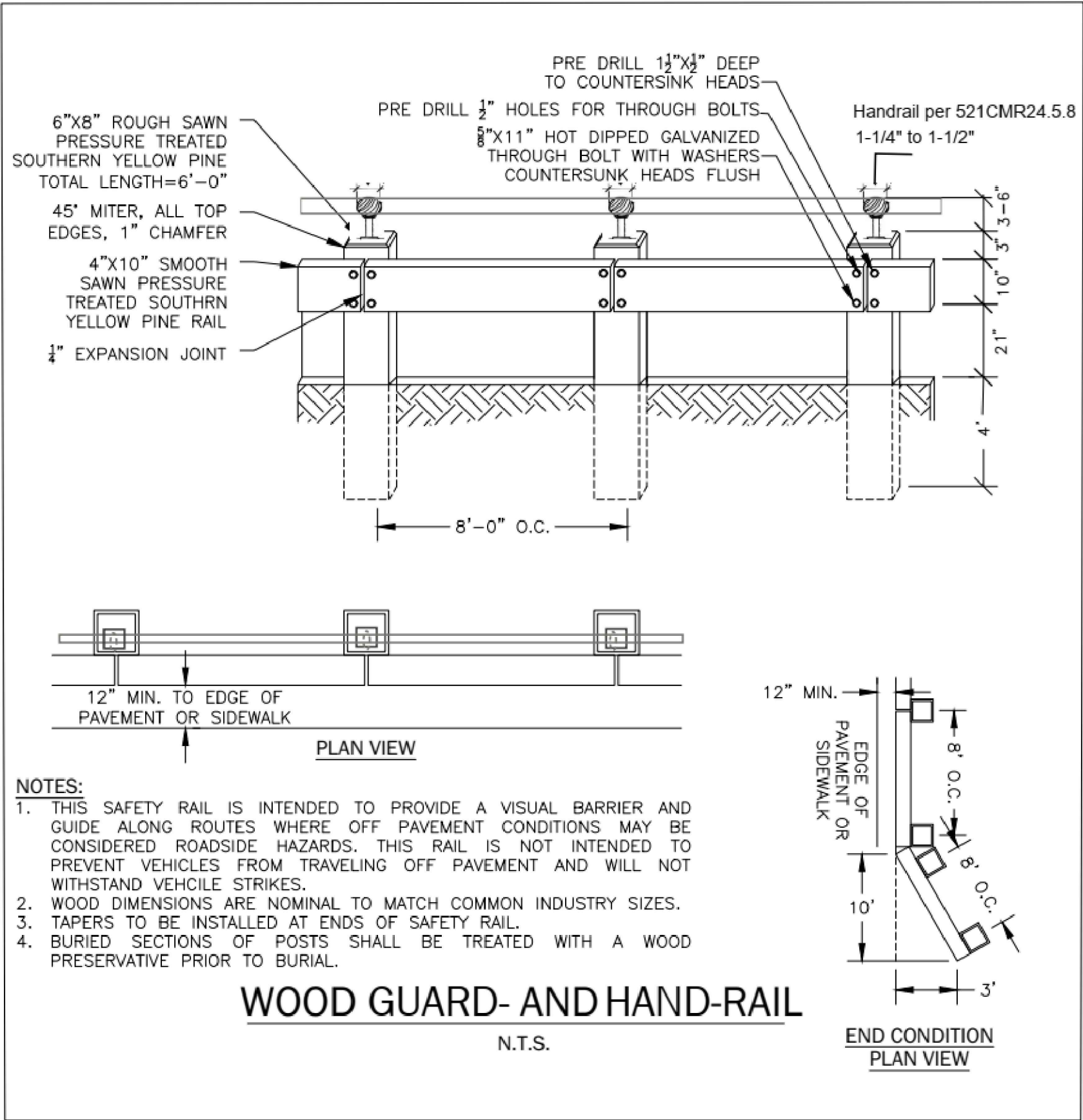


Retaining Wall Profiles

Soil Properties	
Mapped Soil	Merrimac urban land complex
Hydrologic soil group	HSG A
K factor (Rock Free)	0.28
K factor (Whole Soil)	0.28

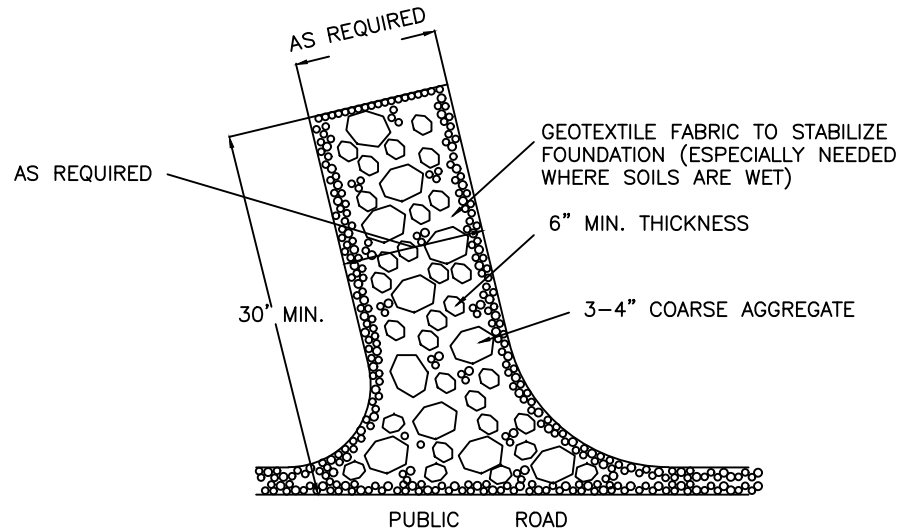
Total land area to be disturbed in buffer= 494 SF ±
Volume of soil to be filled=200 Cubic Yards ±

Cut and Fill Analysis - 75 Lakeshore Drive, Bellingham, MA						
Elevation (Ft.)	Existing Area (Sq.Ft)	Existing Vol (Cu.Ft)	Proposed Area (Sq.Ft)	Proposed Vol (Cu.Ft)	Area diff, SF	Vol Difference, Cu ft
239	3753.629	0	3753.63	0	0.00	0
240	3659.309	3706.37	3673.87	3713.68	14.56	7.31
241	3538.07	3598.52	3574.49	3624.06	36.42	25.54
242	3441.088	3489.47	3493.77	3534.05	52.68	44.58
243	3309.67	3375.17	3399.70	3446.63	90.03	71.46
244	2891.342	3098.15	3096.66	3247	205.32	148.85
245	2159.564	2516.57	2205.77	2638.65	46.20	122.08
246	1767.516	1960.27	1849.25	2024.89	81.73	64.62
247	1473.973	1618.52	1709.88	1779.11	235.90	160.59
248	1368.616	1420.97	1697.34	1703.6	328.72	282.63
249	1253.026	1310.4	1685.23	1691.28	432.21	380.88
250	1056.277	1153.25	1673.18	1679.2	616.90	525.95
251	881.076	967.35	1661.18	1667.17	780.10	699.82
252	764.842	822.27	1534.00	1597.17	769.16	774.9
253	670.268	717.04	1522.02	1528.01	851.76	810.97
254	506.05	586.24	1088.92	1299.44	582.87	713.2
255	301.134	399.18	622.13	844.71	321.00	445.53
256	45.43	154.51	45.40	278.53	-0.03	124.02
257	0.029	15.54	0.00	0	-0.03	-15.54
Total		30910		36297		5387
Notes	1. Volume (+) fill, (-) excavation 2. The volume included retaining wall for the propsoed conditon.				Volume (CY)	200



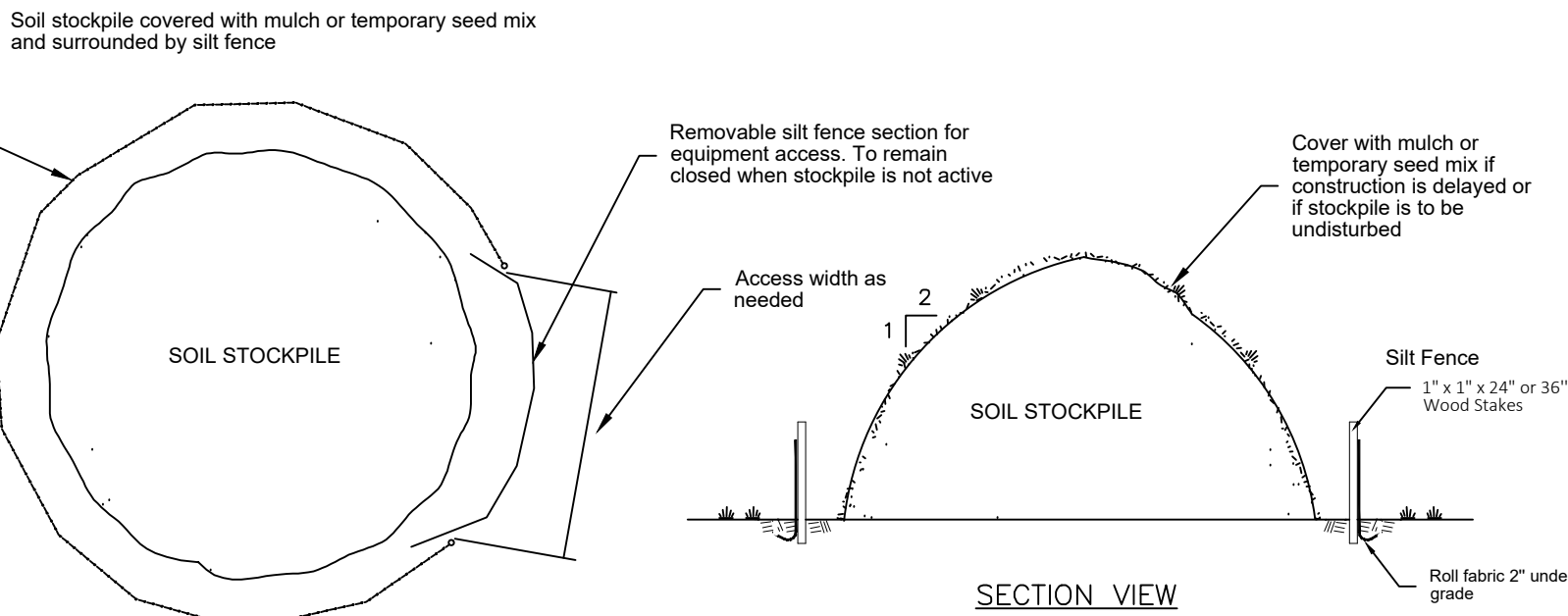
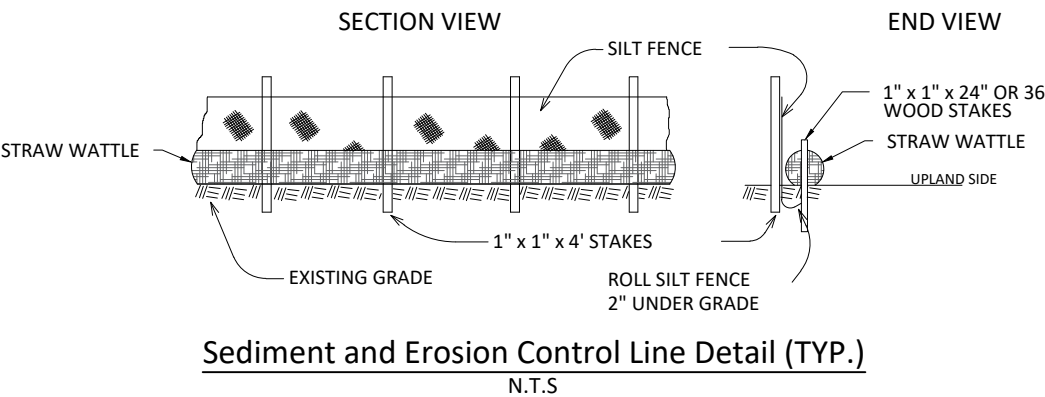
Depth, inches	Horizon	Texture	Matrix Color	Remarks
0 - 60	fill	cru stone, MS	10 YR 6/6	Frable

Weeping = none
Standing water = none
Estimated high ground water = 60" + (Elev=239 ft)
Permeability not tested.



STABILIZED CONSTRUCTION ENTRANCE

AGGREGATE TO BE PLACED AT ALL CONSTRUCTION ACCESS/EGRESS POINTS AND SHALL BE CLEARED OF EXCESS SEDIMENT ON A WEEKLY BASIS (OR MORE FREQUENTLY AS NEEDED). ANY SEDIMENT DEPOSITED ON THE PUBLIC ROADWAYS FROM CONSTRUCTION VEHICLES SHALL BE SWEEPED UP ON A DAILY BASIS.



SOIL STOCKPILE PROTECTION DETAIL (TYP.)

Retaining Wall Design Calculations (Geogrid part)

Seismic acceleration =	0.2	Stability (see details on separate page)
Max. Sl behind wall	10H : 1 V	
Safety factor		
Overturning	2	7.11 OK
Sliding	1.5	2.14 OK
Geogrid pullout	1.5	43.99 OK
Bearing capacity	3000	2248.6 OK
Lateral pressure coef, K	0.35	
Combined geogrid safety factor	0.9	
Friction angle, φ	34	deg
Geogrid Type		
Wall height, ft	22	
Geogrid vertical space, ft, ΔZ	1.8125	
Soil unit weight, γ	146	lbm/cu ft
Reinforcement	527	lbs/ft
Total required tensile strength per lift	1362.67	1022.00
Miragrid design strength	3226	2323
Factor of Safety,		
F=No c/H	1.50	2.37
Surcharge, ft	2.00	292.00
Pullout geogrid length, ft, (K γ Z ΔZ)/(2 γ fds tan φ)	0.52	0.52
Min. Geogrid L, ft	13.2	9.6
(Jewell, for global stability)	0.6	30
Design Geogrid Ld, ft	0.25	15.4
	23	15

Drain Calculations

Hydraulic conductivity, ft/s	0.0001
Groundwater depth, ft	10
Maximum flow, cfs/ft	0.001
Length of wall, ft	160
Total flow, cfs	0.16
Drain pipe Manning's n	0.011
Drain pipe diam, in	4
Drain pipe slope, ft/ft	0.01
Pipe flow capacity, cfs	0.24

General notes

- The deed record owner is OWNERS: LEAH CAROL HULSTROM REVOCABLE LIVING TRUST, 75 LAKE SHORE DRIVE, BELLINGHAM, MASS., Norfolk County Registry of Deed BK. 42631, PG. 194
- See Bellingham Assessor's Map 74, Lot 58 for property records.
- The Zoning district for the parcel is Suburban.
- The lot is shown in FEMA Zone X, the 0.2% annual chance floodplain. FIRM 25021C0311F, Effective 07/08/2025. The backyard lake is shown as Zone A without base flood elevation. The house and driveway, drainage system, water and sewer lines are all located outside of the AE zone in a minimal flood hazard zone X.
- The bearing basis of this survey refers to the Massachusetts state plane coordinate system (NAD '83) mainland system, based on RTK GPS observations on the Macors real-time network.
- The elevations shown refer to the north American vertical datum of 1988 based on RTK GPS observations on the Macors real-time network and are subject to local benchmark adjustment.
- This plan is based on information provided by a survey prepared in the field by Levesque Geomatics, Inc dated August 13, 2025.
- Owners of abutting properties are according to current assessor's records.
- This plan is only for the purpose of site grading work including retaining walls, gravel parking and stairway.
- The contractor is responsible for all existing utilities confirmed by Dig safe and related town records.
- The construction of the wall shall be inspected four (04) times by the design engineer:

- When the footing hole is excavated,
- After the sub base and large block had been installed
- When the second tier wall started, and
- IV When the wall and stairs are completed.

- If field conditions are to be changed, the contractor shall notify the design engineer and relevant Town and State agencies.

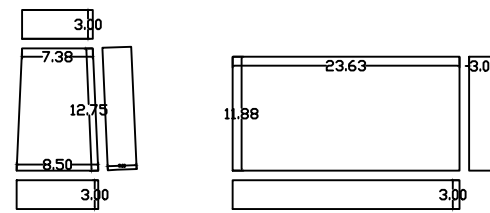
Retaining Wall Construction Notes:

- Install proper drainage in the backfill as shown in the detail.
- The reinforced soil design is based on Jewell et al. charts.
- The surcharge load is calculated based on the Caterpillar 963D.
- The footing hole should be excavated 1.5 feet below the original grade and filled with 0.5 feet of 1 to 1 1/2 inch crushed stones, compacted with a 3,600 lbf compactor to achieve a 95% compaction ratio.
- Reference: Jewell, R. A. (1991). Application of revised design charts for steep reinforced slopes, Geotextiles and Geomembranes, Vol. 10, No. 3, 1991, pp. 203-234.

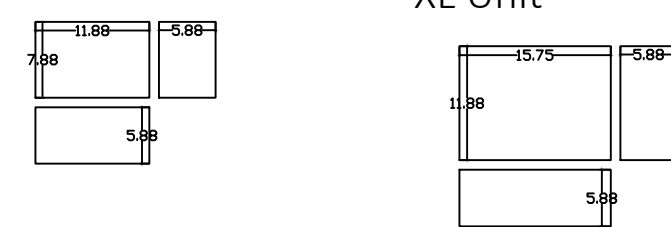
Construction Sequencing and Erosion Control Plan

- Stake work limits; install sediment and erosion controls.
- Schedule pre-construction meeting with Town Inspector and Design Engineer.
- Excavate the first-tier wall footings; request inspection.
- Build first tier wall and drainage system; inspect before backfill.
- Construct the second-tier wall and install guard rail.
- Lay Stratagrid 200 at the base block and every three course of blocks.
- SRW adhesive should be applied between each course of block.
- Conduct compaction tests and establish protocol for each compactor.
- Landscape and hydroseed disturbed areas.

Wedge Cap Unit



Coping/Step Tread



Corner

Unilock - Concord (Typical)

Creative Land & Water Engineering, LLC

Environmental Scientists and Engineers

P.O. Box 584 - Southborough - MA - 01772

774-454-0266 www.claweng.com

Plan Title:	Site Improvement Plan		
Project Name:	Retaining Walls		
Site Address:	75 Lakeshore Drive, Bellingham, MA		
Owner:	Leah Hulstrom	Client:	Leah Hulstrom
Project No:	J198-79	Drawn by:	HS, DSW
Designed by:	DSW, FA	Approved by:	DSW
Date:	10/7/2025	Scale:	Indicated
Sheet No:	1 of 1		
Rev.:	Date:	Description	By:

