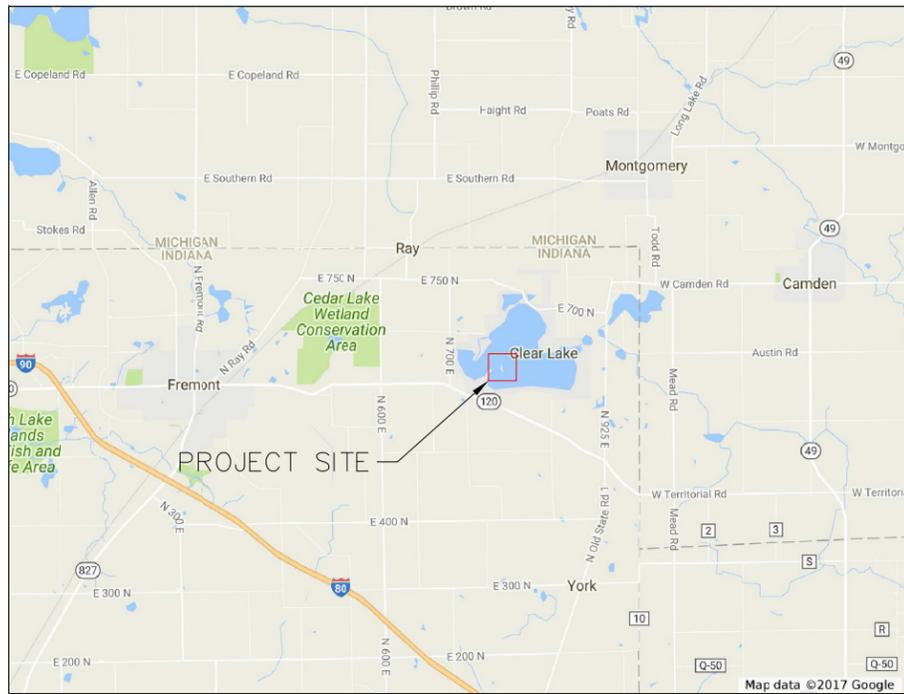


KASOTA ISLAND SHORELINE PROTECTION

VICINITY LOCATION MAP



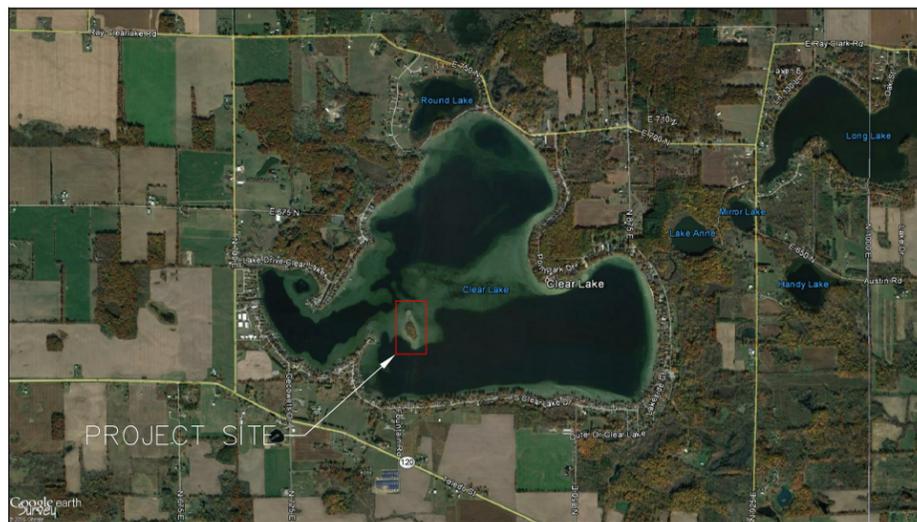
SHEET INDEX

- 1 TITLE SHEET AND LOCATION MAPS
- 2 CONSTRUCTION PLAN VIEW
- 3 CONTOUR MAP
- 4 DISTURBED AREA MAP
- 5 TYPICAL DETAIL - ISLAND ACCESS
- 6 TYPICAL DETAIL - PLANTING PLAN
- 7 TYPICAL DETAIL - PROTECTIVE FENCE
- 8-12 CROSS SECTIONS
- 13-14 EROSION CONTROL AND PLANTING PLAN
- 15-20 CONSTRUCTION SPECIFICATIONS
- 21 GLACIAL STONE QUANTITY CALCULATIONS

COUNTY LOCATION MAP



PROJECT LOCATION MAP



FOR:
 CLEAR LAKE TOWNSHIP LAND CONSERVANCY, INC.
 111 GECOWETS DRIVE
 FREMONT, INDIANA 46737

PROJECT LOCATION:
 CLEAR LAKE TOWNSHIP
 STEUBEN COUNTY

 SECTION 19, TOWNSHIP 38 N, RANGE 15 E
 44°04'30" N 84°50'40" W
 HYDROLOGIC UNIT CODE - 0400003020010

MAP PROJECT LOCATIONS SHOWN BY

INDIANA STATE MAP
 NOT TO SCALE



LEGEND

-  STONE TOE WALL
-  STONE TOE
-  SOIL ENCAPSULATED LIFTS
-  PROTECTIVE FENCE
-  ISLAND ACCESS
-  TEMPORARY BENCH MARK

BENCHMARK

TEMPORARY BENCHMARK ON SOUTH SIDE OF ISLAND
 NORTHING - 2363402.33'
 EASTING - 552472.87'
 ELEVATION - 1038.62'

ALIGNMENT INFORMATION

THE ALIGNMENT LINE IS THE CIRCUMFRANCE OF THE ISLAND WHERE THE EXISTING BANK IS AN ELEVATION OF 1037.38'.

ISLAND ACCESS - STATIONS

1. 0+78
2. 1+45
3. 2+12
4. 6+00
5. 7+12
6. 8+00
7. 9+00
8. 13+86



NOTES:

1. BLACK LINES - 5 FOOT MAJOR CONTOURS
2. WHITE LINES - 1 FOOT MINOR CONTOURS

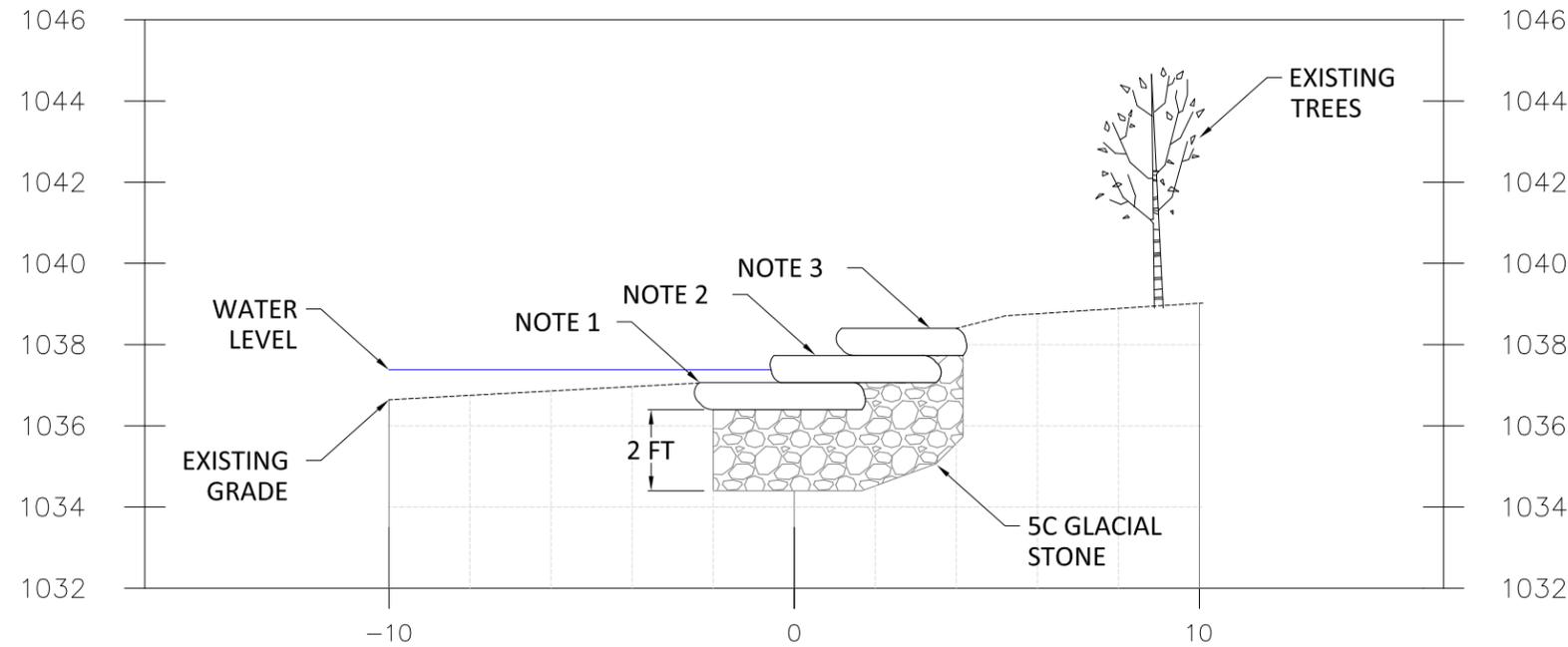
DESIGN BY:	JWS	REVISION NUMBER	REVISION DATE	PROJECT NO.:		PAGE NO.
DRAWN BY:	JWS	.	.	DATE:	06.05.2017	3
CHECKED BY:	WSS	.	.	HORIZONTAL SCALE:	.	of
APPROVED BY:	CLS	.	.	VERTICAL SCALE:	.	21



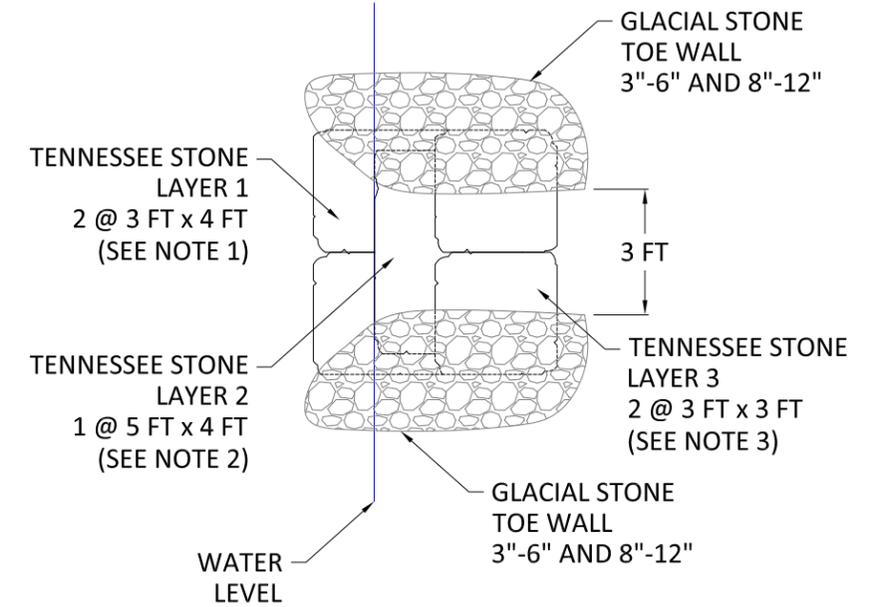
- NOTES:**
1. TOTAL AREA OF PROPOSED DISTURBED LAND IS 37,900 FT² WHICH EQUATES TO 0.87 ACRES
 2. CONSTRUCTION OF THE STEEP SLOPE BANK IS TO BE COMPLETED FROM A BARGE ON THE WATER
 3. CONSTRUCTION OF THE SHALLOW SLOPE BANK MAY BE COMPLETED FROM THE BANK SLOPE WITH NO MORE THAN 20 FT OF DISTURBANCE

DESIGN BY:	JWS	REVISION NUMBER	REVISION DATE	PROJECT NO.:	PAGE NO.
DRAWN BY:	JWS	.	.	DATE: 06.05.2017	4
CHECKED BY:	WSS	.	.	HORIZONTAL SCALE:	of
APPROVED BY:	CLS	.	.	VERTICAL SCALE:	21

PROPOSED ISLAND ACCESS - CROSS SECTION

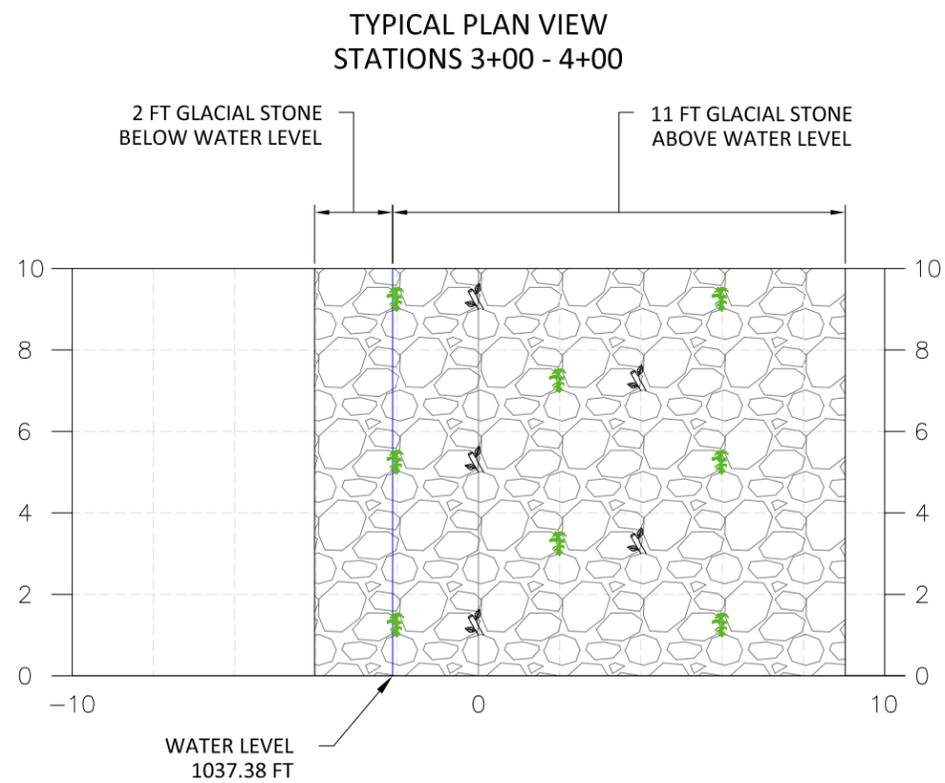
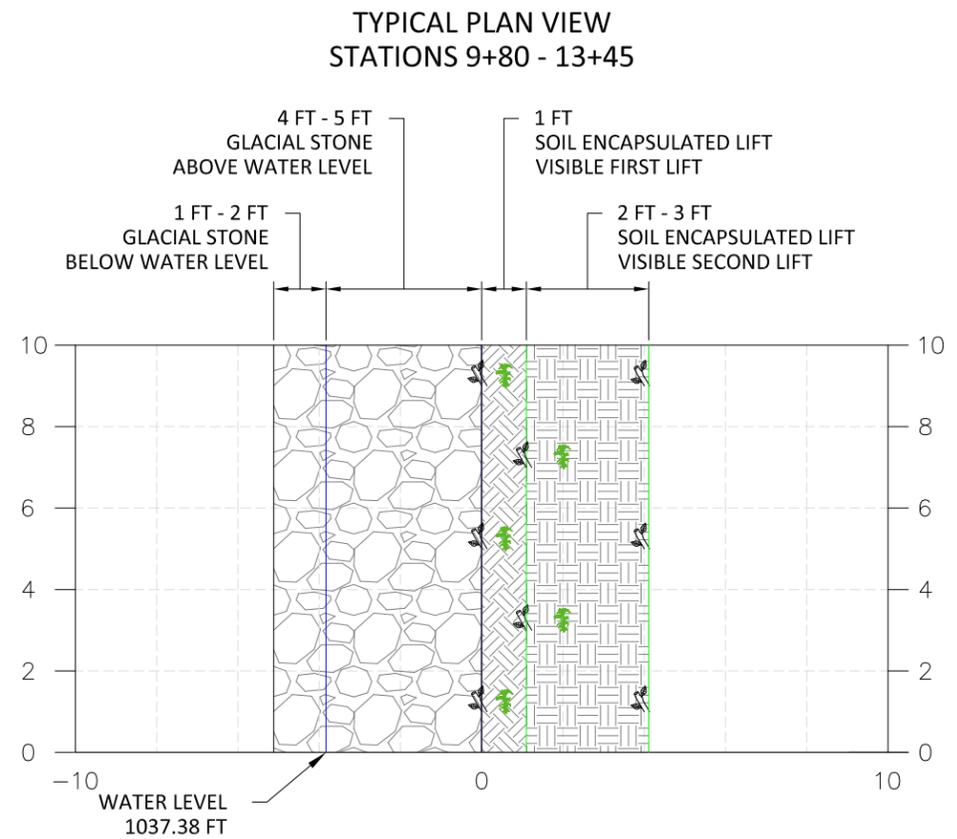
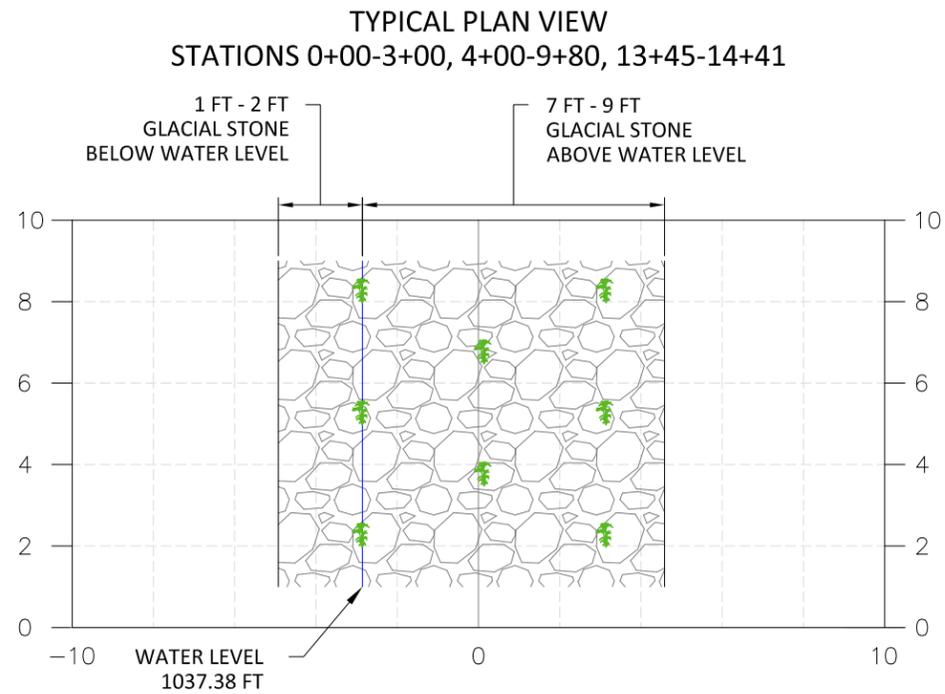


PROPOSED ISLAND ACCESS - PLAN VIEW

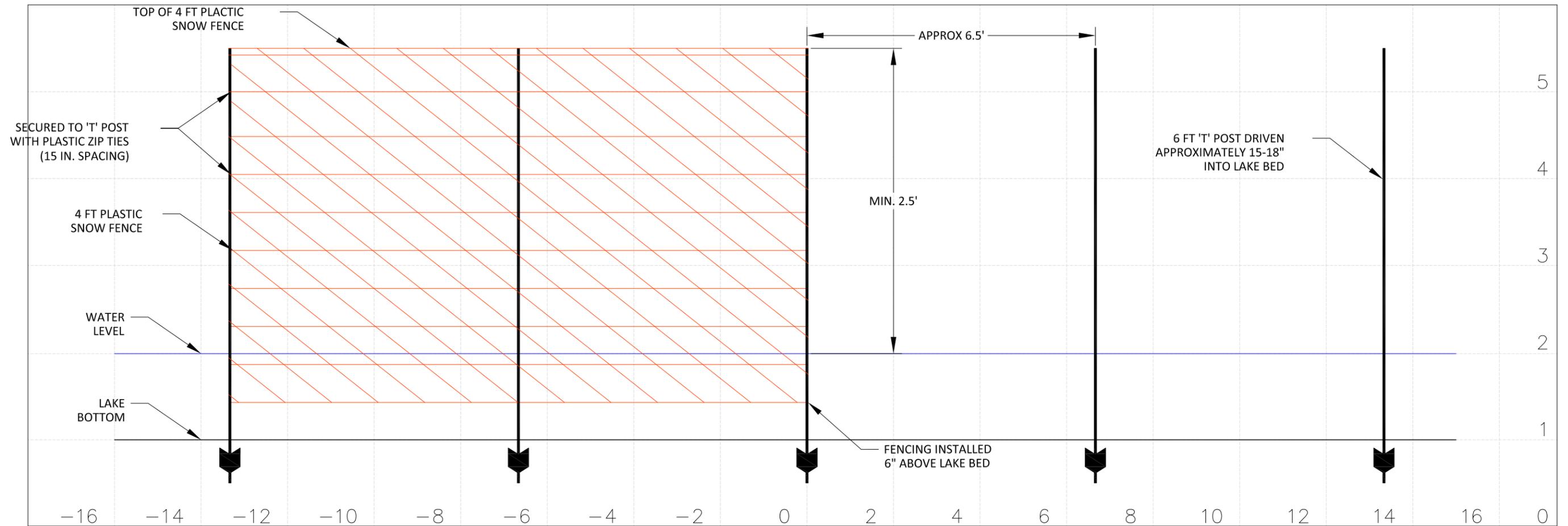


NOTES:

1. BOTTOM LAYER OF TENNESSEE STONE CONSISTING OF 2 STONES MEASURING 3 FT WIDE BY 4 FT DEEP AND 8 IN THICK. TREAD PORTION OF THE STONE TO BE 1.5 FT DEEP. THIS LAYER TO BE IMBEDDED INTO THE LAKE BED ON TOP OF A 2 FT DEEP STABILIZATION LAYER OF 5C GLACIAL STONE.
2. SECOND LAYER OF TENNESSEE STONE CONSISTING OF 1 STONE MEASURING 5 FT WIDE BY 4 FT DEEP AND 8 IN THICK. TREAD PORTION OF THE STONE TO BE 1.5 FT DEEP. THIS LAYER TO BE SUPPORTED BY 2.5 FT OF LAYER 1 AND 1.5 FT OF 2 FT DEEP STABILIZATION LAYER OF 5C GLACIAL STONE.
3. TOP LAYER, LAYER 3, OF TENNESSEE STONE CONSISTING OF 2 STONES MEASURING 3 FT x 3 FT x 8 IN THICK. TREAD PORTION OF THE STONE TO BE THE FULL 3 FT DEPTH. THIS LAYER TO BE SUPPORTED BY 2.5 FT OF LAYER 2 AND 0.5 FT OF 2 FT DEEP STABILIZATION LAYER OF 5C GLACIAL STONE.



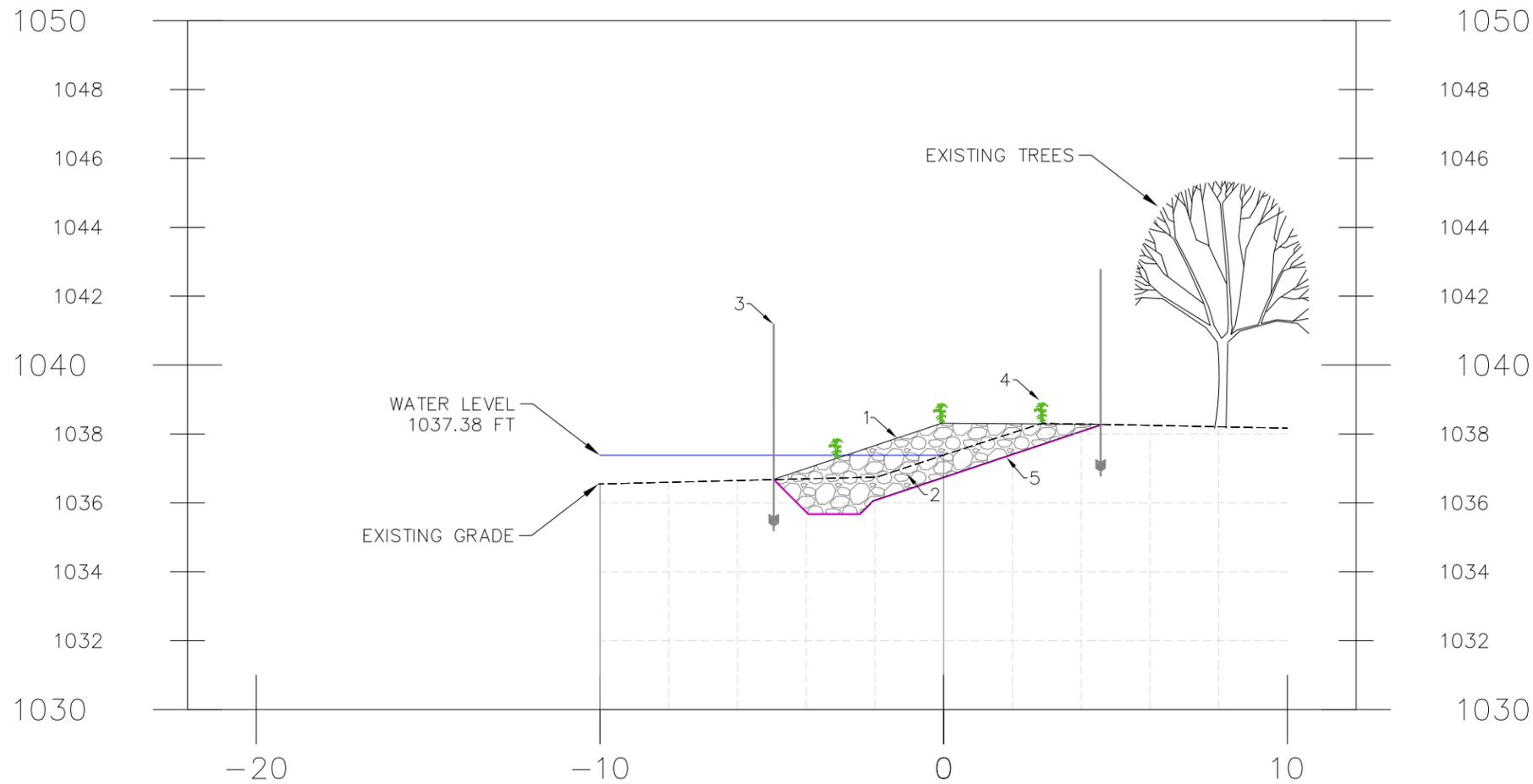
PROTECTIVE FENCE - PROFILE VIEW



NOTES:

1. PROTECTIVE FENCE RECOMMENDED TO BE INSTALLED AND IN PLACE FOR A MINIMUM OF SIX (6) MONTHS FOLLOWING THE PLANTING OF THE NATIVE PLANTS

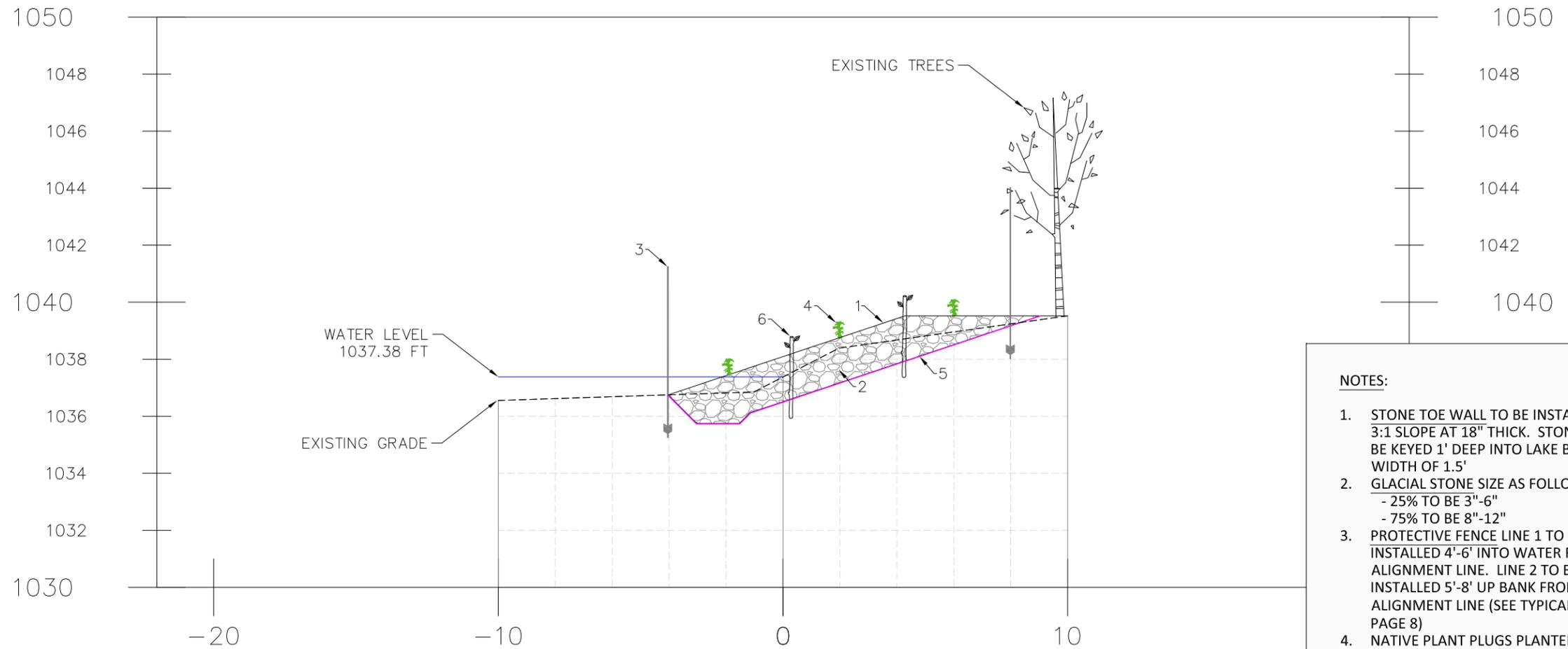
0+57.98



- NOTES:**
- STONE TOE WALL TO BE INSTALLED ON A 3:1 SLOPE AT 18" THICK. STONE TOE TO BE KEYED 1' DEEP INTO LAKE BED WITH A WIDTH OF 1.5'
 - GLACIAL STONE SIZE AS FOLLOWS:
 - 25% TO BE 3"-6"
 - 75% TO BE 8"-12"
 - PROTECTIVE FENCE LINE 1 TO BE INSTALLED 4'-6' INTO WATER FROM ALIGNMENT LINE. LINE 2 TO BE INSTALLED 5'-8' UP BANK FROM ALIGNMENT LINE (SEE TYPICAL DETAIL PAGE 8)
 - NATIVE PLANT PLUGS PLANTED IN 3 ROWS SPACED 3 FT O.C. FROM STATION 0+00 TO 3+00, 4+00 TO 9+80, AND 13+45 TO 14+41 (SEE TYPICAL DETAIL PAGE 7)
 - GEOTEXTILE FABRIC
- CROSS SECTIONAL AREA OF STONE:**
- BELOW WATER LEVEL - 6.2 FT²
 ABOVE WATER LEVEL - 4.3 FT²

EXISTING ELEVATIONS	-10.04	-10.04	-1.94	-0.00	2.87	10.00
		1036.55	1036.75	1037.38	1038.31	1038.17
OFFSETS						

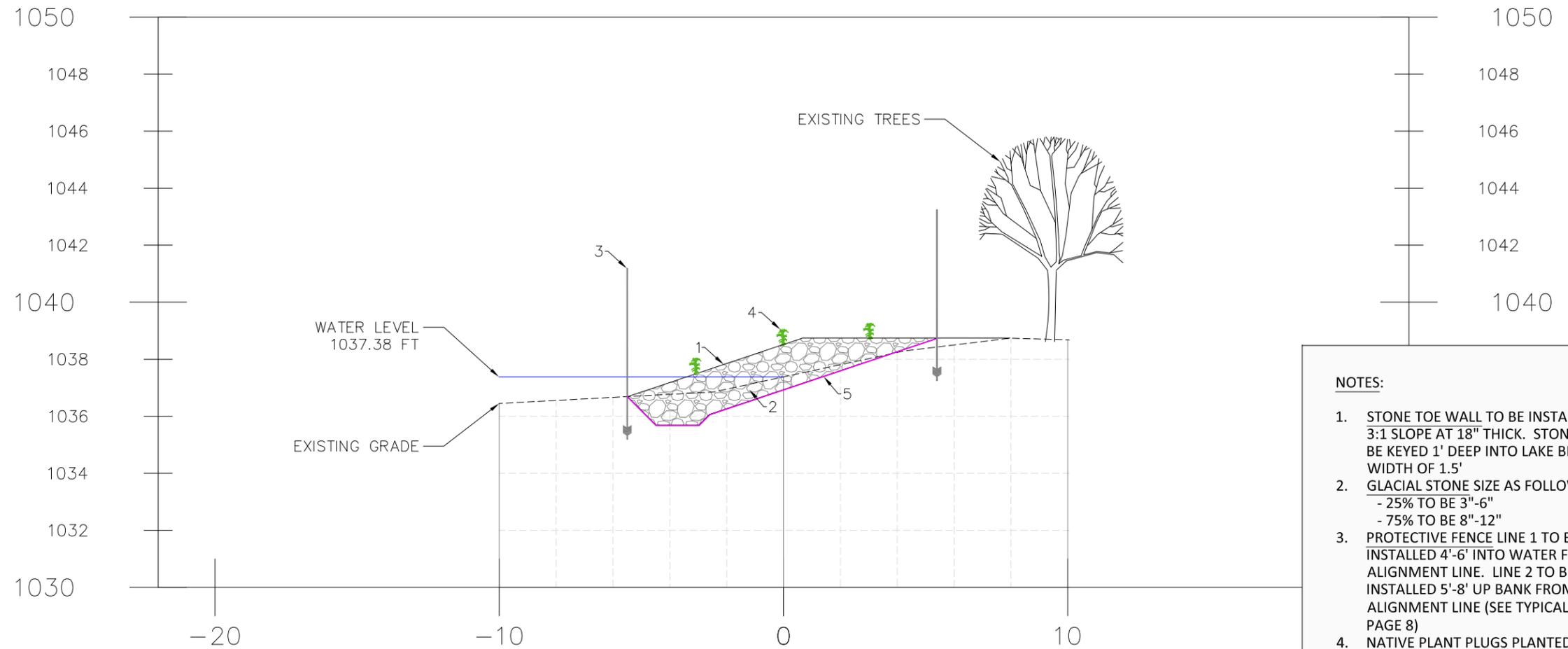
3+84.09



- NOTES:**
- STONE TOE WALL TO BE INSTALLED ON A 3:1 SLOPE AT 18" THICK. STONE TOE TO BE KEYED 1' DEEP INTO LAKE BED WITH A WIDTH OF 1.5'
 - GLACIAL STONE SIZE AS FOLLOWS:
 - 25% TO BE 3"-6"
 - 75% TO BE 8"-12"
 - PROTECTIVE FENCE LINE 1 TO BE INSTALLED 4'-6" INTO WATER FROM ALIGNMENT LINE. LINE 2 TO BE INSTALLED 5'-8" UP BANK FROM ALIGNMENT LINE (SEE TYPICAL DETAIL PAGE 8)
 - NATIVE PLANT PLUGS PLANTED IN 3 ROWS SPACED 4 FT O.C. FROM STATION 3+00 TO 4+00 (SEE TYPICAL DETAIL PAGE 7)
 - GEOTEXTILE FABRIC
 - LIVE STAKES PLANTED IN 2 ROWS SPACED 4 FT O.C. FROM STATION 3+00 TO 4+00 (SEE TYPICAL DETAIL PAGE 7)
- CROSS SECTIONAL AREA OF STONE:**
- BELOW WATER LEVEL - 5.9 FT²
 ABOVE WATER LEVEL - 10.2 FT²

EXISTING ELEVATIONS					
		1036.55	1036.85	1037.38	1038.39
OFFSETS		10.00	1.03	0.00	1.97
					10.00
					1039.52

5+74.02

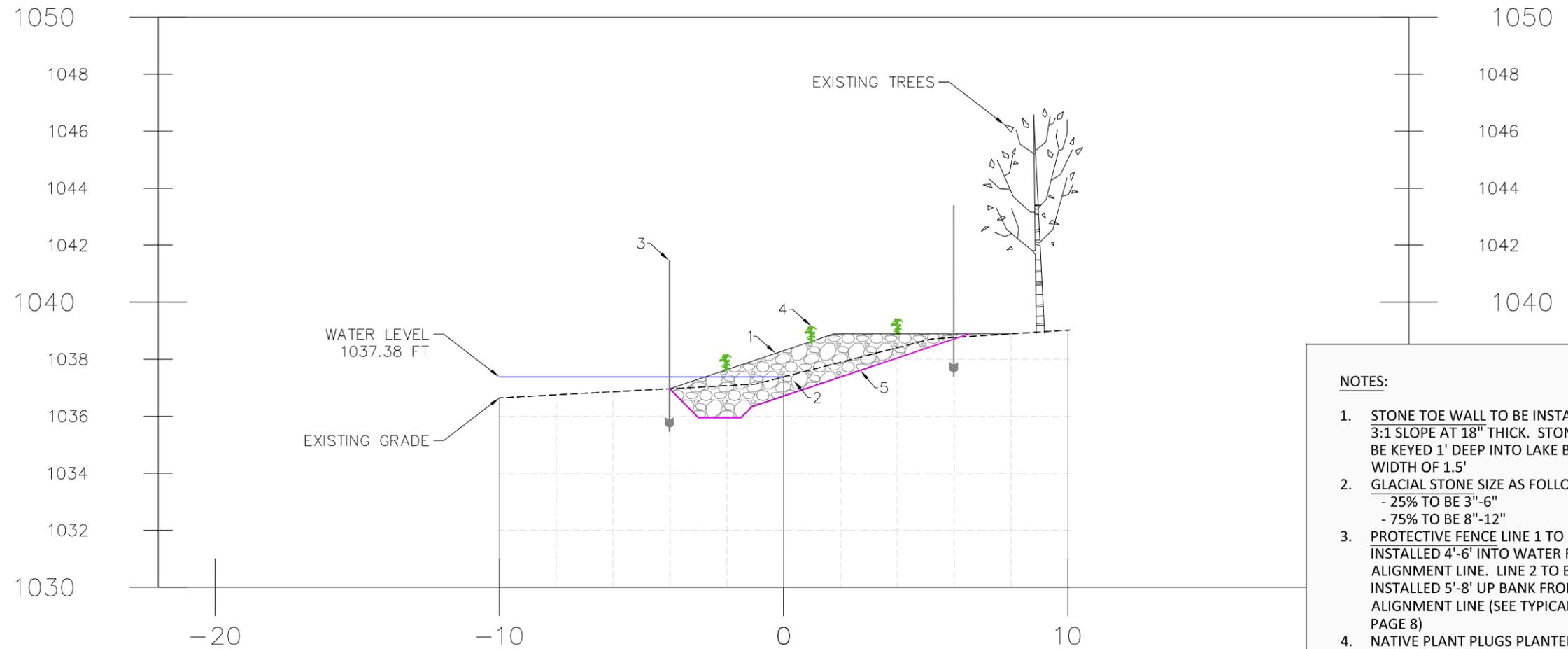


- NOTES:**
- STONE TOE WALL TO BE INSTALLED ON A 3:1 SLOPE AT 18" THICK. STONE TOE TO BE KEYED 1' DEEP INTO LAKE BED WITH A WIDTH OF 1.5'
 - GLACIAL STONE SIZE AS FOLLOWS:
 - 25% TO BE 3"-6"
 - 75% TO BE 8"-12"
 - PROTECTIVE FENCE LINE 1 TO BE INSTALLED 4'-6' INTO WATER FROM ALIGNMENT LINE. LINE 2 TO BE INSTALLED 5'-8' UP BANK FROM ALIGNMENT LINE (SEE TYPICAL DETAIL PAGE 8)
 - NATIVE PLANT PLUGS PLANTED IN 3 ROWS SPACED 3 FT O.C. FROM STATION 0+00 TO 3+00, 4+00 TO 9+80, AND 13+45 TO 14+41 (SEE TYPICAL DETAIL PAGE 7)
 - GEOTEXTILE FABRIC
- CROSS SECTIONAL AREA OF STONE:**
- BELOW WATER LEVEL - 6.2 FT²
 ABOVE WATER LEVEL - 6.4 FT²

EXISTING ELEVATIONS	-10.01	-10.01	-2.48	0.00	4.25	7.96	10.05
OFFSETS	-10.01	-10.01	-2.48	0.00	4.25	7.96	10.05

	1036.45	1036.85	1037.38	1038.29	1038.74	1038.68	
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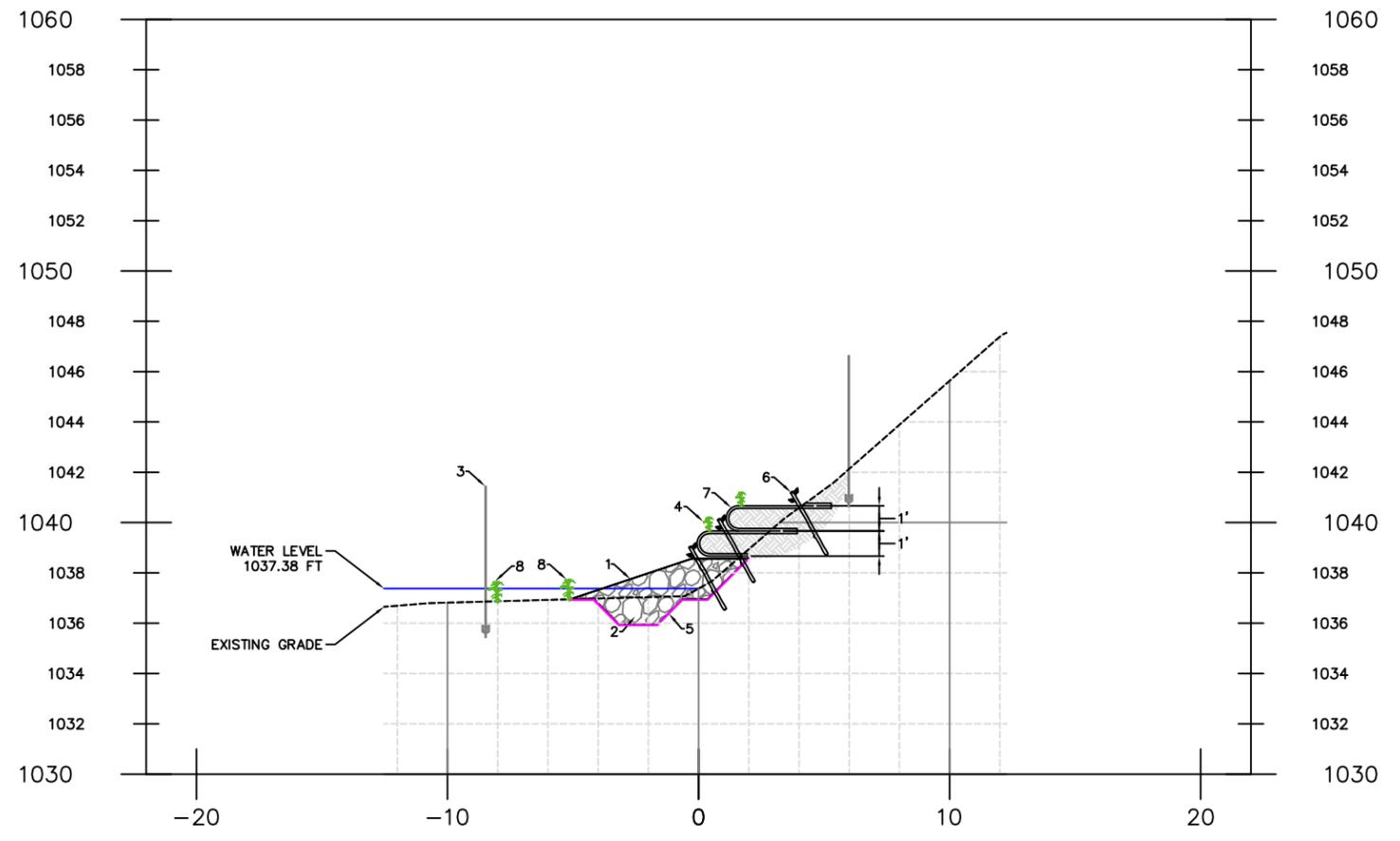
9+09.72



- NOTES:**
- STONE TOE WALL TO BE INSTALLED ON A 3:1 SLOPE AT 18" THICK. STONE TOE TO BE KEYED 1' DEEP INTO LAKE BED WITH A WIDTH OF 1.5'
 - GLACIAL STONE SIZE AS FOLLOWS:
 - 25% TO BE 3"-6"
 - 75% TO BE 8"-12"
 - PROTECTIVE FENCE LINE 1 TO BE INSTALLED 4'-6" INTO WATER FROM ALIGNMENT LINE. LINE 2 TO BE INSTALLED 5'-8' UP BANK FROM ALIGNMENT LINE (SEE TYPICAL DETAIL PAGE 8)
 - NATIVE PLANT PLUGS PLANTED IN 3 ROWS SPACED 3 FT O.C. FROM STATION 0+00 TO 3+00, 4+00 TO 9+80, AND 13+45 TO 14+41 (SEE TYPICAL DETAIL PAGE 7)
 - GEOTEXTILE FABRIC
- CROSS SECTIONAL AREA OF STONE:**
- BELOW WATER LEVEL - 4.8 FT²
 ABOVE WATER LEVEL - 7.2 FT²

EXISTING ELEVATIONS		1036.64	1037.13	1037.38	1038.71	1039.02
OFFSETS		-10.03	-0.98	0.00	5.19	10.06

11+42.23



- NOTES:**
- STONE TOE TO BE INSTALLED ON A 3:1 SLOPE AND 18" DEEP. STONE TOE TO BE KEYED 1' DEEP INTO LAKE BED WITH A WIDTH OF 1.5'
 - GLACIAL STONE SIZE AS FOLLOWS:
 - 25% TO BE 3"-6"
 - 75% TO BE 8"-12"
 - PROTECTIVE FENCE LINE 1 TO BE INSTALLED 4'-6" INTO WATER FROM ALIGNMENT LINE. LINE 2 TO BE INSTALLED 5'-8' UP BANK FROM ALIGNMENT LINE (SEE TYPICAL DETAIL PAGE 8)
 - NATIVE PLANT PLUGS PLANTED IN 2 ROWS SPACED 4 FT O.C. FROM STATION 9+80 TO 13+45 (SEE TYPICAL DETAIL PAGE 7)
 - GEOTEXTILE FABRIC
 - LIVE STAKES PLANTED IN 3 ROWS SPACED 4 FT O.C. FROM STATION 9+80 TO 13+45 (SEE TYPICAL DETAIL PAGE 7)
 - SOIL ENCAPSULATED LIFTS WITH NATIVE SEED
 INSTALL 2 LIFTS EACH 1 FT THICK
 - EMERGENT AND SUB-EMERGENT PLANTS
 INSTALLED 3 FT CENTER TO CENTER
- CROSS SECTIONAL AREA OF STONE:**
- BELOW WATER LEVEL - 4.7 FT²
 ABOVE WATER LEVEL - 4.1 FT²

EXISTING ELEVATIONS	-12.53 - 1036.65	0.00 - 1037.38	12.27 - 1047.55
OFFSETS			

**KASOTA ISLAND
SHORELINE PROTECTION**

CROSS SECTION

DESIGN BY: JWS	REVISION NUMBER	REVISION DATE	PROJECT NO.:	PAGE NO.
DRAWN BY: JWS	.	.	DATE: 06.05.2017	12
CHECKED BY: WSS	.	.	HORIZONTAL SCALE:	of
APPROVED BY: CLS	.	.	VERTICAL SCALE:	21

Planting Plan

Bank Treatment #1 (Station 9+80 – 13+45)

Approximately 375 native live stake shrubs will be planted into the glacial stone toe wall and/or encapsulated lifts as described in the embankment cross-sections and Planting Plan View. When established the shrubs will provide root mass to help hold the soil in place. The live stakes will be planted 4 ft. on center. A minimum of four species will be planted from the following list:

Redosier dogwood	Cornus stolonifera
Silky dogwood	Cornus amomum
Elderberry	Sambucus Canadensis
Buttonbush	Cephalanthus occidentalis
Gray Dogwood	Cornus racemosa
Hazelnut	Corylus americana
Spicebush	Lindera benzoin

Approximately 200 shade and drought tolerate native grass plugs will be installed into the encapsulated lifts (Station 9+80 – 13+45) to provide canopy cover while the native shrubs become established. Two rows will be planted on a 4 ft. spacing. The native grasses will also be more esthetically pleasing until the shrubs become established. A native grass seed mix will also be planted into the lifts. The following four species of plugs and seed will be planted:

Virginia Wild Rye	Elymus virginicus
Beak Grass	Diarrhena Amerciana
Fowl Manna Grass	Glyceria autumnale
Indian Wood Oats	Chasmanthium latifolium

Approximately 250 emergent and submergent native plants will be installed into the sandy lake bottom. Two rows will be planted on a 3 ft spacing. To aid in the establishment of the plants in the sandy substrate, they are to be anchored by installing them in a cotton mesh bag weighted with soil and gravel. A minimum of four species will be planted from the following list:

Longleaf Pondweed	Potamogeton nosdosus
Floating Pondweed	Potamogeton natans
Chairmaker's Bulrush	Schoenoplectus americanus
American Water-Willow	Justicia americana
Pickerelweed	Pontederia cordata
American White Waterlily	Nymphaea tuberosa

Bank Treatment #2 (Station 3+00 – 4+00)

Two rows of native plant plugs (50) will be installed from Station 3+00 to 4+00 along with the two rows of native live stake shrubs. Species to be planted are the same as described in Bank Treatment #2. A minimum of five species will be planted. The lower row (near water line) will be planted to wetland species and the upper row to upland species as identified on the list.

Bank Treatment #3 – Stations 0+00 to 3+00, 4+00 to 9+80, and 13+45 to 14+41.

Approximately 1000 native, low profile and showy (flowering) plant plugs will be installed within the glacial stone toe wall. The plugs will be installed on three foot spacing in a diamond pattern (see Planting Plan View). A minimum of five species will be selected from the following list: Those species identified with an asterisk are adapted to wet conditions and should be planted within the saturated zone or two (2) lower rows. Those species with double asterisk can be planted into the lower or upper two rows.

New England Aster **	Aster novae-angliae
Tall Coreopsis **	Coreopsis tripteris
Broad-Leaved Purple Coneflower **	Echinacea purpurea
Wild Bergamont **	Monarda fistulosa
Switch Grass **	Panicum virgatum
Brown-eyed Susan**	Rudbeckia triloba
Compass Plant	Silphium laciniatum
Stiff Goldenrod	Solidago rigida
Common Spiderwort	Tradescantia ohiensis
Heath Aster	Aster ericoides
Bristly Sedge *	Carex comosa
Crested Oval Sedge *	Carex cristatella
Marsh Blazing Star *	Liatris spicata
Common Mountain Mint *	Pycnanthemum virginianum

Permanent Seeding - Establishment of Lawn Turf – Disturbed Areas on the Island and Staging Area

The disturbed areas on the island and staging area will be planted and established with a high quality seed which provides a high tolerance for heavy traffic. The new seeding on the Island will be fertilized and covered with Erosion Control Blanket to assist in the establishment of the vegetation. Straw mulch will be applied following seeding of the staging area. The following seed mix will be planted at 8-10 lbs per 1000 sq. ft:

Cisco’s Execu-Turf Playmaker Mix or Equivalent.

Temporary Seeding

A Temporary seeding shall be applied if disturbed areas are exposed for more than 15 days. Winter wheat will be seeded at the rate of 150 lbs. per acre.

CONSTRUCTION SPECIFICATION

EROSION CONTROL BLANKET

1. SCOPE

This work shall consist of furnishing all labor, materials, tools and equipment necessary to place Erosion Control Blanket on the channel bank as shown on the design plans.

2. MATERIALS – North American Green SC150 BN or equivalent

The Erosion Control Blanket will be a machine-produced mat of 70% straw and 30% coconut fiber with a functional longevity of up to approximately 18 months. The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with 100% biodegradable woven natural organic fiber netting. The mesh openings will be 0.5 by 1.0 inches.

3. INSTALLATION

When under pressure of severe conditions, even the best erosion control products cannot function to their full potential without being properly installed and anchored.

The top edge of the blanket shall be placed and anchored in a six (6) inch deep by six (6) inch wide trench. After placing the blanket in the trench and stapling (see design typical) backfill with soil and compact. The bottom edge of the blanketed area shall be tucked between rock and soil interface and under the rock six (6) inches. When geotextile fabric is used under the rock, it may be wrapped up around the rock in lieu of extending the Erosion Control Blanket.

A minimum of six (6) inch overlap is required between blankets. Additional staples and longer staples (10"-12") shall be required when installing the blanket on 1.25H:1V slopes. The staple pattern shall be every 20 inch across the width of the blanket and every 24 inch along the length of the blanket. This pattern of stapling will require 3.4 staples per syd of blanket.

CONSTRUCTION SPECIFICATION

GEOTEXTILE FABRIC

1. SCOPE

This work shall consist of furnishing all materials, equipment and labor necessary for the installation of geotextile fabric for slope protection.

2. MATERIALS

Geotextile fabric shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns, having a composition of at least 95 percent, by weight, of polypropylene, polyester or polyvinylidene-chloride. The geotextile fabric will be inert to commonly encountered chemicals. The geotextile shall be free of any chemical treatment or coating that might significantly reduce its permeability and shall have no flaws or defects that significantly alter its physical properties.

Nonwoven Geo-textile

The class and type of geotextile fabric and requirements of material for slope protection are:

Class 1 Nonwoven

Tensile Strength	180 lbs min
Bursting Strength	320 psi min
Elongation	50 % max
Puncture	80 lbs min
Ultraviolet Light Resistance	70% min tensile strength retained
Permittivity	0.7 second min

3. SURFACE PREPARATION

The surface on which the geotextile fabric is to be placed shall be graded as shown on the design plans. The surface shall be reasonably smooth and free of holes, sharp objects and projections.

4. PLACEMENT

a. General

The geotextile fabric shall be placed on the prepared surface at the locations and in accordance with the details shown on the design plans. The geotextile fabric shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when the stone is placed against it. No cuts or punctures will be permitted. The geotextile fabric may be folded and overlapped to permit proper placement in the designated area.

b. Slope Protection

The roll or panel length shall be placed parallel to the direction of water flow. The minimum overlap shall be 18", in any direction. The geotextile fabric shall not be placed until it can be anchored and protected with the intended covering within 48 hours. If the geo-textile will not be covered within 48 hours, a temporary covering will be used for protection from ultraviolet light.

Securing pins shall be placed along the edge of the panel to adequately secure it during placement. At vertical laps, securing pins shall be inserted through both layers along a line through the approximate midpoint of the overlap. At horizontal laps and laps across slopes, securing pins shall be inserted through the bottom layer only. Securing pins shall be placed along a line approximately 2 inches in from the edge of the outer limits of the placed geotextile fabric at intervals not greater than 12 feet. Additional pins shall be installed as necessary to prevent any slippage of the fabric, regardless of locations.

CONSTRUCTION SPECIFICATION

Glacial (Natural) Stone

1. SCOPE

The work shall consist of the installation of glacial (natural) stone, including filter layers or bedding where specified.

2. MATERIALS

All stone, including Filter layers or bedding shall come from sources approved by the engineer or designated representative. The stone shall meet the quality and grading requirements provided on the construction drawings.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the stone or bedding course is to be placed shall be cut or filled and graded to the lines and grades on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall be compacted to a density equal to the adjacent existing soil material.

Stone materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved.

4. EQUIPMENT-PLACED STONE

The stone shall be placed by equipment on the surfaces and to the depths specified. The stone layer shall be constructed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material.

5. FILTER LAYERS OR BEDDING

When the drawings specify filter layers or bedding under the stone, the filter or bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding will not be required, but the surface of such layers shall be finished reasonably free of mounds, dips or windrows.

CONSTRUCTION SPECIFICATION

SEEDING

1. SCOPE

The work shall consist of furnishing all labor, equipment and materials for seeding a permanent mixture of grasses (Native and Cool Season) on the areas shown on the drawings and/or all disturbed areas.

2. GENERAL

Permanent fertilizing, seeding, mulching and blanketing shall be performed within 15 days of disturbance. If a permanent seeding cannot be completed within the 15 days a temporary seeding can be used during the summer months.

Preferred Seeding Dates

Cool Season Grasses	March 1 to May 20 or August 1 to September 20
Warm Season Grasses	April 15 to May 30 or After October 1 (Late summer seeding if water provided)

3. FERTILIZER

The fertilizer (cool season grasses only) shall be a regular commercial fertilizer and shall be in such physical condition to insure uniform application. Apply phosphorus free 12-12-12 or equivalent at the rate of 350 lbs/acre.

4. SEED

The seed shall be good quality and conform to the latest Indiana seed laws. Species and rate of seeding shall be as specified in the "Erosion Control and Planting Plan". Seed shall be applied at a pure live seed (PLS) rate.

5. PREPARATION OF SEEDBED

The entire area to be seeded shall be reasonably smooth prior to beginning seedbed preparation. Fertilizer, if required, shall be applied uniformly and incorporated into the top 3" of the soil. The seedbed preparation should be suspended when the soil is too

wet or too dry. On side slopes steeper than 2-1/2:1, the 3" minimum depth of seedbed preparation is not required, but the soil shall be worked enough to insure sufficient loose soil to provide seed cover.

6. SOWING THE SEED

Unless otherwise specified, the seeding operation shall be performed immediately after preparation of the seedbed. The seed will be broadcast uniformly over the area to be seeded. Immediately after seeding, the soil shall be firmed to give the seed a cover of not more than ½ " for cool season grasses and ¼" for warm season grasses and forbs. On slopes greater than 2-1/2:1, the seed may be covered by hand.

7. MULCHING

The required mulching (straw mulch or erosion control blanket) shall be performed as soon as possible after seeding. The mulch shall be applied uniformly over the area. The type and rate of mulch can be found in the "Erosion Planting Plan".

When mulching is required, all areas seeded during any one day shall be mulched within 24 hours. If straw mulch is applied it shall be anchored unless otherwise approved. Anchoring of the mulch may be performed by a commercially available tackifier, a mulch anchoring tool, by installation of mulch netting or by other approved methods.

GLACIAL STONE - DESIGN QUANTITIES

Shallow Slope - Stone Toe Wall

Station	Length (ft)	Glacial Stone Below Water Level			Glacial Stone Above Water Level		
		Area (sft)	Average Area (sft)	Volume (cys)	Area (sft)	Average Area (sft)	Volume (cys)
0+00.00	--	6.2	--	--	4.3	--	--
0+57.98	57.98	6.2	6.20	13.31	4.3	4.30	9.23
3+84.09	326.11	5.9	6.05	73.07	10.2	7.25	87.57
5+74.02	189.93	6.2	6.05	42.56	6.4	8.30	58.39
9+09.72	335.70	4.8	5.50	68.38	7.2	6.80	84.55
9+80.00	70.28	4.8	4.80	12.49	7.2	7.20	18.74
*Steep Slope - Stone Toe (See Below)							
13+45.00	--	6.2	--	--	4.3	--	--
14+41.00	96.00	6.2	6.20	22.04	4.3	4.30	15.29
Steep Slope - Stone Toe							
9+80.00	--	4.7	--	--	4.1	--	--
11+42.23	162.23	4.7	4.70	28.24	4.1	4.10	24.63
13+45.00	202.77	4.7	4.70	35.30	4.1	4.10	30.79
Design Volume (cys)				295.40	Design Volume (cys)		329.19

Adjustments

- Reuse existing stone located on the island as Glacial Stone for Below Water Level. Existing stone on the island equates to 70% of the proposed required Glacial Stone.

Revised Volumes	Glacial Stone Below Water Level		Glacial Stone Above Water Level	
	Revised Volume (cys)	88.62	Revised Volume (cys)	329.19

- The size of 25% of the glacial stone should be 3"-6" while the size of the remaining 75% of glacial stone is designed to be 8"-12".

Volumes by Size (cys)	Glacial Stone Below Water Level		Glacial Stone Above Water Level	
	Size - 3"-6"	22.16	Size - 3"-6"	82.30
	Size - 8"-12"	66.47	Size - 8"-12"	246.89

- Glacial stone conversion from volume (cys) to weight (ton) using the following unit weights.

Weights by Size (ton)	Glacial Stone Below Water Level		Glacial Stone Above Water Level	
	3"-6" @ 1.5 ton/cyd	33.23	3"-6" @ 1.5 ton/cyd	123.45
	8"-12" @ 1.4 ton/cyd	93.05	8"-12" @ 1.4 ton/cyd	345.65

- Total proposed Glacial Stone

Glacial Stone Below Water Level	126.28 tons
Glacial Stone Above Water Level	469.10 tons
Project Total Glacial Stone	595.38 tons