

STATE OF VERMONT

VTARNG - Feigel Hill Bypass Camp Ethan Allen Training Site

STATE OF VERMONT MILITARY DEPARTMENT
BUILDING #5, CAMP JOHNSON
789 VERMONT NATIONAL GUARD RD
COLCHESTER, VT 05448-3099

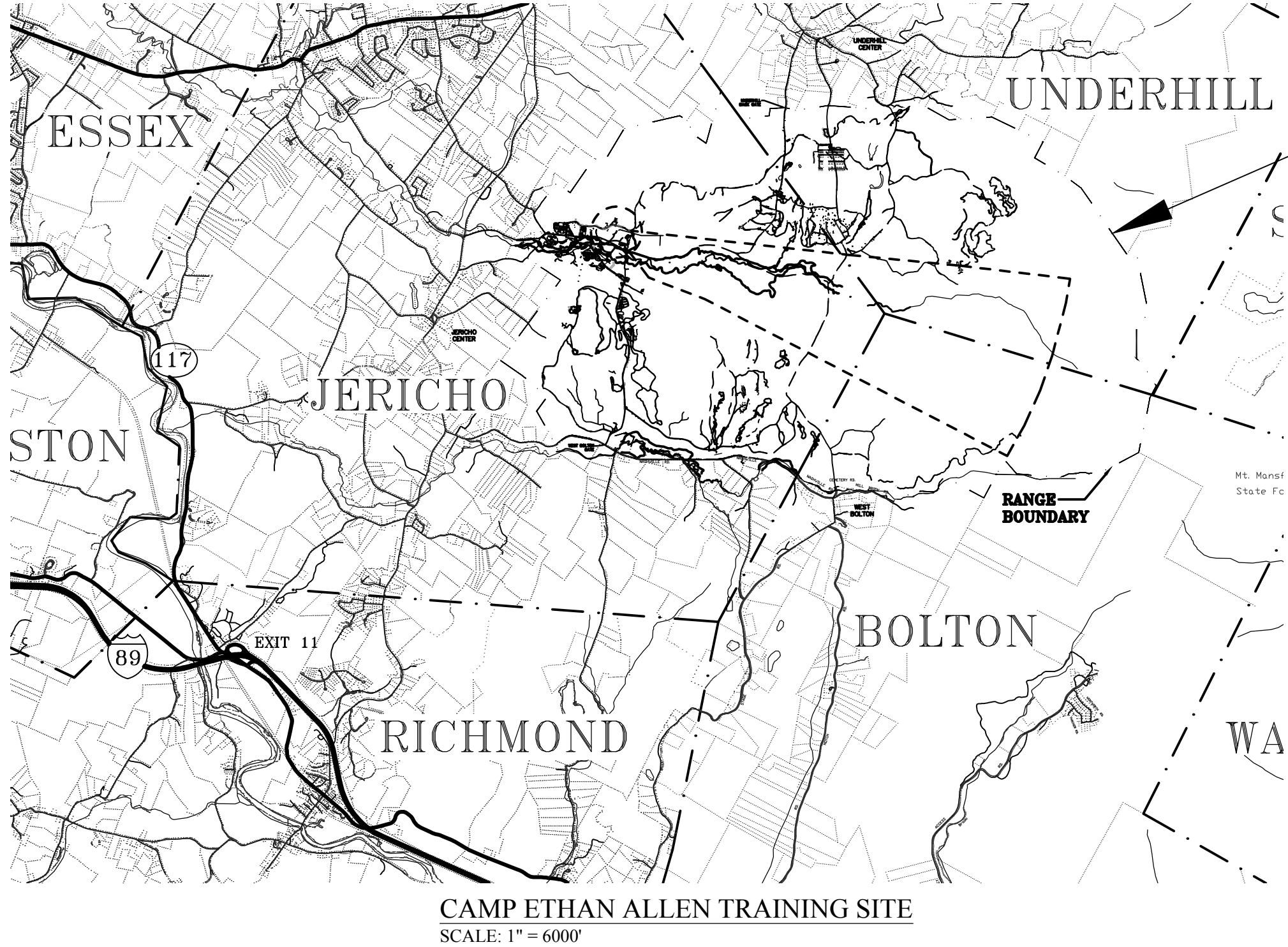


MAY, 2018

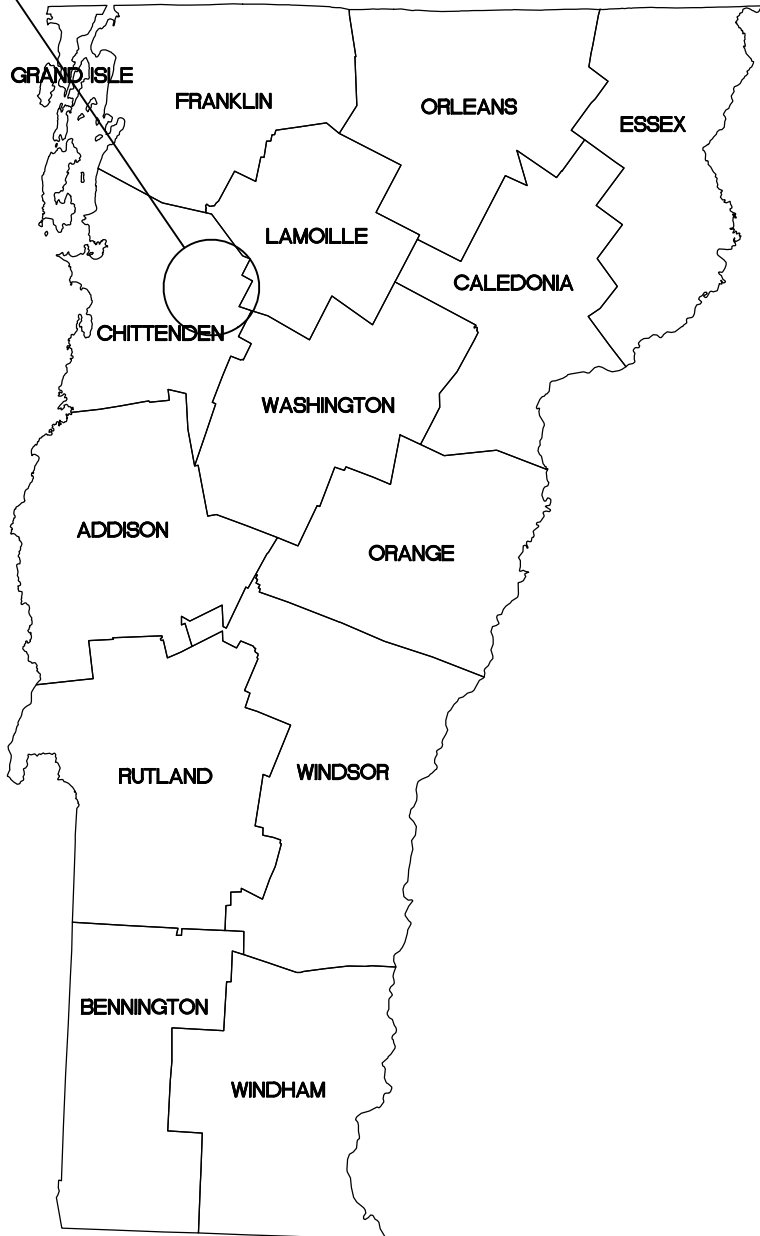
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PROJECT LOCATION:
Camp Ethan Allen Training Site - Underhill, VT



CAMP ETHAN ALLEN TRAINING SITE
SCALE: 1" = 600'



GENERAL NOTES:

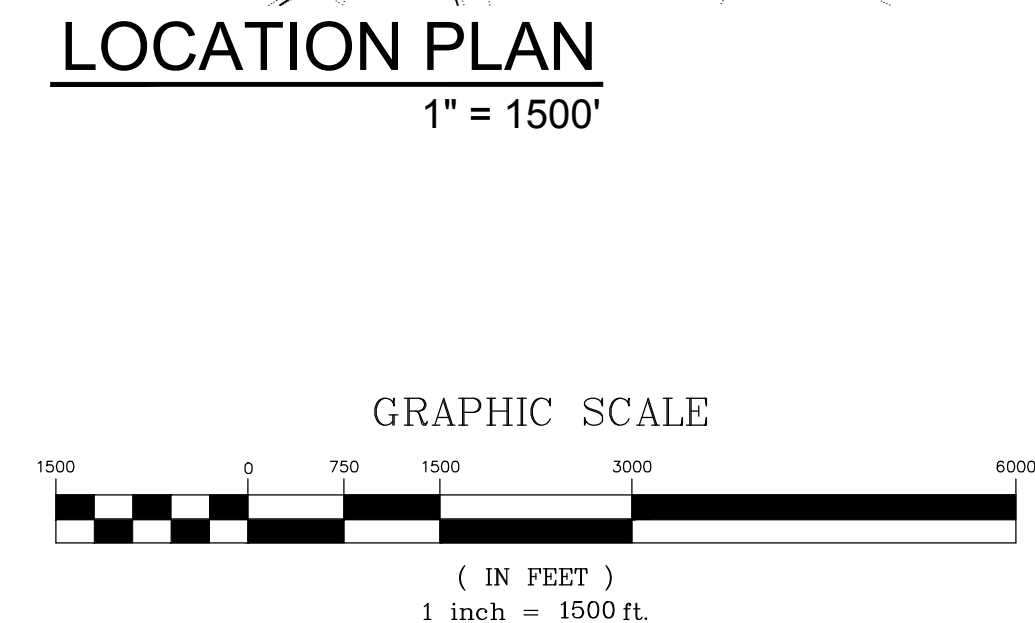
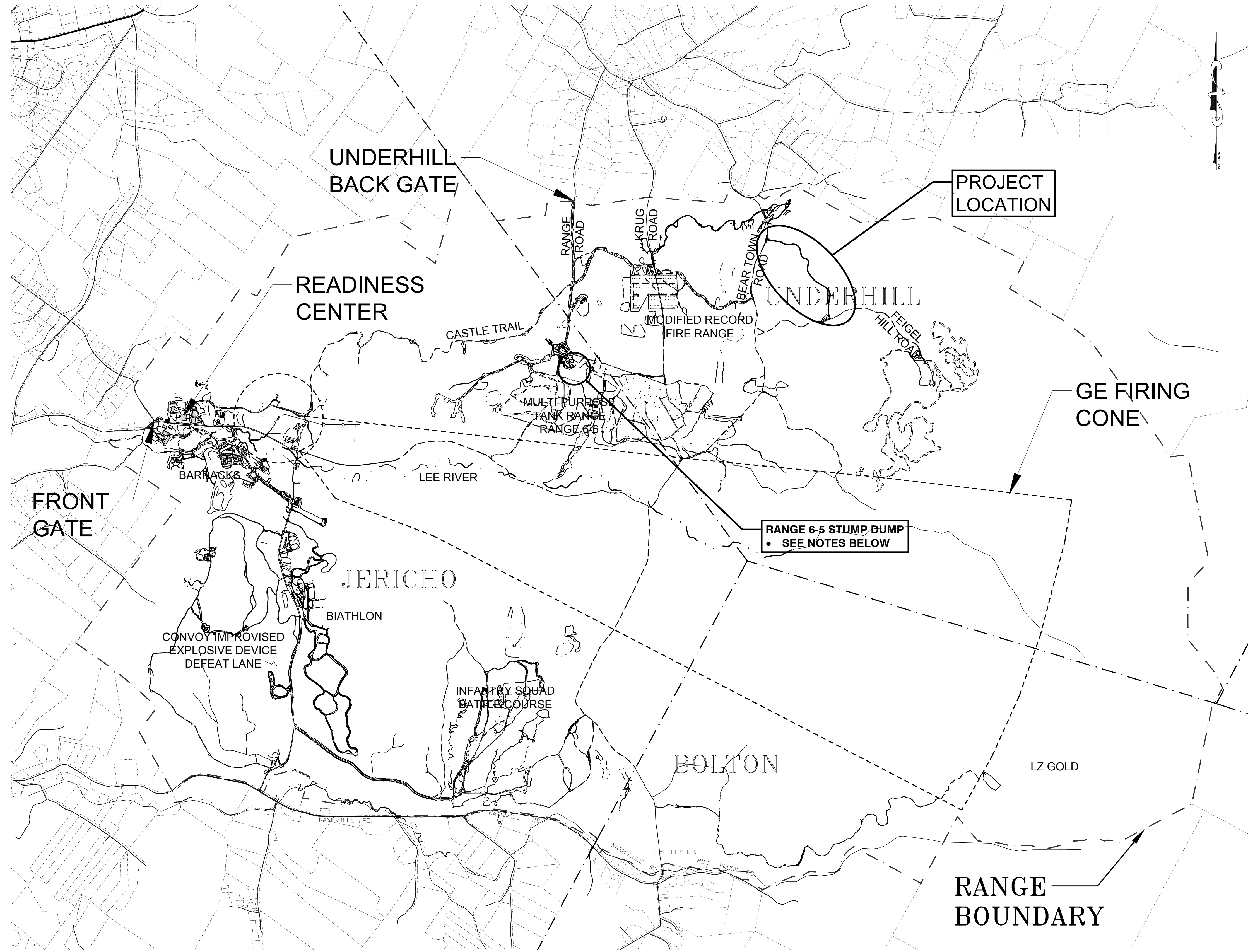
- UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON UTILITY EVIDENCE VISIBLE AT GROUND SURFACE AND ARE SUBJECT TO FIELD VERIFICATION BY EXCAVATION. UTILITIES SHOWN DO NOT PURPORT TO CONSTITUTE OR REPRESENT ALL UTILITIES LOCATED UPON OR ADJACENT TO THE SURVEYED PREMISES. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER. THE CONTRACTOR SHALL CONTACT DIG SAFE (888-344-7233) PRIOR TO ANY CONSTRUCTION. IN ADDITION, THE CONTRACTOR SHALL HIRE A PRIVATE UTILITY LOCATING FIRM TO LOCATE OWNER OWNED UNDERGROUND UTILITIES PRIOR TO START OF ANY EXCAVATION.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFORMING TO ALL OSHA (STATE/FEDERAL) REGULATIONS INCLUDING TRENCHING AND CONFINED SPACE REQUIREMENTS.
- THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL ITEMS AND MATERIALS INCORPORATED INTO THE SITE WORK. WORK SHALL NOT BEGIN ON ANY ITEM UNTIL SHOP DRAWING APPROVAL IS GRANTED.
- ALL EXISTING UTILITIES NOT INCORPORATED INTO THE FINAL DESIGN SHALL BE REMOVED OR ABANDONED AS INDICATED ON THE PLANS OR DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL MAINTAIN AS-BUILT PLANS (WITH TIES) FOR ALL UNDERGROUND UTILITIES. THOSE PLANS SHALL BE SUBMITTED TO THE OWNER AT THE COMPLETION OF THE PROJECT.
- THE CONTRACTOR SHALL REPAIR/RESTORE ALL DISTURBED AREAS (ON OR OFF THE SITE) AS A DIRECT OR INDIRECT RESULT OF THE CONSTRUCTION.
- ALL GRASSED AREAS SHALL BE MAINTAINED UNTIL FULL VEGETATION IS ESTABLISHED.
- MAINTAIN ALL TREES OUTSIDE THE CONSTRUCTION LIMITS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK NECESSARY FOR COMPLETE AND OPERABLE FACILITIES AND UTILITIES.
- IN ADDITION TO THE REQUIREMENTS SET IN THESE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL COMPLETE THE WORK IN ACCORDANCE WITH ALL PERMIT CONDITIONS.
- THE TOLERANCE FOR FINISH GRADES FOR ALL GRAVEL SURFACES SHALL BE 0.1 FEET.
- ANY DEWATERING NECESSARY FOR THE COMPLETION OF THE SITEWORK SHALL BE CONSIDERED AS PART OF THE CONTRACT AND SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
- EXISTING PAVEMENT TO BE REMOVED SHALL BE DISPOSED OF AT AN APPROVED OFF-SITE LOCATION. EXISTING EXCAVATED MATERIAL TO BE REMOVED SHALL BE DISPOSED OF AT A DESIGNATED ON-SITE LOCATION. CONTRACTOR IS RESPONSIBLE FOR STOCKPILING EXCAVATED MATERIAL FROM TRUCKS AT THE DESIGNATED WASTE AREA.
- IF THERE ARE ANY CONFLICTS OR INCONSISTENCIES WITH THE PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR VERIFICATION BEFORE WORK CONTINUES ON THE ITEM IN QUESTION.
- HORIZONTAL AND VERTICAL DATUM BASED ON VCS NAD 83 AND NAVD 88 RESPECTIVELY AND ARE CALCULATED BASED UPON GPS OBSERVATIONS PERFORMED ON SITE DURING THE TIME OF SURVEY.
- EXISTING STONE WALLS AND FOUNDATIONS SHALL NOT BE DISTURBED EXCEPT AS SHOWN ON THE PLANS.
- ALL CONSTRUCTION PERSONNEL WILL BE REQUIRED TO ATTEND AN ORIENTATION AND ORDNANCE IDENTIFICATION SESSION THAT THE EOD UNIT WILL PROVIDE, PRIOR TO ENTERING THE PROJECT SITE. SUBSEQUENT NEW FIELD EMPLOYEES ARE ALSO REQUIRED TO ATTEND THE SAFETY COURSE. THE ORDNANCE SESSION WILL COVER IDENTIFICATION OF VARIOUS ORDNANCE WITH MAY BE ENCOUNTERED AND PROCEDURES FOR NOTIFICATION OF EOD PERSONNEL.
- THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING TESTING AND INSPECTION SERVICES INDICATED IN THE CONTRACT DOCUMENTS, TYPICAL FOR CONCRETE AND SOIL TESTING.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT AND FIELD ENGINEERING REQUIRED FOR COMPLETION OF THE PROJECT. CIVIL ENGINEERING ASSOCIATES WILL PROVIDE AN AUTOCAD FILE WHERE APPLICABLE.
- CURRENTLY, BACKGROUND CHECKS ARE NOT REQUIRED FOR CEATS AND THE SECURITY OFFICE IS FINALIZING THE BADGING PROCESS, BUT MOST LIKELY WILL NOT REQUIRE CONTRACTORS TO SURRENDER THEIR LICENSE UPON ENTRY TO CEATS IN EXCHANGE FOR A VISITOR'S BADGE.
- EXISTING ROADS: MAINTAIN EXISTING ROADS AREAS ADEQUATE FOR CONSTRUCTION OPERATIONS. AT A MINIMUM, ALL EXISTING ROADS SHALL BE MAINTAINED/REPAIRED TO THE PRECONSTRUCTION CONDITION.
 - RECONDITION BASE AFTER USE, INCLUDING REMOVING CONTAMINATED MATERIAL, ADDING SUBBASE MATERIAL, REGRADING, PROOFROLLING AND COMPACTING.

CLEARING NOTES:

- ALL CLEARING FOR TREES GREATER THAN 3" IN DIAMETER NEED TO TAKE PLACE BETWEEN OCTOBER 1st AND APRIL 15th.
- FIREWOOD OBTAINED FROM THE CLEARING ON THIS PROJECT (BOTH HARDWOOD AND SOFTWOOD/10" TO 24" DIAMETER) SHALL BE CUT INTO LOG LENGTHS AND DELIVERED TO AN AREA NEAR "RANGE CONTROL" DESIGNATED BY THE OWNER.
- EXISTING STUMPS TO BE REMOVED SHALL BE DISPOSED OF AT THE LOCATION INDICATED ON THE PLANS OR AN ON-SITE LOCATION IDENTIFIED AT THE PRE-BID MEETING.
- TREES/LIMBS/BRUSH SHALL BE CHIPPED (AFTER FIREWOOD REMOVED) AND CHIPS CAN EITHER BE PILED ON SITE OR REMOVED.

RANGE 6-5 STUMP DUMP:

- ADDITIONAL CLEARING MAY BE REQUIRED
- DISPOSE OF STUMPS BY EXTENDING EXISTING SLOPE (OR EXCAVATING AND BURYING)
- COVER WITH A MINIMUM OF 1 FOOT OF ON-SITE SOIL
- SEED AND MULCH
- CONFIRM FINAL LOCATION WITH OWNER



SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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OWNER:



VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL BYPASS

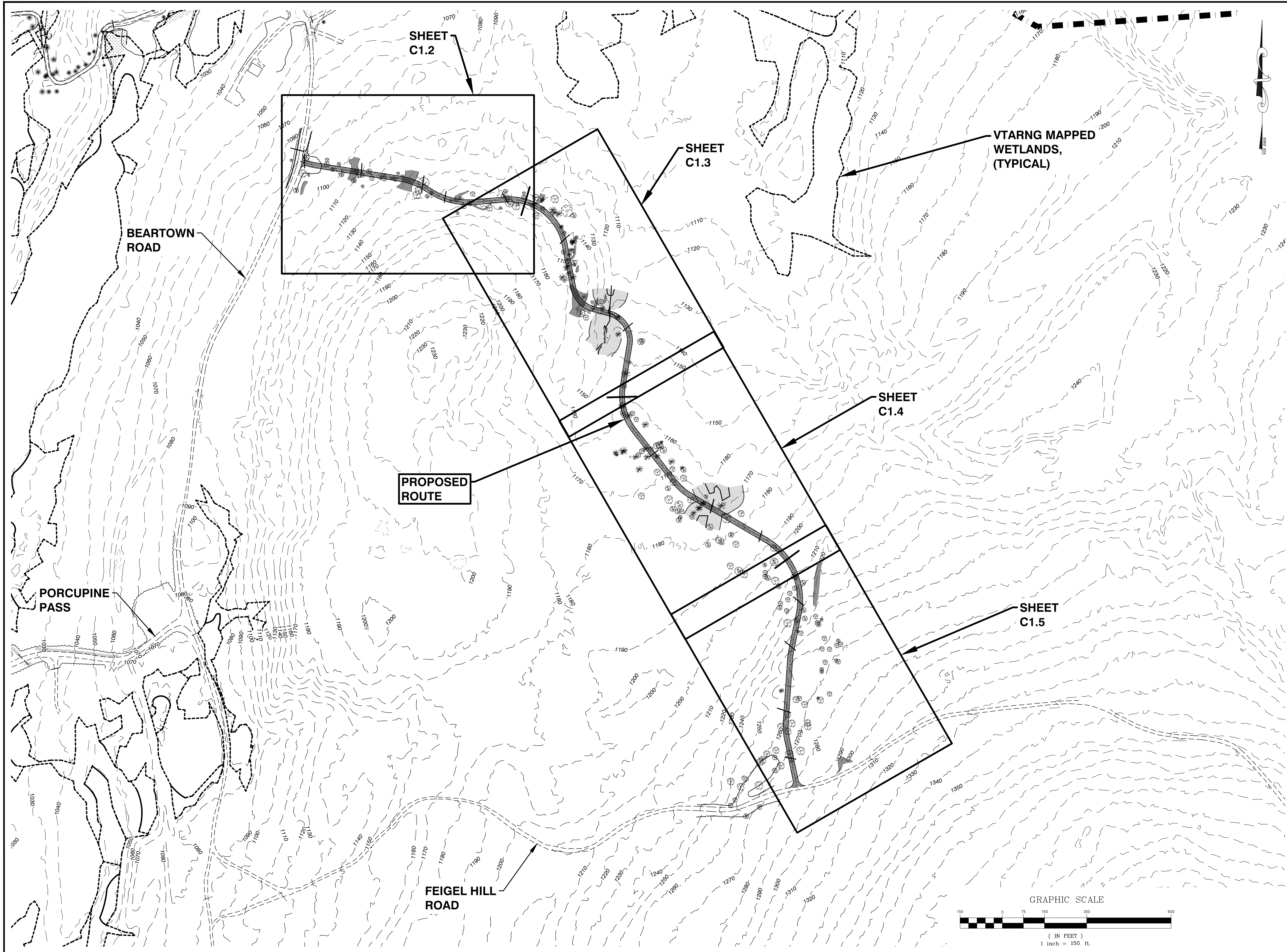
CAMP ETHAN ALLEN
TRAINING SITE
UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

PROJECT LOCATION PLAN

DATE
5/25/2018
SCALE
1" = 1500'
PROJ. NO.
16100.34

DRAWING NUMBER
L-1



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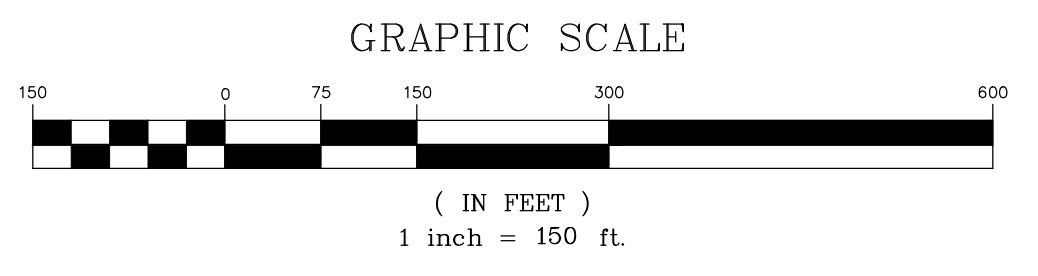
CAMP ETHAN ALLEN
 TRAINING SITE
 UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

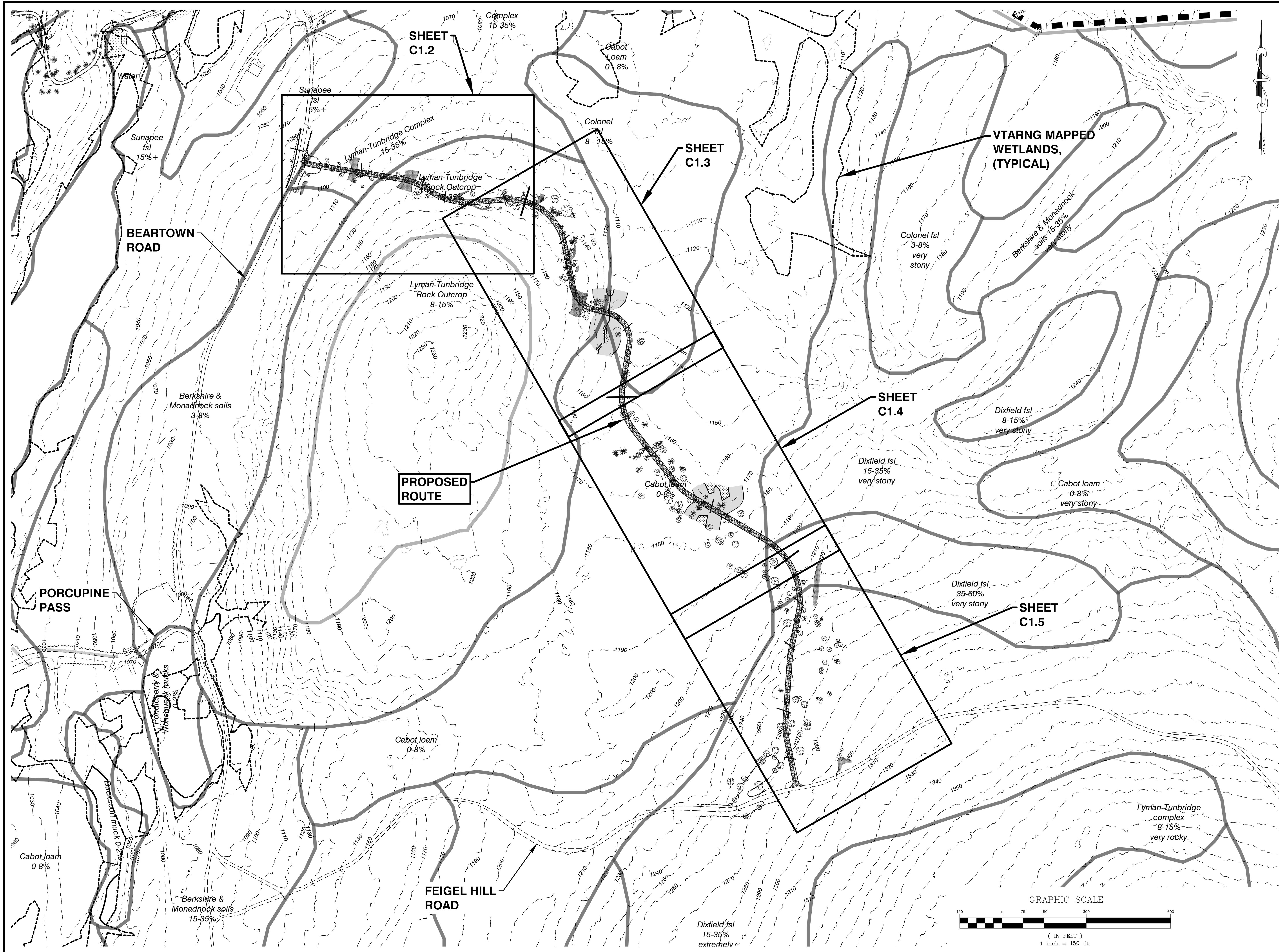
OVERALL SITE PLAN

DATE
 5/25/2018
 SCALE
 1" = 150'
 PROJ. NO.
 16100.34

DRAWING NUMBER
C1.0



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PROJECT:

**FEIGEL HILL
 BYPASS**

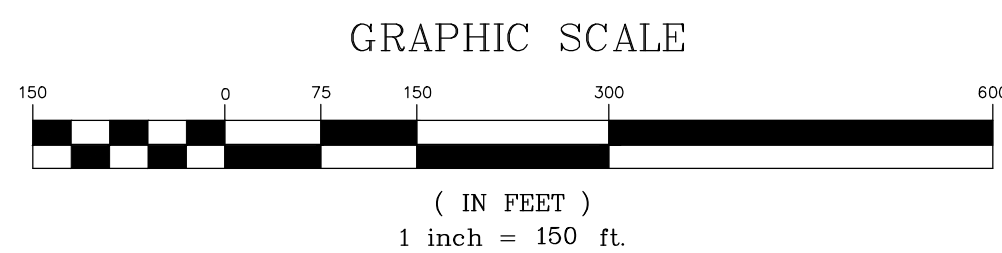
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 TRAINING SITE
 UNDERHILL, VT

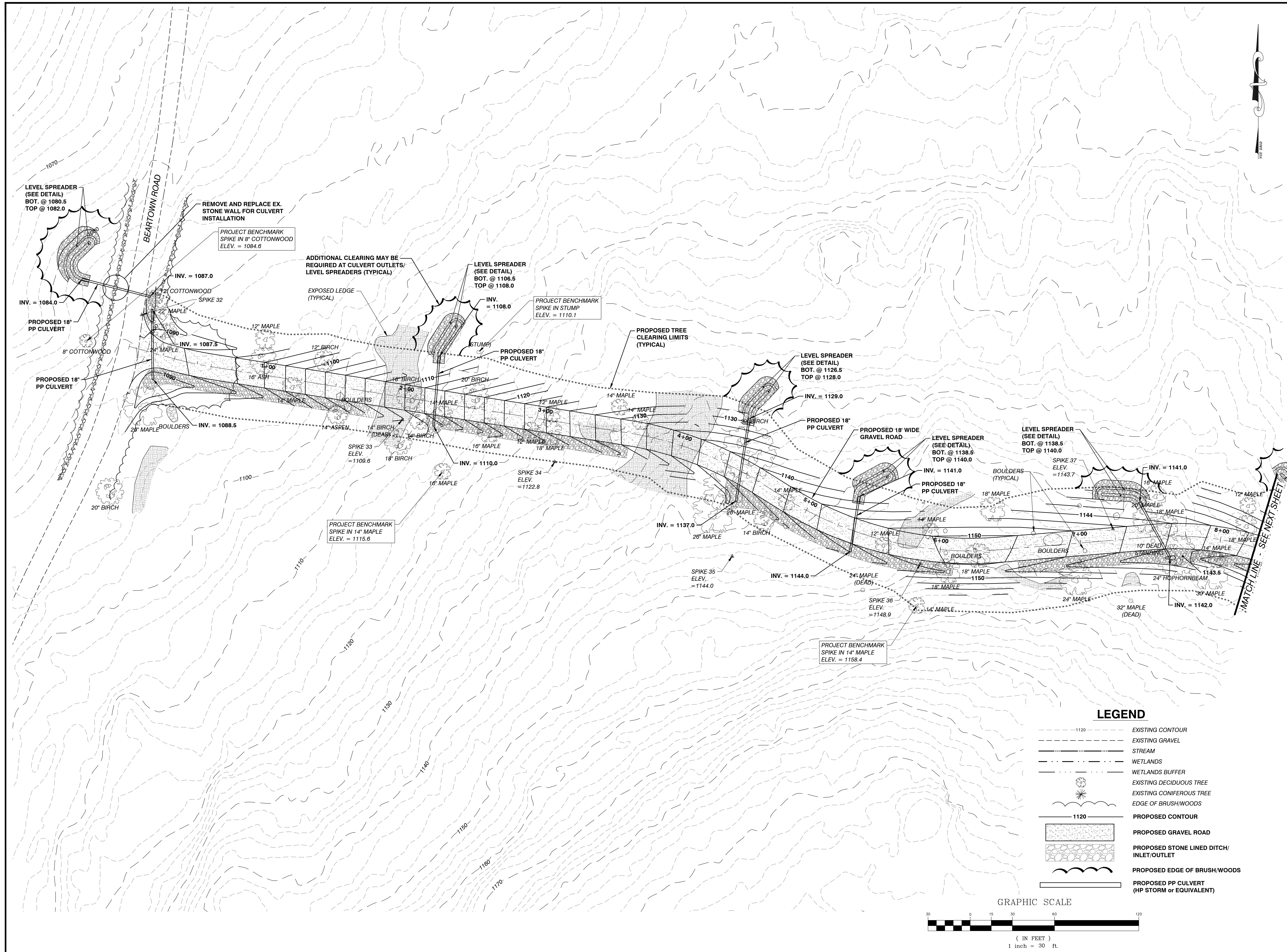
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5/25/18	BCE	STORMWATER SUBMITTAL PLANS


**EXISTING SOILS
 INFORMATION**

DATE
5/25/2018
 SCALE
1" = 150'
 PROJ. NO.
16100.34


DRAWING NUMBER
C1.1





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 COLCHESTER, VERMONT

PROJECT:
**FEIGEL HILL
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 CAMP ETHAN ALLEN
 TRAINING SITE
 UNDERHILL, VT

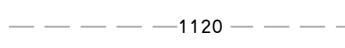
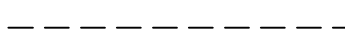
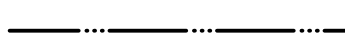
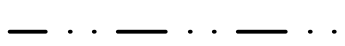
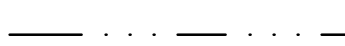



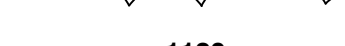
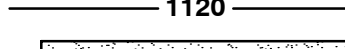



DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

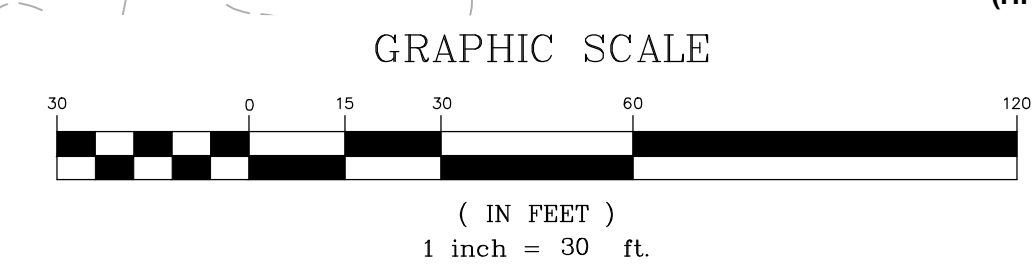
**PARTIAL ROAD
 PLAN**

DATE
 5/25/2018
 SCALE
 1" = 30'
 PROJ. NO.
 16100.34

DRAWING NUMBER
C1.2

LEGEND

-  EXISTING CONTOUR
-  EXISTING GRAVEL
-  STREAM
-  WETLANDS
-  WETLANDS BUFFER
-  EXISTING DECIDUOUS TREE
-  EXISTING CONIFEROUS TREE
-  EDGE OF BRUSH/WOODS
-  PROPOSED CONTOUR
-  PROPOSED GRAVEL ROAD
-  PROPOSED STONE LINED DITCH/
INLET/OUTLET
-  PROPOSED EDGE OF BRUSH/WOODS
-  PROPOSED PP CULVERT
(HP STORM or EQUIVALENT)



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CAMP JOHNSON
COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL
BYPASS

CAMP ETHAN ALLEN
TRAINING SITE
UNDERHILL, VT

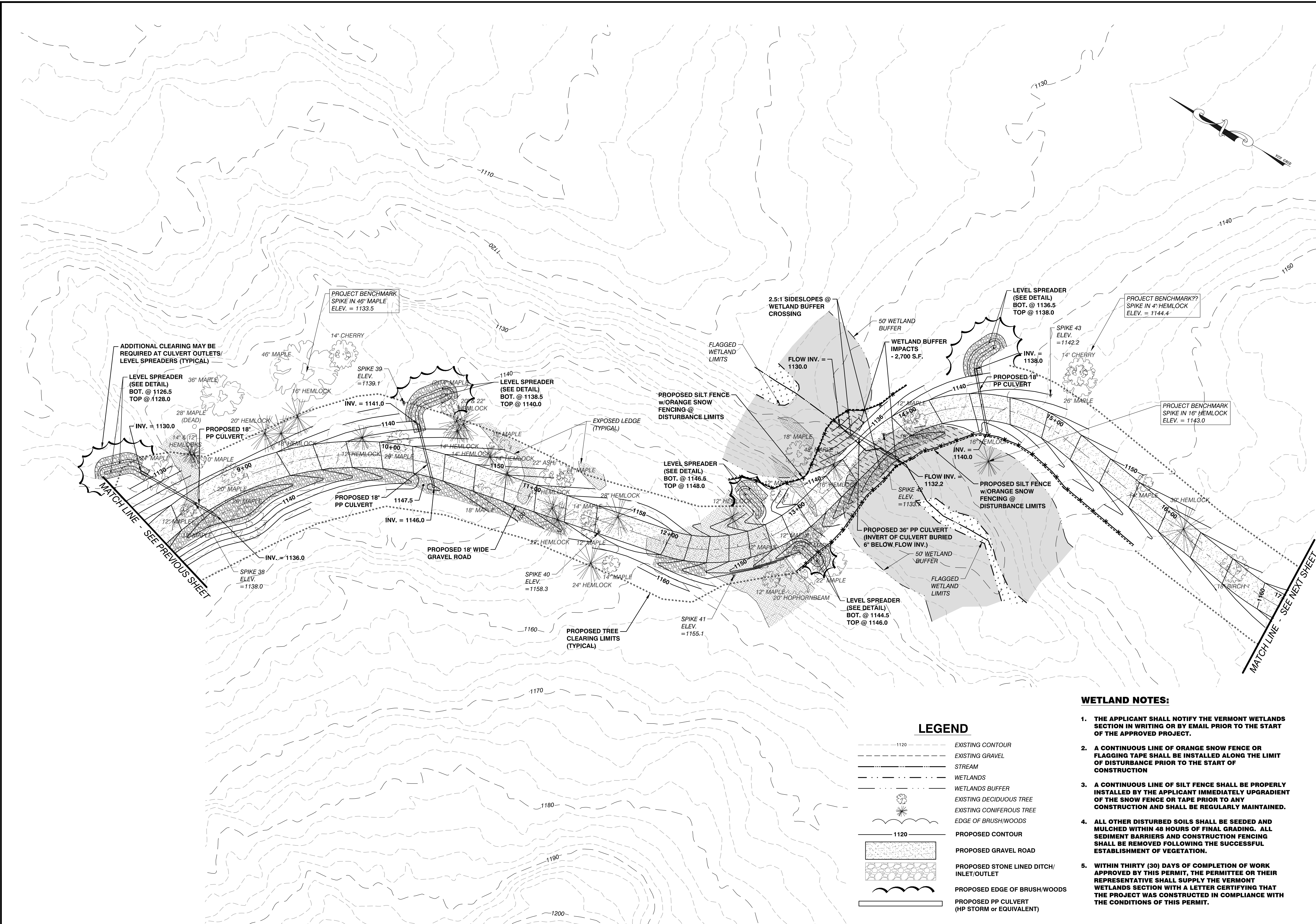
DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

PARTIAL ROAD
PLAN

DATE
5/25/2018
SCALE
1" = 30'
PROJ. NO.
16100.34

DRAWING NUMBER

C1.3



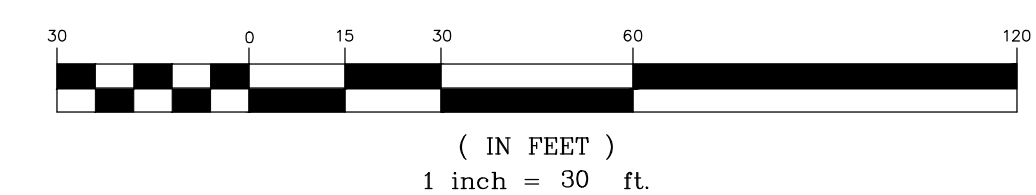
LEGEND

- 1120 --- EXISTING CONTOUR
- - - - - EXISTING GRAVEL
- ==== STREAM
- WETLANDS
- WETLANDS BUFFER
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EDGE OF BRUSH/WOODS
- 1120 ----- PROPOSED CONTOUR
- PROPOSED GRAVEL ROAD
- PROPOSED STONE LINED DITCH/ INLET/OUTLET
- PROPOSED EDGE OF BRUSH/WOODS
- PROPOSED PP CULVERT (HP STORM or EQUIVALENT)

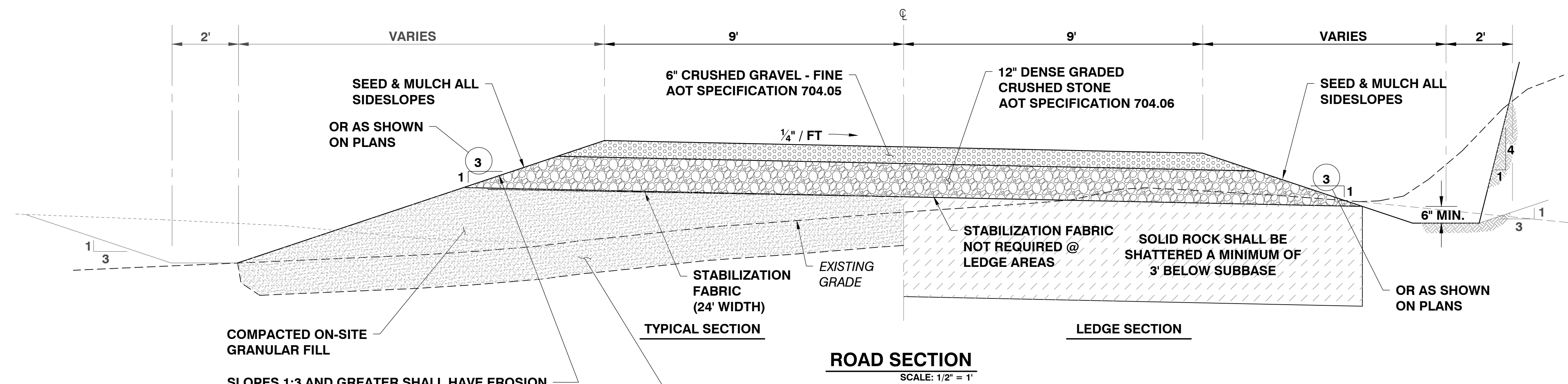
WETLAND NOTES:

1. THE APPLICANT SHALL NOTIFY THE VERMONT WETLANDS SECTION IN WRITING OR BY EMAIL PRIOR TO THE START OF THE APPROVED PROJECT.
2. A CONTINUOUS LINE OF ORANGE SNOW FENCE OR FLAGGING TAPE SHALL BE INSTALLED ALONG THE LIMIT OF DISTURBANCE PRIOR TO THE START OF CONSTRUCTION
3. A CONTINUOUS LINE OF SILT FENCE SHALL BE PROPERLY INSTALLED BY THE APPLICANT IMMEDIATELY UPGRADIENT OF THE SNOW FENCE OR TAPE PRIOR TO ANY CONSTRUCTION AND SHALL BE REGULARLY MAINTAINED.
4. ALL OTHER DISTURBED SOILS SHALL BE SEEDED AND MULCHED WITHIN 48 HOURS OF FINAL GRADING. ALL SEDIMENT BARRIERS AND CONSTRUCTION FENCING SHALL BE REMOVED FOLLOWING THE SUCCESSFUL ESTABLISHMENT OF VEGETATION.
5. WITHIN THIRTY (30) DAYS OF COMPLETION OF WORK APPROVED BY THIS PERMIT, THE PERMITTEE OR THEIR REPRESENTATIVE SHALL SUPPLY THE VERMONT WETLANDS SECTION WITH A LETTER CERTIFYING THAT THE PROJECT WAS CONSTRUCTED IN COMPLIANCE WITH THE CONDITIONS OF THIS PERMIT.

GRAPHIC SCALE



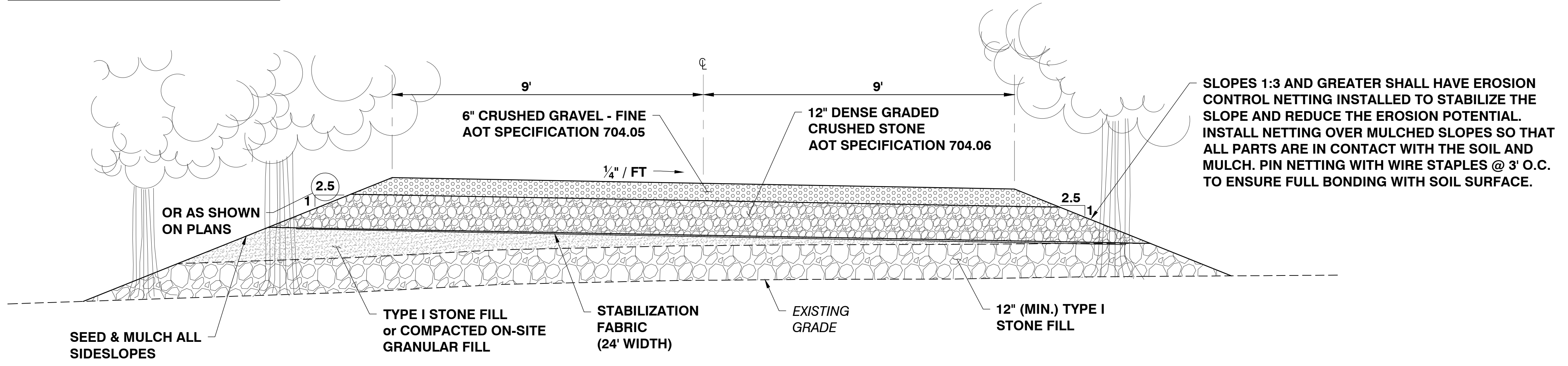
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SLOPES 1:3 AND GREATER SHALL HAVE EROSION CONTROL NETTING INSTALLED TO STABILIZE THE SLOPE AND REDUCE THE EROSION POTENTIAL. INSTALL NETTING OVER MULCHED SLOPES SO THAT ALL PARTS ARE IN CONTACT WITH THE SOIL AND MULCH. PIN NETTING WITH WIRE STAPLES @ 3' O.C. TO ENSURE FULL BONDING WITH SOIL SURFACE.

12"± OF TOPSOIL/UNSUITABLE MATERIAL TO BE REMOVED AS NECESSARY AND REPLACED WITH ON-SITE FILL
- REMOVED MATERIAL MAY BE REUSED AS TOPSOIL, WASTED AT STUMP DUMP, OR STOCKPILED AT OWNER DESIGNATED AREA

NOTE:
CLEARING AND GRUBBING WILL BE REQUIRED FOR ROAD IMPROVEMENTS AS CONSTRUCTION IS A NEW ROAD THROUGH WOODS



ROAD SECTION @ LOW AREAS/WETLAND CROSSINGS
STA 13+25 TO 14+00
STA 21+50 TO 22+75
SCALE: 1/2" = 1'

BLASTING SECTION NOTES:

- SECTIONS SHOWN BELOW ARE ANTICIPATED TO REQUIRE BLASTING AND ARE THE QUANTITIES ESTIMATED AS THE ALLOWANCE AMOUNTS.
 - STATION 1+80 TO 2+15
 - STATION 3+25 TO 4+15
 - STATION 5+65 TO 5+85
 - STATION 8+35 TO 8+65
 - STATION 10+90 TO 11+00
 - STATION 11+85 TO 12+75
 - STATION 13+05 TO 13+15
 - STATION 32+85 (10'Ø)

- NEW CULVERT LOCATIONS SHOWN ARE APPROXIMATE. FIELD CONDITIONS MAY ALTER LOCATIONS AND WILL DETERMINE INVERTS.
- STONE LINED SWALE LOCATIONS MAY VARY DEPENDING ON SITE CONDITIONS DURING CONSTRUCTION.

CULVERT SCHEDULE			
LOCATION	DIAMETER (in.)	PIPE LENGTH (ft)	COMMENTS
BEARTOWN ROAD	18" PP	50	1 F.E.S.
STA 0+15	18" PP	50	1 F.E.S.
STA 2+20	18" PP	50	1 F.E.S.
STA 4+45	18" PP	60	1 F.E.S.
STA 5+35	18" PP	40	1 F.E.S.
STA 7+55	18" PP	45	1 F.E.S.
STA 8+60	18" PP	60	1 F.E.S.
STA 10+25	18" PP	45	1 F.E.S.
STA 13+70	*36" PP	45	
STA 14+50	18" PP	45	1 F.E.S.
STA 19+35	18" PP	40	1 F.E.S.
STA 22+25	*30" PP	50	
STA 24+25	18" PP	40	1 F.E.S.
STA 27+10	18" PP	50	1 F.E.S.
STA 28+75	18" PP	50	1 F.E.S.
STA 31+05	18" PP	50	1 F.E.S.
STA 32+75	18" PP	40	1 F.E.S.
INCLUDE EXTRA CULVERTS FOR FIELD LOCATED INSTALLATIONS	18" PP	60	2 F.E.S.

SITE ENGINEER:

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COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL BYPASS

CAMP ETHAN ALLEN
TRAINING SITE
UNDERHILL, VT

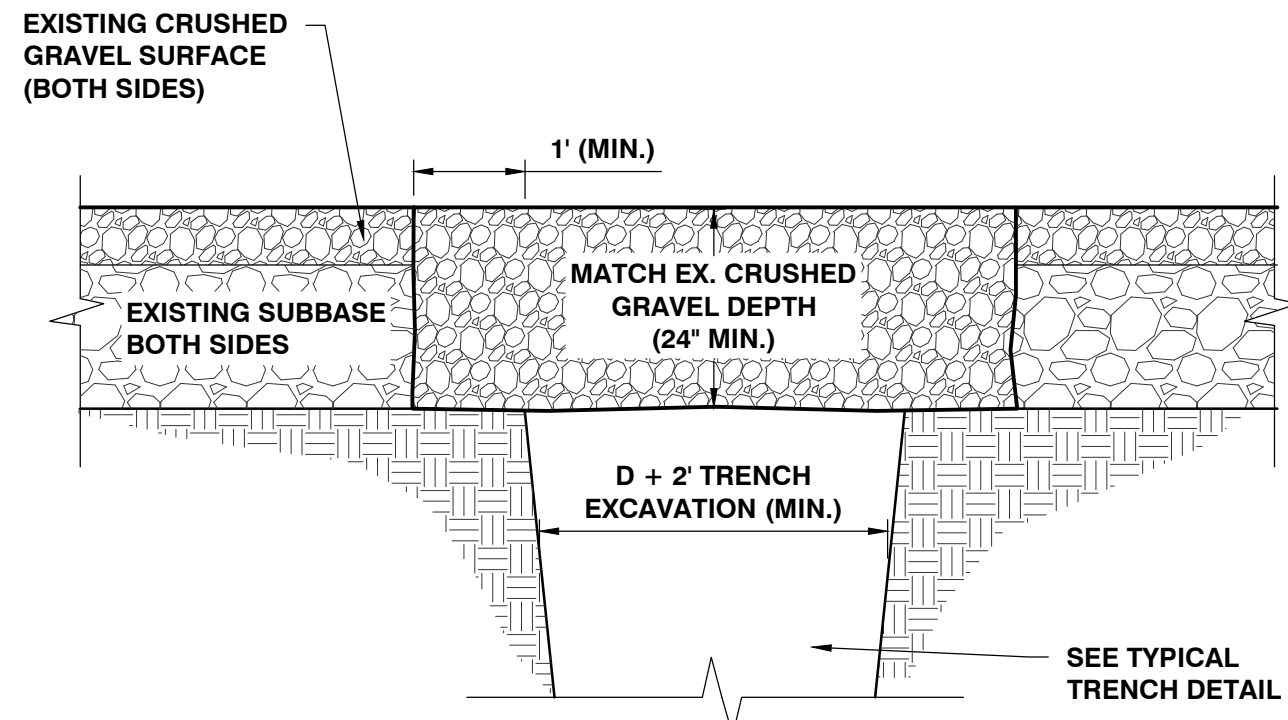
DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

SITE DETAILS

DATE: 5/25/2018
SCALE: AS SHOWN
PROJ. NO. 16100.34

DRAWING NUMBER: **C3.0**

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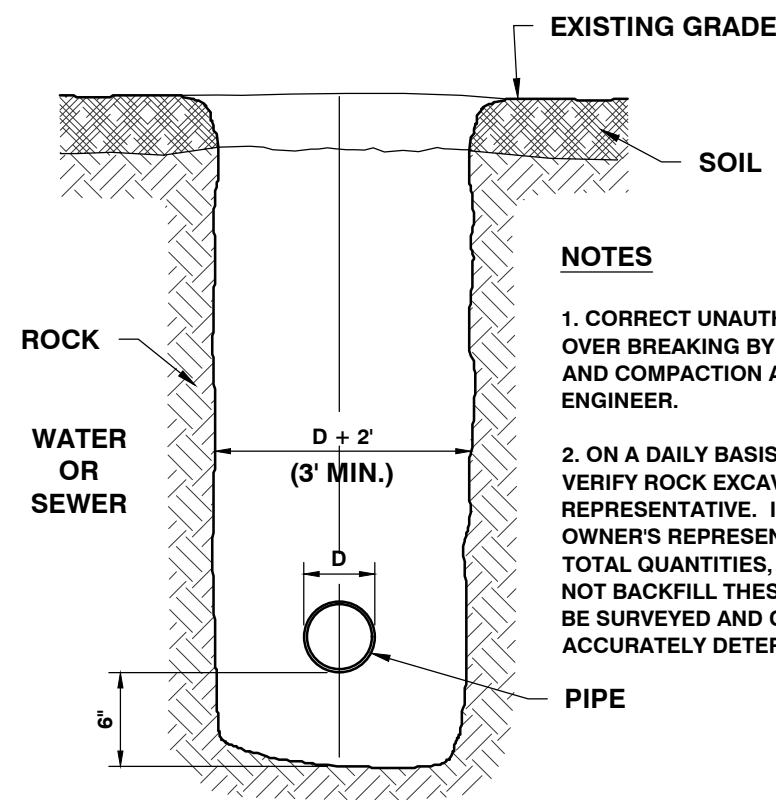
GRAVEL ROAD REPAIR SECTION

- NOTES:
1. ALL BACKFILL SHALL BE MADE IN SIX INCH (6") LIFTS AND COMPACTED TO NOT LESS THAN 95% MAXIMUM DRY DENSITY ACCORDING TO ASTM D698.
 2. CRUSHED GRAVEL SHALL MEET VTRANS SPECIFICATION FOR CRUSHED GRAVEL - FINE, 704.05A

S-005a Replace Gravel

S-005a

REVISED 12/08/2017



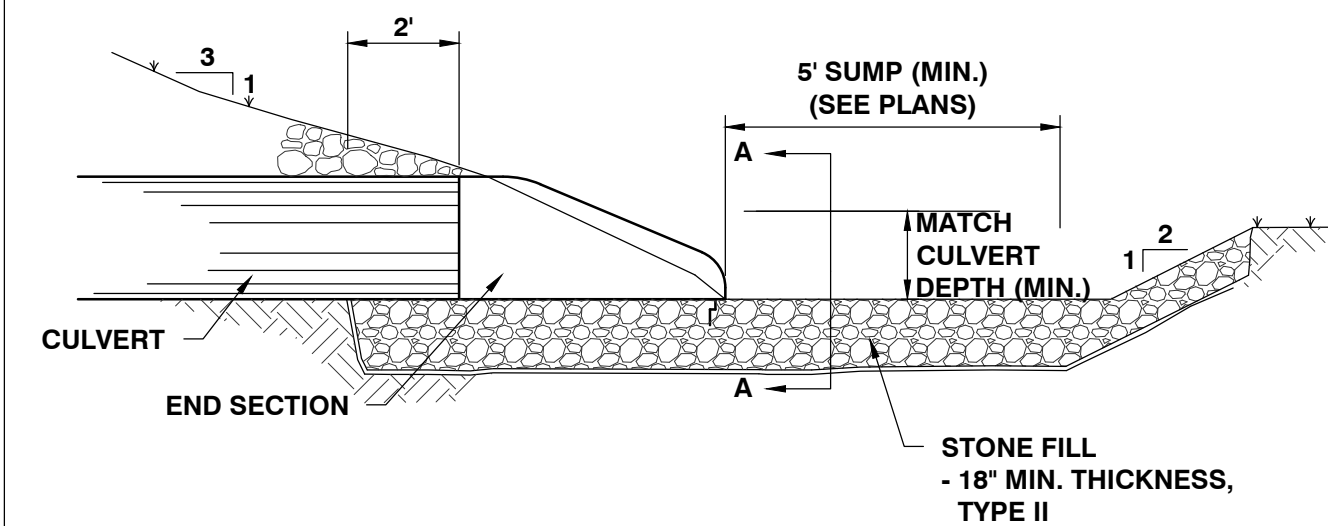
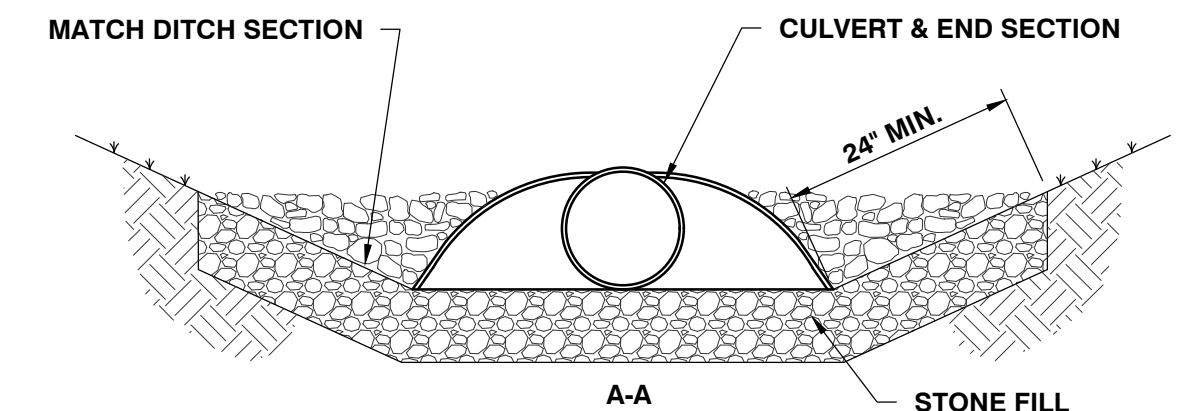
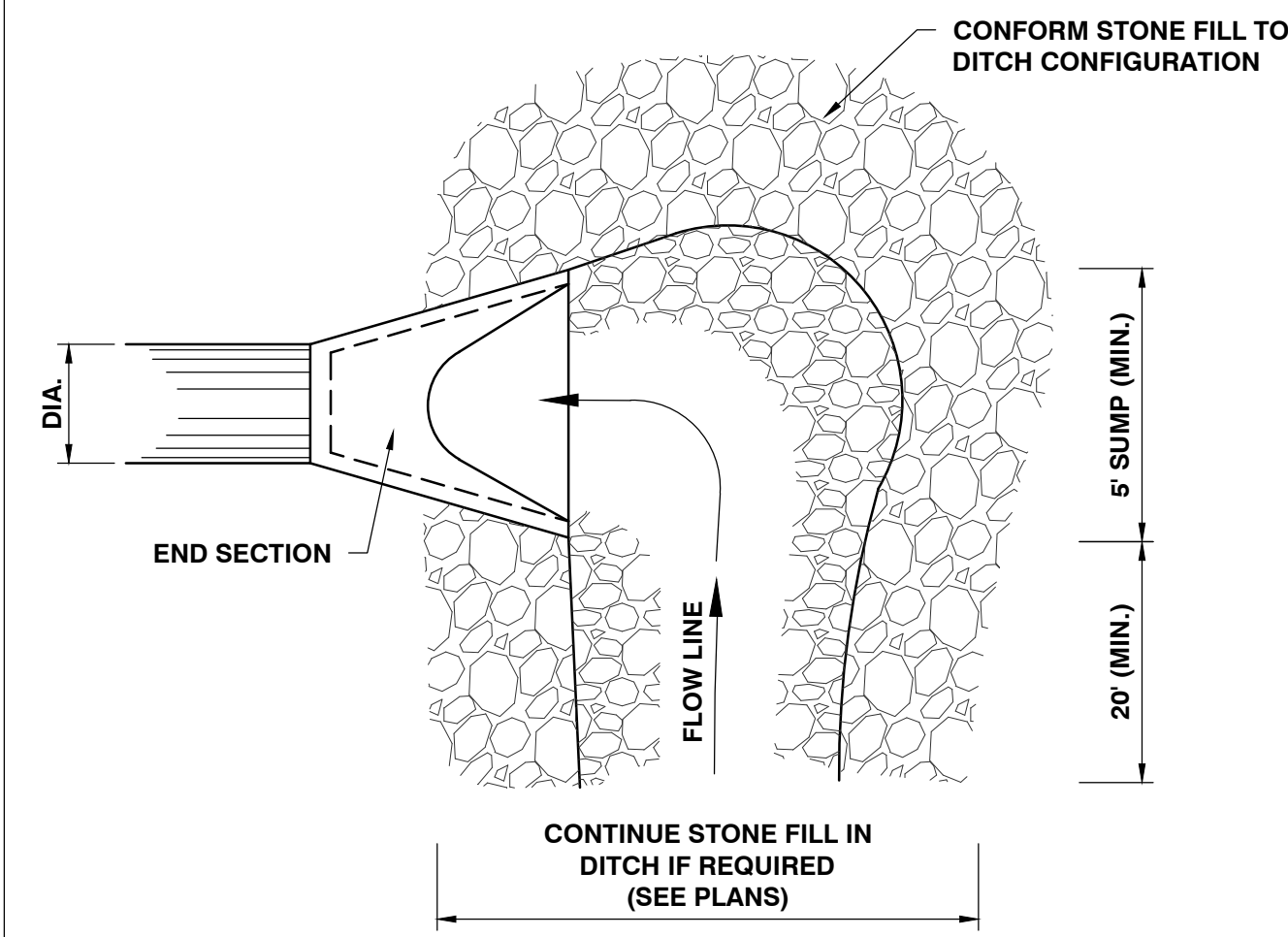
TRENCH ROCK EXCAVATION PAY LIMITS

- NOTES
1. CORRECT UNAUTHORIZED ROCK REMOVAL OF OVER BREAKING BY REMOVAL, BACKFILLING AND COMPACTION AS DIRECTED BY THE ENGINEER.
 2. ON A DAILY BASIS, THE CONTRACTOR SHALL VERIFY ROCK EXCAVATION WITH THE OWNER'S REPRESENTATIVE. IF THE CONTRACTOR AND OWNER'S REPRESENTATIVE DO NOT AGREE ON TOTAL QUANTITIES, THE CONTRACTOR SHALL NOT BACKFILL THESE AREAS UNTIL THEY CAN BE SURVEYED AND CROSS-SECTIONED TO ACCURATELY DETERMINE THE PAY QUANTITY.

M-001 Excav Pay

M-001

REVISED 06/12/2015

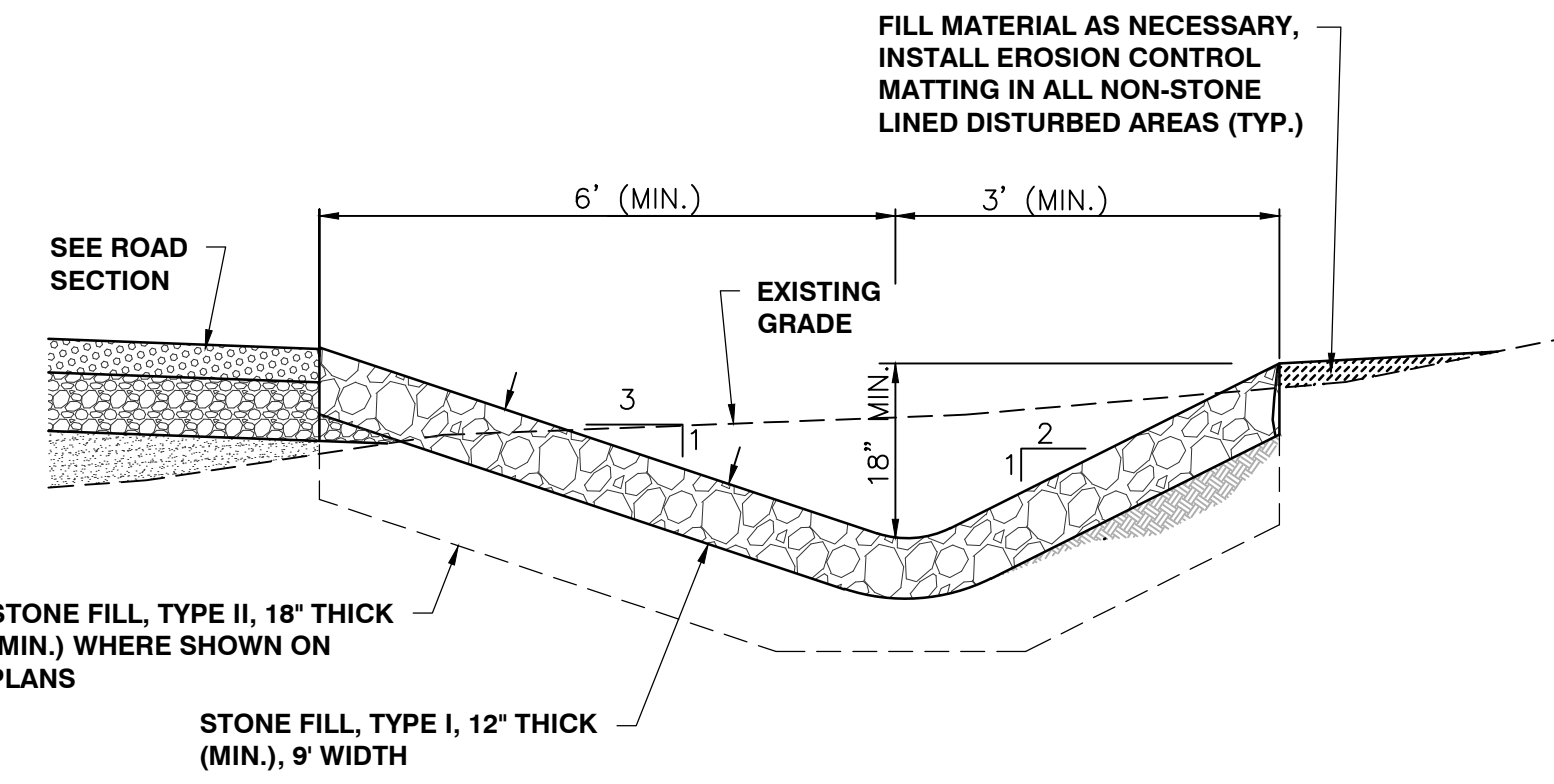


END SECTION DETAIL w/ STONE FILL @ INLET

- NOTES:
- ALL DRAINAGE PIPES 18" IN DIAMETER AND SMALLER TO HAVE AN END SECTION
 - ALL DRAINAGE PIPES TO HAVE STONE FILL @ THE INLET

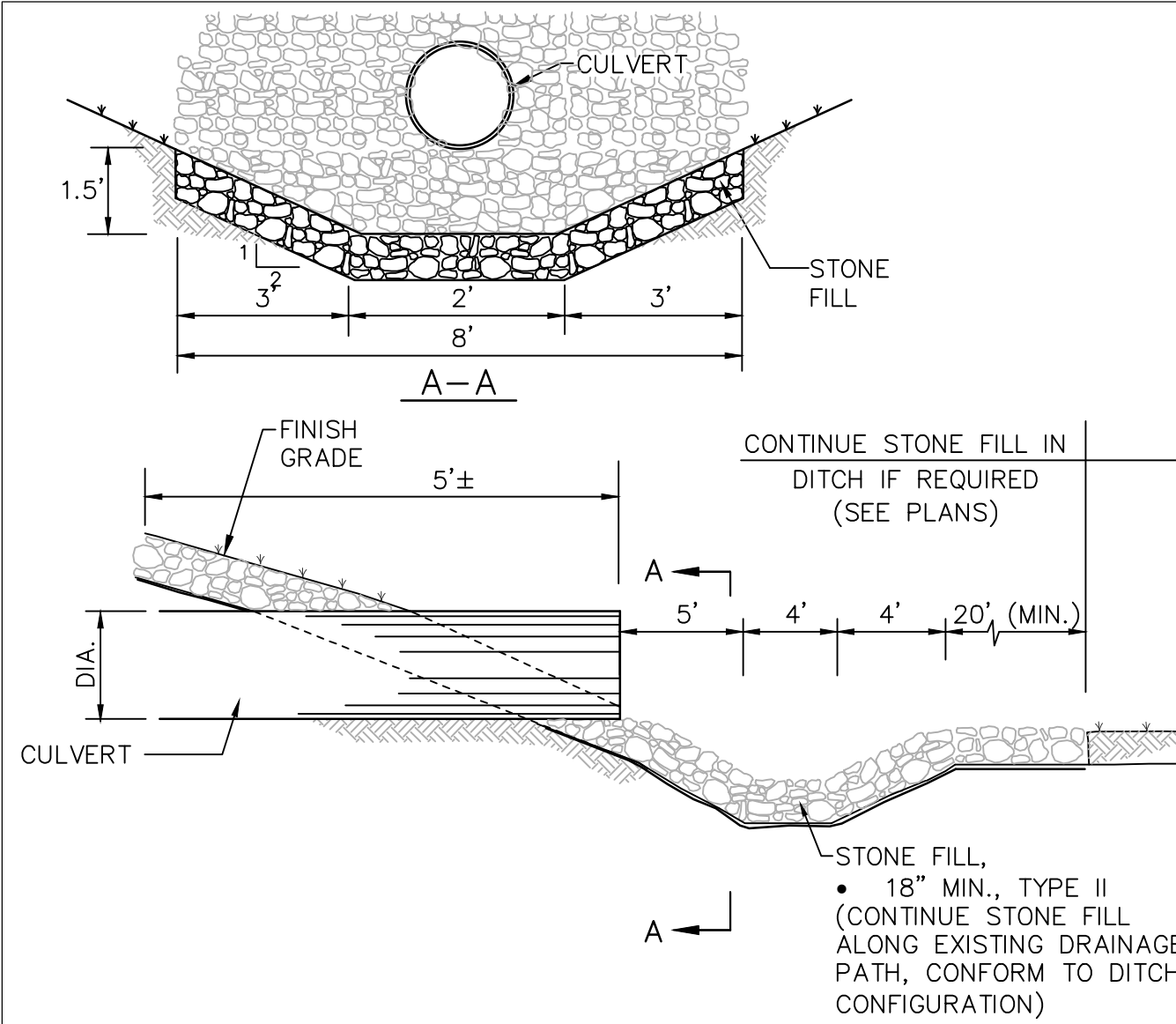
ST-015

N.T.S.



STONE LINED DITCH

N.T.S.



STONE FILL @ CULVERT OUTLET

ALL DRAINAGE PIPE TO HAVE STONE FILL @ CULVERT OUTLETS

N.T.S.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cca-vt.com

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OWNER:



VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL BYPASS

CAMP ETHAN ALLEN TRAINING SITE UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

SITE DETAILS

DATE
5/25/2018

SCALE
AS SHOWN


PROJ. NO.
16100.34

DRAWING NUMBER
C3.1



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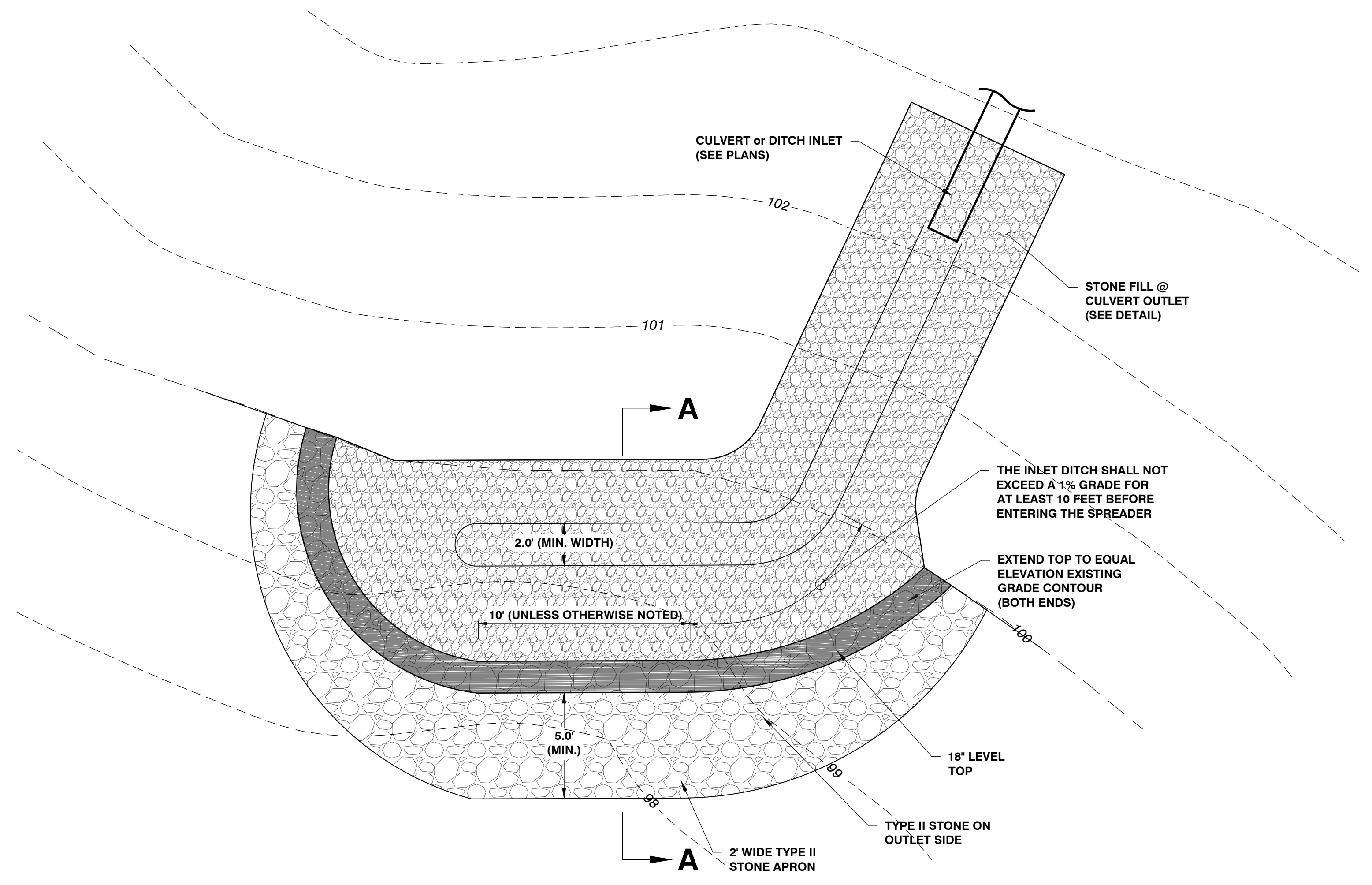
PROJECT:
**FEIGEL HILL
 BYPASS**
 CAMP ETHAN ALLEN
 TRAINING SITE
 UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

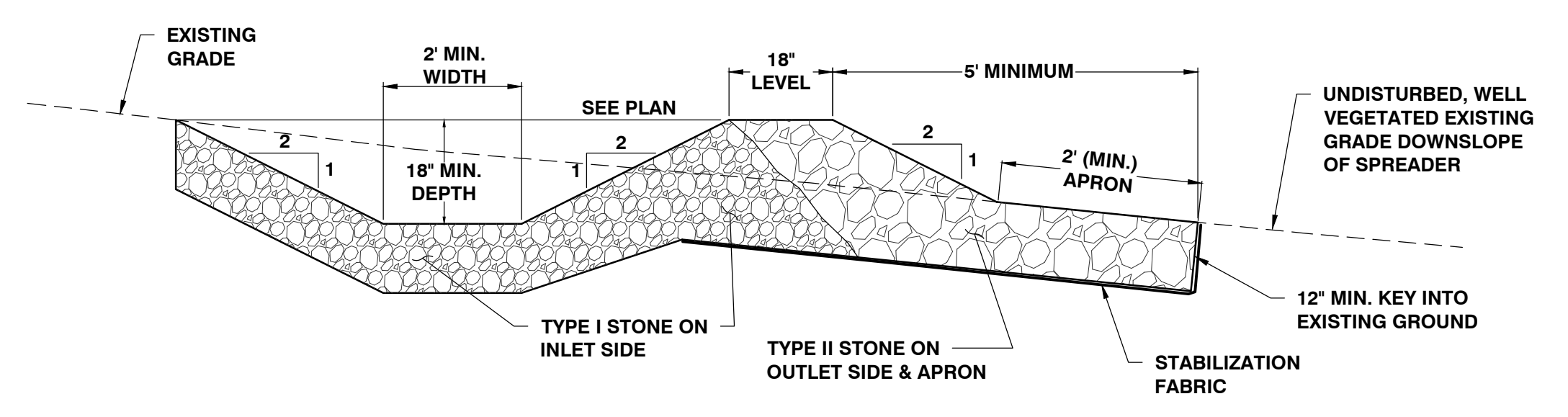
**LEVEL SPREADER
 DETAILS**

DATE
 5/25/2018
 SCALE
 AS SHOWN
 PROJ. NO.
 16100.34

DRAWING NUMBER
C3.2

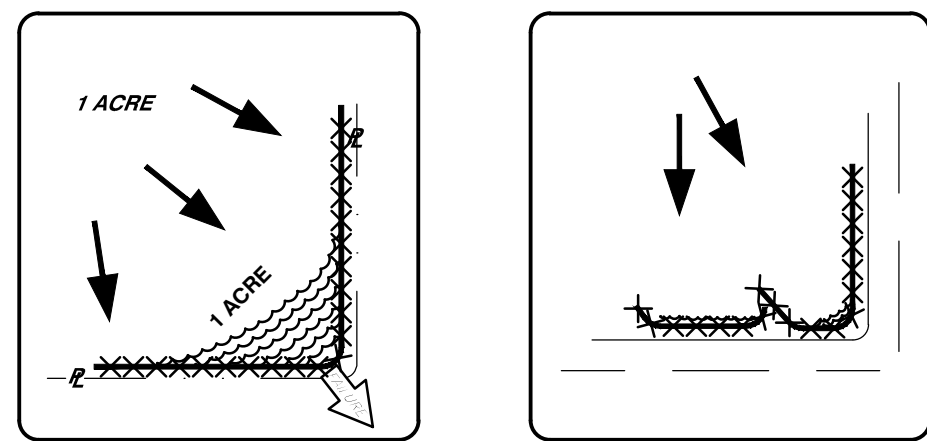


LEVEL SPREADER - PLAN VIEW
 SCALE: 1/4" = 1'



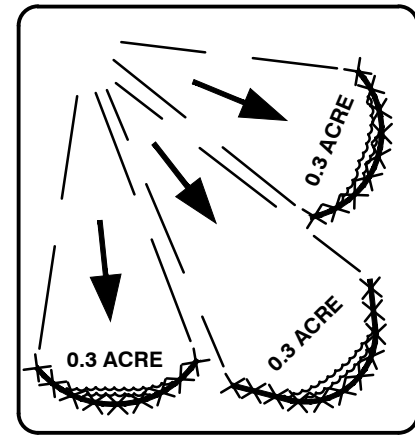
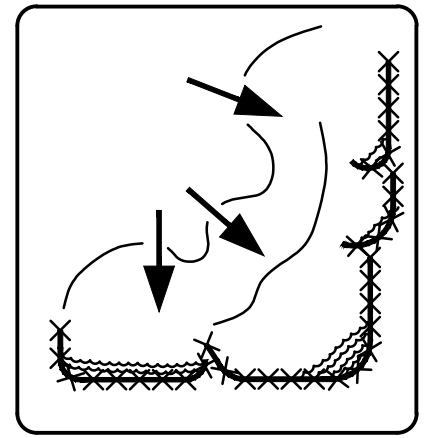
LEVEL SPREADER - SECTION A-A
 SCALE: 1/2" = 1'

P:\AutoCAD Projects\2016\16100.34\16100.34-1-CADD Files - Feigel Hill Bypass\Drawings\16100.34 - Details-Specs.dwg, 5/22/2018 11:06:19 AM, pmead



Incorrect - Do Not layout "perimeter control" silt fences along property lines. All sediment laden runoff will concentrate and overwhelm the system.

Correct - Install J-hooks



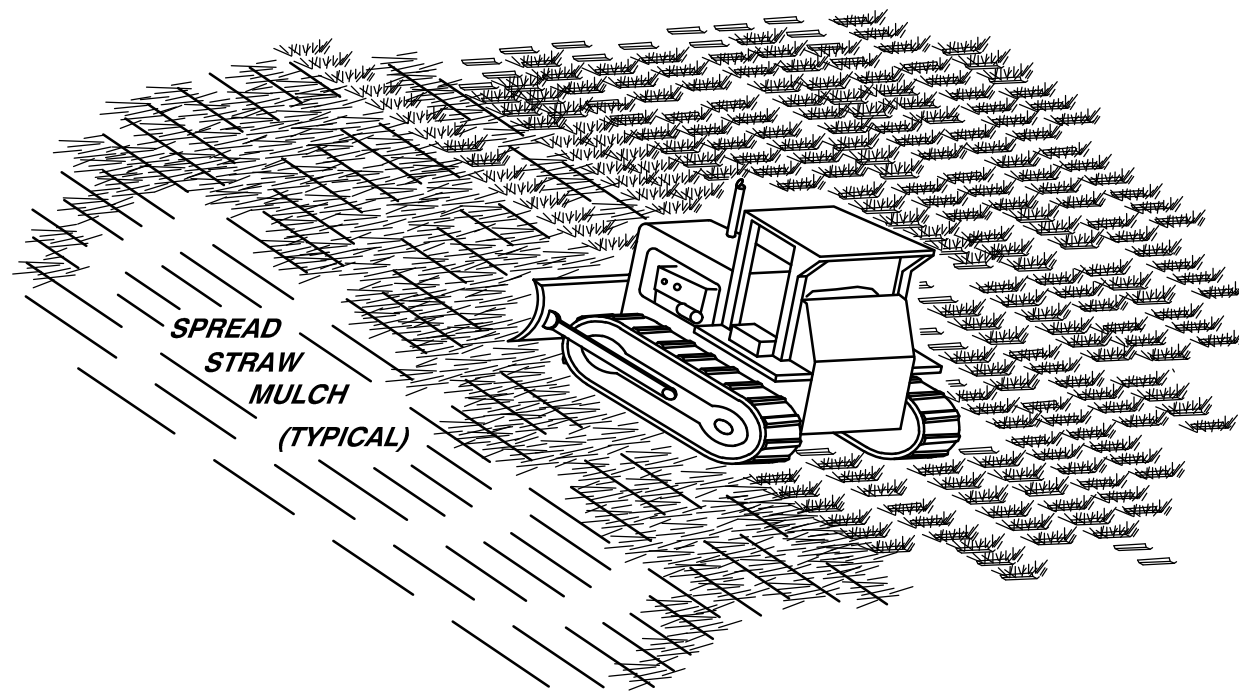
Discrete segments of silt fence, installed with J-hooks or "smiles" will be much more effective.

SILT FENCE PLACEMENT FOR PERIMETER CONTROL

N.T.S.

REVISED 12/19/2014

E-010



TRACKING WITH MACHINERY ON SANDY SOIL PROVIDES ROUGHENING WITHOUT UNDUE COMPACTION.

NOTES:

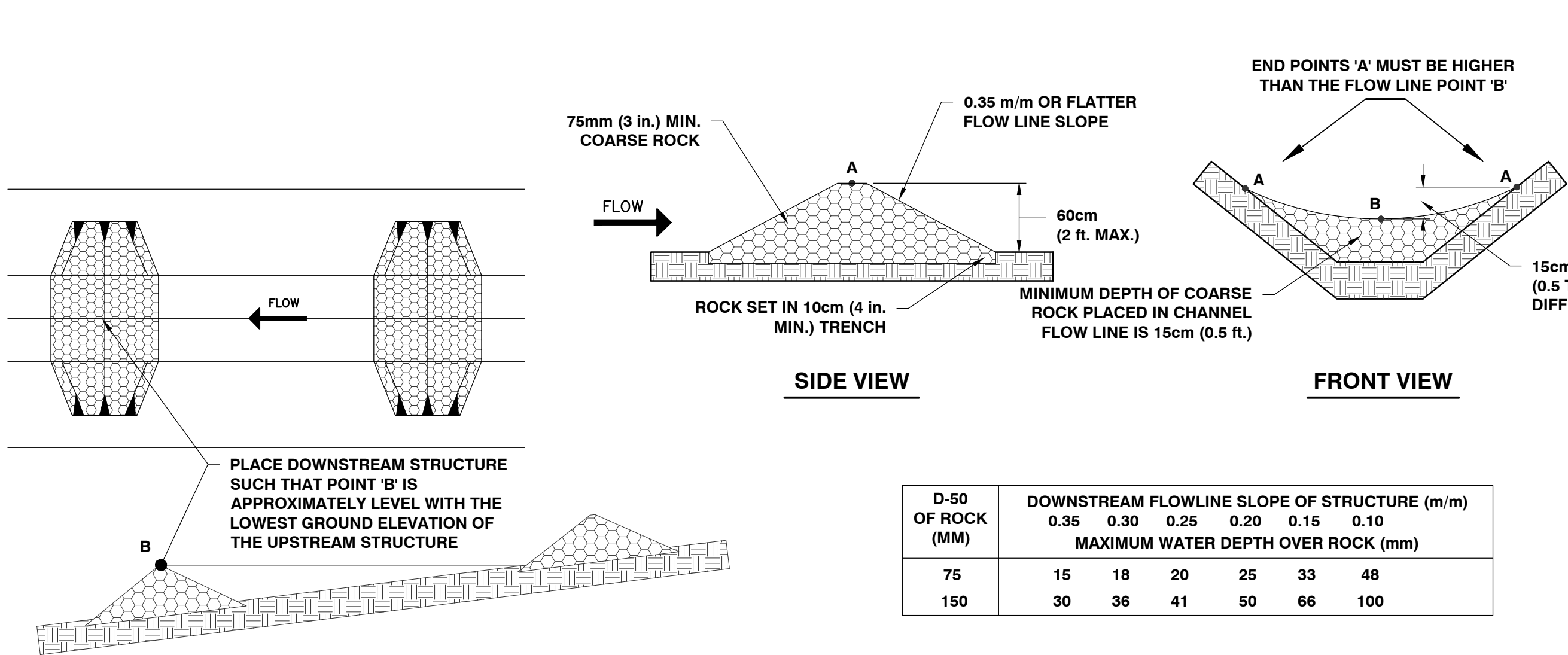
1. ROUGHEN SLOPE WITH BULLDOZER.
2. BROADCAST SEED AND FERTILIZER.
3. SPREAD STRAW MULCH 3" (2 1/2 TONS PER ACRE)
4. PUNCH STRAW MULCH INTO SLOPE BY RUNNING BULLDOZER UP AND DOWN SLOPE.

STRAW ANCHORING

N.T.S.

REVISED 12/19/2014

E-012 Straw Anchoring



PLACE DOWNSTREAM STRUCTURE SUCH THAT POINT 'B' IS APPROXIMATELY LEVEL WITH THE LOWEST GROUND ELEVATION OF THE UPSTREAM STRUCTURE

SIDE VIEW

FRONT VIEW

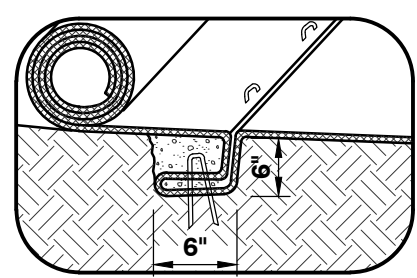
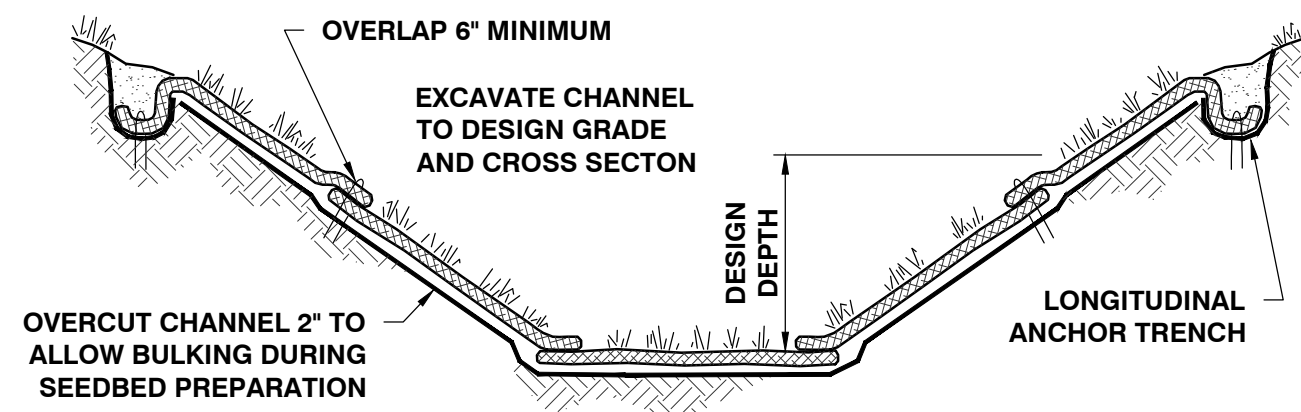
D-50 OF ROCK (MM)	DOWNSTREAM FLOWLINE SLOPE OF STRUCTURE (m/m)					
	0.35	0.30	0.25	0.20	0.15	0.10
75	15	18	20	25	33	48
150	30	36	41	50	66	100

STONE CHECK DAM STRUCTURE

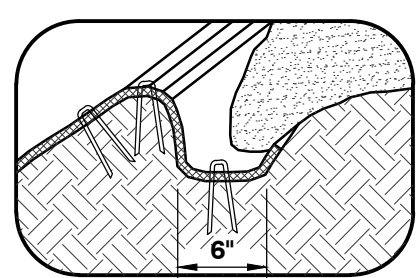
N.T.S.

REVISED 08/01/2014

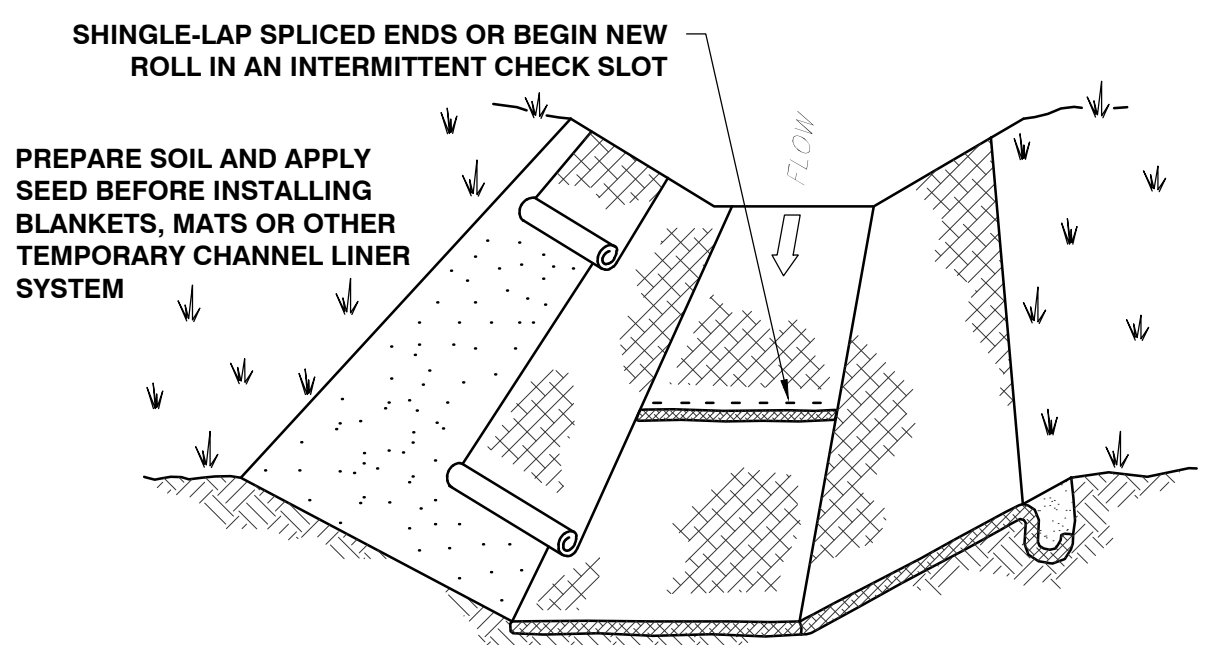
E-006 Stone Check Dam



INTERMITTENT CHECK SLOT



LONGITUDINAL ANCHOR TRENCH



NOTES:

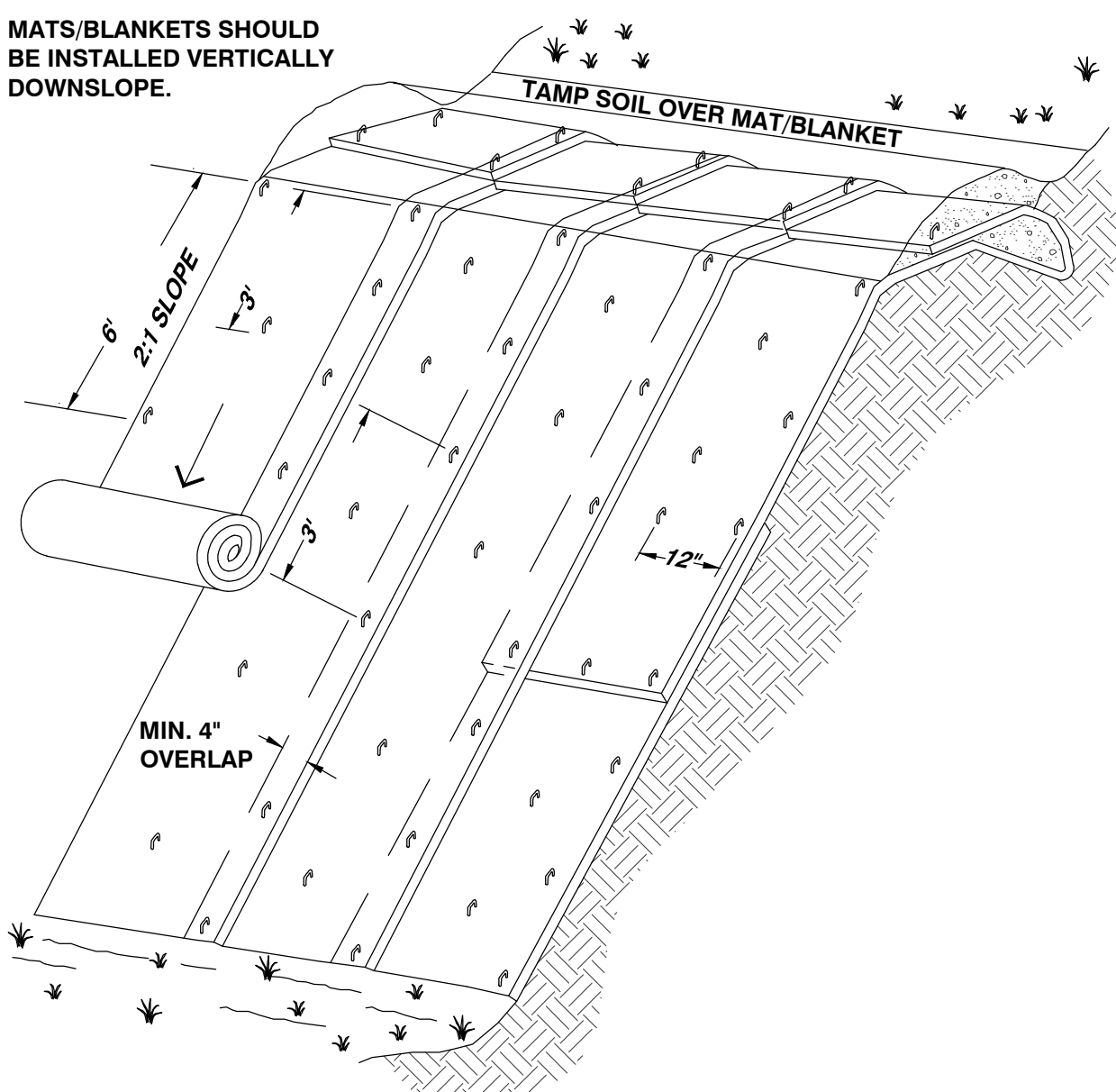
1. DESIGN VELOCITIES EXCEEDING 2 FT./SEC/ REQUIRE TEMPORARY BLANKETS, MATS OR SIMILAR LINERS TO PROTECT SEED AND SOIL UNTIL VEGETATION BECOMES ESTABLISHED.
2. GRASS-LINED CHANNELS WITH DESIGN VELOCITIES EXCEEDING 6 FT./SEC. SHOULD INCLUDE TURF REINFORCEMENT MATS.

GRASS-LINED CHANNEL TYPICAL INSTALLATION

N.T.S.

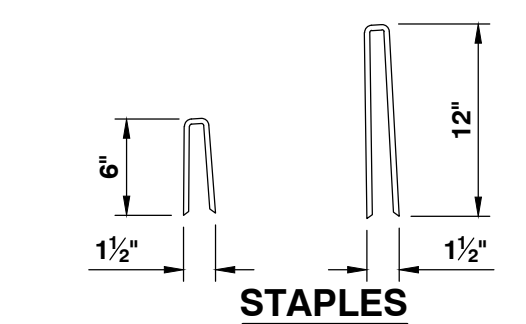
REVISED 12/19/2014

E-011 Grass Lined Channel

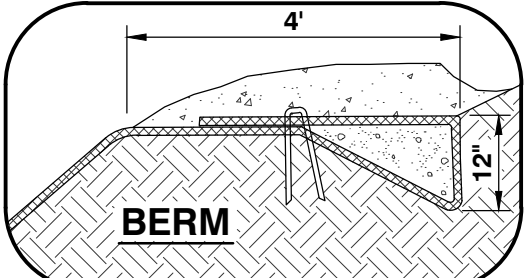


ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABILIZATION



STAPLES



BERM

NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

N.T.S.

REVISED 08/01/2014

E-009 Slope Erosion Blankets

LANDSCAPE GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Finish grading; bring rough grade in areas to design elevations as shown on the drawings.
2. Topsoil: Work shall consist of furnishing, placing and shaping topsoil, and placing, spreading, and shaping topsoil form stockpiles or stripped areas.

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be loose, friable, reasonably free of admixtures of subsoil, free from refuse, stumps, roots, brush, weeds, rocks, and stones 1 1/4 inch in overall dimensions. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth. It shall contain not less than three (3) nor more than twenty (20) percent organic matter. Any material which has become mixed with undue amounts of subsoil during any operation at the source or during placing or spreading will be rejected and shall be replaced by the Contractor with acceptable material.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

- A. Clean subgrade of all stumps, stones, roots, trash or other materials which might hinder proper tillage or spreading.
- B. All surfaces on which topsoil is to be placed shall be graded to a reasonably true surface and scarified by raking, discing or other approved means to a minimum depth of two inches before placing topsoil.

3.03 PLACING TOPSOIL

- A. Minimum final depth of topsoil shall be 4 inches.
- B. Place topsoil when seeding operations can closely follow spreading operations. Use topsoil in relatively dry state.
- C. Topsoil shall be spread and shaped to the lines and grades shown on the plans, or as directed by the Engineer. The depth stated in the contract to which the topsoil is to be placed is that required after final rolling of the material has taken place. All stones, roots and debris over 1/4 inch in diameter along with any sodding weeds and other undesirable material shall be removed.
- D. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction. The Contractor shall perform such work as required to provide a friable surface for seed germination and plant growth prior to seeding.
- E. It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until the completion of the work.

SEEDING

PART 1 - GENERAL

1.1 Section Includes:

- A. Seeding:
 1. Furnish all labor, materials and equipment to complete all seeding work as shown on the drawings and specified herein.
 2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

Planting Restrictions: Seeding and initial fertilizing shall be done between May 1st and September 15th unless otherwise authorized. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untilable. If seeding is done during July or August, additional mulch material may be required. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEED

- A. Conservation Seed Mix:

Minimum Organic Matter Content

Kind of Seed	Minimum Germination	Minimum Purity	Lbs./Acre
Creeping Red Fescue	85%	98%	22.5
Tall Fescue	95%	95%	22.5
Red Top	90%	90%	3
Birdsfoot Trefoil	85%	98%	9
Annual Ryegrass	95%	85%	3
TOTAL =			60

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum of 85 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.

2.3 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium.

2.4 MULCHES

- A. Mulch: Provide air-dry, clean, mildew- and seed-free, hay or threshed straw of wheat, rye, oats, or barley.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decigrams/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 2. Protect grade stakes set by others until directed to remove them.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.
 1. Apply fertilizer directly to subgrade before loosening.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniform fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moistened prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 APPLICATION RATES

- A. When a soil test is not available, the following minimum amounts should be applied:
 1. Agricultural limestone: 2 tons/acre.
 2. Nitrogen (N): 50 lbs./acre.
 3. Phosphate: 100 lbs./acre.
 4. Potash: 100 lbs./acre.
 - a. This is the equivalent of 500 lbs./acre of 10-20-20 fertilizer or 1,000 lbs./acre of 5-10-10.
 5. Hay mulch: 2 tons/acre.

3.3 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

- C. Protect seeded areas with slopes exceeding 1:3 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

- D. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a depth of 3/16 inch, and roll surface smooth.

3.4 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 MAINTENANCE

- A. Maintain and establish seeding by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
2. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - a. Seeded Areas: 90 days from date of Substantial Completion.
 - b. When initial maintenance period has not elapsed before end of planting season, or if seeding is not fully established, continue maintenance during next planting season.

3.6 SATISFACTORY CONDITIONS

- A. Installations shall meet the following criteria as determined by Engineer/Owner:
 1. Satisfactory Seeded Area: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

- B. Use specified materials to reestablish area that do not comply with requirements and continue maintenance until areas are satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris, created by work. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cca-vt.com

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OWNER:



VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL BYPASS

CAMP ETHAN ALLEN TRAINING SITE UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

EROSION CONTROL DETAILS, LANDSCAPING and SEEDING SPECIFICATIONS

DATE

5/25/2018

SCALE

AS SHOWN

PROJ. NO.

16100.34

DRAWING NUMBER

C4.1

PROJECT COORDINATION

PART 1 – GENERAL

1.01 MEETINGS & PROJECT ACCESS

- A. The Owner shall be notified five (5) days prior to commencement of Work by the Contractor.
- B. The Contractor will coordinate with the Owner to arrange an on-site pre-construction meeting prior to commencement of any work. Job superintendents and subcontractors shall be included in this meeting.
- C. The Contractor will coordinate all phases of the Work, so as not to interfere with the normal work procedures in the area.
- D. The Contractor shall conduct his work in such a manner as to not interfere with or endanger work or traffic in areas adjacent to the construction area, except as permitted by the Owner. The Contractor shall so arrange his construction operations as to provide access for emergency vehicles and equipment to the work site at all times.

1.02 LABOR

- A. The Contractor and subcontractors will employ mechanics skilled in their respective trades.
- B. All labor will be performed in a neat and workmanlike manner.

1.03 PROTECTION OF PERSONS AND PROPERTY

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all O.S.H.A. safety precautions in connection with the Work.
- B. Fire Protection: The Contractor shall take all necessary precautions to prevent fires adjacent to the Work and shall provide adequate facilities for extinguishing fires. The Contractor shall also prevent fires in project related buildings and shall prevent the spread of fires to areas outside the limits of the Work.
- C. Safety Precautions: Prior to commencement of Work, the Contractor shall be familiar with all safety regulations and practices applicable with construction operations. No additional payments will be made for equipment and procedures necessitated by these safety precautions.

1.04 CORRECTION OF WORK

- A. The Contractor shall promptly correct all Work rejected by the Owner as defective or as failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such rejected Work.

1.05 WEATHER CONDITIONS

- A. No Work shall be done when, in the opinion of the Owner, the weather is unsuitable. No concrete, earth backfill, embankment, or paving shall be placed upon frozen material. If there is delay or interruption in the Work due to weather conditions, the necessary precautions must be taken to bond new Work to old.
- B. Protection Against Water and Storm: The Contractor shall take all precautions to prevent damage to the Work by storms or by water entering the site of the Work directly or through the ground. In case of damage by storm or water, the Contractor, at his own expense, shall make repairs or replacements or rebuild such parts of the Work as the Engineer may require in order that the finished work may be completed as required by the Drawings and Specifications.

1.06 DISPOSAL OF DEBRIS

- A. All debris and excess materials, other than that which is authorized to be reused, become the property of the Contractor and shall be promptly removed from the property. The Contractor shall receive title to all debris and/or excess material. The Owner will not be responsible for any loss or damage to debris or excess material owned by the Contractor.

1.07 PROJECT LAYOUT

- A. The Contractor shall be responsible for providing all necessary survey staking.
 1. Locate and protect control points before starting work on the site.
 2. Preserve permanent reference points during progress of the Work.
 3. Establish a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
 - a. Record locations, with horizontal and vertical data, on Project Record Documents.

1.08 TESTING

- A. The Contractor is responsible for obtaining testing and inspection services.

SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:

1. Remove surface debris.
2. Clear site of plant life and grass.
3. Remove trees and shrubs.
4. Remove root system of trees and shrubs.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 PROTECTION

- A. Protect utilities that remain from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to the site at all times.

3.02 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas. Remove stumps, roots and tap roots and other projections 1 1/2" or greater in diameter to 2'-0" below the excavated surfaces in cut areas and 2'-0" below the exposed subgrade in fill areas.

3.03 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. The Contractor shall coordinate Work with the Engineer and Owner in establishing suitable areas within the property limits for depositing debris, rocks and extracted plant life. The Contractor shall be responsible for backfilling (capping) and grading all waste sites.

3.04 UTILITIES

- A. Coordinate with utility companies and agencies as required.

SITE EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:

1. All excavation (unless covered in other sections of these specifications), removal and stockpile of topsoil, stabilization fabric, and other miscellaneous and appurtenant works.
2. Site filling.
3. Roadway structural sections.

1.02 PROTECTION

- A. Protect bench marks and existing structures.
- B. Protect above or below grade utilities which are to remain.

1.03 SUBMITTALS

- A. Testing Laboratory reports indicating that material for backfill meets requirements of this Section.
- B. Field density test reports of site fill in place.
- C. Field density test reports for roadway structural sections in place.
- D. Stabilization Fabric: Submit copies of manufacturer's specifications and installation instructions.

PART 2 – PRODUCTS

2.01 STRUCTURAL FILL – CRUSHED GRAVEL (AOT SPEC. 704.05, FINE)

- A. All materials shall be secured from approved sources. This gravel shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin elongated pieces, soft or disintegrated stone, dirt, organic or other objectionable matter. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

At least 50% by mass (weight) of the material coarser than the No. 4 sieve shall have at least one fractured face.

2.02 CRUSHED GRAVEL (AOT SPEC. 704.05, COARSE)

- A. All materials shall be secured from approved sources. This gravel shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin elongated pieces, soft or disintegrated stone, dirt, organic or other objectionable matter. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4"	95 – 100
No. 4	25 – 50
No. 100	0 – 12
No. 200	0 – 6

At least 50% by mass (weight) of the material coarser than the No. 4 sieve shall have at least one fractured face.

2.03 COMPACTED FILL/GRANULAR BORROW

- A. All materials shall be secured from approved sources. This material shall be free of shale, clay, friable material, debris, and organic matter. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3"	100
3/4"	75 – 100
No. 4	20 – 100
No. 100	0 – 20
No. 200	0 – 6

2.04 DRAINAGE COURSE (AOT SPEC. 704.16)

- A. All materials shall be secured from approved sources. Rock for drainage applications shall be produced from natural gravels or crushed quarried rock and shall consist of clean, hard, sound, and durable material. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1"	100
3/4"	90 – 100
3/8"	20 – 55
No. 4	0 – 10
No. 8	0 – 10

2.05 DENSE GRADED CRUSHED STONE (AOT SPEC. 704.06)

- A. All materials shall be secured from approved sources. Dense Graded Crushed Stone shall consist of clean, hard, uniformly graded, crushed stone. It shall be sufficiently free from dirt, deleterious material, and pieces that are structurally weak. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3 1/2"	100
3"	90 – 100
2"	75 – 100
1"	50 – 80
1/2"	30 – 60
No. 4	15 – 40
No. 200	0 – 6

Source: This material shall be obtained from crushed quarried rock sources. The area from which this material is obtained shall be stripped and cleaned before blasting.

Not more than 30% by mass (weight) of the material coarser than the No. 4 sieve shall consist of thin and/or elongated pieces.

2.06 RECYCLED ASPHALT PAVEMENT (RAP) 1 1/2" MINUS CRUSHED ASPHALT

- A. All materials shall be secured from approved sources. This material shall be free of Portland Cement and approved by the engineer prior to installation. This material shall not be mixed with gravel and shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

2.07 SAND BORROW AND CUSHION (AOT SPEC. 703.03)

- A. All materials shall be secured from approved sources. Sand Borrow shall consist of material reasonably free from silt, loam, clay, or organic matter. This material shall meet the following grading requirements:

Sieve Designation	Percent Finer by Weight
2"	100
1 1/2"	90 – 100
1/2"	70 – 100
No. 4	60 – 100
No. 100	0 – 20
No. 200	0 – 8

2.08 GEOTEXTILE

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
 2. Grab Tensile Strength: 120 lbf; ASTM D 4632.
 3. Tear Strength: 50 lbf; ASTM D 4533.
 4. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
 5. Permittivity: 1.7 per second, minimum; ASTM D 4491.
 6. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 1. Survivability: Class 3; AASHTO M 288.
 2. Grab Tensile Strength: 200 lbf; ASTM D 4632.
 3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
 4. Tear Strength: 75 lbf; ASTM D 4533.
 5. Puncture Strength: 90 lbf; ASTM D 4833.
 6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
 9. Weight: 4.0 oz/yd² minimum.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Maintain and protect existing utilities remaining which pass through work area.
- D. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.02 EROSION CONTROL

- A. Erosion control must be installed prior to beginning any earthwork operations.

3.03 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be excavated, re-landscaped or regraded and stockpile in areas designated on site or as directed by the Engineer.
- B. Maintain the stockpile in a manner which will not obstruct the natural flow of drainage.
 1. Maintain stockpile free from debris and trash.
 2. Keep the topsoil damp to prevent dust and drying out.

3.04 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be regraded in accordance with plans.
- B. Excavate subsoil required to accommodate site structures, construction operations, roads, and parking areas.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- D. Notify engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- E. Correct areas over-excavated by error as directed by the Engineer.

3.05 DITCHES

- A. Cut accurately to the cross-sections, grades, and elevations shown.
- B. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the work.
- C. Dispose of excavated materials as shown on the drawings or directed by the Engineer; except do not, in any case, deposit materials less than three feet from the edge of a ditch.

3.06 ROADWAY EMBANKMENTS AND BERMS

- A. When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.
- B. Any excavated rock, ledge, boulders, and stone, except where required in the construction of other items or otherwise directed, shall be used in the construction of embankments to the extent of the project requirements and generally shall be placed so as to form the base of an embankment.
- C. Frozen material shall not be used in the construction of embankments, nor shall the embankments or successive layers of the embankments be placed upon frozen material. Placement of material other than rock shall stop when the sustained air temperature, below 32 degrees Fahrenheit, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable for use in embankments.
- D. When an embankment is to be constructed across a swamp, muck, or areas of unstable soils, the unsuitable material shall be excavated to reach soils of adequate bearing capacity and the embankment begun. Alternative methods, such as use of a stabilization fabric in place of excavation and backfill, may be utilized only after approval of same by the Engineer.
- E. Material being placed in embankments shall be placed in horizontal layers of uniform thickness across the full width of the embankment. Stumps, trees, rubbish, and other unsuitable material shall not be placed in embankments.
- F. Embankment areas shall be placed in eight-inch maximum lifts. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction. Each layer shall be kept crowned to shed water to the outside edge of embankment and continuous leveling and manipulating will be required to assure uniform density. The entire area of each layer shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors, or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.
- G. All fill material shall be compacted at a moisture content suitable for obtaining the required density. In no case shall the moisture content in each layer under construction be more than three percent above the optimum moisture content and shall be less than that quantity that will cause the embankment to become unstable during compaction. Sponginess, shoving, or other displacement under heavy equipment shall be considered evidence for an engineering determination of lack of stability under this requirement, and further placement of material in the area affected shall be stopped or retarded to allow the material to stabilize.
- H. When the moisture content of the material in the layer under construction is less than the amount necessary to obtain satisfactory compaction by mechanical compaction methods, water shall be added by pressure distributors or other approved equipment. Water may also be added in excavation or borrow pits. The water shall be uniformly and thoroughly incorporated into the soil by disc, harrowing, blading, or by other approved methods. This manipulation may be omitted

for sands and gravel. When the moisture content of the material is in excess of three percent above optimum moisture content, dry material shall be thoroughly incorporated into the wet material, or the wet material shall be aerated by disking, harrowing, blading, rotary mixing, or by other approved methods; or compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content by evaporation.

3.07 COMPACTION REQUIREMENTS

- A. All backfills and fills shall be compacted in even lifts (12" maximum) to attain the required densities as follows:

Location	Modified Proctor ASTM D-1557
Subgrade (8") and Gravel for Roads and Parking Lots	95%
General Embankments	90%

UTILITY TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:

1. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- C. Comply with all requirements of governmental agencies having jurisdiction.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

- A. Fill and backfill materials:

1. Provide backfill materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension.
2. Fill material is subject to the approval of the Engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 2" within 2" of the outside of pipe.
4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter, and as approved by the Engineer.

PART 3 – EXECUTION

3.01 PROCEDURES

- A. Existing Utilities:

1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
2. When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.
3. If the service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Engineer and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

- B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this section.

- C. Dewatering: The Contractor, at all times, shall conduct his operations so as to prevent the accumulation of water, ice, and snow in excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress of quality of the work. Under no conditions shall water be allowed to rise in open trenches after pipe has been placed.
- D. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner which will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets, nor cause any interference in the use of streets and road by the public. Pipes under construction shall not be used for drainage of excavations.

- E. Maintain access to adjacent areas at all time.

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VERMONT ARMY NATIONAL GUARD

CAMP JOHNSON COLCHESTER, VERMONT

PROJECT:

FEIGEL HILL BYPASS

CAMP ETHAN ALLEN TRAINING SITE UNDERHILL, VT

DATE	CHECKED	REVISION
5/25/18	BCE	STORMWATER SUBMITTAL PLANS

SPECIFICATIONS

DATE

5/25/2018

SCALE

3.02 TRENCHING

- A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing facilities without prior written approval of the Engineer.
- B. Provide sheeting and shoring necessary for protection of the work and for the safety of personnel.
 - 1. Sheeting and bracing required for trenches shall be removed to the elevation of the pipe, but no sheeting will be allowed to be pulled, removed, or disturbed below the pipe.
- C. A trench shall be excavated to the required depth and to a width sufficient to allow for joining of the pipe and compaction of the bedding and backfill material under and around the pipe. Where feasible, trench walls shall be vertical.
- D. The completed trench bottom shall be firm for its full length and width.
- E. If indicated on the plans or directed by the Engineer, poor foundation material encountered below the normal grade of the pipe bed shall be removed and replaced with granular backfill.
- F. Where pipes are to be placed in embankment fill, the excavation shall be made after the embankment has been completed to a height of 3 feet plus the diameter of the pipe above the designed grade of the pipe.
- G. Excavating for appurtenances:
 - 1. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - 2. Over-depth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Owner.
- H. Excavation shall not interfere with normal 45' bearing splay of foundations.
- I. All trenching shall be in accordance with the latest OSHA requirements.
- J. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.
- K. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

3.03 BEDDING

- A. Pipe Bedding Area: Prior to laying pipe, bedding material shall be placed to the limits of the excavation and to a depth beneath the pipe as specified. This material shall be either sand, gravel, or crushed stone and shall not contain large lumps and stones over one inch in diameter. As the pipe is laid, bedding material shall be extended to 6" above the pipe and leveled along the width of the trench.

3.04 BACKFILLING

- A. Backfilling shall not be done in freezing weather, with frozen materials, or when materials already placed are frozen.
- B. Unless otherwise specified or indicated on the plans, material used for backfilling trenches above the bedding area shall be suitable material which was removed during excavation or obtained from borrow and when compacted shall make a dense stable fill. The material shall not contain vegetation, porous matter, masses of roots, individual roots more than 18 inches long or 1/2 inch thick, or stones greater than 50 pounds or larger than six inches in the widest dimension.
- C. If additional material is required, it shall be furnished from approved sources.
- D. Backfill material shall be evenly spread and compacted in lifts not more than 12 inches thick or as approved by the Engineer. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction.
- E. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the Engineer.
- F. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.
- G. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.
- H. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.
- I. Backfill material shall be compacted to the following percentages of maximum dry density and the in-place moisture content shall not be more than 2% above the optimum moisture content, as determined by Modified Proctor ASTM D1557.
 - 1. Around all structures, under roadway paving, shoulder and embankments - 95%.
 - 2. All other areas - 90%.

ROCK AND BOULDER EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

- 1. Work included: Furnish all labor and equipment required for excavation, disposal and replacement of rock and boulders.
 - a. All boulders within the range boundaries shown on the site plans to be removed shall be included as part of the Contractors mass rock removal.

1.2 SUBMITTALS

- A. Blasting Plan: For record purposes; approved by authorities having jurisdiction.
- B. Seismic Survey Report: For record purposes; from seismic survey agency.
- C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.3 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
 - 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 - 2. Seismographic monitoring during blasting operations.
 - 3. Explosive Firm: The company specializing in explosives for disintegration of rock with a minimum of five (5) years documented experience.
- B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:
 - 1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 - 2. Seismographic monitoring during blasting operations.
 - 3. Seismic Survey Firm: The company specializing in seismic surveys with a minimum of five (5) years documented experience.

1.4 SCHEDULING

- A. Drilling operations shall be conducted Monday through Friday, from 7:00 A.M. to 4:00 P.M.
- B. Blasting operations shall be conducted Monday through Friday, from 8:00 A.M. to 4:00 P.M.
- C. Notification: Notify adjacent property owners and residents (within 1,500') a minimum of seven (7) days in advance of all anticipated blasting operations. Explain blasting and seismic operation and schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Pre-Blast Survey and Site Examination:
 - 1. Conduct a pre-blast survey on all adjacent buildings and individual water systems within a distance of 1,500 feet. Also include pre-blast surveys for up to six (6) residences along Range Road in Underhill Center. The survey shall include pictures and notes of all signs of distress in the buildings and verification of quality and quantity of water in all individual water systems.
 - 2. Verify site conditions and note all subsurface irregularities, which may affect any work requiring blasting.
 - 3. Identify required lines, levels, contours and datum.
 - 4. Obtain a seismic survey prior to rock excavation to determine maximum charges that can be used without damaging adjacent properties, other work or existing utilities.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, and other hazards created by blasting operations.
- B. When ledge rock or boulders are encountered, the material shall be uncovered and the Contractor shall take cross-sections of the ledge rock surface. If the Contractor uncovers ledge but fails to cross section the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Owner.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission and all necessary permits from authorities having jurisdiction (local, state and federal) before bringing explosives to Project site or using explosives on Project site.
 - 1. Perform blasting without damaging adjacent structures, property, or site improvements.
 - 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

- A. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to

permit installation of permanent construction.

3.5 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations under construction.

- 1. If rock below grade is shattered by blasting caused by holes drilled too deep, or too heavy charges of explosives, or any other circumstance due to blasting, and if such shattered rock does not provide suitable foundation, the rock shall be removed and the excavation refilled with screened gravel at the expense of the Contractor.

DRAINAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Culvert pipe and appurtenances.
 - 2. Stone fill.
 - 3. Drainage Structures

1.02 REFERENCES

- A. Vermont Agency of Transportation Standard Specifications, Latest Edition.

1.03 SUBMITTALS

- A. Manufacturer's technical data for:
 - 1. Pipe and appurtenances.
 - 2. Structures.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer.
- B. All culverts and storm drains shall meet the requirements of Section 601 of the Standard Specifications.

2.02 DRAINAGE PIPE & PERFORATED PIPE

- A. Culvert / Drainage Pipe
 - 1. Corrugated Polyethylene pipe and fittings (smooth interior) meeting the requirements of AASHTO M-330.
 - 2. For drainage piping installed by directional boring techniques, use PE 3408 high density polyethylene pipe meeting ASTM D3350 Standard (SDR 11 or better)

2.03 CONCRETE STRUCTURES

- A. ASTM C478, sized as indicated.

2.04 METAL ACCESSORIES

- A. Manhole frames and covers:
 - 1. Grey cast iron, ASTM A48, as shown on plans.

2.05 STONE FILL

- A. Stone for stone fill shall be approved, hard, blasted angular rock other than serpentine rock containing the fibrous variety chrysotile (asbestos). The least dimension of the stone shall be greater than 1/3 of the longest dimension. The stone fill shall be reasonably well graded from the smallest to the maximum size stone specified so as to form a compact mass when in place.
 - 1. Type I - The longest dimension of the stone shall vary from 1 inch to 12 inches, and at least 50 percent of the volume of the stone in place shall have a dimension of 4 inches.
 - 2. Type II - The longest dimension of the stone shall vary from 2 inches to 36 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 12 inches.
 - 3. Type III - The longest dimension of the stone shall vary from 3 inches to 48 inches and at least 50 percent of the volume of the stone in place shall have a least dimension of 16 inches.
 - 4. Type IV - The longest dimension of the stone shall vary from 3 inches to 60 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 20 inches.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which storm sewer system work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 GENERAL

- A. When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.

3.03 PREPARATION

- A. Hand trim excavation (where necessary) to required elevations. Correct over-excavations with fill material.
- B. The slopes shall be graded to match the grade as shown on the plans. Where required, end sections shall be placed and backfilled to prevent undermining.

- C. Remove large stones or other hard matter which could damage drainage structures or impede consistent backfilling or compaction.

3.04 INSTALLATION OF PIPE

- A. All pipe and fittings shall be carefully examined for defects and no pipe or fittings shall be laid which are known to be defective. If any defective piece is discovered after laying, it shall be removed and replaced at the Contractor's expense. All pipes and fittings shall be cleaned before they are laid and shall be kept clean until accepted in the completed work.
- B. The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade.
- C. Unless otherwise permitted by the Engineer, the Contractor shall provide for the temporary diversion of water to permit the installation of the pipe in a reasonably dry trench.
- D. Where the pipe is to be laid below the existing ground line, a trench shall be excavated to the required depth and to a width sufficient to allow for joining of the pipe and compaction of the bedding and backfill material under and around the pipe.
- E. The completed trench bottom shall be firm for its full length and width.
- F. If indicated on the plans or directed by the Engineer, unsuitable foundation material encountered below the normal grade of the pipe bed shall be removed and replaced with Granular Backfill, or other specified or approved material.
- G. The Contractor shall take all necessary precautions to prevent floatation of the pipe in the trench.
- H. When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.

3.05 MANHOLES

- A. Precast concrete structures:
 - 1. Place precast concrete structures and covers as shown on the Drawings.
 - 2. Where manholes occur in pavement, set tops of frames and covers flush with finish surface.
 - 3. Provide rubber joint gasket complying with ASTM C443.

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SCALE

AS SHOWN

PROJ. NO.

16100.34

DRAWING NUMBER

C5.1