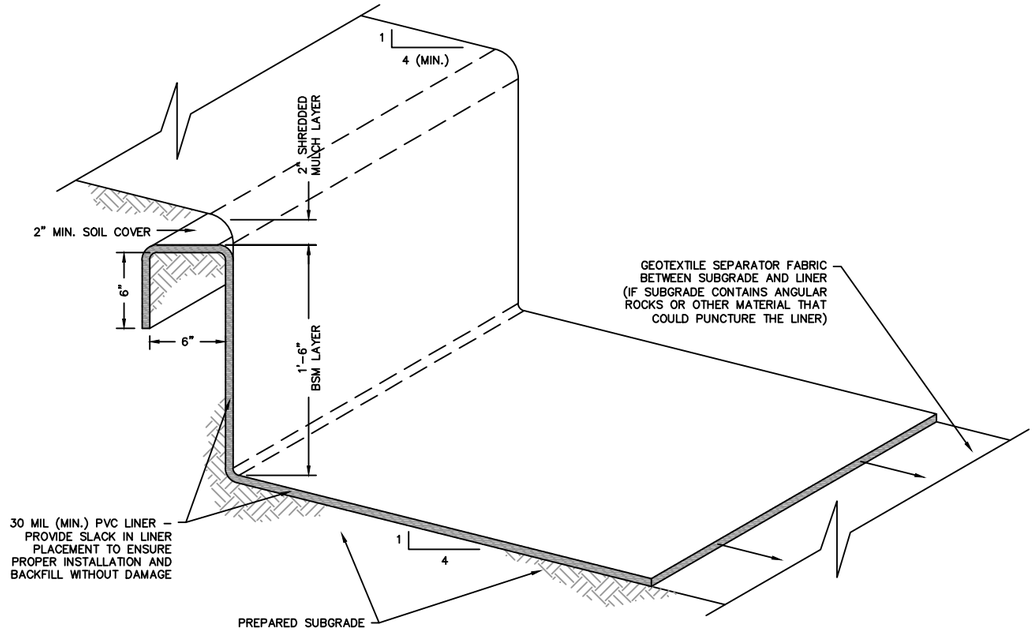
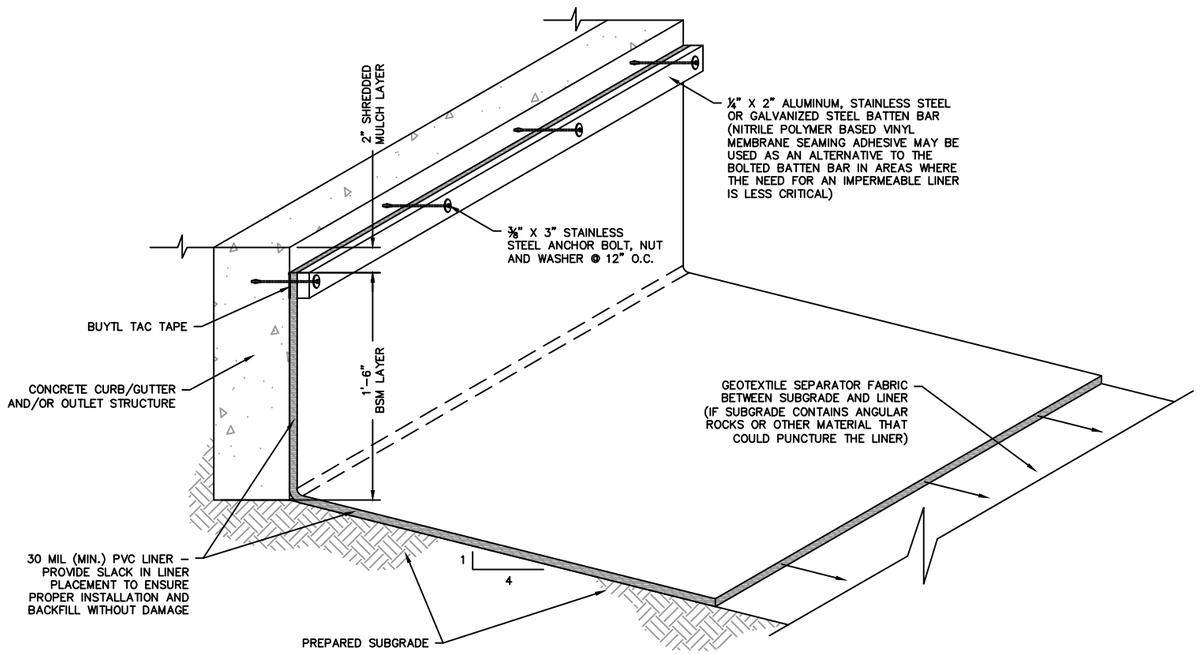


DETAIL 2 – IMPERMEABLE GEOMEMBRANE LINER/KEY IN DETAIL (NTS)



DETAIL 3 – IMPERMEABLE GEOMEMBRANE LINER/CONCRETE CONNECTION DETAIL (NTS)

1. BIORETENTION SOIL MEDIUM (BSM)
   1.1. BSM SHALL HAVE THE FOLLOWING MIX (PERCENT BY VOLUME): SAND 70–80%; LEAF COMPOST 5–10%; TOPSOIL 5–10%; SHREDDED CEDAR MULCH 5–10%
   1.2. SAND SHALL BE WASHED CLEAN AND FREE OF DELETERIOUS MATERIALS. ASTM C–33, 0.02"–0.04" GRAIN SIZE. CALCIUM CARBONATED OR DOLOMITIC SAND SUBSTITUTIONS ARE NOT ACCEPTABLE.
   1.3. CLASS I ORGANIC LEAF COMPOST SHALL CONSIST OF AGED LEAF MULCH AND SHALL BE THE RESULT OF BIOLOGICAL DEGRADATION AND TRANSFORMATION OF PLANT–DERIVED MATERIALS UNDER CONTROLLED CONDITIONS DESIGNED TO PROMOTE AEROBIC DECOMPOSITION, THE MATERIAL SHALL BE WELL COMPOSTED, FREE OF VIABLE WEED SEEDS AND CONTAIN MATERIAL OF A GENERALLY HUMUS NATURE CAPABLE OF SUSTAINING GROWTH OF VEGETATION, WITH NO MATERIALS TOXIC TO PLANT GROWTH. COMPOST SHALL BE PROVIDED BY A LOCAL US COMPOSTING COUNCIL SEAL OF TESTING ASSURANCE (STA) MEMBER. A COPY OF THE PROVIDER'S MOST RECENT INDEPENDENT STA TEST REPORT SHALL BE SUBMITTED TO AND APPROVED BY THE PROJECT MANAGER PRIOR TO DELIVERY OF BSM TO THE PROJECT SITE. COMPOST MATERIAL SHALL ALSO MEET THE FOLLOWING CRITERIA:
      - 100 PERCENT OF THE MATERIAL SHALL PASS THROUGH A 1/2 INCH SCREEN
      - PH OF THE MATERIAL SHALL BE BETWEEN 6.0 AND 8.4
      - MOISTURE CONTENT SHALL BE BETWEEN 35 AND 50 PERCENT
      - MATURITY GREATER THAN 80 PERCENT (MATURITY INDICATOR EXPRESSED AS PERCENTAGE OF GERMINATION/VIGOR, 80+/80+)
      - MATURITY INDICATOR EXPRESSED AS CARBON TO NITROGEN RATIO < 12
      - MATURITY INDICATOR EXPRESSED AS AMMONIA(N)/NITRATE(N) RATIO < 4
      - MINIMUM ORGANIC MATTER SHALL BE 40 PERCENT DRY WEIGHT BASIS
      - SOLUBLE SALT CONTENT SHALL BE NOT GREATER THAN 5500 PARTS PER MILLION OR 0–5 MMHOS/CM
      - PHOSPHORUS CONTENT SHALL BE NO GREATER THAN 15 PARTS PER MILLION
      - HEAVY METALS (TRACE) SHALL NOT EXCEED 0.5 PARTS PER MILLION
      - CHEMICAL CONTAMINANTS: MEET OR EXCEED US EPA CLASS A STANDARD, 40 CFR 503.13, TABLES 1 & 3 LEVELS
      - PATHOGENS: MEET OR EXCEED US EPA CLASS A STANDARD, 40 CFR 503.32(A) LEVELS
   1.4. TOPSOIL SHALL HAVE LESS THAN 5% CLAY AND BE CLASSIFIED AS A SANDY LOAM, LOAMY SAND, OR LOAM PER USDA TEXTURAL TRIANGLE. ONSITE, NATIVE MATERIAL SHALL NOT BE USED AS TOPSOIL. TEXTURAL ANALYSIS SHALL BE PERFORMED ON TOPSOIL, PREFERABLY AT ITS SOURCE, PRIOR TO INCLUDING TOPSOIL IN THE MIX. TOPSOIL SHALL BE FREE OF SUBSOIL, DEBRIS, WEEDS, FOREIGN MATTER, AND ANY OTHER MATERIAL DELETERIOUS TO PLANT HEALTH. TOPSOIL SHALL HAVE A PH RANGE OF 5.5 TO 7.5 AND MOISTURE CONTENT BETWEEN 25–55%. CONTRACTOR SHALL CERTIFY THAT TOPSOIL MEETS THESE SPECIFICATIONS.
   1.5. SHREDDED (3X) CEDAR MULCH SHALL BE 100 PERCENT ORGANIC AND FREE OF STAINS, PAINTS, CHEMICAL TREATMENTS, ETC.
   1.6. BSM SHALL BE UNIFORMLY MIXED, UNCOMPACTED, FREE OF STONES, STUMPS, ROOTS, OR OTHER SIMILAR OBJECTS LARGER THAN TWO INCHES. NO OTHER MATERIALS OR SUBSTANCES SHALL BE MIXED OR DUMPED WITHIN THE BIORETENTION AREA THAT MAY BE HARMFUL TO PLANT GROWTH OR PROVE A HINDRANCE TO THE FACILITY'S FUNCTION AND MAINTENANCE.
   1.7. BSM SHALL BE FREE OF PLANT OR SEED MATERIAL OF NON–NATIVE, INVASIVE SPECIES, OR WEEDS.
   1.8. FULLY MIXED BSM SHALL BE TESTED PRIOR TO INSTALLATION AND HAVE A LOW P–INDEX OF LESS THAN 30, PH OF 5.5–6.5, CATION EXCHANGE CAPACITY (CEC) GREATER THAN 10, PHOSPHOROUS (PHOSPHATE, P205) NOT TO EXCEED 69 PPM. SHOULD PH FALL OUTSIDE OF THE ACCEPTABLE RANGE, IT MAY BE MODIFIED WITH LIME (TO RAISE) OR IRON SULFATE PLUS SULFUR (TO LOWER). THE LIME OR IRON SULFATE MUST BE MIXED UNIFORMLY INTO THE BSM PRIOR TO USE IN THE BIORETENTION FACILITY.
   1.9. BSM SHALL BE DELIVERED FULLY MIXED. ONSITE MIXING OF PILES WILL NOT BE ALLOWED. MIXING OF THE BSM TO A HOMOGENEOUS CONSISTENCY SHALL BE DONE TO THE SATISFACTION OF THE PROJECT MANAGER.
2. MULCH – ROCK MULCH SHALL NOT BE ALLOWED WITHIN THE BIORETENTION AREA. MULCH SHALL BE AGED, SHREDDED (3X), CHEMICAL FREE, APPLIED TO A 2–INCH LAYER OVER THE SURFACE OF THE FILTER BED.
3. UNDERDRAIN – A 6–INCH DIAMETER PVC, SDR–35 AND ALL REQUIRED FITTINGS. PERFORATED UNDERDRAIN (WITHIN THE FILTER BED) SHALL HAVE 1/2" PERFORATIONS AT 6–INCH O.C. OR APPROVED EQUIVALENT.
4. UNDERDRAIN BEDDING AND RESERVOIR STORAGE LAYER – WASHED NO. 4 COARSE AGGREGATE PER CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
5. GRAVEL DIAPHRAGM LAYER – CLEAN AND WASHED ROUND "PEA GRAVEL" PER ASTM D448, 1/4" – 1/2" DIAMETER PEBBLES; 3/8" AVERAGE SIZE.
6. PLANTINGS – PLANTING AND SEEDING SHALL OCCUR IN EITHER APRIL – MAY OR IN SEPTEMBER – OCTOBER.
7. BSM/PLANTINGS SHALL NOT BE INSTALLED/PLANTED UNTIL ALL CONSTRUCTION IS COMPLETE ON SITE.

NATIVE SEED MIX FOR BIORETENTION PONDS

COMMON NAME	SCIENTIFIC NAME	VARIETY	PLS (LBS/ACRE)	OUNCES/ACRE
SAND BLUESTEM	ANDROPOGON HALLII	GARDEN	3.5	
SIDEOATS GRAMA	BOUTELOUA CURTIPENDULA	BUTTE	3	
PRAIRIE SANDREED	CALAMOVILFA LONGIFOLIA	GOSHEN	3	
INDIAN RICEGRASS	ORYZOPSIS HYMENOIDES	PALOMA	3	
SWITCHGRASS	PANICUM VIRGATUM	BLACKWELL	4	
WESTERN WHEATGRASS	PASCOPYRUM SMITHII	ARIBA	3	
LITTLE BLUESTEM	SCHIZACHYRIUM SCOPARIUM	PATURA	3	
ALKALI SACATON	SPOROBOLUS AIROIDES		3	
SAND DROPSEED	SPOROBOLUS CRYPTANDRUS		3	
* PASTURE SAGE	ARTEMISIA FRIGIDA			2
* BLUE ASTER	ASTER LAEVIS			4
* BLANKET FLOWER	GAILLARDIA ARISTATA			8
* LEWIS FLAX	LINUM LEWISII			6
* PRAIRIE CONEFLOWER	RATIBIDA COLUMNIFERA			4
* PURPLE PRAIRIE CLOVER	DALEA (PETALOSTEMUM) PURPUREA			4
		SUB–TOTALS	27.5	28
		TOTAL LBS/ACRE	29.3	

PLANTINGS (1 GALLON OR LARGER/NO SEED)
1. NATIVE GRASSES
   1.1. SWITCHGRASS (PANICUM VIRGATUM) – THIS SHOULD BE THE PRIMARY GRASS USED WITH ANY OTHER GRASSES USED, PLACED IN DECORATIVE CLUSTERS.
   1.2. BIG BLUESTEM (ANDROPOGON GERARDII)
   1.3. LITTLE BLUESTEM (ANDROPOGON SCOPARIUS)
2. NATIVE OR DRYLAND FLOWERS
   2.1. SEDUM AUTUMN FIRE
   2.2. ARIZONA SUN BLANKET FLOWER (GAILLARDIA GRANDIFLORA ARIZONA SUN OR GAILLARDIA ARISTATA).
3. OR ADDITIONAL OTHER PLANTINGS IF SPECIFICALLY APPROVED AND DEMONSTRATED TO BE SUITABLE FOR A BIORETENTION ENVIRONMENT.

BIORETENTION / RAINGARDEN

CITY OF LOVELAND
PUBLIC WORKS DEPT.
STORMWATER

STORMWATER CONSTRUCTION DRAWINGS

APPROVED: **KWG**
DATE: **SEPTEMBER 2020**
DRAWN BY: **AMH**

DRAWING
SW–20