of work will provide the data necessary to determine if subsurface interconnections between the quarry area and the fen exist, and if they do exist, what the hydraulic relationships (i.e. flow direction and gradient) between the fen and the site are. If subsurface zones of saturation are identified that could have a hydraulic interconnection with the fen, a monitoring strategy will be developed for the fen during quarry operations.

In response to the Ohio EPA comments, the work plan has been revised to expand the residential well survey to include other residences along Garrison Road adjacent to the Phase I area, in addition to the Culbertson residence. One additional test boring has also been added to the work plan to investigate subsurface conditions below the southwest trending swale that crosses the southern part of the Phase I area. The borings, as proposed, will also provide data that will allow for evaluation of any potential hydrogeologic interconnection between the Phase I area and the Vanderglas Fen.

The Culbertson Fen is located west of the Phase I operational area along Garrison Road in Mad River Township, Clark County, Ohio. Enon Sand & Gravel intends to quarry limestone to a floor elevation of approximately 846 to 852 feet above mean sea level (feet, msl) in the Phase I quarry area east of Garrison Road, as shown on the attached Figure 1.

Figure 2 is a map of the site showing residential well locations, the locations of existing site test borings, a cross-section trace (A-A') through the residential wells, and the proposed location of test borings to define subsurface stratigraphy east of Garrison Road and on the Culbertson property west of Garrison Road. The logs of the residential wells and the site borings are included in Appendix A of this work plan.

Figure 3 is a cross section (A-A') through the residential wells and shows the bedrock surface and the overlying glacial stratigraphy. Water levels from the well logs also are shown on the cross section. The cross section shows that the thickness of unconsolidated material above bedrock varies from approximately 36 to 70 feet and is composed mainly of materials described on the well logs as clay and clay and gravel. Deposits of sand, gravel, or sand and gravel are relatively thin and discontinuous. No residential wells are completed in the unconsolidated

deposits so water levels above bedrock are not defined by the available data. Bedrock water levels are below the top of rock, except at Well Nos. 762321 and 913338. Bedrock water levels below the top of bedrock indicate unconfined aquifer conditions and a lack of hydraulic interconnection between the bedrock and the isolated sand and gravel deposits. Based on the stratigraphic and water-level data, the Culbertson and Vanderglas Fens appear to be perched above the local aquifer and do not have a hydraulic interconnection with the bedrock aquifer.

Investigative Procedures

In order to define the depth to bedrock and to characterize the unconsolidated materials above bedrock east of Garrison Road, we propose completion of five soil borings at the locations shown on Figure 2. If permission can be obtained, a test boring will also be drilled on the Culbertson property west of Garrison Road, between Garrison Road and the Culbertson Fen. These borings will be drilled using sonic drilling and sampling techniques. Specifically, a 6-inch diameter drill pipe will be used to drill the holes and a 4-inch diameter sample barrel that fits within the 6-inch drill pipe will be used to collect continuous soil samples as the test borings are drilled. An experienced hydrogeologist from Eagon & Associates will supervise drilling and log samples from the test borings.

If saturated intervals of sand, or sand and gravel, are encountered at the test-boring locations, two-inch diameter monitoring wells will be installed. The wells will be constructed using Schedule 40 PVC casings with thread and couple joints and PVC well screens with 0.010-inch slot openings. Screen lengths will be nominal five or ten feet; to be determined in the field based on the thickness of sand/sand and gravel zones. The monitoring wells will be developed to insure that the well screens are open to facilitate measurement of accurate water levels and responsiveness during hydraulic testing. Well development will be accomplished by surging, bailing, and/or pumping depending on the productivity of the well. Hydraulic testing will be performed at each monitoring well to determine the hydraulic conductivity of the screened material. Hydraulic testing may be performed using slug or pumping test methods, depending on the amount of drawdown observed during well development. Slug and/or pumping-test data will be analyzed using standard methods to determine hydraulic conductivities. The monitoring well elevations (ground and top-of-well casing) and locations will be surveyed so that water levels and stratigraphy can be accurately correlated. Ground-water levels from the monitoring wells will be used to evaluate groundwater flow and hydraulic gradients, if possible. The monitoring wells, if any are installed, can be used for groundwater monitoring during quarry operation.

If no saturated intervals of sand, or sand and gravel, are encountered at the borings, the boreholes will be grouted and no monitoring wells will be installed. Independent of the results of the investigation of unconsolidated materials, one bedrock monitoring well will be installed near the proposed location of boring 19-1, using standard rotary methods. The bedrock monitoring well will be constructed similar to the residential wells with casing seated into competent bedrock and an open borehole from the bottom of the casing to the base of the

carbonate aquifer. The bedrock well will be used for long-term water-level monitoring during quarry operations. As part of the investigation, the water levels at the residential wells along Garrison Road will also be measured, if allowed by the owners. The ground and top-of-casing elevations at the residential wells will be surveyed. Points around the Culbertson and Vanderglas Fens will also be surveyed (assuming that property access is granted) to provide an accurate map of the fens including ground elevations. If the Culbertson well can be measured, it will be used as part of the water-level monitoring network during quarry operation. Any work performed on the Culbertson or Vanderglas properties will be dependent on being granted access to the properties and permission to perform the work as specified.

Data Analysis

Data collected during this investigation will be provided to Ohio EPA in a written report. The report will include well logs, well construction diagrams, and the results of any hydraulic testing. Depending on the number and locations of monitoring wells installed, the report may also include groundwater flow maps and additional cross sections to better visualize the relationships between saturated hydrostratigraphic units. The report will also include observations regarding any potential hydraulic interconnection between unconsolidated deposits and/or bedrock and the Culbertson or Vanderglas Fens and recommendations for future monitoring.

Schedule

Enon Sand & Gravel intends to initiate drilling activities in the fall of 2019 after crops are off of the agricultural field that covers the Phase I area. In the interim, agreements will be pursued for access to the Culbertson and Vanderglas properties for surveying and drilling and a location for the test boring on the Culbertson property will be determined. After field work is complete, the report described in the Data Analysis section above will be prepared and submitted to Ohio EPA. We anticipate submittal of the report in December 2019. An approximate timeline for these activities is provided below.

Prior to October 14 – Negotiate access agreements for drilling and/or surveying on Culbertson and Vanderglas properties. Hire contractors for drilling and surveying. Locate utilities.

October 14 – October 25 – Drilling, well development, and residential well survey.

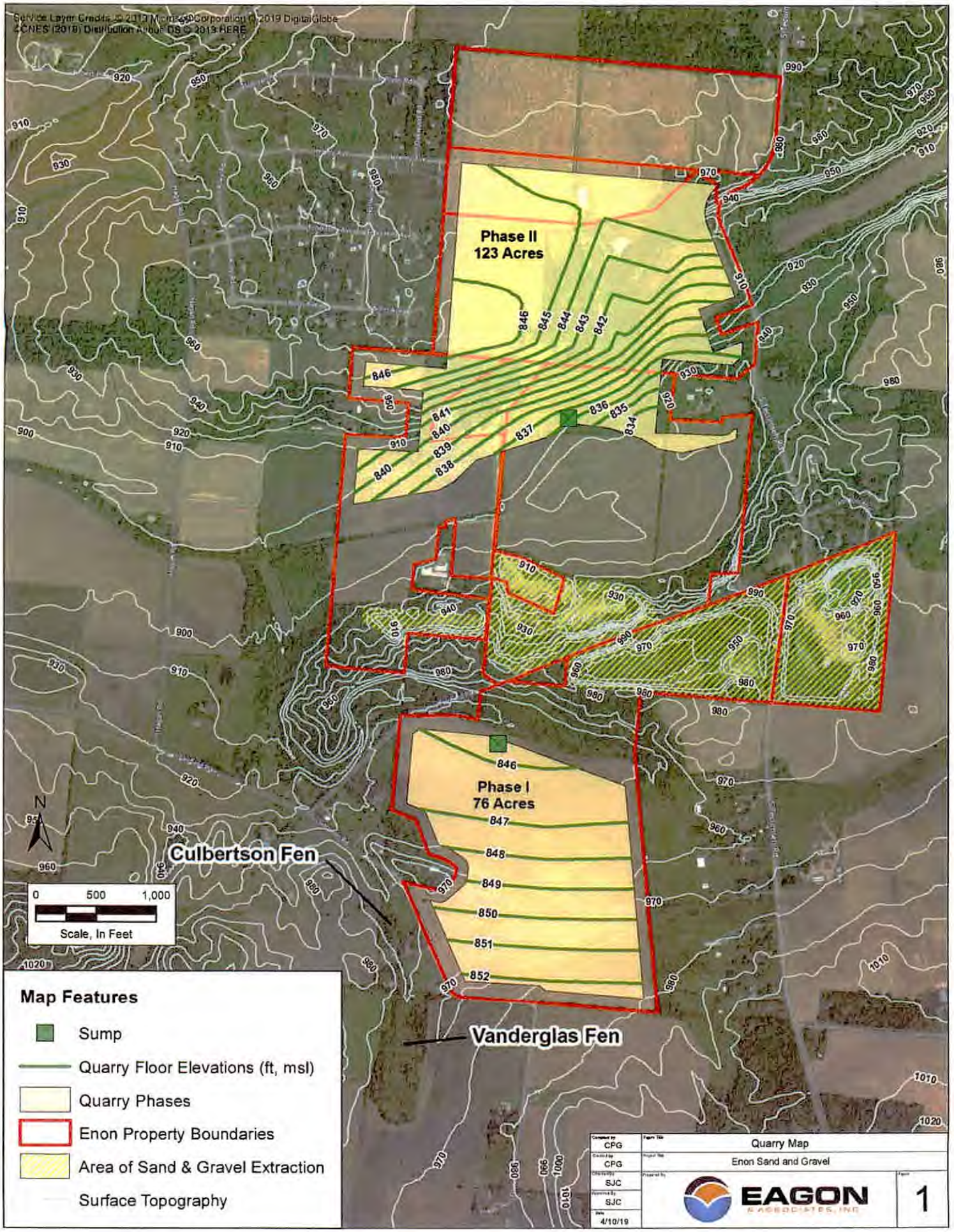
October 28 – November 1 – Surveying, hydraulic testing, and formalize well logs.

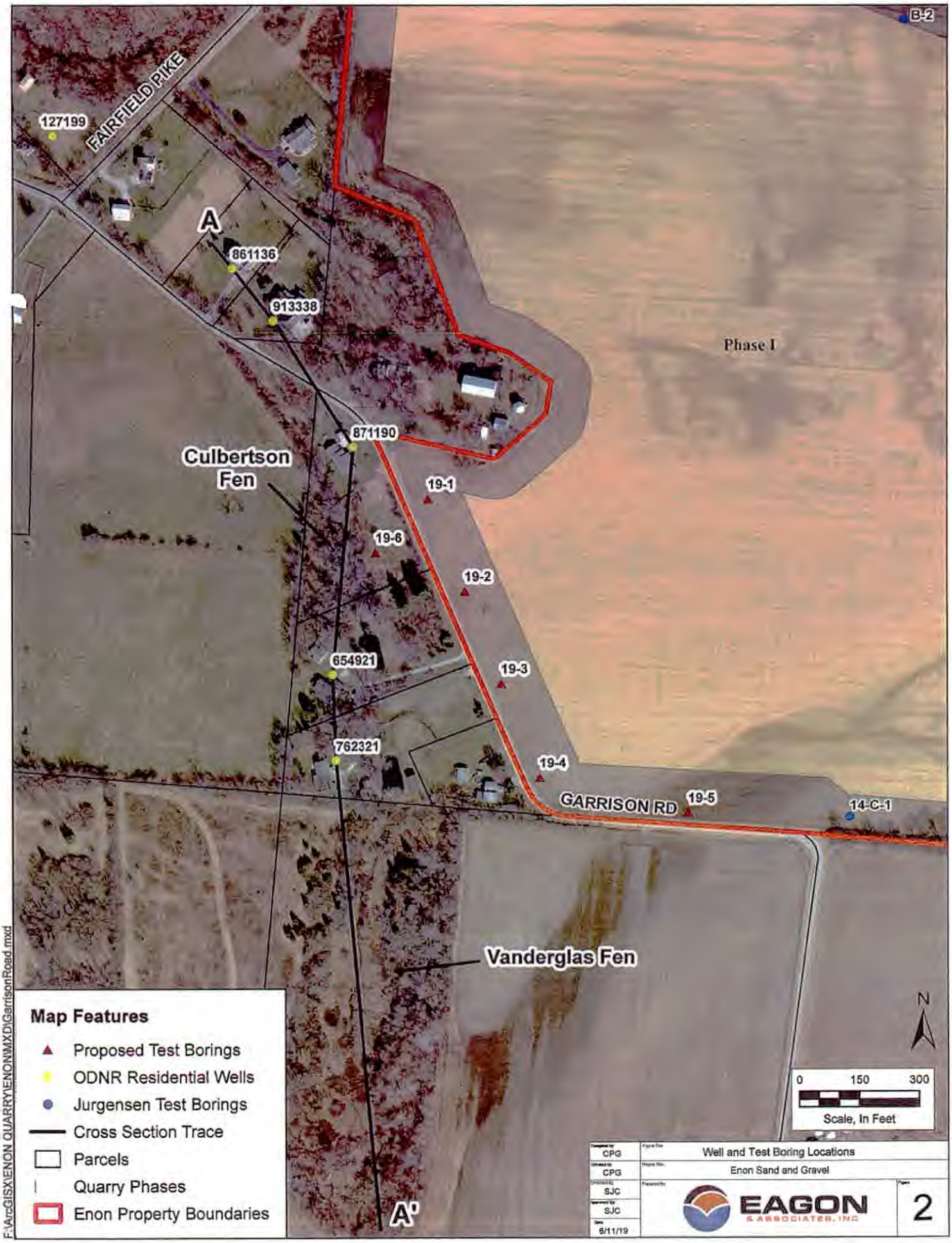
November 4 – November 15 – Data analysis and evaluation.

November 18 – December 13 – Prepare report.

December 16 – Submit report to Ohio EPA.

January 6, 2020 – Meet with Ohio EPA to discuss findings and recommendations.


Service Layer Credits: © 2019 Microsoft Corporation © 2019 DigitalGlobe
CNES (2019) Distribution Airbus DS © 2019 HERE
Phase II
123 Acres
Phase I
76 Acres
Culbertson Fen
Vanderglas Fen
N
0 500 1,000
Scale, In Feet
Map Features
Sump
Quarry Floor Elevations (ft, msl)
Quarry Phases
Enon Property Boundaries
Area of Sand & Gravel Extraction
Surface Topography
Quarry Map
Enon Sand and Gravel
CPG
CPG
SJC
SJC
4/10/19
EAGON & ASSOCIATES, INC.
1


B-2
FAIRFIELD PIKE
127199
A
861136
913338
Phase I
871190
Culbertson Fen
19-1
19-6
19-2
654921
19-3
762321
19-4
GARRISON RD
19-5
14-C-1
Vanderglas Fen
A'
N
0
150
300
Scale, In Feet
Map Features
Proposed Test Borings
ODNR Residential Wells
Jurgensen Test Borings
Cross Section Trace
Parcels
Quarry Phases
Enon Property Boundaries
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CPG
CPG
SJC
SJC
6/11/19
Well and Test Boring Locations
Enon Sand and Gravel
EAGON & ASSOCIATES, INC
2

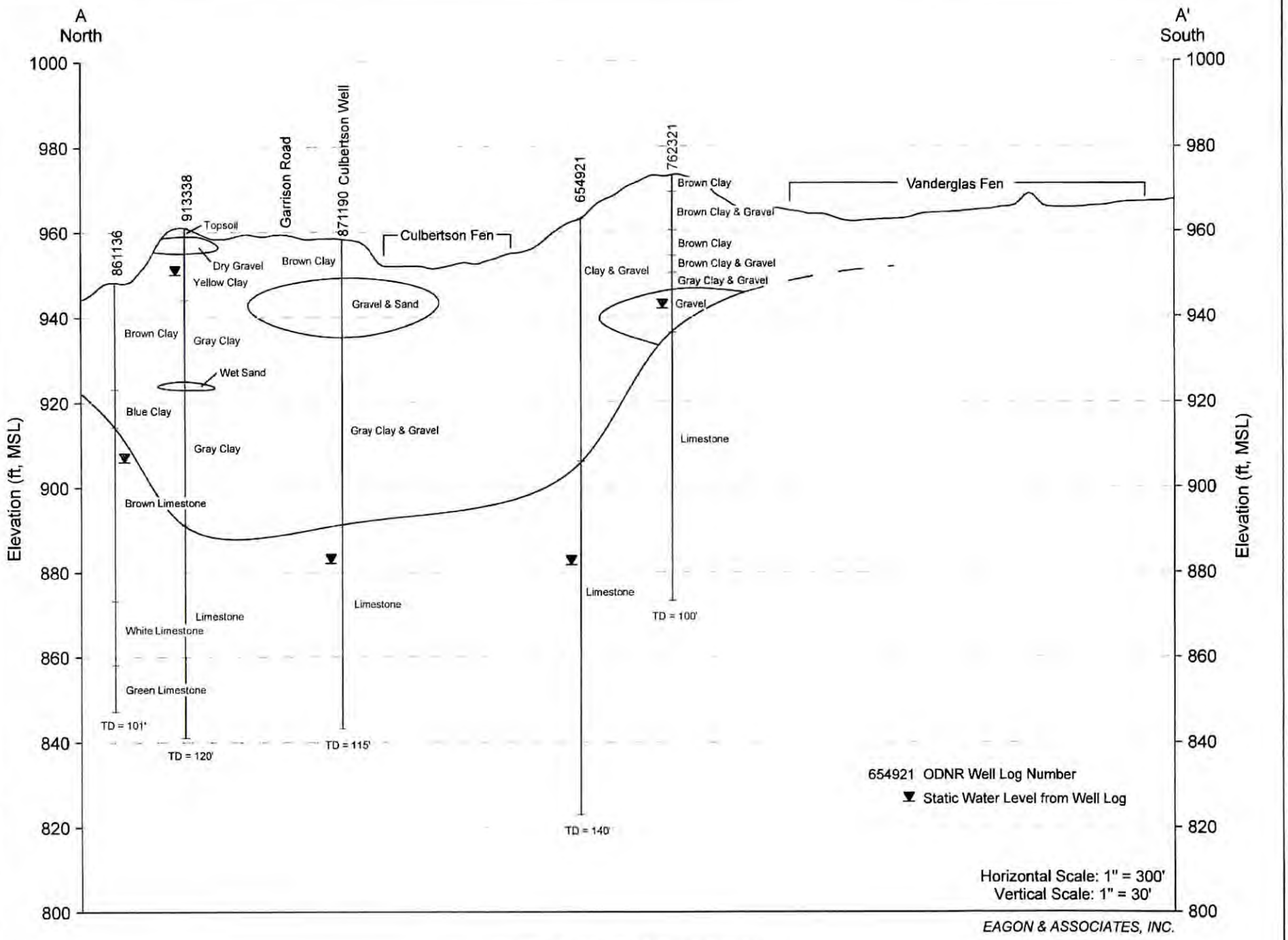

Figure 3. Cross Section A-A'
Enon Sand and Gravel - Clark County, Ohio

GraphwinEnon\GarrisonRd_CrossSection.grf, 4/10/19

APPENDIX A

SITE TEST-BORING LOGS AND RESIDENTIAL WELL LOGS

Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 871190

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *JIM FLORA*
County: *CLARK* **Township:** *MADRIVER* **Section Number:**
Address: *5825 GARRISON RD* **Lot Number:**
City: **State:** *OH* **Zip Code:**
Location Number: **Location Map Year:** **Location Area:**
Latitude: *39.844066* **Longitude:** *-83.901316*

CONSTRUCTION DETAILS

Borehole Diameter: **1:** *8.75 in.* **Borehole Depth:** **1:** *115 ft.* **Depth to Bedrock:**
2: **2:**
Casing Diameter: **1:** *5 in.* **Casing Length:** **1:** *70 ft.* **Casing Thickness:** **1:** *0.17 in.*
2: **2:** **2:**
Casing Height Above Ground: *1* **Aquifer Type:** *LIMESTONE*
Date of Completion: *8/7/1998* **Total Depth:** *115 ft.* **Well Use:** *DOMESTIC*
Driller's Name: *CRABTREE WELL AND PUMP*
Screen Diameter: **Slot Size:** **Screen Length:**
Type: **Material:**
Set Between:
Gravel Pack Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed:**
Grout Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *75 ft.* **Test Rate:** *12 gpm* Associated Reports
Drawdown: *40 ft.* **Test Duration:** *2 hrs.*

COMMENTS:

WELL LOG

Formations	From	To
BROWN CLAY	0	9
SAND & GRAVEL	9	23
GRAY GRAVEL & CLAY	23	67
LIMESTONE	67	115

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Well log questions - Web site questions - Web policies

Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 913338

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *THOMAS DIYON*
County: *CLARK* **Township:** *MADRIVER* **Section Number:**
Address: *5766 GARRISON RD* **Lot Number:**
City: **State:** *OH* **Zip Code:** *45324*
Location Number: **Location Map Year:** **Location Area:**
Latitude: *39.844930* **Longitude:** *-83.902047*

CONSTRUCTION DETAILS

Borehole Diameter: 1: **Borehole Depth: 1:** *120 ft.* **Depth to Bedrock:**
2: **2:**
Casing Diameter: 1: *5.63 in.* **Casing Length: 1:** *72 ft.* **Casing Thickness: 1:** *0.188 in.*
2: **2:** **2:**
Casing Height Above Ground: **Aquifer Type:** *SAND*
Date of Completion: *6/25/2000* **Total Depth:** *120 ft.* **Well Use:** *DOMESTIC*
Driller's Name: *HAMILTON & SONS WELL DRILLING*
Screen Diameter: **Slot Size:** **Screen Length:**
Type: **Material:**
Set Between:
Gravel Pack Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed:**
Grout Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *10 ft.* **Test Rate:** *8 gpm* Associated Reports
Drawdown: **Test Duration:** *1 hrs.*
COMMENTS:

WELL LOG

Formations	From	To
TOP SOIL	0	2
DRY GRAVEL	2	6
YELLOW CLAY	6	17
GRAY CLAY	17	36
WET SAND	36	38
GRAY CLAY	38	70

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Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 861136

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *DAVID & DONCEY GAMBLE*
County: *CLARK* **Township:** *MADRIVER* **Section Number:**
Address: *5730 GARRISON RD* **Lot Number:**
City: **State:** *OH* **Zip Code:**
Location Number: **Location Map Year:** **Location Area:**
Latitude: *39.845287* **Longitude:** *-83.902421*

CONSTRUCTION DETAILS

Borehole Diameter: **1:** *8.75 in.* **Borehole Depth:** **1:** *34 ft.* **Depth to Bedrock:**
2: **2:**
Casing Diameter: **1:** *6 in.* **Casing Length:** **1:** *34 ft.* **Casing Thickness:** **1:** *0.21 in.*
2: **2:** **2:**
Casing Height Above Ground: *1* **Aquifer Type:** *LIMESTONE*
Date of Completion: *11/21/1997* **Total Depth:** *101 ft.* **Well Use:** *DOMESTIC*
Driller's Name: *JENKINS PUMP SALES & SERV.*
Screen Diameter: **Slot Size:** **Screen Length:**
Type: **Material:**
Set Between:
Gravel Pack Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed:**
Grout Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *41 ft.* **Test Rate:** *20 gpm* Associated Reports
Drawdown: *20 ft.* **Test Duration:** *2 hrs.*

COMMENTS:

WELL LOG

Formations	From	To
BROWN CLAY	0	25
BLUE CLAY	25	34
BROWN LIMESTONE	34	75
WHITE LIMESTONE	75	90
GRAY LIMESTONE	90	101
WATER AT	98	98

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Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 654921

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *JIM FLORA*
County: *CLARK* **Township:** *MADRIVER* **Section Number:** *29*
Address: *5849 GARRISON RD* **Lot Number:**
City: **State:** *OH* **Zip Code:**
Location Number: **Location Map Year:** **Location Area:**
Latitude: *39.842487* **Longitude:** *-83.901471*

CONSTRUCTION DETAILS

Borehole Diameter: 1: 2: **Borehole Depth:** 1: *140 ft.* 2: **Depth to Bedrock:**
Casing Diameter: 1: *5.5 in.* 2: **Casing Length:** 1: *60 ft.* 2: **Casing Thickness:** 1: 2:
Casing Height Above Ground: **Aquifer Type:** *LIMESTONE*
Date of Completion: *5/29/1986* **Total Depth:** *140 ft.* **Well Use:**
Driller's Name: *EATON WELL & PUMP*
Screen Diameter: **Slot Size:** **Screen Length:**
Type: **Material:**
Set Between:
Gravel Pack Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed:**
Grout Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *80 ft.* **Test Rate:** *20 gpm* Associated Reports
Drawdown: *10 ft.* **Test Duration:** *1 hrs.*

COMMENTS:

WELL LOG

Formations	From	To
GRAVEL & CLAY	0	57
LIMESTONE	57	140

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Water Well Log and Drilling Report

Ohio Department of Natural Resources
Division of Soil and Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 762321

View Image of Original Well Log

ORIGINAL OWNER AND LOCATION

Original Owner Name: *GARY BROOKINS*
County: *CLARK* **Township:** *MADRIVER* **Section Number:**
Address: *5905 GARRISON RD* **Lot Number:**
City: **State:** *OH* **Zip Code:**
Location Number: **Location Map Year:** **Location Area:**
Latitude: *39.841890* **Longitude:** *-83.90143*

CONSTRUCTION DETAILS

Borehole Diameter: 1: 2: **Borehole Depth:** 1: *100 ft.* 2: **Depth to Bedrock:**
Casing Diameter: 1: *5 in.* 2: **Casing Length:** 1: *40 ft.* 2: **Casing Thickness:** 1: 2:
Casing Height Above Ground: **Aquifer Type:** *LIMESTONE*
Date of Completion: *10/28/1992* **Total Depth:** *100 ft.* **Well Use:** *DOMESTIC*
Driller's Name: *CRABTREE WELL AND PUMP*
Screen Diameter: **Slot Size:** **Screen Length:**
Type: **Material:**
Set Between:
Gravel Pack Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed:**
Grout Material/Size: **Vol/Wt Used:**
Method of Installation: **Placed**

WELL TEST DETAILS

Static Water Level: *30 ft.* **Test Rate:** *25 gpm* Associated Reports
Drawdown: *70 ft.* **Test Duration:** *2 hrs.*

COMMENTS:

WELL LOG

Formations	From	To
BROWN CLAY	0	4
BROWN GRAVEL & CLAY	4	13
BROWN CLAY	13	19
BROWN GRAVEL & CLAY	19	23
GRAY GRAVEL & CLAY	23	27
GRAVEL	27	37
LIMESTONE	37	100

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LOGO Bowser-Morner, Inc.

CPT NUMBER 2 (950 Elev)

CLIENT Demmy Sand and Gravel
PROJECT NAME Springfield, OH
PROJECT NUMBER 162936
PROJECT LOCATION
DATE STARTED 8/5/2013 COMPLETED 8/6/2013
GROUND ELEVATION Probe ID B-2
DRILLING CONTRACTOR
NOTES

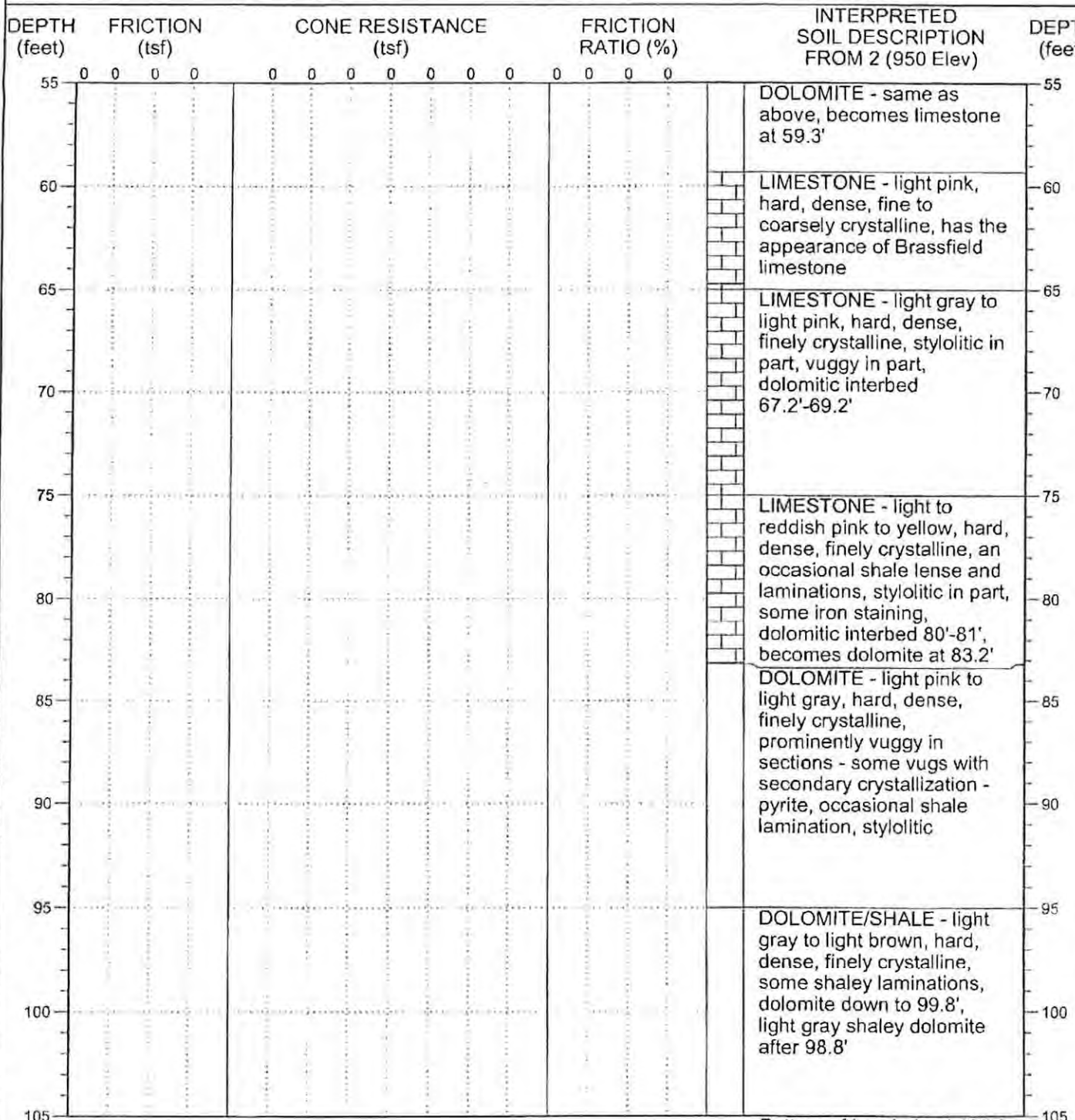
DEPTH (feet)	FRICTION (tsf)	CONE RESISTANCE (tsf)	FRICTION RATIO (%)	INTERPRETED SOIL DESCRIPTION FROM 2 (950 Elev)	DEPTH (feet)
0	0 0 0 0	0 0 0 0 0 0 0	0 0 0 0	SOIL	0
5				DOLOMITE - light gray to light brown, mottled coloration in part, hard, dense, finely to crystalline, some shaley stringers, open fractures, vuggy in part, cherty in part	5
10					10
15				DOLOMITE - similar to above, becomes more vuggy after 20', some vugs have secondary dolomite	15
20					20
25				DOLOMITE - light - dark gray, hard, dense, finely crystalline, fossiliferous, becomes very dark and shaley at 27.2-33'	25
30					30
35				DOLOMITE - light gray to bluish gray, hard, dense, finely crystalline, shaley in part, lightly vuggy in part	35
40					40
45				DOLOMITE - light gray to medium gray, hard, dense, finely crystalline, argillaceous in part, trace pyrite, shaley interbeds throughout bottom of run, very soft shale 53.9-55.0	45
50					50

(Continued Next Page)

LOGO Bowser-Morner, Inc.

CPT NUMBER 2 (950 Elev)

CLIENT Demmy Sand and Gravel
PROJECT NAME Springfield, OH
PROJECT NUMBER 162936
PROJECT LOCATION
DATE STARTED 8/5/2013 COMPLETED 8/6/2013
GROUND ELEVATION Probe ID B-2
DRILLING CONTRACTOR
NOTES



INTERPRETED SOIL DESCRIPTION FROM 2 (950 Elev)

DOLOMITE - same as above, becomes limestone at 59.3'

LIMESTONE - light pink, hard, dense, fine to coarsely crystalline, has the appearance of Brassfield limestone

LIMESTONE - light gray to light pink, hard, dense, finely crystalline, stylolitic in part, vuggy in part, dolomitic interbed 67.2'-69.2'

LIMESTONE - light to reddish pink to yellow, hard, dense, finely crystalline, an occasional shale lense and laminations, stylolitic in part, some iron staining, dolomitic interbed 80'-81', becomes dolomite at 83.2'

DOLOMITE - light pink to light gray, hard, dense, finely crystalline, prominently vuggy in sections - some vugs with secondary crystallization - pyrite, occasional shale lamination, stylolitic

DOLOMITE/SHALE - light gray to light brown, hard, dense, finely crystalline, some shaley laminations, dolomite down to 99.8', light gray shaley dolomite after 98.8'

Bottom of borehole at 105.0 feet.

DEPTH (feet)