BreadLoaf
Architects
Planners
Builders

Agenda Item III.2

January 6, 2021

Valerie Capels, Town Administrator
Town of Bristol
1 South Street
PO Box 249
Bristol, VT 05443

Re: Potential Cost Impacts of Geotechnical Recommendations
Bristol Public Works Department
Building Needs and Site Analysis

Dear Valerie,

Per the request of the Select Board at their November 9, 2020 meeting and our November 19, 2020 proposal, Bread Loaf Corporation (BLC) and Knight Consulting Engineers (KCE) conducted four geotechnical borings at the Department of Public Works site on November 30, 2020 for the purpose of developing a preliminary understanding of the nature and approximate depth of existing fill materials.

A copy of KCE's Fill Investigation Report dated December 8, 2020 is attached. This report describes the boring locations, exploration process and provides a log of the materials encountered in each boring sample. The report also provides a preliminary analysis of the site's characteristics and preliminary geotechnical recommendations for addressing the unsuitable soil conditions that were discovered. A copy of the Bottom of Fill Elevations plan which has been highlighted to accentuate proposed building footprints is also attached

As stated in KCE's report, "Based upon the borings the on-site fill materials appear to be a very loose-to-medium dense mixture of sand, gravel, topsoil, roots, concrete, brick, cinders, asphalt and wood". Silty peat, glass and porcelain were also encountered at individual boring locations and fill depths appear to range from +/- 13 ft. deep to +/- 23 ft. deep.

Recommendations/actions to address unsuitable soil conditions and slope stability encountered at the Department of Public Works site are indicated in the Findings and Conclusions section of KCE's report. Recommendations/actions are summarized below:

New Buildings - KCE identified two subgrade remediation options.

Option 1: Existing fill materials should be stabilized in place using GEOPIERs. (Information on the GEOPIER soil stabilization system assumed for estimating purposes is provided as an attachment to this letter.)

Option 2: Existing fill materials should be completely removed (to undisturbed native soils) and replaced with compacted structural fill.

New Parking Lots - KCE stated "new parking lots should remain unpaved if existing fill materials are left in place". If parking lots are paved, KCE indicated "Paved parking lots should have existing fill materials completely removed and replaced with structural fill…" and also noted GEOPIERs are not a cost effective approach for stabilizing parking lots.

Slope Stability - KCE indicated "The existing fill slopes should be protected from future erosion by diverting runoff away from the northerly slope face or adding a stabilizing channel to transport the runoff down the slope face". KCE also recommended a more detailed slope analysis be included in the final design of the site.

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BLC prepared a rough order-of-magnitude estimate of the cost associated with implementation of these recommendations/actions on the development cost of the new buildings and parking areas being considered for the DPW site. See the table below for the rough order of magnitude estimated cost to implement each recommendation/activity.

Recommendation/Activity	Rough Order of Magnitude Estimated Cost
New Buildings (Option 1): Stabilize existing fill in place with GEOPIERs	+/- $400,000
New Buildings (Option 2) and New Parking Lots: Remove and replace existing fill with structural fill at proposed buildings and paving areas	+/- $638,000
Slope Stability: Regrade slope, install stabilization fabric, rip-rap channels, seed, mulch and provide ground cover plantings.	+/- $43,000

A copy of the rough order-of-magnitude estimate and the associated plan diagrams are attached for your information. These documents illustrate the assumptions made in preparation of the rough order-of-magnitude estimated cost indicated above.

The estimated site construction costs to implement the recommendations/actions are over and above site construction costs that are typically associated with the cost of conventional construction. Accordingly these site construction costs may warrant reconsideration of development of the Department of Public Works and Police Facilities as presently programmed and configured at this site.

Given other considerations, should the Town decide that the site construction costs are not prohibitive to further consideration of this site, BLC recommends a that Phase I Environmental Site Assessment (ESA), and Phase II Environmental Survey if needed, should be performed. Since the geotechnical study did not investigate for the presence, extent or nature of potential subgrade environmental hazards, and the rough order of magnitude estimate of costs do not account for potential costs related to handling or disposal of hazardous or toxic materials, a Phase I ESA is recommended prior to proceeding with further planning work to identify and define additional risks and costs associated with hazardous or toxic substances that may be present in the existing fill materials due to the history of the site's use.

We look forward to reviewing this information with you and answering any questions at your convenience.

Regards,

Stephen Rooney, Architect
Bread Loaf Corporation

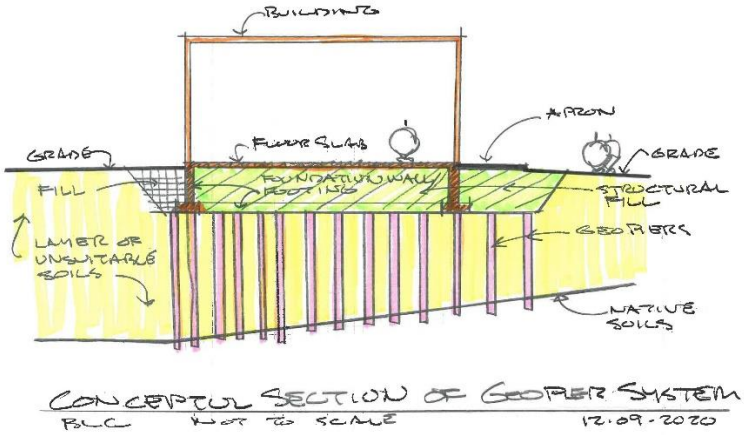
Encl: GEOPIER Soil Stabilization System Information, 12-23- 2020
Bottom of Fill Elevations, Proposed Building Footprints Highlighted, 12-09-2020
GEOPIER (Option 1) Plan Diagram
Remove and Replace All Fill (Option 2) Plan Diagram
Slope Stabilization Plan Diagram
ROM Estimate of Site Remediation Costs, 01-04-2021
Knight Consulting Engineers, Inc., Fill Investigation Report, 12-8-2020

Cc: Jim Pulver, Bread Loaf Corporation
Fred Bellucci, Bread Loaf Corporation
Eric Goddard, Knight Consulting Engineers

GEOPIER Soil Stabilization System Information, 12-23-2020

The GEOPIER Soil Stabilization System is comprised of piers made of compacted granular fill that are installed within in the unsuitable soil layer that is located in the area beneath the foundation of a building or other type of structure. The GEOPIERs (piers) are drilled or vibrated into place and spaced on a grid beneath the new foundation and at-grade floor slabs. The size, depth and grid spacing of the piers is dependent upon the weight to be supported, the characteristics and depth of unsuitable soils. The elevation of the top of the piers is generally +/- 1ft above the bottom elevation of the new foundations. After the piers are installed, the work area is graded to the bottom elevation of the new foundations and structural fill is placed below the floor slab extending from the top of pier elevation to the bottom of the at-grade slabs. After installation of the GEOPIER system a conventional foundation system and conventional at-grade slabs can be installed for the building.

This system is illustrated by the conceptual section and photographs indicated below.




Geopier "Impact" installation. Loader is placing aggregate in the hopper.


Geopier "Impact" installation. Hopper with tube extension is being vibrated down into the soil.


Geopier "Impact" installation. Aggregate placed in hopper drops to bottom of tube and is compacted below as the tube is withdrawn from the ground.

In Addition, for an informational video on the GEOPIERS system similar to that which was assumed for preparation of the order of magnitude cost estimate see:

https://youtu.be/wm7Cri8DK-c .

Bottom of Fill Elevations

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

12-9-2020

Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

B-1 BORING LOCATION

ww-tp5 PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

PROPOSED BUILDING FOOTPRINT

APPROX. 1FT CONTOURS

PROPOSED RELOCATED DOG POUND

PROPOSED DIESEL TANK

SEPTIC FIELD

64'-0"

+(-4.0')

18'-7 1/4"

79'-1"

17'-3 3/4"

+(-3.0')

B-2 (-26')

B-3 (<-21')

B-4 (-13')

B-1 (<-18.3')

(-9.6')

ww-tp4

ww-tp6

ww-tp5

(-7.0')

ww-tp1

ww-tp2

+(-2.0')

ww-tp3

+(-1.0')

+0.0'

GREY GARAGE +(-2.6')

GREEN GARAGE +0.0'

23'-3"

54'-2 1/2"

157'

E.O. NEW PAVE

137'

F.O. NEW FNTDN

111'-0"

42'-7 3/4"

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

PROPOSED EDGE OF PAVEMENT

Reference 0' Elevation

PINE ST.

IRON PIPE BENCHMARK

APPROX. BOUNDARY LINES

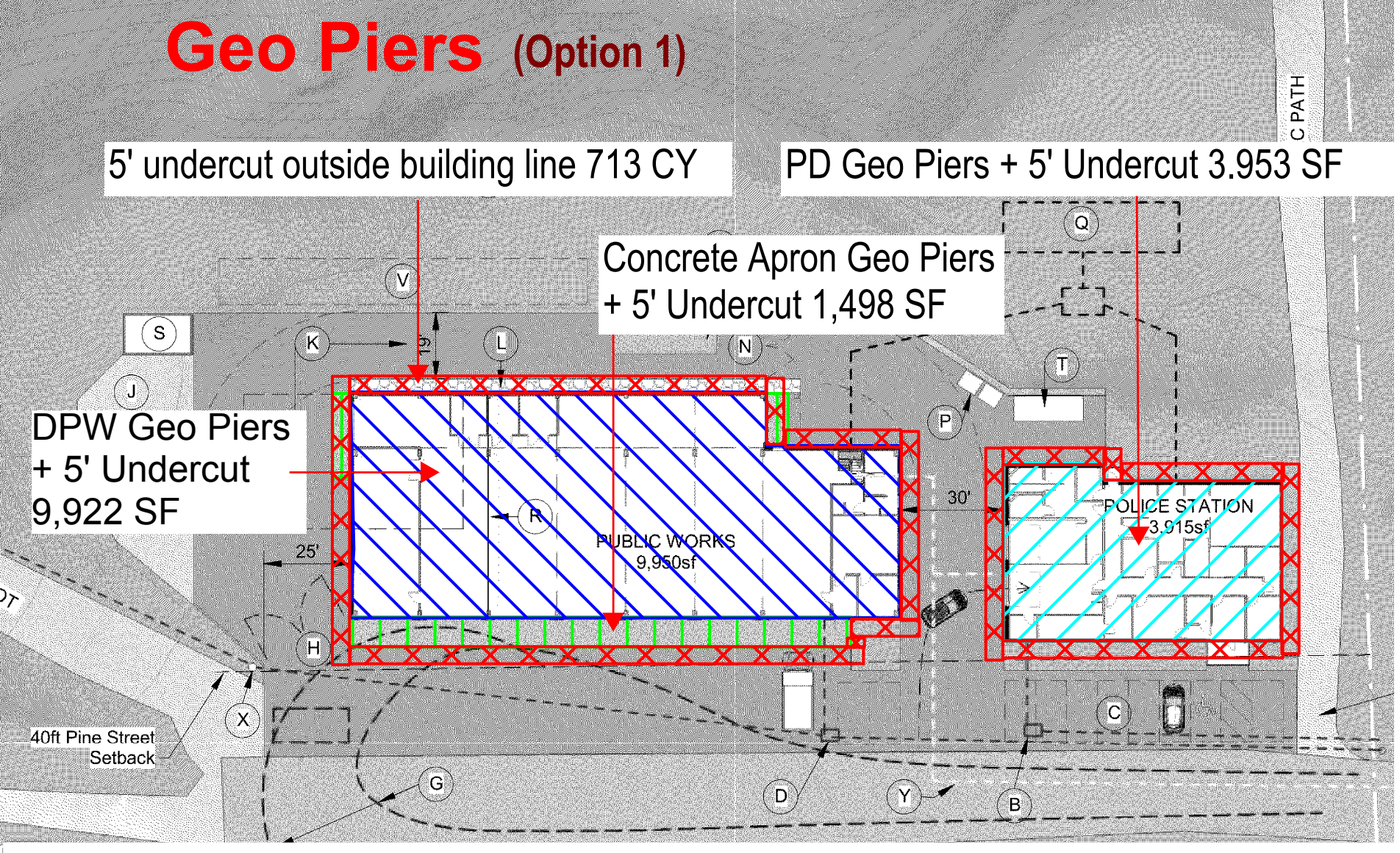
46'
E.O. NEW PAVE

149'
F.O. NEW FNDTN.

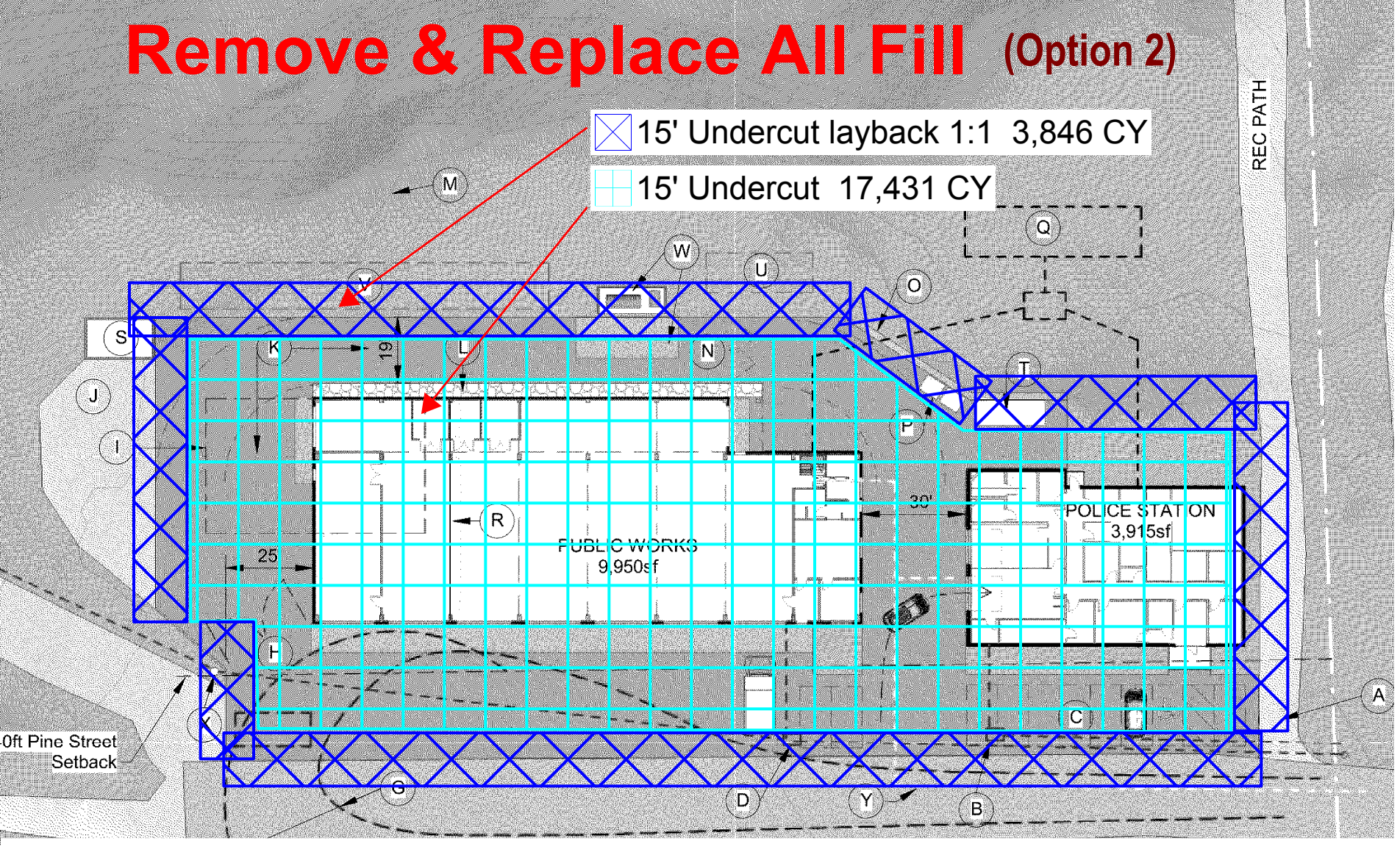
123'
F.O. NEW FNDTN

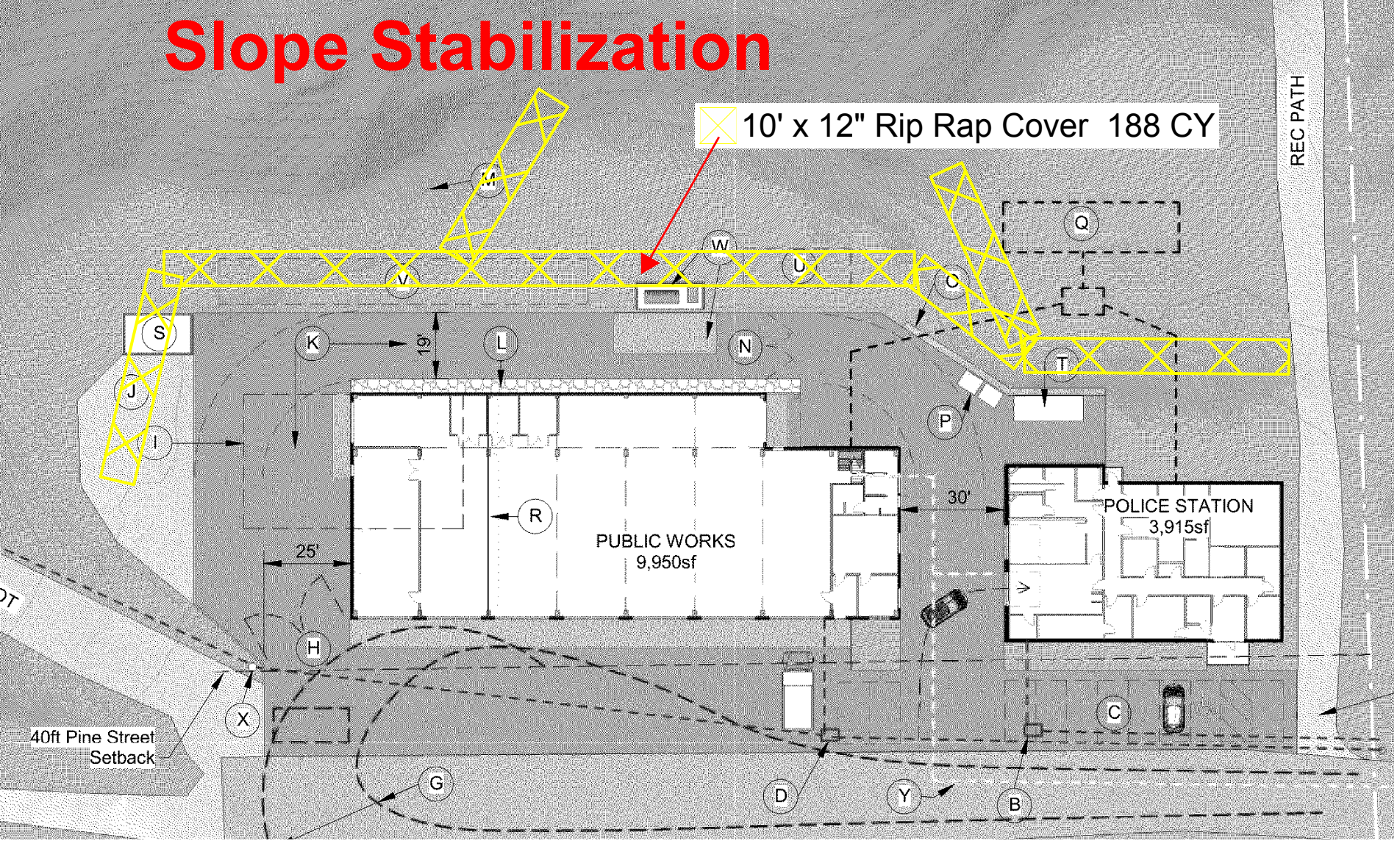
Bread Loaf Architects Planners Builders

Geo Piers (Option 1)



Remove & Replace All Fill (Option 2)




Slope Stabilization
10' x 12" Rip Rap Cover 188 CY
REC PATH
PUBLIC WORKS
9,950sf
POLICE STATION
3,915sf
30'
25'
40ft Pine Street
Setback
S
K
L
N
W
V
U
C
Q
T
P
J
I
R
H
X
G
D
Y
B
C

Bristol DPW & PD Site Remediation Due

To Unsuitable Soils ROM 1/4/21

Estimate

BreadLoaf Architects Planners Builders

Division	Description	Quantity	UM	Unit Cost	Division Total
01	**Geo Piers ROM**				**$398,964**
01199.999	**Scope**				**$398,964**
01000.002	Undercut 5' w/structural fill @ DPW Bldg. footprint	1,837	CY	$45.60	$83,767
01000.003	Dispose soil onsite	1,837	CY	($9.60)	-$17,635
01000.006	Undercut 5' w/structural fill @ DPW Conc. Aprons	277	CY	$45.60	$12,631
01000.007	Dispose soil onsite	277	CY	($9.60)	-$2,659
01000.008	Undercut 5' w/structural fill @ PD Bldg. footprint	732	CY	$45.60	$33,379
01000.009	Dispose soil onsite	732	CY	($9.60)	-$7,027
01000.010	Undercut 5' w/structural fill @ 5' Outside Building Footprint	713	CY	$45.60	$32,513
01000.012	Dispose soil onsite	713	CY	($9.60)	-$6,845
01000.014	17' Geo Piers @ DPW	9,950	SF	$16.00	$159,200
01000.016	17' Geo Piers @ DPW Conc. Aprons	1,500	SF	$16.00	$24,000
01000.018	17' Geo Piers @ PD	3,915	SF	$16.00	$62,640
01000.020	Obstructions	1	LS	$25,000.00	$25,000
03	**Remove & Replace all Fill at Entire Site**				**$638,310**
03099.999	**Scope**				**$638,310**
03000.002	Remove all fill & replace with Structural Fill Avg. depth 15'	21,277	CY	$38.00	$808,526
03000.004	Dispose soil onsite	21,277	CY	($8.00)	-$170,216
04	**Slope Stabilization**				**$43,263**
04399.999	**Scope**				**$43,263**
04300.000	Re-Grade Slope	687	CY	$15.00	$10,305
04300.002	Slope Stabilization Fabric	756	SY	$4.00	$3,024
04300.004	Seed & Mulch	756	SY	$1.50	$1,134
04300.006	Ground Cover Plantings	1	LS	$10,000.00	$10,000
04300.008	10' x 12" RipRap @ top of slope + 2 channels down slope	188	CY	$100.00	$18,800

December 8, 2020

Bread Loaf Corporation
Attn: Stephen Rooney, AIA
1293 Route 7 South
Middlebury, VT 05753

Re: Fill investigation for the proposed DPW-Police Facility located at 80 Pine Street in Bristol, VT.

Dear Steve:

This is to report our interpretation of the fill conditions at the site of the proposed DPW-Police Facility located at 80 Pine Street in Bristol, VT. Our findings are based upon 4 soil borings (B-1 thru B-4) performed by Mike's Boring & Coring (MB&C) from East Barre, Vermont. DIG-SAFE was contacted by your firm to locate public utilities near the proposed borings (DIG-SAFE #2020-470-9127).

Attached are copies of the 4 soil borings. Some of the information has been plotted on the site plan provided by your office.

No attempt was made by Knight Consulting Engineers to investigate for the presence, extent or nature of hazardous or toxic substances.

We appreciate the opportunity to conduct this geotechnical investigation, and stand ready to assist in future phases of this project.

Sincerely,

Eric Goddard

Eric Goddard, P.E.
Senior Vice President
Bristol DPW-Police Fill Investigation Report (12-08-2020).doc

DESCRIPTION OF EXPLORATION PROGRAM

The fill investigation was comprised of 4 soil borings along the northerly and westerly sides of the proposed DPW-Police Facility site located at 80 Pine Street in Bristol, Vermont. Two of the soil borings (B-2 & B-4) were drilled into native soil and two of the soil borings (B-1 & B-3) encountered refusal on probable concrete or boulders. All soil borings were performed using Standard Penetration Test (SPT) split-spoon sampling procedures.

Hollow-stem augers were first advanced to a pre-determined depth. Then a standard 2" OD split spoon sampler was attached to the end of the drill rod and driven into the soil. The SPT value (units are blows per foot) were recorded as the sum of the number of blows of a 140 pound hammer, free falling 30 inches, required to drive the sampler over the second and third of four 6 inch increments. Once the SPT value was recorded and a disturbed sample obtained, the sampler was advanced to the next sampling depth and the process was repeated.

It should be noted that the information reported on the boring logs is a field visual interpretation and does not always match the description based upon laboratory analysis of the submitted samples.

The boring locations and elevations are depicted on the **Soil Boring Locations & Elevations Plan.**

The bottom of fill elevations are depicted on the **Bottom of Fill Elevations Plan**.

SITE OVERVIEW

The site of the proposed DPW-Police Facility is located at 80 Pine Street in Bristol, Vermont. The existing plateau slopes gradually from southeast to northwest with approximate elevations ranging from 0 feet to -3 feet. The site is bordered by steeply-sloped dumped fills along the northerly and westerly perimeter. The fill slopes range from 65% to 80%. An old landfill is located at the toe of these fill slopes. Surface runoff currently flows toward the fill slope and is causing erosion of the unprotected slope face.

A DPW employee indicated that the on-site fill materials contain ditch cleaning debris and concrete sidewalks among other items. The same employee also reported that in 2018 there was a localized slope failure involving a 10'-wide wedge of soil north of Soil Boring B-3. It is unclear whether this failure was triggered by erosion, soil saturation or some other cause. It was reported by Bread Loaf that there has been a history of settlement of the existing building located at the NW corner of the site.

SUBSURFACE CONDITIONS

Based upon the soil borings, the on-site fill materials appear to be a very loose-to-medium dense mixture of sand, gravel, topsoil, roots, concrete, brick, cinders, asphalt and wood. Silty peat was encountered at Soil Boring B-1; glass and porcelain were encountered at Soil Boring B-2. Below is a summary of the fill depth results:

Boring	Boring Elevation	Bottom of Fill Depth	Bottom of Fill Elev.
B-1	-3.0'	>15.25'	<-18.25'
B-2	-3.0'	23.0'	-26.0'
B-3	-2.75'	>18.25'	<-21.0' (1)
B-4	0.0'	13.0'	-13.0'
ww-tp1	-2.25'	4.75'	-7.0'
ww-tp4	-8.3'	1.3'	-9.6'

Note (1): Bottom of fill was predicted to be at -20'+/- based upon the existing fill slopes.

FINDINGS AND CONCLUSIONS:

New Buildings: Based upon the soil boring results, the existing fill materials should be either: 1) stabilized in-place using GEOPIER's, or 2) completely removed and replaced with structural fill compacted to 95% of the Modified Proctor density. A potential complication with the installation of GEOPIER's is the possibility of obstructions above the bottom of the fill elevation. This may necessitate pre-drilling for installation of the piers or excavating to remove the obstructions when encountered. More refined fill information will likely be needed in order to perform detailed design of the GEOPIER's.

New Parking Lots: Based upon the soil boring results, new parking lots should remain unpaved if the existing fill materials are left in-place. Paved parking lots should have the existing fill materials completely removed and replaced with structural fill compacted to 95% of the Modified Proctor density. GEOPIER's are typically not a cost-effective approach for stabilizing parking lots.

Slope Stability: The existing fill slopes should be protected from future erosion by diverting runoff away from the northerly slope face or adding a stabilized channel to transport the runoff down the slope face. There will likely be periodic sloughing and localized failures of the existing slopes due to the inherent instability of the fill materials. Preliminary setbacks for 1.25 and 1.50 Factors-of-Safety are plotted on the **Preliminary Slope Factors-of-Safety Limits Plan.** It should be noted that these limits are intended as planning guidelines based upon the toes of the existing steep fill slopes depicted on the plans and the assumption of mostly granular soil properties. Further erosion may impact these limits. One design consideration is to cut back the top of slope to achieve a flatter (more stable) slope face and protecting the face with vegetation and erosion control matting. A more detailed slope analysis is recommended to be included in the final design of the site.

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

PROPOSED RELOCATED DOG POUND

SEPTIC FIELD

64'-0"

+(-4.0')

18'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

TP-3

B-2 (-3')

B-3 (-2.75')

(-8.3')

ww-tp4

ww-tp6

ww-tp5

23'-3"

40'-0"

GREY GARAGE +(-2.6')

ww-tp1

(-2.25')

+(-2.0')

ww-tp2

+(-1.0')

B-4 (0')

+0.0'

ww-tp3

42'-7 3/4"

17'-0"

10'-8 3/4"

GREEN GARAGE +0.0'

B-1 (-3')

157'

E.O. NEW PAVE

137'

F.O. NEW FNDTN

109'-5 3/4"

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

Reference 0' Elevation

PINE ST.

IRON PIPE BENCHMARK

APPROX. BOUNDARY LINES

46'
E.O. NEW PAVE

149'
F.O. NEW FNDTN.

123'
F.O. NEW FNDTN

Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Soil Boring Locations & Elevations

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

PROPOSED RELOCATED DOG POUND

SEPTIC FIELD

64'-0"

+(-4.0')

18'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

TP-3

B-2 (-26')

B-3 (<-21')

(-9.6')

ww-tp4

ww-tp6

ww-tp5

23'-3"

40'-0"

GREY GARAGE +(-2.6')

ww-tp1

(-7.0')

+(-2.0')

ww-tp2

+(-1.0')

B-4 (-13')

+0.0'

42'-7 3/4"

17'-0"

10'-8 3/4"

ww-tp3

GREEN GARAGE +0.0'

B-1 (<-18.3')

157'

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109'-5 3/4"

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123'
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Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Bottom of Fill Elevations

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

TP-1
PROPOSED TEST PITS

ww-tp5
PREVIOUS 1989 WASTE WATER PERMIT TEST PITS

APPROX. 1FT CONTOURS

OPTIONAL IF NEEDED

PROPOSED DIESEL TANK

SEPTIC FIELD

F.O.S.=1.25

F.O.S.=1.5

B-1

B-2

B-3

B-4

64'-0"

+(-4.0')

19'-7 1/4"

42'-5 1/4"

54'-2"

38'-2 1/4"

+(-3.0')

23'-3"

40'-0"

157'

E.O. NEW PAVE

137'

F.O. NEW FNTDN

GREY GARAGE +(-2.6')

ww-tp1

ww-tp2

+(-2.0')

ww-tp3

+(-1.0')

+0.0'

42'-7 3/4"

GREEN GARAGE +0.0'

17'-0"

10'-8 3/4"

109'-5 3/4"

114'

F.O. NEW FNDTN

135'

E.O NEW PAVE

ww-tp4

ww-tp6

ww-tp5

PINE ST.

IRON PIPE BENCHMARK

APPROX. BOUNDARY LINES

46'
E.O. NEW PAVE

149'
F.O. NEW FNDTN.

123'
F.O. NEW FNDTN

Graphic Scale: 1 inch = 40 feet

0 40' 80' 120' 160'

Preliminary Slope Factors-of-Safety Limits

Bristol Public Works and Police Dept. Building Site and Needs Analysis

CONCEPT DESIGN

11/10/20

BreadLoaf
Architects
Planners
Builders

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 1 DATE: 11-30-2020 HOLE #: B- 1 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -3'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No. Rec.	Sample Pen. Inches	Sample Inches
5'-7'	Dry	1/1/1/1	Moist/damp	6'	Very loose brown sand and gravel into silty peat - fill	1	24	8
10'-12'	Dry	54/48/11/9	Damp/dry		Very dense-to-medium dense brown cmf sand with concrete - fill	2	24	8
15'-17'	Dry	100 for 3"			Fill	3	3	0
				15'-3"	Refusal on probable concrete			

Ground Surface to 15' Used 3.25" Auger Then SS to 8' refusal at 15'3"

Earth Boring	15'3"
Rock Coring	
Samples:	3
HOLE NUMBER	B-1

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 2 DATE: 11-30-2020 HOLE #: B- 2 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -3'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
5'-7'	Dry	2/2/2/2	Damp		Very loose-to-loose brown silt & f sand, tr roots, cinders and brick - fill	1	24	6
10'-12'	Dry	3/5/9/12	Damp		Loose-to-medium dense brown silt & f sand, tr roots - fill	2	24	4
14'-16'	Dry	5/5/6/9	Damp		Loose-to-medium dense brown mf sand, some concrete & asphalt, tr silt - fill	3	24	10
16'-18'	Dry	7/8/12/9	Damp		Medium dense brown silt & f sand, some brick and cinders - fill	4	24	15
18'-20'	Dry	17/5/7/6	Damp	18.5'	Loose-to-medium dense brown silt & f sand, some cinders, porcelain, glass & concrete - fill	5	24	9
20'-22'	Dry	2/17/15/8	Damp	20.5'	Medium dense sand, cinders, brick & concrete - fill	6	24	10
22'-2'4'	Dry	6/8/7/9	Damp/moist	23'	Loose-to-medium dense sand, cinders, brick & concrete (fill) into medium dense brown cmf sand & f gravel, tr silt (native soil)	7	24	11

Ground Surface to 22' Used 3.25" Auger Then SS to 24'

Earth Boring 24'
Rock Coring
Samples: 7
HOLE NUMBER B-2

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 2 DATE: 11-30-2020 HOLE #: B- 3 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: -2.75'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Rec. Inches	Sample Inches
4'-6'	Dry	7/3/3/3	Moist	5.5'	Loose brown silty fine sand into loose black cmf sand, tr roots - fill	1	24	8
6'-8'	Dry	4/3/4/5	Moist		Loose mixture of brown & dark brown cmf sand, some f gravel, tr silt - fill	2	24	6
8'-10'	Dry	11/26/8/3	Moist/damp	9.5'	Medium dense black/brown silty cmf sand, some f gravel, tr roots - fill	3	24	8
10'-12'	Dry	4/2/3/2	Moist		Very loose-to-loose oxidized brown cmf sand, tr f gravel, silt & roots - fill	4	24	7
12'-14'	Dry	2/4/8/12	Damp	13'	Very loose-to-medium dense brown silty cmf sand, some f gravel, tr asphalt & roots - fill	5	24	3
14'-16'	Dry	13/11/19/8	Damp		Medium dense brown silty cmf sand, some f gravel (layer of asphalt at 15') - fill	6	24	8
16'-18'	Dry	5/2/2/3	Damp	17'	Loose brown silty cmf sand into very loose orange/brown organics (rotten wood) & black cinders - fill	7	24	12
18'-20'	Dry	100 for 3"	Damp		Pink/brown cmf sand, some f gravel, tr silt - fill	8	24	2
				18'-3"	Refusal on probable boulder or concrete			

Ground Surface to 18' Used 3.25" Auger Then SS to refusal at 18'3"

Earth Boring	18'3"
Rock Coring	
Samples:	8
HOLE NUMBER	B-3

MIKE'S BORING & CORING LLC.
PO Box 75 ° East Barre, Vermont 05649 ° 802 476-5073

TO: Eric Goddard Knight Consulting Engineers 183 Commerce Lane Williston, VT 05495	PROJECT NAME: Proposed DPW-Police Bldg LOCATION: Bristol, VT MBC JOB #: 202074	SHEET: 4 DATE: 11-30-2020 HOLE #: B-4 LINE & STA. OFFSET:	

Ground Water Observations NWTD at 0 Hours	Augers-Size I.D. 3.25" Split Spoon 2" Hammer Wt. 140# Hammer Fall 30"	Surface Elevation: 0'+/- Date Started: 11-30-2020 Date Completed: 11-30-2020 Boring Foreman: Mike McGinley Inspector: Eric Goddard Soils Engineer: Eric Goddard

LOCATION OF BORING: As staked-

Sample Depths From/To (Feet)	Type of Sample	Blows per 6" on Sampler	Moisture Density or Consist.	Strata Change Elev.	Soil Identification	Sample No.	Sample Pen. Inches	Sample Rec. Inches
0'-2'	Dry	9/9/11/13	Moist		Medium dense brown cmf sand & mf gravel, tr silt - fill	1	24	13
2'-4'	Dry	11/9/8/5	Moist	3.5'	Medium dense brown cmf sand, some f gravel, tr silt - fill	2	24	10
4'-6'	Dry	3/4/7/4	Moist		Loose-to-medium dense brown cmf sand, some f gravel, tr silt - fill	3	24	10
6'-8'	Dry	3/4/2/3	Moist		Loose brown cmf sand, some f gravel, tr silt - fill	4	24	10
8'-10'	Dry	5/6/9/7	Moist	10'	Medium dense brown cmf sand, some f gravel, tr silt into possible cinders @ 10' - fill	5	24	10
10'-12'	Dry	5/9/11/8	Moist		Medium dense black/brown cmf sand & f gravel, tr silt (possible cinders) - fill	6	24	9
12'-14'	Dry	6/8/8/9	Moist	13'	Medium dense black/brown cmf sand & f gravel, tr silt with possible cinders (fill) into medium dense oxidized brown cmf sand & f gravel, tr silt (native soil)	7	24	15
15'-17'	Dry	12/16/9/13	Moist		Medium dense brown cmf sand & mf gravel, tr silt (pushed stone) - native soil	8	24	4

Ground Surface to 15' Used 3.25" Auger Then SS to 17'

Earth Boring	17'
Rock Coring	
Samples:	8
HOLE NUMBER	B-4