



April 11, 2024

Mr. Mark Bismack  
5319 23 Mile Road  
Shelby Township, Michigan 48306

RE: Letter of Infiltration Evaluation  
Old Orion Court Development  
Old Orion Court  
Rochester Hills, Michigan  
G2 Project No. 240236

Dear Mr. Bismack:

In accordance with your request, we have completed the infiltration evaluation for the proposed development in Rochester Hills, Michigan. Our infiltration evaluation was conducted using a Double-Ring Infiltrometer in accordance with the guidelines presented in the “Low Impact Design Manual for Michigan – A Design Guide for Implementers and Reviewers” published in 2008 by the Southeastern Michigan Council of Governments (SEMCOG) and Oakland County. The purpose of our investigation was to determine infiltration rates within the areas of the proposed underground detention system. Typically municipalities do not allow infiltration to be accounted for if groundwater is within 1 to 3 feet of the bottom of the system.

## FIELD OPERATIONS

Infiltration tests were performed within test pits excavated at the areas of the proposed detention system. G2 Consulting Group, LLC (G2) directed excavation operations for two test pits within these areas to depths of approximately 1-1/2 feet and 3 feet below existing grade based on information provided by Nowak and Fraus Engineers. The elevation at each test pit and hand auger was interpolated from the preliminary Topographical Survey prepared by Nowak and Fraus Engineers. No surveying was performed to verify the existing ground surface elevation or bottom of test pit elevation at each test pit location.

Field infiltration testing was performed at the base of each test pit with a double ring infiltrometer as described within the above-mentioned guidelines. The test consists of embedding two cylindrical rings (6-inches and 12-inches in diameter) a minimum of 2 inches into a level ground surface. After embedding the rings, the test area is pre-soaked for one hour. Based on a drop of the water level in each ring of less than 2 inches for the last 30-minute presoaking period, we determined 30-minute intervals would be utilized between readings during test operations for all the locations.

At each test location, a G2 staff engineer added water to the infiltration rings as required per the testing guidelines and obtained readings of the drop in water level within the center ring at the appropriate time intervals. After each reading, the rings were refilled, and the procedure repeated. The test was completed upon obtaining a stabilized rate of drop, which is defined as a difference of 1/4 inch or less of drop between the highest and lowest reading of four consecutive readings.

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**INFILTRATION RESULTS**

G2 Consulting Group, LLC (G2) previously performed a geotechnical investigation for the project, dated December 18, 2018. Based on our observations within the test pits, soil conditions at the test pits consist of existing fill, peat, sand, and gravelly sand which are consistent with the soil conditions encountered at the soil borings performed in conjunction with our geotechnical investigation.

Based on the SEMCOG and County guidelines, the average drop that occurs in the center ring represents the infiltration rate for the test location, expressed as inches per hour. The following table provides the results of our observed infiltration rates at the base of each test pit. *The design engineer should apply an appropriate factor of safety to the observed infiltration rate.*

Test Pit No.	Test Depth (ft/Elev.)	Groundwater Depth (ft/Elev.)	Soil Type (USCS)	Observed Infiltration Rate (iph)
I-1	-1-1/2± (~800.5)	3 (~799)	Sand (SP)	0.3
I-2	-3 ± (~801)	3-1/2 (~800.5)	Peat (PT)	0.2

G2 performed hand augers within the footprint of the proposed detention system to obtain additional groundwater elevations. The chart below presents the results of our groundwater observations:

Hand Auger	Existing Ground Surface Elevation (Elev.)	Groundwater Depth Encountered (Elev.)	Groundwater Depth Completion (Elev.)
HA-1	±804	±801	±801-1/2
HA-2	±801-1/2	±799-1/2	±799-1/2
HA-3	±802	±796	±798

**GENERAL COMMENTS**

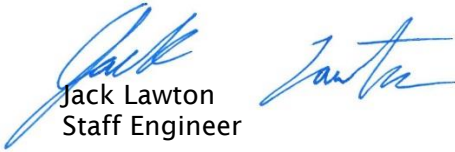
If changes occur in the design, location, or concept of the project, conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm any assumptions regarding the project scope presented herein or make changes in writing. The scope of the present investigation was limited to evaluation of subsurface conditions at the provided excavation locations. No chemical or environmental testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this letter upon the data from the tests performed at the approximate locations shown on the Infiltration Test and Hand Auger Location Plan, Plate No. 1. This letter does not reflect variations that may occur between the actual test locations and the entirety of the underground detention system footprint. The nature and extent of any such variations may not become clear until the time of construction.

We appreciate the opportunity to be of service to Mr. Mark Bismack on this project and look forward to discussing the results presented. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please call us.

Sincerely,

**G2 Consulting Group, LLC**



Jack Lawton  
Staff Engineer

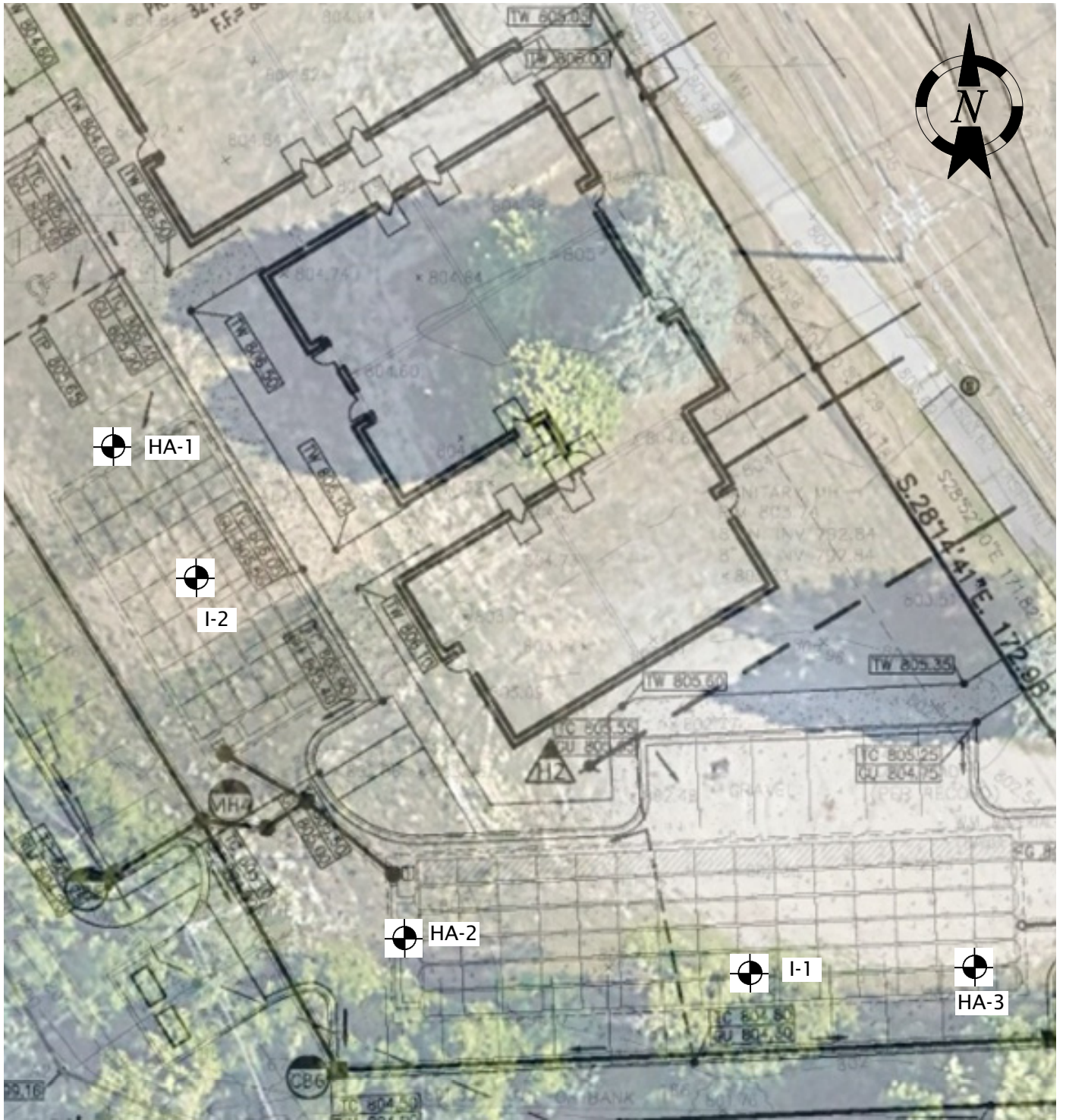


Amy L. Schneider, P.E.  
Project Manager


JML/ALS/ljv

Encl: Plate No. 1  
Figure Nos. 1 and 2  
Figure Nos. 3 and 4  
Figure No. 5

Infiltration Test and Hand Auger Location Plan  
Test Pit Logs  
Double-Ring Infiltration Test Results  
General Notes Terminology



**Legend**


 Infiltration Testing and Hand Auger Locations Completed by G2 Consulting Group, LLC on April 3, 2024

**Infiltration Test and Hand Auger Location Plan**

Old Orion Court Development  
 Old Orion Court  
 Rochester Hills, Michigan 48306



Project No. 240236	
Drawn by: JML	
Date: 4/8/24	Plate No. 1
Scale: NTS	

Project Name: Old Orion Court Development

Project Location: Old Orion Court  
Rochester Hills, Michigan 48306

G2 Project No. 240236

Latitude: N/A Longitude: N/A



Soil Boring No. I-1  
CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA				
ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 802.0 ft ±	DEPTH (ft)	SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
		Topsoil: Dark Brown Silty Sand (4 inches)	0.3					
		Aggregate Base: Gray Crushed Limestone	0.8					
		Fill: Brown Sand with trace silt	2.0					
		Black Peat	2.5					
		Gray Sand with trace silt and gravel	5.0					
797.0		End of Boring @ 5 ft	5.0					
792.0			10					

Total Depth: 5 ft  
Excavation Date: April 3, 2024  
Inspector: J. Lawton  
Contractor: G2 Consulting Group  
Operator: Property Owner

Water Level Observation:  
4 feet during drilling operations; 3 feet upon completion

Excavation Backfilling Procedure:  
Excavated Soils

Excavation Equipment:  
12-inch wide excavator bucket

TEST PIT: 240236.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 4/11/24

Figure No. 1



Project Name: Old Orion Court Development

Project Location: Old Orion Court  
Rochester Hills, Michigan 48306

G2 Project No. 240236

Latitude: N/A Longitude: N/A



Soil Boring No. I-2  
CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 804.0 ft ±	DEPTH (ft)	SAMPLE TYPE/NO.	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	PERCENT COMPACTION	UNCOF. COMP. ST. (PSF)
		Topsoil: Dark Brown Silty Sand (1 inch)	0.1					
		Fill: Brown Sand with trace silt and gravel, occasional brick debris	3.0					
		Black Peat	3.5					
		End of Boring @ 3.5 ft						
799.0			5					
794.0			10					

Total Depth: 3.5 ft  
Excavation Date: April 3, 2024  
Inspector: J. Lawton  
Contractor: G2 Consulting Group  
Operator: Property Owner

Excavation Equipment:  
12-inch wide excavator bucket

Water Level Observation:  
3-1/2 feet during and upon completion of drilling operations

Excavation Backfilling Procedure:  
Excavated Soils

TEST PIT: 240236.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 4/11/24

Figure No. 2

# G2 Consulting Group, LLC

## Double-Ring Infiltration Test



Project: Old Orion Court Job No.: 240236  
 Location of Project: Rochester Hills, MI Test Pit No. I-1 Depth (ft) 1.5  
 Description of Soil: Sand w/ trace silt and gravel Depth of Test (ft) 1.5  
 Tested By: JML Date of Testing: 4/3/2024  
 Inner Casing Dia. (in): 6 Outer Casing Dia. (in) 12  
 Casing Depth (in): 2

### Field Testing Results

#### 1) Pre-soak Results:

Time (min)	Initial Depth of Water (in)	Final Depth of Water (in)	Depth Change (in)
30	4	3 1/2	1/2
60	4	3 1/2	1/2

#### 2) Double-Ring Infiltration Test Results:

Trial No.	Time (min)	Initial Depth of Water (in)	Final Depth of Water (in)	Depth Change (in)
1	30	4	3 1/2	1/2
2	30	4	3 3/4	1/4
3	30	4	3 3/4	1/4
4	30	4	3 3/4	1/4

Trial No.	Time Interval (min)	Head Drop (in)	Infiltration Rate (iph)	Design Infiltration Rate (iph)
I-1	30	5/16	0.6	0.3

# G2 Consulting Group, LLC

## Double-Ring Infiltration Test



Project: Old Orion Court Job No.: 240236  
 Location of Project: Rochester Hills, MI Test Pit No. I-2 Depth (ft) 3  
 Description of Soil: Brown Sand Depth of Test (ft) 3  
 Tested By: JML Date of Testing: 4/3/2024  
 Inner Casing Dia. (in): 6 Outer Casing Dia. (in) 12  
 Casing Depth (in): 2

### Field Testing Results

#### 1) Pre-soak Results:

Time (min)	Initial Depth of Water (in)	Final Depth of Water (in)	Depth Change (in)
30	4	3 3/4	1/4
60	4	3 3/4	1/4

#### 2) Double-Ring Infiltration Test Results:

Trial No.	Time (min)	Initial Depth of Water (in)	Final Depth of Water (in)	Depth Change (in)
1	30	4	3 3/4	1/4
2	30	4	3 3/4	1/4
3	30	4	3 7/8	1/8
4	30	4	3 7/8	1/8

Trial No.	Time Interval (min)	Head Drop (in)	Infiltration Rate (iph)	Design Infiltration Rate (iph)
TP-2	30	3/16	0.4	0.2



## GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

### PARTICLE SIZE

Boulders	- greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel - Coarse	- 3/4 inches to 3 inches
- Fine	- No. 4 to 3/4 inches
Sand - Coarse	- No. 10 to No. 4
- Medium	- No. 40 to No. 10
- Fine	- No. 200 to No. 40
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

### CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

<b>Second Major Constituent (percent by weight)</b>	<b>Minor Constituent (percent by weight)</b>
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

### COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

Density Classification	COHESIONLESS SOILS Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

### SAMPLE DESIGNATIONS

- AS - Auger Sample - Cuttings directly from auger flight
- BS - Bottle or Bag Samples
- S - Split Spoon Sample - ASTM D 1586
- LS - Liner Sample with liner insert 3 inches in length
- ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
- PS - Piston Sample - 3 inch diameter unless otherwise noted
- RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).