



MILLENNIUM ENGINEERING, INC.
Land Surveyors and Civil Engineers

January 5, 2022

Dirk Grotenhuis, Chair
Town of Nottingham Planning Board
P.O. Box 114
Nottingham, NH 03290

Re: Subdivision Application, 100 Smoke Street, Tax Map 11, Lot 3

Dear Mr. Grotenhuis,

On behalf of the Applicant, Concrete Products of Londonderry, attached please find a Subdivision Application and supporting documents for a 4-lot residential subdivision at 100 Smoke Street. All the lots will utilize existing frontage on Smoke Street.

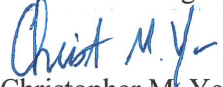
This submittal includes the following:

- Subdivision Application
- Subdivision Application Filing Fee (\$1200.00)
- Subdivision Plans (6 full size sets, 10 11x17 sets)
- Electronic Copy

We trust this submittal provides the necessary information for the Board's review and approval. If you have any questions, please feel free to contact our office at your earliest convenience.

Sincerely

Millennium Engineering, Inc.


Christopher M. York, P.E.
Project Manager

Massachusetts: 62 Elm Street - Salisbury - MA - 01952
Massachusetts: 10 Mulliken Way - Newburyport - MA - 01950
New Hampshire: 13 Hampton Road - Exeter - NH - 03833
www.Mei-MA.com

Phone: 978 - 463 - 8980 Fax: 978 - 499 - 0029
978 - 961 - 9931 978 - 499 - 0029
603 - 778 - 0528 603 - 772 - 0689
www.Mei-NH.com

Case#

Project Name

Date



Town of Nottingham

P.O. Box 114, 139 Stage Road, Nottingham NH 03290 Office 603-734-4881, Fax 603-679-1013

PLANNING BOARD PROJECT APPLICATION

Subdivision Type: Conventional ☒ Open Space ☐ LLA ☐

Site Plan Review: Conventional ☐ Change of Use ☐

Concurrent- Subdivision/ Site Plan Review ☐

Amendment to Approval of: Subdivision ☐ Site Plan ☐ Other ☐

Total Acreage: <u>35.4 Ac.</u>	Current Use Acreage:	# of Proposed Lots: <u>4</u>
Project Address: <u>100 Smoke Street</u>		
Current Zoning Districts: <u>Residential / Agricultural</u>		
Overlay Districts: <u>Aquifer Protection</u>	Map(s): <u>11</u>	Lot (s): <u>3</u>
Request: <u>The applicant proposes a 4-lot residential subdivision.</u>		
<u>All the lots will have frontage on Smoke Street.</u>		

The Property owner shall designate an agent for the project. This person (the applicant) shall attend pre-application conferences and public hearings, will receive the agenda, recommendations, and case reports, and will communicate all case information to other parties as required.

All contacts for this project will be made through the Applicant listed below.

- ☒ Form A "Abutters List" has been filed with this application no earlier than 5 days within submittal of this application with 3 labels per address on address labels (same size as Avery 5160/8160)
- ☒ Form B "Authorization to Enter upon Subject Property" has been filed with this application
- ☒ Form C "Authorization to Represent" has been filed with this application
- ☒ 6 sets of full size plans
- ☒ 10 sets of 11"x17" plans
- ☐ Waiver Form(s) None proposed
- ☒ Completed Checklist

Case#:	Project Name:	Date:
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Case#

Project Name

Date

Owner 1:

Company: Concrete Products of Londonderry

Phone: 978-388-1509

Fax: 978-388-0065

E-mail: greg.s@sheaconcrete.com

Address: 87 Haverhill Road Amesbury, MA 01913

Owner 1 Signature

Date

10/25/21

Owner 2:

Company:

Phone:

Fax:

E-mail:

Address:

Owner 2 Signature

Date

Owner 3:

Company:

Phone:

Fax:

E-mail:

Address:

Owner 3 Signature

Date

Owner 4:

Company:

Phone:

Fax:

E-mail:

Address:

Owner 4 Signature

Date

Applicant (Contact): Greg Strati's

Company: Concrete Products of Londonderry

Phone: 978-388-1509

Fax: 978-388-0065

E-mail: greg.s@sheaconcrete.com

Address: 87 Haverhill Road Amesbury, MA 01913

Developer:

Company:

Phone:

Fax:

E-mail:

Address:

Engineer: Eric Botterman

Company: Millennium Engineering, Inc.

Phone: 978-463-8980

Fax: 978-499-0029

E-mail: ebotterman@mei-ma.com

Address: 62 Elm Street Salisbury, MA 01952

ABUTTER(S) LIST

* PRINT THREE (3) ADDRESS LABELS PER ABUTTER INCLUDING THE APPLICANT, OWNER AND PROFESSIONAL(S)

*

Case#

Project Name

Date

1. APPLICANT INFORMATION:Printed Name: Greg Stratis Contact Telephone: 978-388-1509Address: 87 Haverhill Road Amesbury, MA 01913**2. OWNER INFORMATION:**Printed Name: Concrete Products of LondonderryAddress: 87 Haverhill Road Amesbury, MA 01913**3. PROFESSIONAL(S) INFORMATION:**Printed Name: Eric BotthermanAddress: 62 Elm Street Salisbury, MA 01952

Abutter(s) Information					
	Map:	Lot:	Sub lot:	Name:	Address:
4.	11	1-1		Kevin Norr	90 Smoke Street
6.	10	4-3		Stephen + Megan Miller	87 Smoke Street
7.	7	9		David B. Fernald	57 Raymond Road
8.				John T. Fernald Jr, TR	
9.	11	4		Emilio + Nina Jimenez	106 Smoke Street
10.	6	1		Michael + Fay Littlefield	110 Smoke Street
11.	11	5		Raymond + Lisa Kennard	119 Kennard Road
12.					
13.					
14.					
15.					
16.					
17.					

I, MEGAN STRATIS, the undersigned, certify that to the best of my knowledge, the above is an accurate and complete abutter(s) list and that the information was obtained from the Nottingham Assessing Office no more than five (5) days prior to the date of this application..

Megan Stratis
Applicant's Signature

10/25/21
Date

**Town of Nottingham****P.O. Box 114, 139 Stage Road, Nottingham NH 03290 Office 603-734-4881, Fax 603-679-1013****Web: <http://www.nottingham-nh.gov> Email: plan.zone@nottingham-nh.gov**

AUTHORIZATION TO ENTER UPON SUBJECT PROPERTY

The property owner(s), by the filing of this application, hereby give permission for the members of the Nottingham Planning Board and such agents or employees of the Town as the Nottingham Planning Board may authorize, to enter upon the property which is the subject of this application at any reasonable time for the purpose of such examinations, surveys, tests and/or inspections as may be appropriate to enable this application to be processed.

I/We hereby waive and release any claim or right I/we may now or hereafter possess against any of the above individuals as a result of any examinations, surveys, tests and/or inspections conducted on my/our property in connection with this application. This authorization expires in one year from date of signature

Property Owner(s)

[Signature] 10/25/20
Signature Date

Signature Date

Property Owner(s)

Signature Date

Signature Date

Property Owner(s)

Signature Date

Signature Date

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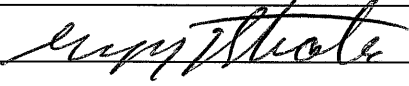
OWNER'S AUTHORIZATION FOR REPRESENTATION**Property location:** 100 Smoke Street

I, the undersigned owner(s) of the property listed above, hereby verify that I have authorized:

Eric Botherman - Millennium Engineering to represent me/us and apply for the required approval(s) from the Planning Board in the Town of Nottingham, New Hampshire for the following:

☒ Subdivision/Lot Line Adjustment ☐ Site Plan Review ☐ Backlot Subdivision
☐ Design Review ☐ Other _____

FOR: A proposed 4-lot subdivision.

Name of Owner	Concrete Products of Londonderry	
Address of Owner	87 Haverhill Road Amesbury, MA 01913	
Signature of Owner		Date 10/25/21

Name of Owner		
Address of Owner		
Signature of Owner		Date

Name of Owner		
Address of Owner		
Signature of Owner		Date

Name of Owner		
Address of Owner		
Signature of Owner		Date



Town of Nottingham

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LAND USE PROJECT FEE SCHEDULE

Fee's Collected at Time of Application:

Project Type	Fee	#Lots	Total
Subdivision	\$200.00 + \$200.00/lot	4	\$200+ 800 = \$1000
Design Review	\$100.00	-----	\$100
Lot Line Adjustment	\$100.00 + \$50.00/lot affected		\$100+
Site Plan 3 acres or less	\$75.00*	-----	\$75
Site Plan 3+ acres	\$100.00*	-----	\$100
* Add \$10 per unit for residential construction or \$1 per 100 sq. ft. for non-residential construction			
Plus Notice Fees:			
Public Notice to abutters & applicant (bordering Town included)	\$10.00/ notice	\$10 x # 10 # abutter(s)/professional(s)	\$ 100
Public Notice in Local Newspaper (Double fee if on a Scenic Road)	\$75.00 (Doubled?)		\$75.00 \$
Date Collected:	Total payable to: Town of Nottingham: \$1200		

Fee's Collected at Time of Acceptance (Not For Design Review Applications)

Fee type	Fee (Amount TBD)	Date paid
Escrow Account- 3 rd party review fees		
Letters of Credit, Bonds, Performance Guarantee		

Fee's Collected at Time of Approval:

Fee type & amount	Payable to:	Total
LCHIP- \$25.00	SEPARATE CHECKS Payable to: <u>Rockingham County Registry of Deeds</u>	\$25.00
RECORDING- \$26.00/ Mylar sheet		\$
ADMINISTRATIVE/ REMAPPING (not for Site Plans)	ONE CHECK payable to: <u>Town of Nottingham:</u>	\$75.00

Fee's collected at time of Certificate of Occupancy:

Impact Fee (Fees will be collected by the Building Inspector at time of CO)-- See Chart

NOTTINGHAM IMPACT FEE ASSESSMENT SCHEDULE ADOPTED OCTOBER 25, 2017				
Fee Assessment Basis	School Impact Fee k-8 Facilities	Fire Department Impact Fee	**Recreation Department Impact Fee	Total Impact Fees
RESIDENTIAL DEVELOPMENT				
Type of structure:	Per Dwelling Unit	Per Dwelling Unit	Per Dwelling Unit	Per Dwelling Unit
Single family detached	\$4,220	\$800	\$344	\$5,364
Attached, 2-family or Multifamily*	\$2,245/unit	\$736/unit	\$298/unit	\$3,279/unit
Manufactured Housing	\$4,206	\$812	\$325	\$5,343
Accessory Dwelling Unit/ Apt. (ADU)	N/A	\$736	\$298	\$1,034

*Impact fee ordinance provisions enable the Planning Board to grant school impact fee waivers for qualified age-restricted housing units in a 55+ development. See impact fee ordinance for waiver criteria.

Case#

Project Name

Date

**** Fees will be dedicated to the Marston Recreation Project**

**Project Application Checklist
Nottingham Planning Board**

This checklist is intended to assist applicants in preparing a complete application for subdivision as required by the Nottingham Subdivision Regulations and must be submitted along with all subdivision applications. An applicant seeking subdivision approval shall be responsible for all requirements specified in the Nottingham Subdivision Regulations even if said requirements are omitted from this checklist.

An applicant seeking subdivision approval shall be responsible for providing all the information listed in the column below entitled "Subdivision" and should place an "x" in each box to indicate that this information has been provided. If an item is considered unnecessary for certain application the "NA" box should be marked instead, indicating "Not Applicable". Only certain checklist items are required for lot line adjustments, as noted by the applicable check boxes below.

Check the Appropriate Box or Boxes Below: <input type="checkbox"/> Lot Line Adjustment <input checked="" type="checkbox"/> Subdivision Plan See Sections I & II See Sections I & II, III, IV & V		Subdivision		Office Use	
		Provided	N/A	Provided	N/A
Section I. General Requirements					
1. Completed Application Form		✓			
2. Complete abutters list		✓			
3. Payment of all required fees		✓			
4. <u>Six (6) full size sets of plans and ten (10) sets of plans 11"x 17" submitted</u> with all required information in accordance with the subdivision regulations and this checklist		✓			
5. Copies of any proposed easement deeds, protective covenants or other legal documents			✓		
6. Any waiver request(s) submitted with justification in writing			✓		
7. Technical reports and supporting documents (see Section IX & X of this checklist)			✓		
8. Completed Application Checklist		✓			
Section II. General Plan Information					
1. Size and presentation of sheet(S) per registry requirements and the subdivision regulations		✓			
2. Title block information:		✓			
a) Drawing title		✓			
b) Name of subdivision		✓			
c) Location of subdivision		✓			
d) Tax map & lot numbers of subjects parcel(s)		✓			
e) Name & address of owner(s)		✓			
f) Date of plan		✓			

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	Provided	N/A	Provided	N/A
g) Scale of plan	✓			
h) Sheet number	✓			
i) Name, address, & telephone number of design firm	✓			
j) Name and address of applicant	✓			
3. Revision block with provision for amendment dates	✓			
4. Planning Board approval block provided on each sheet to be recorded	✓			
5. Certification block (for engineer or surveyor)	✓			
6. Match lines (if any)		✓		
7. Zoning designation of subject parcel(s) including overlay districts	✓			
8. Minimum lot area, frontages & setback dimensions	✓			
9. List Federal Emergency Managements Agency (FFEMA) sheet(s) used to identify 100-year flood elevation, locate the elevation	✓			
10. Note the following: "If, during construction, it becomes apparent that deficiencies exist in the approved design drawings, the Contractor shall be required to correct the deficiencies to meet the requirements of the regulations at no expense to the Town."	✓			
11. Note the following: "Required erosion control measures shall be installed prior to any disturbance of the site's surface area and shall be maintained through the completion of all construction activities, If, during construction, it becomes apparent that additional erosion control measures are required to stop any erosion on the construction site due to actual site conditions, the Owner shall be required to install the necessary erosion protection at no expense to the Town."	✓			
12. Note identifying which plans are to be recorded and which are on file at the Town.				
13. Note the following: "All materials and methods of construction shall conform to Town of Nottingham Subdivision Regulations and the latest edition of New Hampshire Department of Transportation's Standard Specifications for Road & Bridge Construction."	✓			
14. North arrow	✓			
15. Location & elevation(s) of 100-year flood zone per FEMA Flood Insurance Study	✓			
16. Plan and deed references	✓			
17. The following notes shall be provided:	✓			
a) Purpose of plan	✓			
b) Existing and proposed use	✓			
c) Water supply source (name of provider (company) if offsite)		✓		
d) Zoning variances/special exceptions with conditions		✓		
e) List of required permits and permit approval numbers		✓		
f) Vicinity sketch showing 1,000 feet surrounding the site	✓			
g) Plan index indicating all sheets	✓			
18. Boundary of entire property to be subdivided	✓			
19. Boundary monuments	✓			
a) Monuments found	✓			
b) Map number and lot number, name, addresses, and zoning of all abutting land owners	✓			
c) Monuments to be set				
20. Existing streets:	✓			
a) Name labeled	✓			

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Date

	Provided	N/A	Provided	N/A
b) Status noted or labeled	✓			
c) Right-of-way dimensioned	✓			
d) Pavement width dimensioned	✓			
21. Municipal boundaries (if any)		✓		
22. Existing easements (identified by type)		✓		
A. Drainage easement(s)		✓		
B. Slope easement(s)		✓		
C. Utility easement(s)		✓		
D. Temporary easement(s) (Such as temporary turnaround)		✓		
E. No-cut zone(s) along streams & wetlands (as may be requested by the Conservation Commission)		✓		
F. Vehicular & pedestrian access easement(s)		✓		
G. Visibility easement(s)		✓		
H. Fire pond/cistern(s)		✓		
I. Roadway widening easement(s)		✓		
J. Walking trail easement(s)		✓		
K. Other easement(s) Note type(s)		✓		
23. Designation of each proposed lot (by map & lot numbers as provided by the assessor)	✓			
24. Area of each lot (in acres & square feet):	✓			
a) Existing lot(s)	✓			
b) Contiguous upland(s)	✓			
25. Wetland delineation (including Prime Wetlands):	✓			
a) Limits of wetlands	✓			
b) Wetland delineation criteria	✓			
c) Wetland Scientist certification	✓			
26. Owner(s) signature(s)	✓			
27. All required setbacks	✓			
28. Physical features	✓			
a) Buildings	✓			
b) Wells	✓			
c) Septic systems	✓			
d) Stone walls	✓			
e) Paved drives	✓			
f) Gravel drives	✓			
29. Location & name (if any) of any streams or water bodies	✓			
30. Location of existing overhead utility lines, poles, towers, etc.	✓			
31. Two-foot contour interval topography shown over all subject parcels	✓			
32. Map & lot numbers, name, addresses, and zoning of all abutting land owners	✓			
Section III				
Proposed Site Conditions Plan				
(Use Sections I General Requirements & Section II General Plan Information)				
1. Surveyor's stamp and signature by Licensed Land Surveyor	✓			

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Date

	Provided	N/A	Provided	N/A
2. Proposed lot configuration defined by metes & bounds	✓			
3. Proposed easements defined by metes & bounds. Check each type of proposed easement applicable to this application:		✓		
a) Drainage easement(s)		✓		
b) Slope easement(s)		✓		
c) Utility easement(s)		✓		
d) Temporary easement(s) (such as temporary turnaround)		✓		
e) Roadway widening easement(s)		✓		
f) Walking trail easement(s)		✓		
g) Other easement(s) Note type(s)		✓		
4. Area of each lot (in acres & square feet):	✓			
a) Total upland(s)	✓			
b) Contiguous upland(s)	✓			
5) Proposed streets:		✓		
a) Name(s) labeled		✓		
b) Width of right-of-way dimensioned		✓		
c) Pavement width dimensioned		✓		
6. Source and datum of topographic information (USGS required)	✓			
7. Show at least one benchmark per sheet (min.) and per 5 acres (min.) of total site area	✓			
8. Soil Conservation Service (SCS) soil survey information	✓			
9. Location, type, size & inverts of the following (as applicable):		✓		
a) Existing water systems		✓		
b) Existing drainage systems		✓		
c) Existing utilities		✓		
10. 4K affluent areas with 2 test pit locations shown with suitable leaching areas	✓			
11. Location of all water wells with protective radii as required by the NH Department of Environmental Services (meeting Town and NHDES setback requirements)	✓			
12. Existing tree lines	✓			
13. Existing ledge outcroppings & other significant natural features	✓			
14. Drainage, Erosion and Sediment Control Plan(s) containing all of the requirements specified in Section 16.3.2 (Final Plan Requirements) of the Subdivision Regulations		✓		
Section IV				
Construction Detail Drawings				
Note: Construction details to conform with NHDOT Standards & Specifications for Roads & Bridges, Town of Nottingham Highway Department requirements, and Subdivision Regulations		✓		
1. Typical cross-section of roadway		✓		
2. Typical driveway apron detail		✓		
3. Curbing detail		✓		
4. Guardrail detail		✓		
5. Sidewalk detail		✓		
6. Traffic signs and pavement markings		✓		
7. Drainage structure(s)		✓		
8. Outlet protection riprap apron		✓		

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	Provided	N/A	Provided	N/A
9. Level spreader		✓		
10. Treatments swale		✓		
11. Typical section at detention basin		✓		
12. Typical pipe trench		✓		
13. Fire protection details		✓		
14. Erosion control details		✓		
15. Construction Notes		✓		
a) Construction sequence		✓		
b) Erosion control notes		✓		
c) Landscaping notes		✓		
d) Water system construction notes		✓		
e) Sewage system construction notes		✓		
f) Existing & finish centerline grades		✓		
g) Proposed pavement – Typical cross-section		✓		
h) Right-of-way and easement limits		✓		
i) Embankment slopes		✓		
j) Utilities		✓		
Section V.				
Supporting Documentation If Required				
1. Calculation of permitted housing density (for Open Space Subdivisions only as required in the Nottingham Zoning Ordinance)		✓		
2. Stormwater management report		✓		
3. Traffic impact analysis		✓		
4. Environmental impact assessment		✓		
5. Hydrogeological study		✓		
6. Fiscal impact. study provided		✓		
7. Site Inventory and Conceptual Development Plan (from preliminary Open Space Subdivision review only)		✓		

Note: This checklist shall be completed and returned as part of the original application packet.

Concrete Products of Londonderry
c/o Eric Botterman
Millennium Engineering, Inc.
62 Elm Street
Salisbury, MA 01952

March 15, 2021

**Re: Hydrogeological Study of Former Gravel Pit
Smoke Street (Tax Map 11, Lot 3)
Nottingham, NH**

Dear Mr. Botterman,

Geosphere Environmental Management, Inc. (GEOSPHERE) prepared this Hydrogeological Report on behalf of Concrete Products of Londonderry for a former gravel pit property identified as Tax Map 11, Lot 3 on Smoke Street (approximately 100 Smoke Street), Nottingham, New Hampshire (the Site) (see **Figure 1**). It is our understanding that the property may be proposed for subdivision and the creation of four (4) single family residential lots in the front portion of the property, in an area approximately 900 feet wide running along Smoke Street, and 600 feet deep. Proposed subdivision plans and proposed building and septic plans have not yet been developed, and therefore, have not been submitted to the Nottingham Planning Board.

The property is located within the Town of Nottingham's Aquifer Protection District (see **Figure 2**) and as a result, a Hydrogeologic Study, performed by a NH Licensed Geologist, is required as part of the Town of Nottingham's subdivision and zoning approval process. This report addresses the requirements specified in Article III.A.5.a. of the Town of Nottingham's Zoning Regulations, and Article 10.7 of the Town of Nottingham's Subdivision Bylaws. Specifically, this Hydrogeological Report provides a hydrologic mapping of local groundwater flow and aquifer characteristics including bedrock and estimated seasonal high water table (ESHW) elevations, surficial geology, transmissivity, and aquifer boundaries within the area of the proposed residential development.

The boundaries of the Aquifer Protection District are shown on **Figure 3**, along with a delineation of the Property. As shown in **Figure 3**, the Little River abuts the property to the east. The aquifer boundaries are provided from NH GRANIT, a mapping database compiled by Strafford Regional Planning Commission. As shown on **Figure 3**, the eastern portion of the subject property where the proposed development is to take place is located within the Aquifer Protection District. The Aquifer Protection District identifies areas of stratified drift aquifers. Where stratified drift deposits are coarse and saturated with groundwater, these deposits can form stratified drift aquifers that can represent important groundwater resources.

Figure 4 presents the surficial geology of the Property. As shown on **Figure 4**, the eastern portion of the property is predominately composed of glaciomarine and glaciofluvial deposits. These deposits can consist of silt, fine to coarse sand, small to large gravel, cobbles, and

boulders. **Figure 4** presents a suspected transmissivity of the aquifer as approximately 0 – 1000 ft²/day within the area of the proposed development. A subsurface investigation was required to determine the thickness of the overburden layer (depth to bedrock), the ESHWT elevation and saturated thickness of aquifer, the composition of the overburden layer (i.e. percent composition of silt, sand, gravel, or cobbles), and the permeability/transmissivity of the aquifer materials on Site.

SUBSURFACE INVESTIGATION

Test Pit Review

To gain a better understanding of subsurface characteristics of the Site, GEOSPHERE reviewed the 1994 Plan titled “Reclamation Plan Smoke Street: Tax Map 11, Lot 3” by Christopher Albert (**Attachment A**). In December 1994, 27 exploratory test pits were dug on the Property. These test pits were performed to obtain subsurface soil and hydrologic information; specifically, to measure depth to the ESHWT and depth to bedrock prior to the mining of the gravel pit. The locations of all test pits completed at the site are depicted on **Figures 3 and 4** (see also **Attachment A**). Eight (8) of the 27 test pits were dug within the “Phase I” eastern portion of the property in the vicinity of the proposed development, and were used to extrapolate depth to ESHWT and depth to bedrock within the eastern portion of the Property (the Site).

The test pit data from **Attachment A** presents depth (in inches) to ESHWT and total test pit depth and/or depth to bedrock. Test pit logs were not available for **Attachment A**; however, test pit data is provided in the lower left hand corner of the attached Plan. As shown on **Table 1**, the 8 test pits used to determine the ESHWT and bedrock elevations were TP-1, TP-10, TP-11, TP-12, TP-13, TP-14, TP-15, and TP-16. Because the topography displayed in **Attachment A** has changed since the mining of the gravel pit, a plan produced by Millennium Engineering Inc. titled “Existing Conditions at 100 Smoke Street” dated August 29, 2020 (**Attachment B**) was used to georeference the 1994 test pit data to coincide with existing topographic conditions at the Site. **Table 1** presents the approximate 1994 ground elevations for these key test pits (from **Attachment A**) and compares them to estimated 2020 ground elevations presented in the Plan in **Attachment B**. The difference in elevation at the test pit locations allowed the extrapolation of test pit data to be correlated with present day bedrock and ESHWT elevations.

Soil Borings

In order to gain more information about the subsurface soils, groundwater, and aquifer boundaries, on June 29, 2020 GEOSPHERE supervised the advancement of twelve (12) soil borings at the site in four (4) discrete locations. The borings were drilled by Crawford Drilling Services of Westminister, Massachusetts using direct push/GeoProbe equipment. Well logs are included as **Attachment C**, and the locations of the soil borings are shown on **Figure 3** and **Figure 4**.

GEOSPHERE's on-site geologist visually characterized soil samples and collected a composite sample of the borehole material to be submitted for sieve testing (particle size distribution analysis) and hydraulic permeability analysis by GeoTesting Express of Acton, MA. A composite sample was collected to determine the permeability and transmissivity of the aquifer materials on Site. The lab report of the composite sample's permeability and grain size analysis test results can be found in **Attachment D**.

Refusal (the inability to advance drilling rods further into the ground) was encountered at depths of 8 to 12 feet below ground surface (bgs). Due to the presence of large boulders observed on Site, refusal may have been the result of the drilling tools encountering large boulders or the upper surface of weathered bedrock (ledge). Where refusal was encountered, the drill location was moved approximately 5 feet from the refusal location to determine if refusal was encountered due to boulders.

As stated in the borehole logs included as **Attachment C**, five boreholes were drilled in the area of BH-1 where refusal was encountered at 7.5, 7, 6, 5, and 8.5 feet bgs. Three (3) boreholes were drilled in the area of BH-2 where refusal was encountered at 5, 12, and 8 feet bgs. Two (2) boreholes were drilled in the area of BH-2A where refusal was encountered at 8 feet bgs for both boreholes. Two (2) boreholes were drilled in the area of BH-3 where refusal was encountered at 8 and 9.5 feet bgs. As shown on **Table 1**, the deepest refusal at each borehole location was assumed to be the bedrock depth at each location. This depth to bedrock was used in conjunction with test pit data provided in **Attachment A** (and correlated to existing topographic conditions from **Attachment B**) to determine the bedrock elevation contours presented on **Figure 5** (see also bedrock elevations presented in **Table 1**).

No groundwater was encountered in any of the borings except for the final 2 inches of BH-1, which encountered refusal at 8.5 feet bgs. This depth to water was not indicative of ESHWT conditions due to the drought conditions at the time that the boreholes were drilled. ESHWT elevation contours were extrapolated from the test pit data provided in **Attachment A** and are presented on **Figure 6** (see also ESHWT elevations presented in **Table 1**).

Aquifer Characteristics

As shown in the borehole logs (**Attachment C**), the overburden material is comprised of well graded sand with gravel, cobbles (and boulders). **Attachment D** presents a permeability of 4.2×10^{-2} cm/sec, or 119 ft/day. Based on the bedrock elevation and ESHWT elevation on **Table 1**, a saturated thickness of the overburden layer on Site can be calculated in the areas of TP-10 (4.5 feet), TP-12 (1.5 feet), TP-13 (4.0 feet), TP-14 (3.8 feet), and TP-15 (2.7 feet). The average saturated thickness of the aquifer in these locations is approximately 3.3 feet. Knowing the permeability of the overburden material and the approximate aquifer thickness of the Site, transmissivity can be calculated where $\text{transmissivity} = \text{permeability} \times \text{aquifer thickness} = 119 \text{ ft/day} \times 3.3 \text{ ft} = 390 \text{ ft}^2/\text{day}$. A transmissivity of $390 \text{ ft}^2/\text{day}$ is consistent with the aquifer characteristics delineated on **Figure 4**.

Figure 6 and **Figure 5** present the ESHWT elevation contours and bedrock elevation contours extrapolated from **Table 1**, respectively. Based on the ESHWT elevation contours presented on **Figure 6**, groundwater is inferred to flow in an east-northeast direction across the Site, generally following the bedrock high to low elevation contours presented on **Figure 5**. **Figure 7** presents a geologic cross-section running west to east, in the approximate direction of groundwater flow, across the Site and displays aquifer materials, ESHWT and saturated aquifer thickness, and bedrock elevations.

Conclusions

The subsurface materials overlying bedrock (overburden material) encountered on Site is stratified drift sand and gravel, with cobbles and boulders, suitable for groundwater recharge and septic design. The overburden layer on Site ranges from 3.7 feet (TP-15) – 12 feet (BH-2) thick, and the saturated thickness of aquifer materials is limited to 1.5 feet (TP-12) – 4.5 feet (TP-10) thick, based upon test pits conducted by others and recorded Estimated Seasonal High Water Table (ESHWT) measurements. ESHWT depth below ground surface ranges from approximately 1.0 to 5.0 feet (see **Table 1**). Groundwater flow is inferred to flow in an east-northeasterly direction (see **Figure 6**). The transmissivity of aquifer material is approximately 390 ft²/day. The overburden aquifer is not of sufficient saturated thickness (less than 20 feet) or transmissivity (less than 500 ft²/day) to develop a water supply.

The future development of eastern portion of the property, with, presumably, several single family residences, should not significantly limit aquifer recharge. Wastewater discharges from residential septic systems should not adversely impact onsite or adjacent groundwater and surface water resources, including wetlands and the Little River, provided they are designed in accordance with the State of New Hampshire Septic Design Regulations and/or Town of Nottingham Regulations and Bylaws.

Sincerely,
GEOSPHERE ENVIRONMENTAL MANAGEMENT, Inc.



David Niemeyer, NH Licensed Professional Geologist
V.P., Director of Environmental Compliance

ATTACHMENTS

Tables

Figures

Attachment

- A Reclamation Plan Smoke Street: Tax Map 11/Lot 3, Christopher Albert – December, 1994
- B Existing Conditions Plan, 100 Smoke Street, Millennium Engineering Inc. – August 29, 2020
- C Borehole Logs, Geosphere Environmental Management, Inc. – June, 2020
- D Particle Size and Permeability Analysis Test Results – Geo Testing Express

TABLES

Table 1 Subsurface Characteristics and Elevation Data

TABLE 1
Subsurface Characteristics and Elevation Data
 100 Smoke Street, Nottingham, NH

SOUTHEAST PORTION OF PROPERTY - STUDY AREA

ID	Ground Elevation (1994)	Ground Elevation (2020)	Difference in Elevation (1994 - 2020)	ESHWI Depth (1994)	ESHWI Depth (2020)	ESHWI Elevation	Total Depth	Depth to Bedrock (1994)	Depth to Bedrock (2020)	Bedrock Elevation (use 1994 Ground Elev for TPs) (use 2020 Ground Elev For BH)
TP-1	200	202	-2	NE	-	-	11	NE	-	<189
TP-10	198	198	0	2.5	2.5	195.5	7	7	7.0	191
TP-11	187	187	0	NE	-	-	10	NE	-	<177
TP-12	172	172	0	4.0	4.0	168.0	5.5	5.5	5.5	166.5
TP-13	174	173	1	6.0	5.0	168.0	10	10	9.0	164
TP-14	182	182	0	4.2	4.2	177.8	8	8	8.0	174
TP-15	187	184	3	4.0	1.0	183.0	6.7	6.7	3.7	180.3
TP-16	186	186	0	3.0	3.0	183.0	10	NE	-	<176
BH-1	NA	186	-	-	-	-	8.5	-	8.5	177.5
BH-2	NA	192	-	-	-	-	12	-	12	180
BH-2A	NA	188	-	-	-	-	8	-	8	180
BH-3	NA	188	-	-	-	-	9.5	-	9.5	178.5

All elevations and depths are in feet (unless otherwise shown)

Elevations are relative to NAVD88

NE = Not encountered

1994 ground elevations based on elevations shown on on Gravel Pit Reclamation Site Plan, by Christopher Albert, December 1994

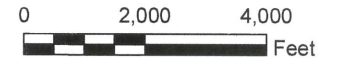
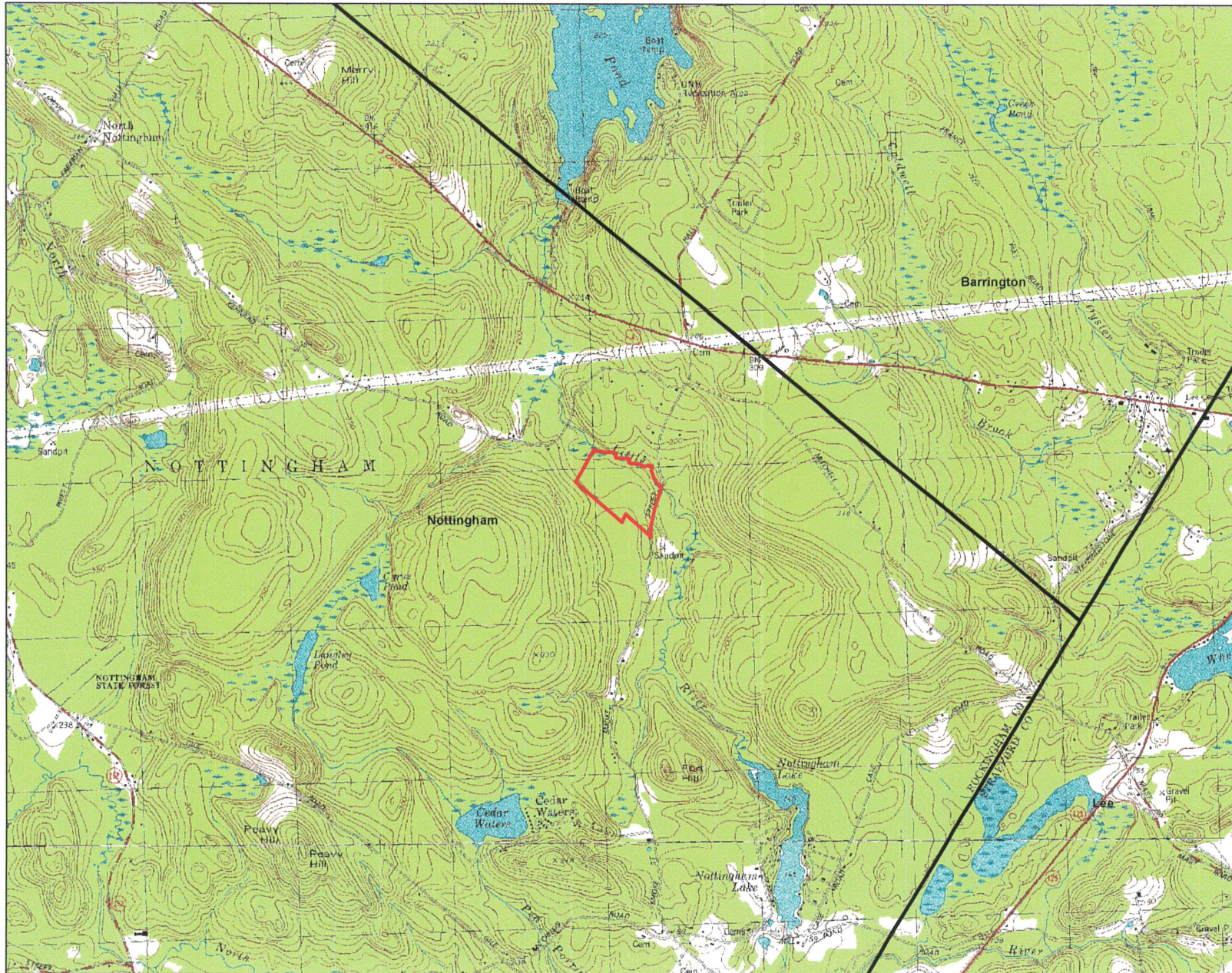
1994 depths based on test pit observations shown on Gravel Pit Reclamation Plan (1994)

2020 ground elevations based on elevation survey conducted by Millennium Engineering and shown on Draft Existing Conditions Plan, August 29, 2020.

Borehole depths to bedrock (assumed) are refusal depths encountered during drilling on June 29, 2020. See GEOSPHERE boring logs.

FIGURES

- Figure 1** Site Locus
- Figure 2** Town of Nottingham Aquifer Protection District
- Figure 3** Site Plan and Aquifer Protection District
- Figure 4** Surficial Geology and Aquifer Transmissivity
- Figure 5** Bedrock Elevation Contour Plan
- Figure 6** Estimated Seasonal High Water Table Elevation Contour Plan
- Figure 7** Geologic Cross-Section A – A'



Legend

 Subject Property

GEOSPHERE
ENVIRONMENTAL MANAGEMENT INC.

FIGURE 1

SITE LOCUS

Hydrogeological Study - 100 Smoke Street
Nottingham, New Hampshire

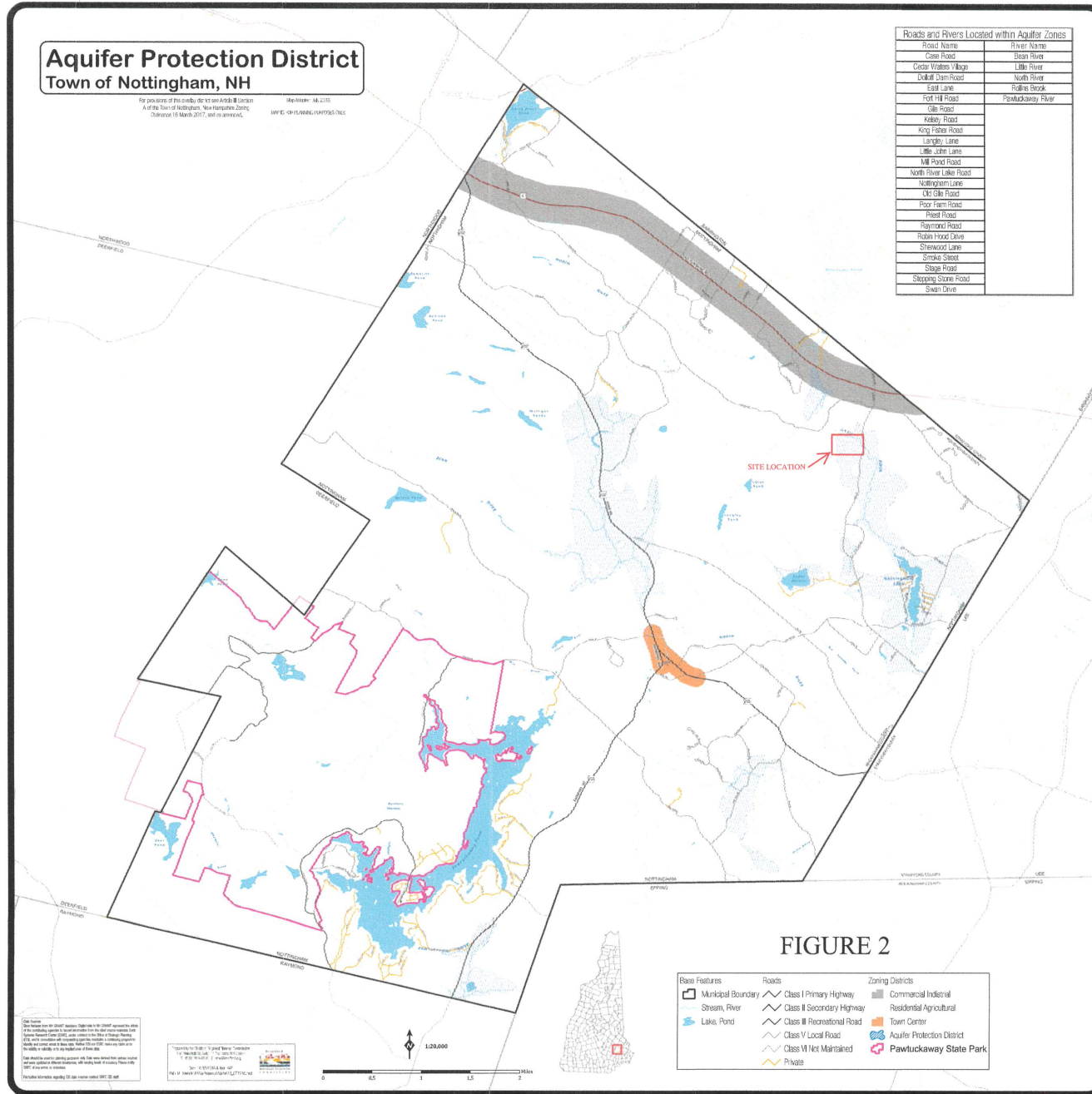
CREATED BY: Matt Knapf 2/2/2021	CHECKED BY: David Niemeyer 2/2/2021	PROJECT: 20208/FIGURES
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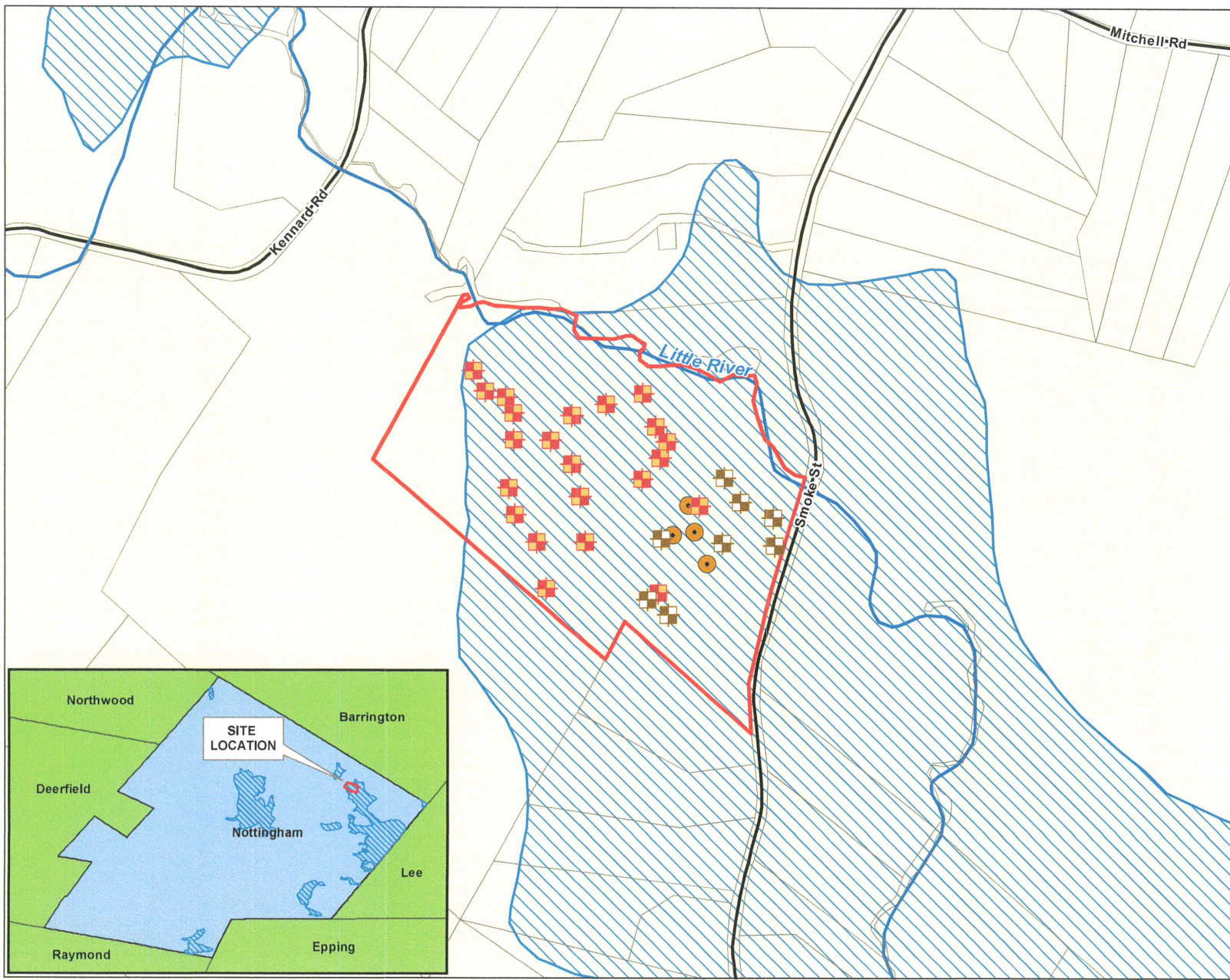
Data Source: NH GRANIT (Earth Systems Research Center, University of New Hampshire), New Hampshire Department of Environmental Services, Barrington, NH Quadrangle 1:25,000.

Aquifer Protection District Town of Nottingham, NH

For provisions of this Ordinance, District and Article 10, Section 1
A of the Town of Nottingham, New Hampshire Zoning
Ordinance 18 March 2017, and its amendments.
Map Number: NH 2015
WPF: 01/15/2015/01/15/2015/01/15/2015

Road Name	River Name
Cedar Road	Bean River
Cedar Waters Village	Little River
Dollar Dam Road	North River
East Lane	Indian Brook
Fort Hill Road	Pawtucket River
Gile Road	
Kelley Road	
King Peter Road	
Linden Lane	
Little John Lane	
Mill Pond Road	
North River Lake Road	
Nottingham Lane	
Old Glen Road	
Poor Farm Road	
Prest Road	
Raymond Road	
Road Pond Drive	
Shenwood Lane	
Smoke Street	
Stage Road	
Stepping Stone Road	
Swan Drive	

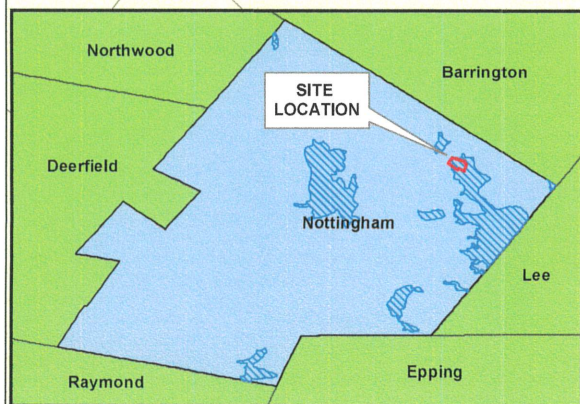




0 400 800
Feet

Legend

- Phase 1 Area Test Pits (1994)
- All Other Test Pits (1994)
- 2020 Boreholes (GEOSPHERE)
- Aquifer Protection District
- Subject Property
100 Smoke Street
(Tax Map 11, Lot 3)
- Surrounding Properties
- Rivers/Streams
- Roads



GEOSPHERE
ENVIRONMENTAL MANAGEMENT INC.

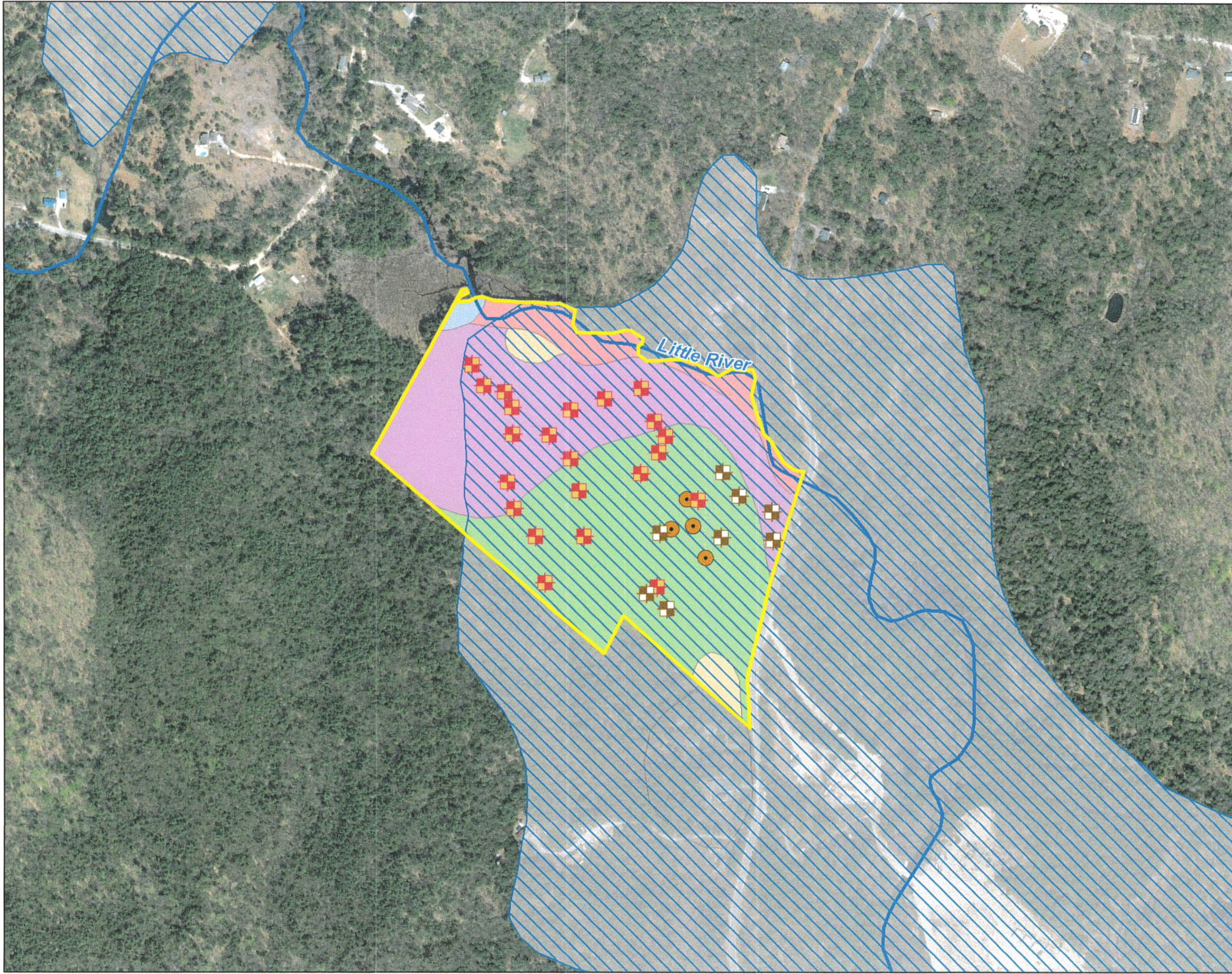
FIGURE 3

SITE PLAN AND
AQUIFER PROTECTION DISTRICT

Hydrogeological Study - 100 Smoke Street
Nottingham, New Hampshire

CREATED BY: Matt Krapp 2/2/2021	CHECKED BY: David Niemeyer 2/2/2021	PROJECT: 2020B/FIGURES
---------------------------------------	---	---------------------------

Data Source: NH GRANIT (Earth Systems Research Center, University of New Hampshire), New Hampshire Department of Environmental Services.



0 400 800
Feet

Legend

- Phase 1 Area Test Pits (1994)
- All Other Test Pits (1994)
- 2020 Boreholes (GEOSPHERE)
- Subject Property
- Rivers/Streams
- Aquifer Protection District

Surficial Geology

- Alluvial
- Glacial Till
- Glaciofluvial
- Glaciomarine
- Palustrine

Aquifer Transmissivity

Feet Squared per Day

- <1000

GEOSPHERE
ENVIRONMENTAL MANAGEMENT INC.

FIGURE 4

SURFICIAL GEOLOGY AND
AQUIFER TRANSMISSIVITY

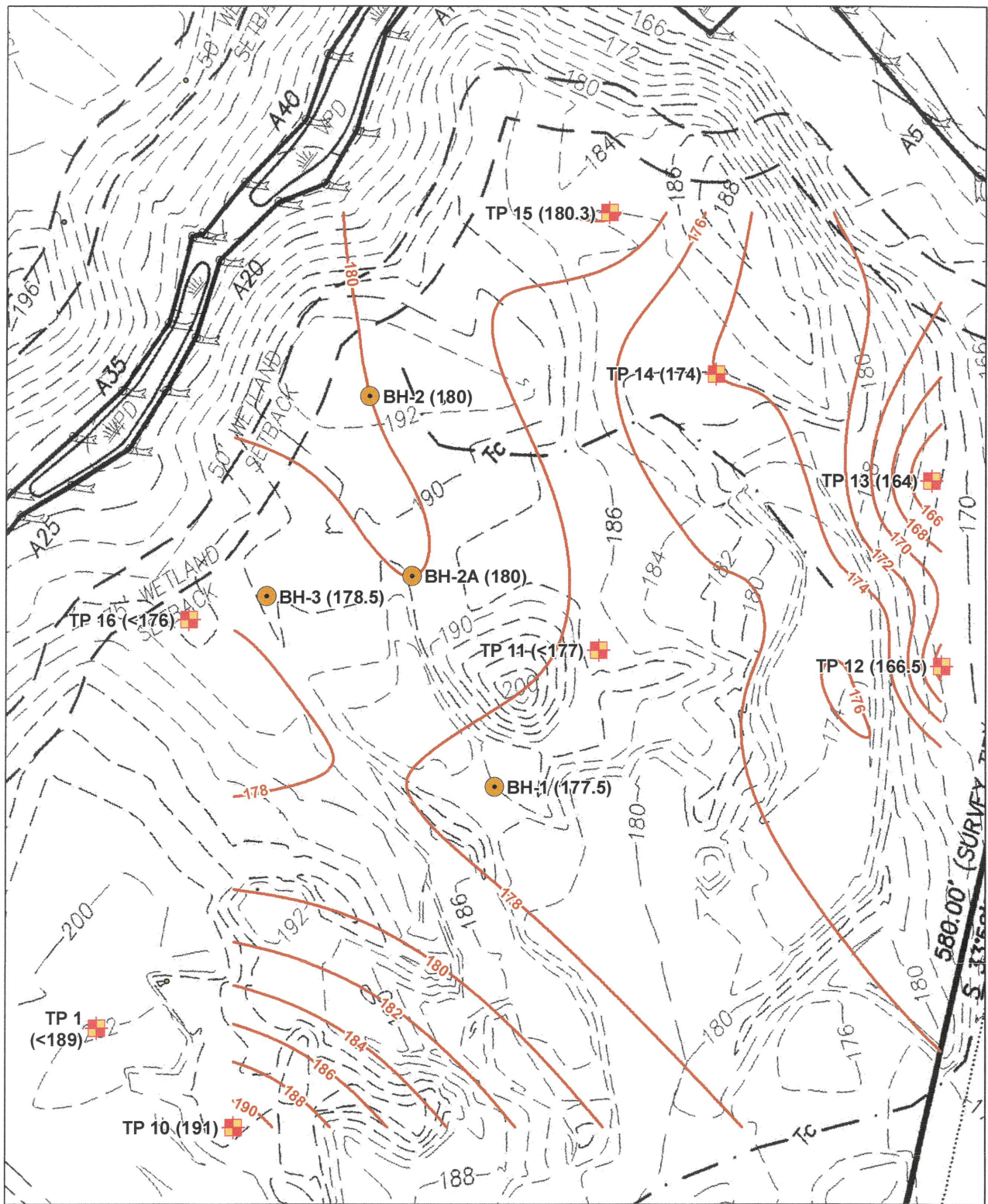
Hydrogeological Study - 100 Smoke Street
Nottingham, New Hampshire

CREATED BY:
Matt Kneip
2/2/2021




CHECKED BY:
David Niemeyer
2/2/2021

PROJECT:
20208/FIGURES

Data Sources: NH GRANIT (Earth Systems Research Center, University of New Hampshire), New Hampshire Department of Environmental Services.

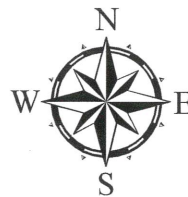


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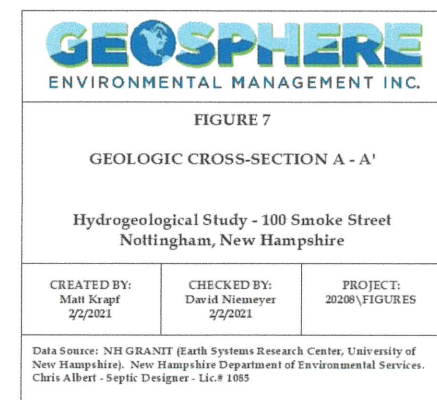
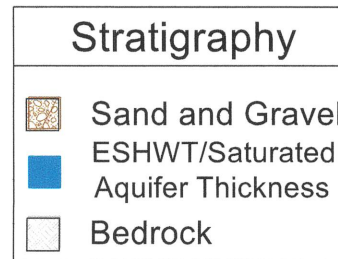
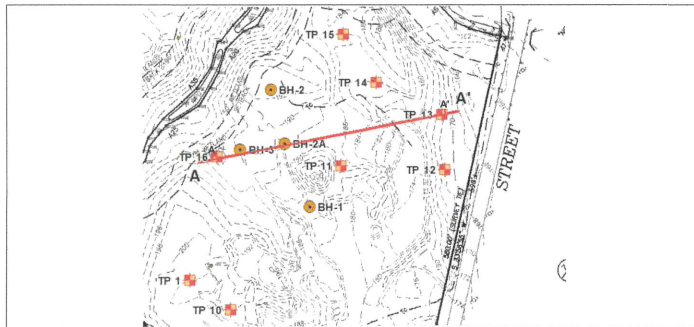
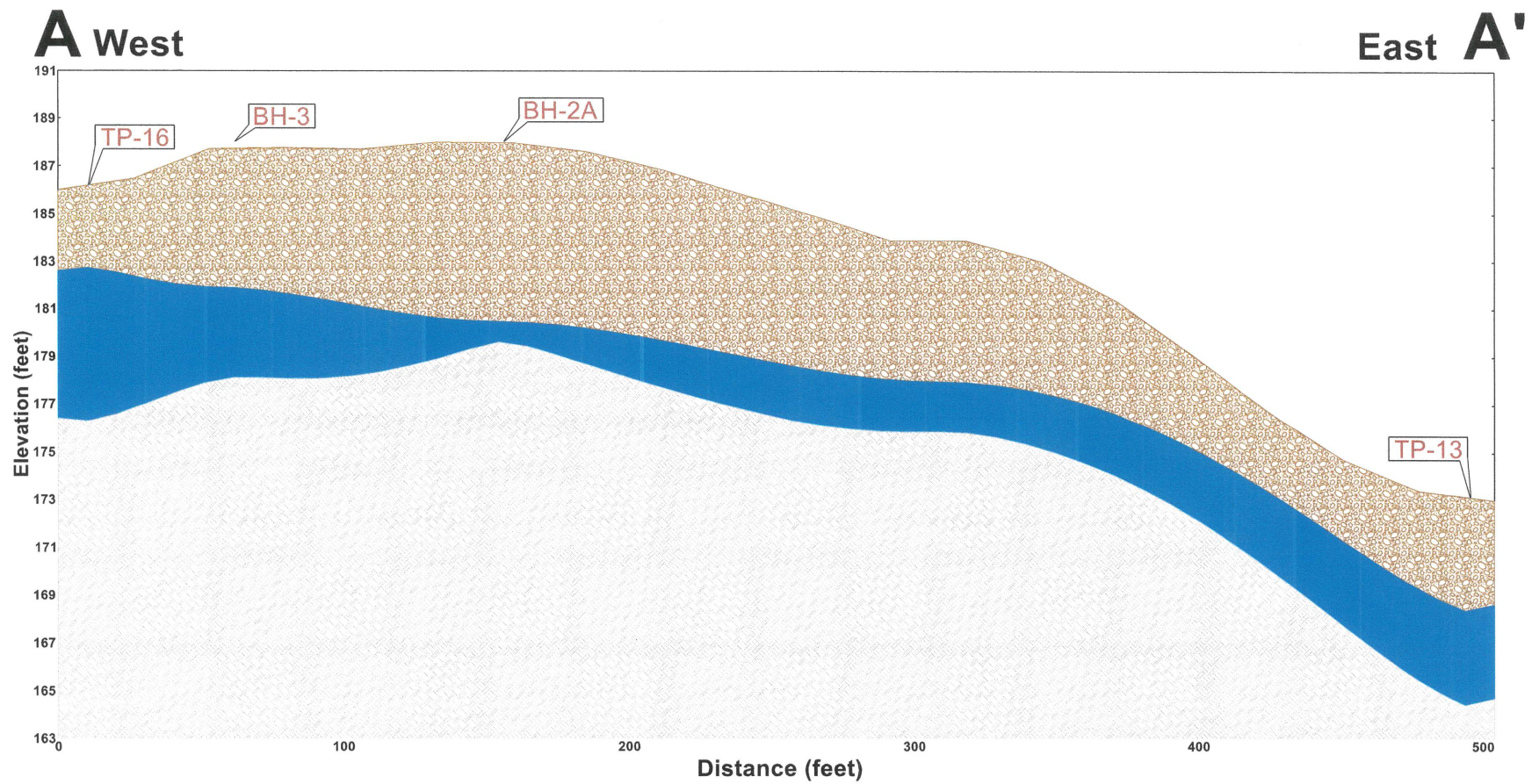
-  Test Pits (1994)
(174) = Elevation of bedrock encountered in test pit
(<189) = Bedrock not encountered and is lower than bottom of test pit elevation (shown)
-  Soil Borings (GEOSPHERE - 2020)
-  Bedrock Elevation Contours
(2-ft. Contour Interval)

Bedrock elevations estimated from observed depth to bedrock measurements made at Test Pits as shown on "Reclamation Plan Smoke Street: Tax Map 11, Lot 3 for New England Precast - Nottingham, NH - December 1994. (Plan prepared by Christopher Albert - Septic Designer, Lic.# 1085) Scale of plan: 1" = 60'

0 125
Feet
Approx Map Scale: 1 inch = 125 feet



GEOSPHERE ENVIRONMENTAL MANAGEMENT INC.		
FIGURE 5 BEDROCK ELEVATION CONTOUR PLAN Hydrogeological Study - 100 Smoke Street Nottingham, New Hampshire		
CREATED BY: Matt Kragt 2/2/2021	CHECKED BY: David Niemeyer 2/2/2021	PROJECT: 2020/08/FIGURES
<small>Data Source: NHI GRANIT (Earth Systems Research Center, University of New Hampshire). New Hampshire Department of Environmental Services.</small>		



Attachment A

Reclamation Plan, Smoke Street: Tax Map 11/Lot 3, Christopher Albert – December, 1994

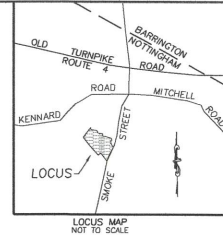
Attachment B

Existing Conditions Plan, 100 Smoke Street, Millennium Engineering Inc. – August 29, 2020

- 1) THIS PLAN DOES NOT SHOW ANY UNRECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT VISIBLE USES OF THE LAND; HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
- 2) THIS PARCEL DOES PARTIALLY LIE WITHIN THE FLOOD ZONE, SEE F.I.R.M. COMMUNITY PANELS 3301SC 011SE AND 3301SC 012OE, DATE MAY 17, 2005.

CONCRETE PRODUCTS OF LONDONDERRY
SHEA CONCRETE PRODUCTS
87 HAVERHILL STREET
AMESBURY, MA 01913
BK. 3426 PG. 2205

LOT AREA
1,539,975 S.F.±
35.4 ACRES±



MINIMUM REQUIREMENTS

AREA	2 ACRES
FRONTAGE	200 FEET
FRONT SETBACK	50 FEET
SIDE SETBACK	50 FEET
REAR SETBACK	50 FEET
MAX BLDG COVER	20%

PROGRESS
PRINT

N/F
MICHAEL G. & FAY A.
LITTLEFIELD
110 SMOKE STREET
NOTTINGHAM, NH 03290
BK. 4791 PG. 2922


 N/F
 DIANE MELKONIAN
 106 SMOKE STREET
 NOTTINGHAM, NH 03290
 BK 2001 PG 676

*NORTH LOT OF LAND OF MARY LOUISE
FERNALD NOTTINGHAM, N.H. 37"
SCALE: 1"=200' DATE: SEPT. - DEC 1978
BY: O.P. WALLACE, SR.
B-8558

"SUBDIVISION OF THE LAND OF INWARD
ACRES ASSOC. NOTTINGHAM, N.H."
SCALE: 1"=100' DATE: SEPT. 29, 1981
BY: DICKSON, HOLDEN AND ASSOC., INC.
D-10477





PLAT OF LAND
IN
NOTTINGHAM, NH

SHOWING
EXISTING CONDITIONS
AT 100 SMOKE STREET
(ASSESSORS MAP 11 LOT 3)

RECORD OWNERS
CONCRETE PRODUCTS OF LONDONDERRY
87 HAVERHILL ROAD, AMESBURY, MA 01913

MILLENNIUM ENGINEERING INC.
ENGINEERS AND LAND SURVEYORS
P.O. BOX 745 13 HAMPTON ROAD EXETER, NH 03833
PHONE: (603) 778-0528 FAX: (603) 772-0689 WWW.MEI-NH.COM

SCALE: 1"=80'	CALC. BY: P.D.B.	PROJECT: M203707
DATE: AUG. 29, 2020	CHKD. BY: H.H.B.	

■ S.B.
 ○ I.P.
 ● I ROD
 FND.


 W1 


STONE BOUND
 IRON PIPE
 IRON ROD
 FOUND
 ASSESSORS MAP
 AND PARCEL
 UTILITY POLE
 WETLAND FLAG
 WETLAND

WETLANDS DELINEATION BY
WEST ENVIRONMENTAL
48 STEVE'S HILL ROAD
NOTTINGHAM, NH 03290

IN ACCORDANCE WITH THE 1987 CORPS OF
ENGINEERS WETLANDS DELINEATION MANUAL,
AS REQUIRED BY THE DES WETLANDS BUREAU.

N/F
STEPHEN J. & MEGAN E.
MILLER
87 SMOKE STREET
NOTTINGHAM, NH 03290
BK. 6092 PG. 771

N/F
DAVID B. FERNALD
JOHN T. FERNALD JR. TRUSTEE
57 RAYMOND ROAD
NOTTINGHAM, NH 03290
BK. 5913 PG. 639

GRAPHIC SCALE

(IN FEET)
1 inch = 80'

Attachment C

Borehole Logs, Geosphere Environmental Management, Inc. – June, 2020

51 Portsmouth Ave.
Exeter, NH 03833

Project No.: 20208

Site: Nottingham, NH

Address: Approx. 98 Smoke St.

Client: Concrete Products

Log of Borehole: BH-1

Borehole Location: BH-1

Geologist/Engineer: Shawn Case

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE				Well Data	Comments
Depth	Symbol	Description	Sample ID	Sample Depth	Moisture	Pen (in)	Rec (in)	
0		Ground Surface						
0		Well Graded Sand With Gravel [SW] Brown-red fine to coarse SAND (~50%) and small to large GRAVEL (~25%) with COBBLES (~25%). Dry to wet, loose to medium dense [0 - 8 feet]. Wet sand encountered at approximately 8 feet. Recovered saturated sand was approximately 1-2 inches.			Dry	60"	38"	
2								
4								
6					Dry	36"	24"	
8		Borehole extended about 6-inches into refusal rock [8 - 8.5 feet] (Boulder or ledge)			Wet			
10		5 boreholes were drilled within an approximate 20 - 30 foot radius. All boreholes showed identical material, due to their close proximity, and are all representative of one another. The general vicinity of these borehole locations is identified as BH-1. Refusal was encountered at the following depths: 7.5, 7, 6, 5, and 8.5 feet. The borehole with the deepest refusal (8.5 feet) was used to classify the material.						
12								
14								
16								
18								
20								
22								

Drill Date: 6/29/2020

Drill Method: Geoprobe

Driller: Crawford Drilling Services

Borehole Diameter: 3-inch

Sampler Diameter: 2-inch

Well Casing Diameter:

PVC Elev.: 0

Static GW Level:

Date of Static GW Level:



51 Portsmouth Ave.
Exeter, NH 03833

Project No.: 20208

Site: Nottingham, NH

Address: Approx. 98 Smoke St.

Client: Concrete Products

Log of Borehole: BH-2

Borehole Location: BH-2

Geologist/Engineer: Shawn Case

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE				Well Data	Comments
Depth	Symbol	Description	Sample ID	Sample Depth	Moisture	Pen (in)	Rec (in)	
0		Ground Surface						
0		Top Soil / Organics [0 - 1 feet]						
2		Well Graded Sand With Gravel [SW] Brown-red fine to coarse SAND (~50%) and small to large GRAVEL (~40%) with COBBLES (~10%). Dry, loose to medium dense [0 - 5 feet]			Dry	60"	50"	
4								
6		Fine to coarse SAND (~70%) and small to large (sm. > lg.) GRAVEL (30%). Dry, loose to medium dense [5 - 7.5 feet]						
8		Well Graded Gravel With Sand [GW] Fine to coarse SAND (~40%) and small to large GRAVEL (~60%). Dry, loose to medium dense. Large GRAVEL may be over-represented as some gravel may have been broken COBBLES.			Dry	60"	60"	
10		Fine to coarse SAND (~20%) and small to large GRAVEL (~30%) with refusal rock (~50%). Refusal may be boulder or ledge.						
12					Dry	24"	6"	
14		3 boreholes were drilled within an approximate 10 - 15 foot radius. All boreholes showed identical material due to their close proximity and are all representative of one another. The general vicinity of these borehole locations is identified as BH-2. Refusal was encountered at the following depths: 5, 12, and 8 feet. The borehole with the deepest refusal (12 feet) was used to classify the material.						
16								
18								
20								
22								

Drill Date: 6/29/2020

Drill Method: Geoprobe

Driller: Crawford Drilling Services

Borehole Diameter: 3-inch

Sampler Diameter: 2-inch

Well Casing Diameter:

PVC Elev.: 0

Static GW Level:

Date of Static GW Level:



51 Portsmouth Ave.
Exeter, NH 03833

Project No.: 20208

Site: Nottingham, NH

Address: Approx. 98 Smoke St.

Client: Concrete Products

Log of Borehole: BH-2A

Borehole Location: BH-2A

Geologist/Engineer: Shawn Case

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE				Well Data	Comments
Depth	Symbol	Description	Sample ID	Sample Depth	Moisture	Pen (in)	Rec (in)	
0		Ground Surface						
0		Well Graded Sand With Gravel [SW] Brown-red fine to coarse SAND (~70%) and small to large GRAVEL (~30%) with COBBLES (> 10%). Dry, loose to medium dense [0 - 8 feet]			Dry	60"	36"	
2								
4								
6								
8		Refusal at 8 feet (boulder or ledge)			Dry	36"	24"	
10		2 boreholes were drilled within an approximate 5 foot radius. Both boreholes showed identical material, due to their close proximity, and were representative of one another The general vicinity of these borehole locations are identified as BH-2A. Refusal was encountered at 8 feet for both boreholes.						
12								
14								
16								
18								
20								
22								

Drill Date: 6/29/2020

Drill Method: Geoprobe

Driller: Crawford Drilling Services

Borehole Diameter: 3-inch

Sampler Diameter: 2-inch

Well Casing Diameter:

PVC Elev.: 0

Static GW Level:

Date of Static GW Level:



51 Portsmouth Ave.
Exeter, NH 03833

Project No.: 20208

Site: Nottingham, NH

Address: Approx. 98 Smoke St.

Client: Concrete Products

Log of Borehole: BH-3

Borehole Location: BH-3

Geologist/Engineer: Shawn Case

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE				Well Data	Comments
Depth	Symbol	Description	Sample ID	Sample Depth	Moisture	Pen (in)	Rec (in)	
0		Ground Surface						
0		Top Soil / Organics [0 - 1 feet]						
2		Well Graded Sand With Gravel [SW] Brown-red fine to coarse SAND (~70%) and small to large (lg > sm.) GRAVEL (~30%) with COBBLES (~25%). Dry, loose to medium dense [0 - 5 feet]			Dry	60"	30"	
4								
6		Fine to coarse SAND (75%) with small to large GRAVEL (25%). Dry, loose to medium dense [5 - 9.5 feet]			Dry	54"	32"	
8								
10		Refusal at 8 and 9.5 feet (boulder or ledge)						
12		2 boreholes were drilled within an approximate 5 foot radius. Both boreholes showed identical material due to their close proximity and are representative of one another. The general vicinity of these borehole locations is identified as BH-3. Refusal was encountered at 8 and 9.5 feet. The borehole with the deepest refusal (9.5 feet) was used to classify the material.						
14								
16								
18								
20								
22								

Drill Date: 6/29/2020

Drill Method: Geoprobe

Driller: Crawford Drilling Services

Borehole Diameter: 3-inch

Sampler Diameter: 2-inch

Well Casing Diameter:

PVC Elev.: 0

Static GW Level:

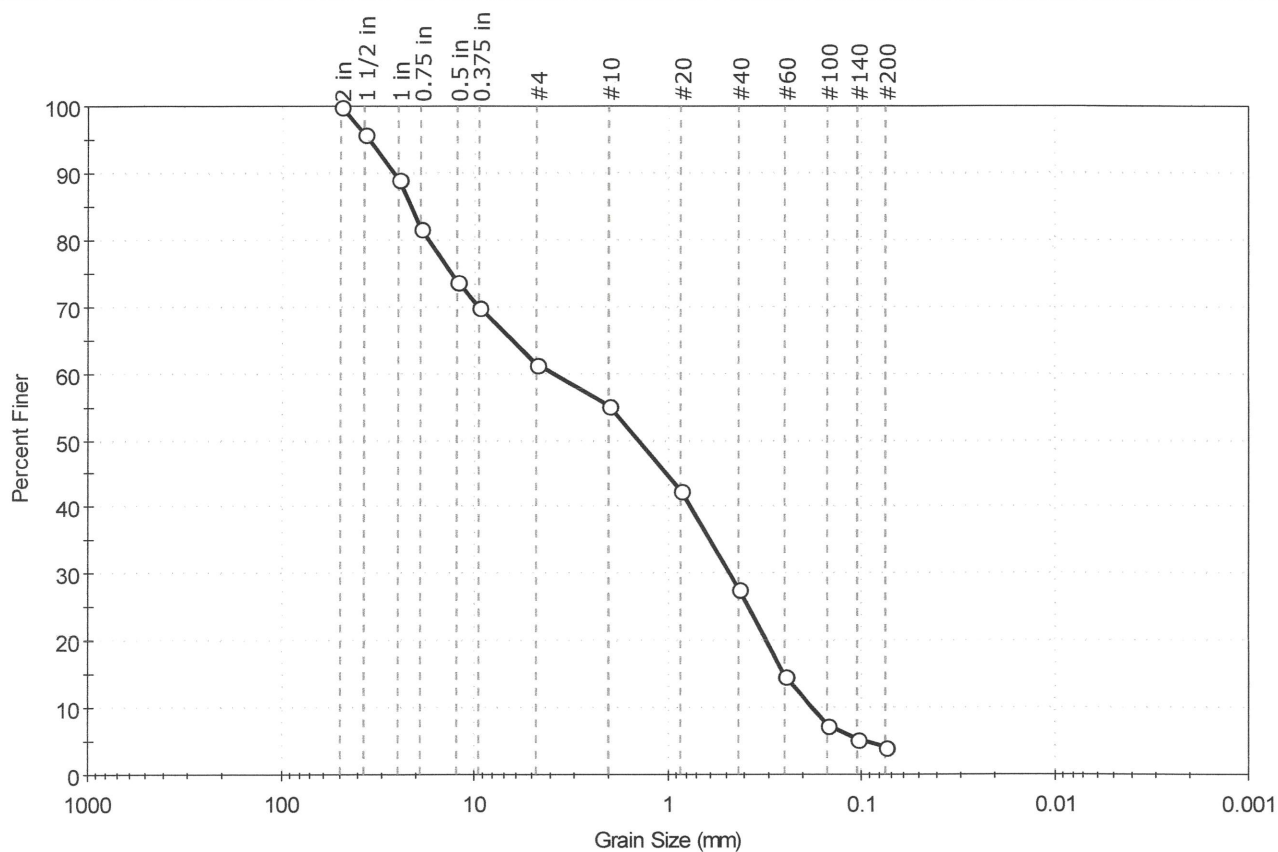
Date of Static GW Level:

Attachment D

Particle Size and Permeability Analysis Test Results – Geo Testing Express

Client:	Geosphere Env. Management		
Project:	Nottingham		
Location:	Nottingham, NH	Project No:	GTX-311980
Boring ID:	---	Sample Type:	bucket
Sample ID:	Soil Comp	Test Date:	07/09/20
Depth :	---	Test Id:	563027
Test Comment:	---		
Visual Description:	Moist, dark yellowish brown sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	38.5	57.5	4.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1 1/2 in	37.50	96		
1 in	25.00	89		
0.75 in	19.00	82		
0.5 in	12.50	74		
0.375 in	9.50	70		
#4	4.75	61		
#10	2.00	55		
#20	0.85	43		
#40	0.42	28		
#60	0.25	15		
#100	0.15	7		
#140	0.11	5		
#200	0.075	4		

Coefficients

D ₈₅ = 21.4402 mm	D ₃₀ = 0.4727 mm
D ₆₀ = 3.8840 mm	D ₁₅ = 0.2514 mm
D ₅₀ = 1.4110 mm	D ₁₀ = 0.1792 mm
C _u = 21.674	C _c = 0.321

Classification

ASTM Poorly graded SAND with Gravel (SP)

AASHTO Stone Fragments, Gravel and Sand (A-1-b (1))

Sample/Test Description

Sand/Gravel Particle Shape : **ROUNDED**

Sand/Gravel Hardness : **HARD**



Client:	Geosphere Env. Management		
Project Name:	Nottingham		
Project Location:	Nottingham, NH		
GTX #:	311980		
Start Date:	07/17/20	Tested By:	jlw
End Date:	07/17/20	Checked By:	emm
Boring #:	---		
Sample #:	Soil Comp		
Depth:	---		
Visual Description:	Moist, dark yellowish brown sand with gravel		

Permeability of Granular Soils (Constant Head) by ASTM D2434

Sample Type:

Remolded

Sample Information:

Maximum Dry Density: --- pcf

Optimum Moisture Content: --- %

Compaction Test Method: ---

Classification (ASTM D2487): ---

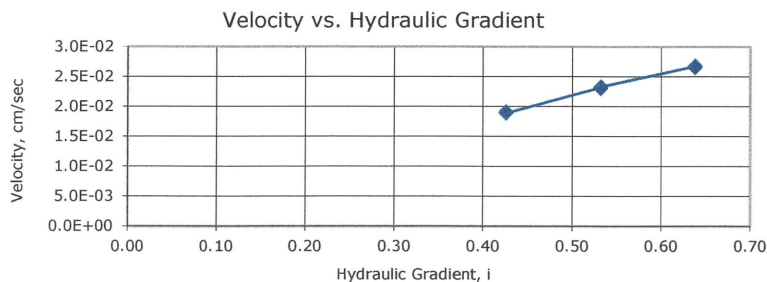
Assumed Specific Gravity: 2.65

Sample Preparation / Test Setup:

Test specimen compacted with moderate effort at air-dried moisture content. Material >3/4-inch removed from sample prior to testing (18% of sample).

Parameter	Initial	Final
Height, in	4.70	4.70
Diameter, in	9.50	9.50
Area, in ²	70.9	70.9
Volume, in ³	333.1	333.1
Mass, g	10777	12100
Bulk Density, pcf	123.2	138.4
Moisture Content, %	0.7	13.1
Dry Density, pcf	122.3	122.3
Degree of Saturation, %	---	98.6
Void Ratio, e	---	0.35

Date	Reading #	Volume of Flow, cc	Time of Flow, sec	Flow Rate, cc/sec	Gradient	Permeability, cm/sec	Temp., °C	Correction Factor	Permeability @ 20 °C, cm/sec
7/17	1	261.1	30	8.70	0.43	4.5E-02	21.2	0.972	4.3E-02
7/17	2	259.4	30	8.65	0.43	4.4E-02	21.2	0.972	4.3E-02
7/17	3	259.1	30	8.64	0.43	4.4E-02	21.2	0.972	4.3E-02
7/17	4	318.0	30	10.60	0.53	4.4E-02	21.2	0.972	4.2E-02
7/17	5	315.9	30	10.53	0.53	4.3E-02	21.2	0.972	4.2E-02
7/17	6	319.4	30	10.65	0.53	4.4E-02	21.2	0.972	4.3E-02
7/17	7	367.2	30	12.24	0.64	4.2E-02	21.3	0.969	4.1E-02
7/17	8	365.0	30	12.17	0.64	4.2E-02	21.3	0.969	4.0E-02
7/17	9	363.9	30	12.13	0.64	4.2E-02	21.3	0.969	4.0E-02



PERMEABILITY @ 20 °C =
 4.2×10^{-2} cm/sec