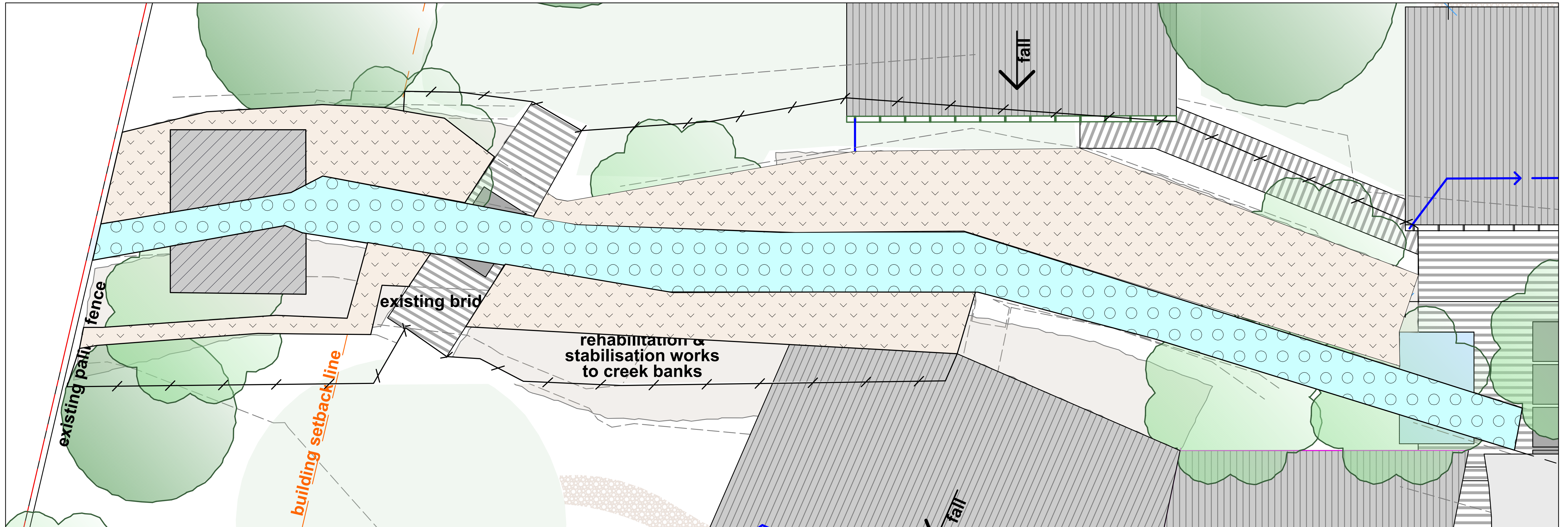
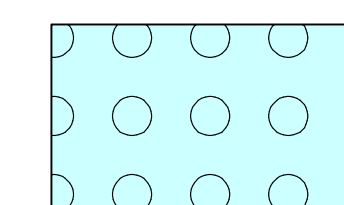


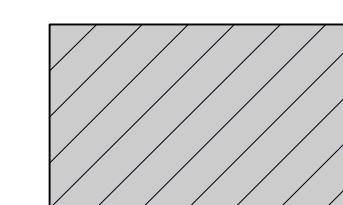
2A Ruskin Rowe Creek Remediation Plan



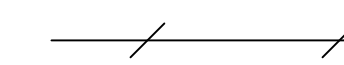
LEGEND



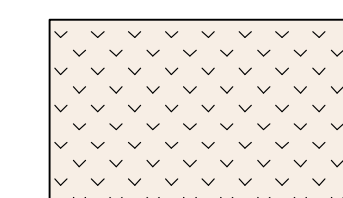
Channel Base Rip Rap



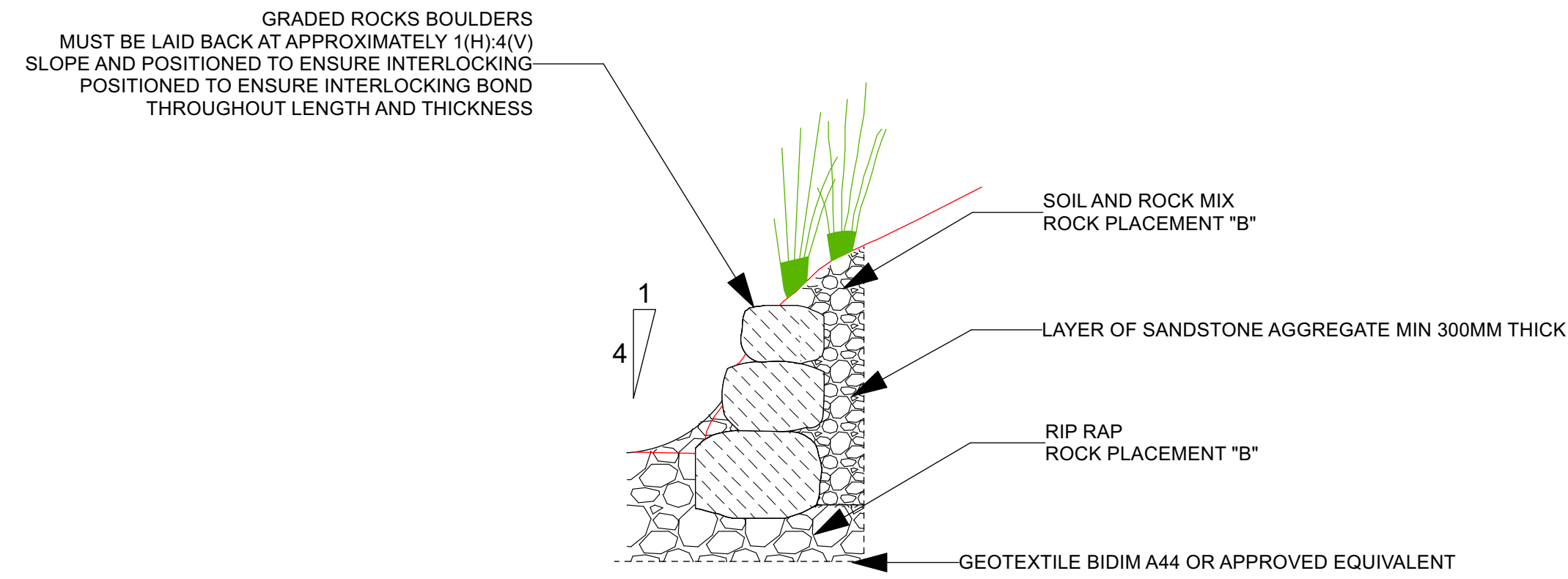
Energy Dissipation Zone with Rip Rap Base Pool



Extent To Rebatter



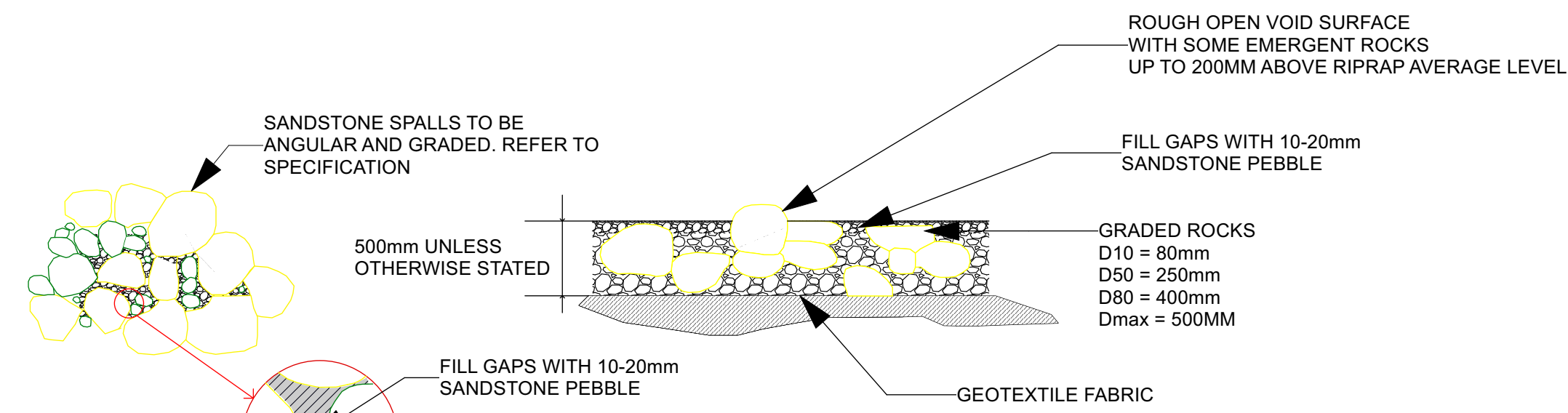
Rock Boulder Wall



TYPICAL CHANNEL BANK PROTECTION
SCALE 1:25@A1

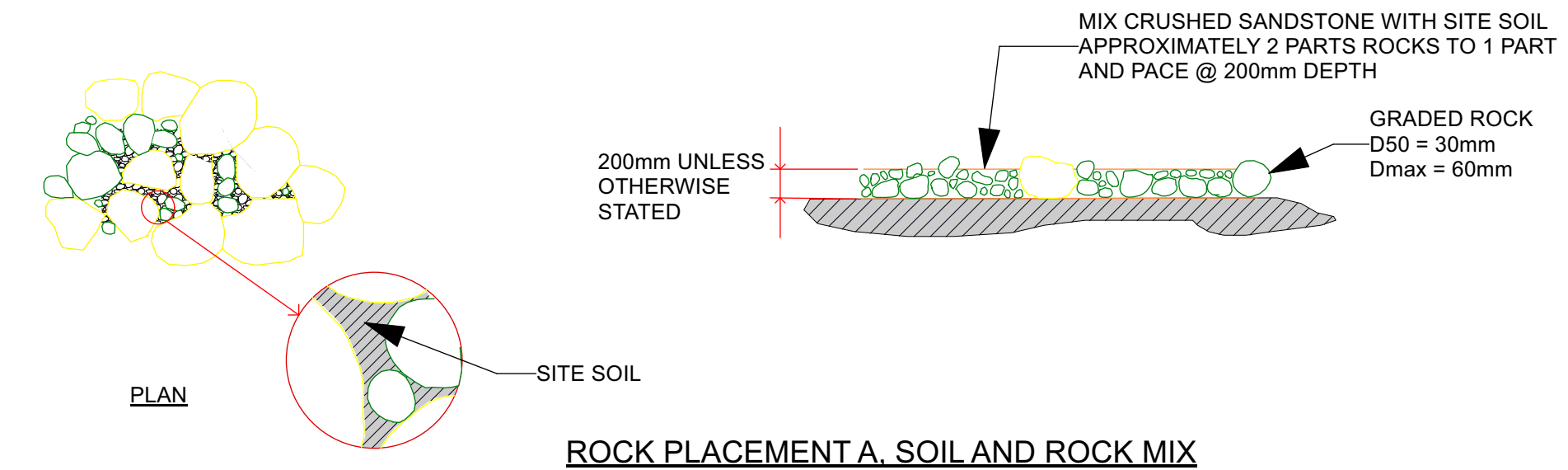
ROCK SIZING TABLE			
ROCK TYPE	TREATMENT	SIZE	COMMENT
01: SANDSTONE PEBBLE	RIP RAP	10-20mm	TO BE USED TO FILL SPALLS VOIDS IN ROCK TOE PROTECTION
02: ANGULAR AGGREGATE	ROCK/LOG WALL BEDDING, DRAINAGE AND BACKFILLING (SOIL AND ROCK MIX)	30mm TO 60mm SIZES	AGGREGATES MUST BE SOUND, CLEAN, HARD, DURABLE, AND FREE OF FINES
03: SANDSTONE SPALLS	RIPRAP	D10 = 80mm D50 = 250mm D80 = 400mm Dmax = 500mm	SANDSTONE SPALLS TO BE ANGULAR, GRADED AND MIXED PRIOR PLACEMENT
04: SANDSTONE BOULDERS	ROCK BOULDER WALL	GRADED ROCK BOULDERS L(0.4-1.0m) x W(0.4-0.6m) x H(0.25-0.5m)	USE LARGER BOULDERS ON ROCK WALL FOOTING

- NOTES:
- HEIGHT OF ROCK WALLS VARY . REFER TO CROSS SECTIONS FOR DETAIL
 - MATERIAL USED FOR BACKFILLING BEHIND THE WALL SHALL BE GRANULAR MATERIALS CONSISTING SANDSTONE AGGREGATE (30-60mm). ANY COMPACTION OF FILL PLACED BEHIND THE WALL SHALL BE CAREFULLY CARRIED OUT TO MINIMISE THE INDUSED LATERAL STRESS AGAINST THE WALL. ROCK SPALLS USED FOR TEMPORARY ROCK PROTECTION MAY BE MIXED WITH SANDSTONE AGGREGATE

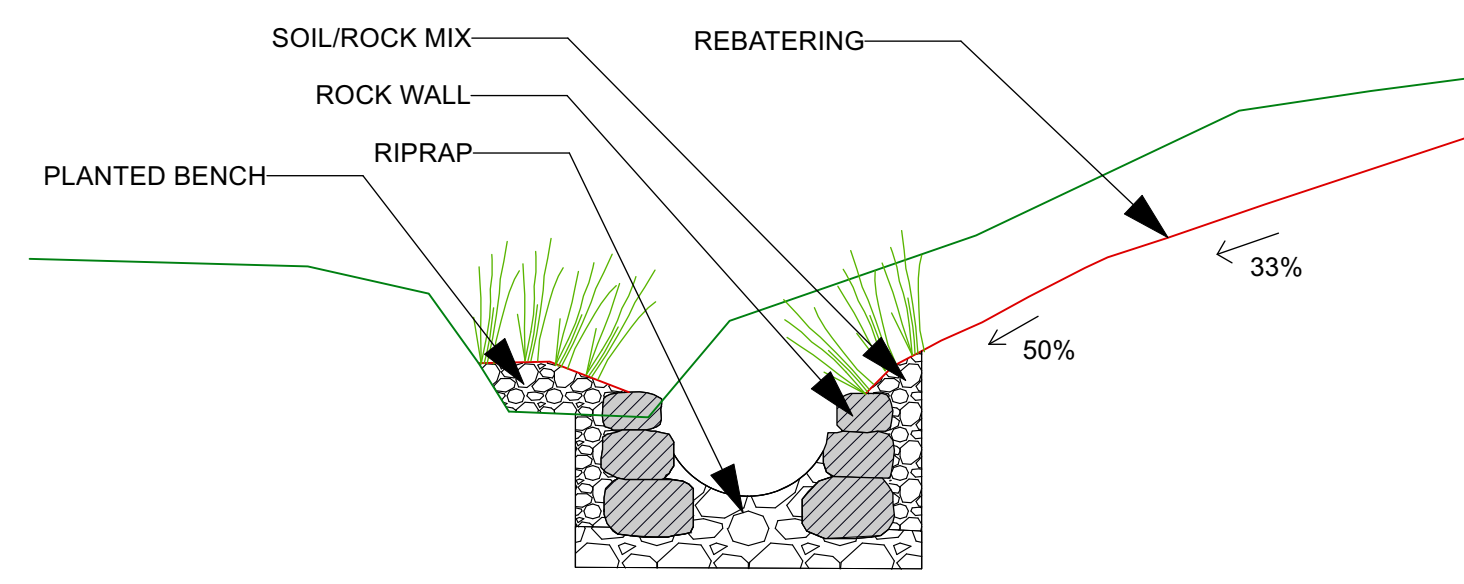


ROCK PLACEMENT B, RIPRAP

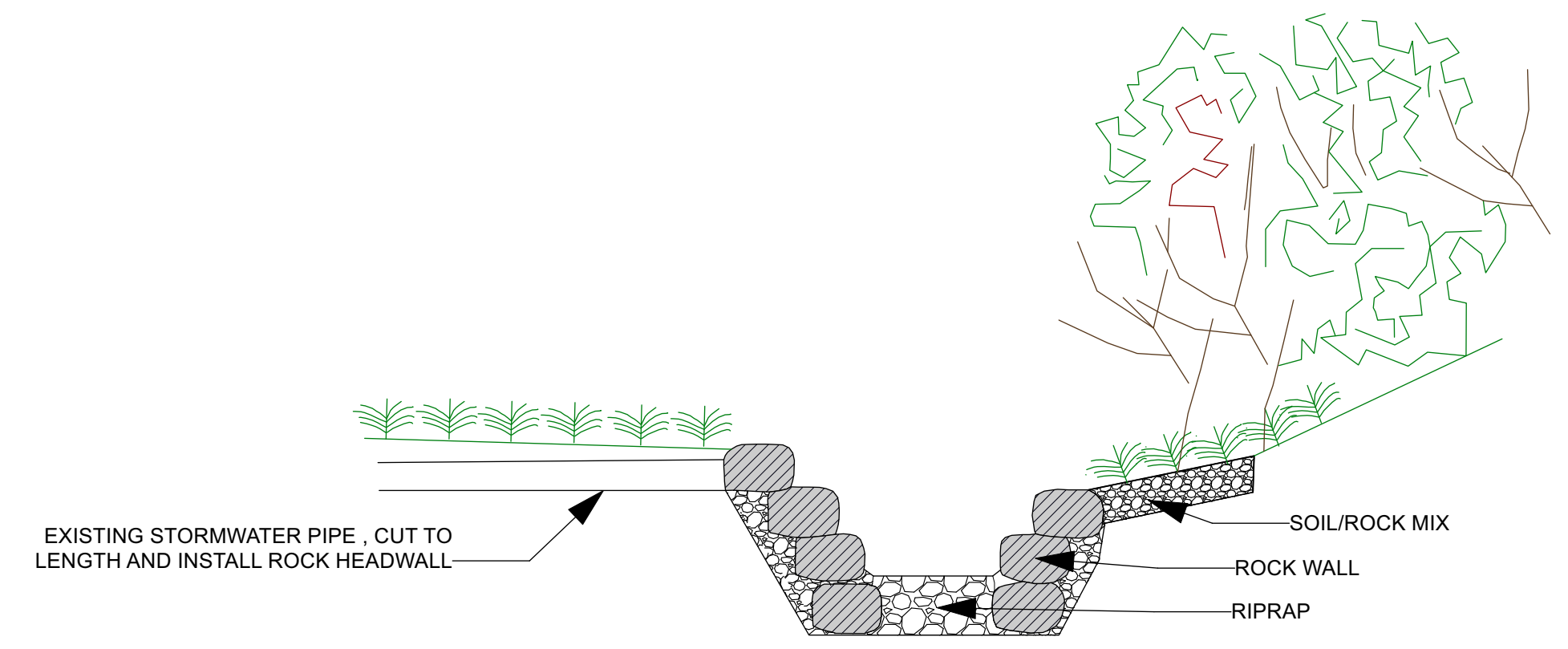
RIP-RAP INSTALLATION NOTE:
RIP-RAP SMALLER THAN 150MM IS TO BE USED TO FILL VOIDS AND IS TO BE LOCKED INTO POSITION WITH LARGER STONES. SMALL RIP-RAP ON THE SURFACE LAYER SHOULD NOT BE ABLE TO BE DISPLACED WITHOUT DISPLACING LARGER STONES. FILL REMAINING VOIDS WITH SANDSTONE PEBBLES



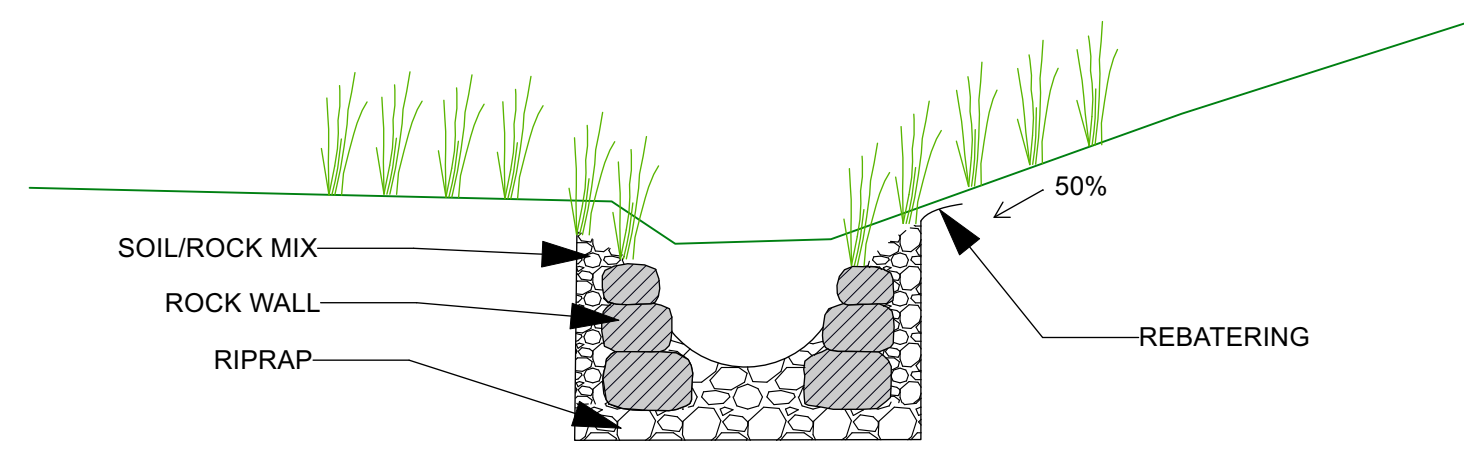
ROCK PLACEMENT A, SOIL AND ROCK MIX



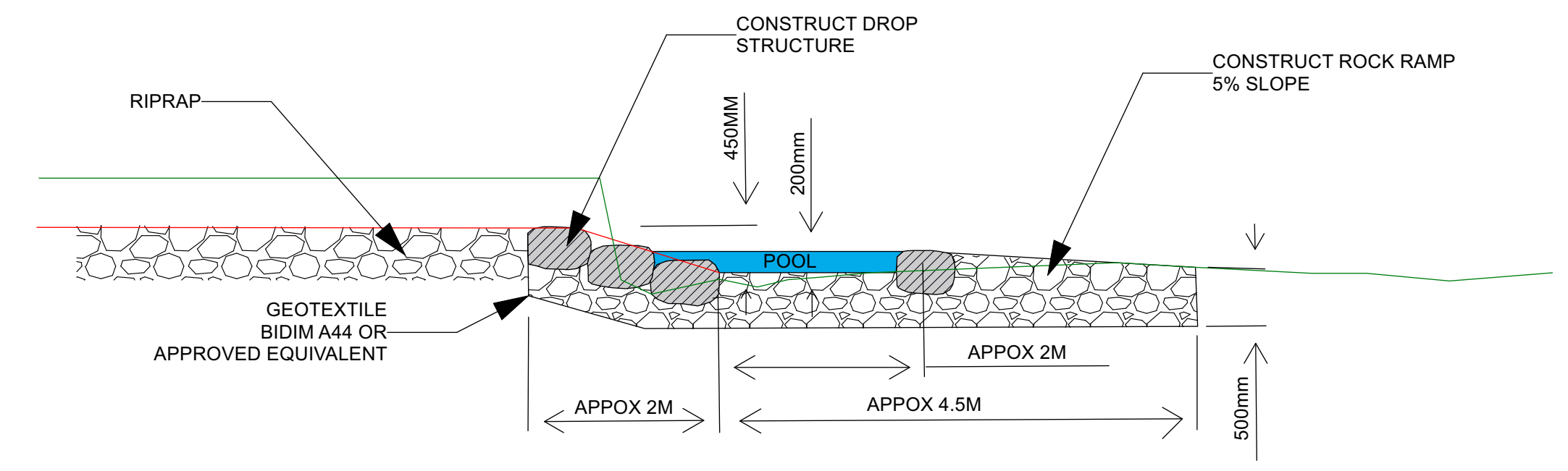
CH 15 DETAIL SECTION
SCALE 1:50@A1



CH 57 DETAIL SECTION
SCALE 1:50@A1



CH 30 DETAIL SECTION
SCALE 1:50@A1



ROCK - RAMP LONG SECTION
SCALE 1:50@A1

ROCK WORKS

1. ROCK SUPPLY:

ROCK SIZES ARE SPECIFIED ACCORDING TO THE IR POSITION AND RESISTANCE TO HYDRAULIC FORCES. THE ROCK HAS BEEN SHOWN SCHEMATICALLY IN THE DRAWINGS. ROCKS DIMENSIONS TO BE AS PER TABLE BELOW:

ROCK TYPE	TREATMENT	SIZE	COMMENT
01: SANDSTONE PEBBLE	RIPRAP	10- 20MM	TO BE USED TO FILL SPALLS VOIDS IN ROCK TOE PROTECTION
02: ANGULAR AGGREGATE	ROCK/LOG WALL BEDDING, DRAINAGE AND BACKFILLING	30MM TO 60MM SIZES	AGGREGATES MUST BE SOUND, CLEAN, HARD, DURABLE, AND FREE OF EXCESSIVE FINES
03: SANDSTONE SPALLS	RIPRAP	Dm - 80MM Dso - 250MM D ₆₀ - 500MM D _{MAX} - 600MM	USE LARGER BOULDERS ROCK WALL FOOTING ON ROCK WALL FOOTING
04: SANDSTONE BOULDERS	ROCK BOULDER WALL	GRADED ROCK BOULDERS L(0.4 - 1.0M) X W(0.4-0.6M) X H(0.2-0.5M)	USE LARGER BOULDERS ON ROCK WALL FOOTING

ROCK SUPPLIED FOR RIP-RAP AND ROCK WALL MUST BE HARD, DURABLE SANDSTONE. ROCK IN THE FORM OF BLOCKS WITH ANGULAR EDGES IS REQUIRED TO ENSURE CONSISTENT INTERLOCKING DURING PLACEMENT. ROCK IS TO BE IN THE NATURAL FORM AND NOT CUT OR SHAPED EXCEPT WHERE SPECIFIED. RETAINED SHALL BE CLEARED AND/OR WHOLLY GRUBBED, AND TOGETHER WITH ALL LYING AND FALLEN AND PLUMB, AND WITH THE TOP SOIL LEVEL OF THE PLANT ROOT BALL LEVEL WITH THE FINISHED ROCKS OBTAINED FROM BULK EXCAVATIONS IS GENERALLY SUITABLE SUBJECT TO INSPECTION. ROCK IMPORTED TO SITE IS TO BE INSPECTED AND APPROVED BY THE SUPERINTENDENT PRIOR TO USE ON SITE. THIS CONSTITUTES A HOLD POINT ON SELECTION OF A ROCK SUPPLY, TESTING OR CERTIFICATION OF THE ROCK TO BE SUPPLIED MUST BE PROVIDED TO ENSURE COMPLIANCE WITH THE FOLLOWING REQUIREMENTS (UNLESS OTHERWISE APPROVED BY THE SUPERINTENDENT)

RELEVANT TESTING REQUIREMENTS FOR ROCK SUPPLY:

TEST	REFERENCE	REQUIREMENTS
PARTICLE DENSITY	AS 1141.6	NOT LESS THAN 2.4
SULPHATE SOUNDNESS	AS 1141.24	NOT LESS THAN 85%
LOS ANGELES ABRASION	AS 1141.23	LESS THAN 35% LOSS OF WEIGHT AFTER 500 REVOLUTIONS
WATER ABSORPTION	AS 1141.6	NOT LESS THAN 2%
TEN PERCENT FINES	BS 812: PART 11.1 : 1990	NOT LESS THAN 80KN

- ROCKS SHALL BE REASONABLY WELL GRADED THROUGHOUT THE LAYER THICKNESS. EACH LOAD OF ROCKS SHALL BE REASONABLY WELL GRADED FROM THE SMALLEST TO THE MAXIMUM SIZE SPECIFIED. STONES SMALLER THAN THE SPECIFIED MIN. PERCENT SIZE SHALL NOT BE PERMITTED IN AN AMOUNT EXCEEDING 10 PERCENT BY WEIGHT OF EACH LOAD.
- THE FIRST ROCK SUPPLY LOAD SHALL BE VISUALLY INSPECTED FOR GRADATION (WOLMAN ROCK COUNT) AND CHECKED AGAINST THE SPECIFICATIONS LISTED IN THIS DOCUMENT (SIZE AND DIMENSION). A VISUAL INSPECTION SHALL BE UNDERTAKEN FOR EVERY 30T (OR EVERY 3 LOADS) SUPPLIED
- ROCK PLACEMENT:**
 - ROCK FOR GRAVEL, AGGREGATE AND RIPRAP SHOULD BE PLACED FROM AN EXCAVATOR BUCKET. NOT DUMPED FROM A TRUCK. TO ENSURE A CONSISTENT GRADATION AND SUITABLE INTERLOCKING OF ROCK, PLACEMENT SHOULD BE NO MORE THAN HALF A BUCKET AT A TIME. EACH HALF BUCKET SHOULD BE RELEASED AT, OR CLOSE TO ITS FINAL POSITION AND NOT ALLOWED TO ROLL DOWN THE SLOPE. ROCK SHOULD BE RELEASED CLOSE TO THE SURFACE AND NOT RELEASED FROM A HEIGHT
 - ROCKS MAY BE LAID WITH A ROCK GRAB FITTED TO AN EXCAVATOR AND THEN POSITIONED BY HAND TO ACHIEVE APPROPRIATE INTERLOCKING
 - SURFACES SHOULD BE ADEQUATELY PREPARED PRIOR TO PLACEMENT OF GEOTEX TILE AND ROCK; ALL SURFACES SHOULD BE FIRM AND FREE OF PLANT ROOTS AND DEBRIS. THE FOUNDATION OF ROCK WALLS MUST BE FIRM PRIOR TO PLACEMENT OF ROCKS.
 - ROCKWORK MUST ALIGN WITH THE DESIGN SURFACE LEVEL AS SHOWN IN THE DRAWINGS.
- GEOTEXTILE:**

SYNTHETIC GEOTEXTILE SHOULD BE HEAVY DUTY A44 BIDIM OR APPROVED EQUIVALENT. LAY MATERIAL ON A SMOOTH SURFACE FREE OF IRREGULARITIES, VEGETATION AND STONES WITH EDGES FOLDED UNDER SURFACE MATERIAL AS SHOWN ON THESE DRAWINGS. OVERLAP OF MINIMUM 0.3M IS REQUIRED BETWEEN THE SHEETS. LAP THE UNSLOP SHEET OVER THAT OF THE DOWNSLOP SHEET. NO ROCK IS TO BE LAID UNDERNEATH GEOTEXTILE EXCEPT WHERE SHOWN SPECIFICALLY ON THE DRAWINGS. IF IRREGULARITIES EXIST IN THE FOUNDATION, LAY GEOTEXTILE UNDERNEATH GRAVEL AND/OR ROCK SPALLS TO PREPARE FOR ROCK PLACEMENT. CARE SHALL BE TAKEN DURING THE INSTALLATION TO ENSURE THAT THE GEOTEXTILE IS NOT DAMAGED.
- SUPERVISION:**

THE SUPERINTENDENT OR A REPRESENTATIVE IS TO BE PRESENT DURING PLACEMENT OF ALL ROCK STRUCTURES TO ENSURE THAT THE CONFIGURATION AND LEVEL VARIATIONS ARE MET.

ROCK WALL FOUNDATION PREPARATION

THE FOUNDATION FOR THE ROCK WALL SHALL BE PREPARED AS FOLLOWS:

- EXCAVATE AND REMOVE ALLUVIUM WITHIN THE FOOTPRINT OF THE ROCK WALL FOOTING AT THE CREEK BED (TOE OF THE CREEK BANK) TO DEPTHS OF APPROXIMATELY 500mm TO 800mm BELOW THE CREEK BED. THE LENGTH OF THE EXCAVATION SHOULD BE THE SAME AS THE LENGTH OF THE ROCK WALL AND THE WIDTH OF THE EXCAVATION SHOULD BE AT LEAST 800mm. DURING INCLEMENT WEATHER, THIS EXCAVATION MAY ENCOUNTER GROUNDWATER OR CREEK WATER INFLOW. THEREFORE, ARRANGEMENT SHOULD BE MADE TO PUMP WATER OUT SO THAT THE EXCAVATION IS KEPT DRY.
- COMPACT ALLUVIUM EXPOSED AT THE BASE OF EXCAVATION TO ACHIEVE DENSITY INDEX OF APPROXIMATELY 70%. DUE TO LIMITED SITE ACCESS A HAND HELD COMPACTOR MAY BE REQUIRED.
- IF THE SUBSOIL (ALLUVIUM) ARE UNSUITABLE FOR REQUIRED COMPACTION, CONSTRUCT A GEOGRID REINFORCED FOUNDATION BASE (400mm THICK ABOVE INSITU COMPACTED ALLUVIUM). THE GEOGRID REINFORCED FOUNDATION BASE IS TO COMPRISE ONE LAYER OF 200mm THICK ANGULAR AGGREGATE (30mm TO 60mm SIZES) WITH A GEOGRID (TENSAR SS30 OR APPROVED EQUIVALENT) PLACED AT THE BASE AND TOP OF AGGREGATE LAYER.
- PLACE GEOTEXTILE AND APPROXIMATELY 300mm THICK AGGREGATE BASE PRIOR ROCK BOULDER PLACEMENT.

EARTHWORKS

- LOOSE MATERIALS FROM THE FACE AND TOE OF THE CREEK BANK SHOULD BE REMOVED BEFORE
- INSTALLATION OF THE ROCK WALL. FOR SHORT TERM STABILITY DURING CONSTRUCTION, WE RECOMMEND THAT THE CREEK BANK IS BATTERED AT 1 VERTICAL TO 1 HORIZONTAL. VERTICAL FACES SHALL NOT BE LEFT EXPOSED FOR MORE THAN ONE WEEK.
- CLEARING AND GRUBBING

TREES AND WEEDS IDENTIFIED FOR REMOVAL MUST BE MANAGED ACCORDING TO COUNCIL GUIDELINES. CLEARING AND GRUBBING SHALL BE RESTRICTED TO THE IMMEDIATE WORKS AREA REQUIRED TO ALLOW CONSTRUCTION OF THE PROJECT FEATURES, UNLESS DIRECTED OR APPROVED BY THE SUPERINTENDENT. THE PRESCRIBED MATERIALS, BEING FENCES, CONCRETE AND/OR BRICK FOUNDATIONS, STRUCTURES OF ALL DESCRIPTIONS, TREES, SHRUBS, SCRUB, STUMPS, LOGS, BOULDERS AND ROOTS EXCEPT THOSE FENCES, STRUCTURES, TREES, SHRUBS AND/OR ITEMS WHICH THE SUPERINTENDENT MAY DIRECT TO BE RETAINED SHALL BE CLEARED AND/OR WHOLLY GRUBBED, AND TOGETHER WITH ALL LYING AND FALLEN TIMBER, RUBBISH AND DEBRIS OF EVERY DESCRIPTION, SHALL BE CLASSIFIED AND TRANSPORTED TO THE APPROPRIATE WASTE MANAGEMENT OR LANDFILL FACILITY.
- REMOVAL OF TOPSOIL
 - SCOPE

DEFINITION: TOPSOIL IS SURFACE SOIL WHICH IS REASONABLY FREE FROM SUBSOIL, REFUSE, CLAY LUMPS AND STONES. PREREQUISITES: REMOVAL OF TOPSOIL FROM ANY SECTION OF THE WORKS SHALL ONLY COMMENCE AFTER EROSION AND SEDIMENTATION CONTROLS HAVE BEEN IMPLEMENTED. EXTENT OF WORK: TOPSOIL THROUGHOUT THE AREAS TO BE CUT AND FILLED, SHALL BE REMOVED AND STOCKPILED SEPARATELY, CLEAR OF WORK, WITH CARE TAKEN TO AVOID CONTAMINATION BY OTHER MATERIALS.
 - EXCAVATION
 - EXTENT

EXCAVATE OVER THE SITE TO GIVE CORRECT LEVELS AND PROFILES AS THE BASIS FOR STRUCTURES, FILLING AND LANDSCAPING. EXCAVATE FOR PITS AND PIPE TRENCHES TO THE REQUIRED SIZES AND DEPTHS. CONFIRM THAT BEARING CAPACITY IS ADEQUATE AND PROVIDE ALLOWANCE FOR COMPACTION AND SETTLEMENT
 - PLACING FILL

GENERAL: PLACE FILL IN NEAR HORIZONTAL LAYERS OF UNIFORM THICKNESS, DEPOSITED SYSTEMATICALLY ACROSS THE FILL AREA. EXTENT: PLACE AND COMPACT FILL TO THE DESIGNATED DIMENSIONS, LEVELS, GRADES AND CROSS SECTIONS SO THE SURFACE IS ALWAYS SELF DRAWING. EDGES: AT JUNCTIONS OF FILL AND EXISTING SURFACES, DO NOT FEATHER THE EDGES. MIX: PLACE FILL IN A UNIFORM MIXTURE PREVIOUS FILL: BEFORE PLACING SUBSEQUENT FILL LAYERS, ENSURE THAT PREVIOUS FILL LAYERS CONFORM TO REQUIREMENTS, INCLUDING MOISTURE CONTENT. PROTECTION: PROTECT THE WORKS FROM DAMAGE DUE TO COMPACTION OPERATIONS. WHERE NECESSARY, LIMIT THE SIZE OF COMPACTION EQUIPMENT OR COMPACT BY HAND. COMMENCE COMPACTING EACH LAYER AT THE STRUCTURE AND PROCEED AWAY FROM IT. PROTECTIVE COVERING: DO NOT DISTURB OR DAMAGE THE PROTECTIVE COVERING OF MEMBRANES DURING BACKFILLING. PLACING AT STRUCTURES GENERAL: PLACE AND COMPACT FILL IN LAYERS SIMULTANEOUSLY ON BOTH SIDES OF STRUCTURES AND ROCK WORKS TO AVOID DIFFERENTIAL LOADING. CAREFULLY PLACE FIRST LAYERS OF FILL OVER THE TOP OF STRUCTURES.
 - PLACEMENT OF SOIL COVER

ALL AREAS WHERE TOPSOIL IS REMOVED DURING THE WORKS SHALL HAVE SOIL COVER REINSTATED. CULTIVATE AND AMELIORATE TOP SOIL WITH COMPOST IF THE TOP SOIL QUALITY DEEMED UNSATISFACTORY BY THE SITE SUPERINTENDENT. ANY STOCKPILED TOPSOIL SHALL BE RE-USED IN THE WORKS UNLESS DEEMED UNSATISFACTORY BY THE SUPERINTENDENT. THE SOIL COVER SHALL BE PLACED ON THE PREPARED SUBGRADE SURFACE TO A MINIMUM DEPTH OF 100mm IN A MANNER THAT WILL NOT CREATE EXCESSIVE COMPACTION (I.E TO ALLOW FOR VIGOROUS PLANT GROWTH). SOIL COVER SHALL BE UNDERTAKEN PRIOR TO THE INSTALLATION OF JUTE MESH AND NATIVE SEEDLINGS.

PLANTING NOTES

- PRE-ORDERING OF PLANT MATERIALS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL PLANT MATERIAL IS AVAILABLE TO SIZES AND SPECIES TYPE NOMINATED IN THE PLANT SCHEDULES. FOR SPECIMENS IN LARGE QUANTITIES THIS WILL REQUIRE THE PRE-ORDERING AND GROWING ON OF SPECIES BY A SELECTED NURSERY FOR AN EXTENSIVE PERIOD OF TIME PRIOR TO THEIR INSTALLATION. PROPOSED PRE ORDERED SPECIMENS ARE TO BE SOURCED AND APPROVED IN CONSULTATION WITH THE PROJECT SUPERINTENDENT. NO SUBSTITUTION OF SPECIES OR SIZES WILL BE ACCEPTED UNLESS GIVEN IN WRITING BY THE SITE SUPERINTENDENT.
- PLANTS

LARGE HEALTHY ROOT SYSTEMS, WITH NO EVIDENCE OF ROOT CURL, RESTRICTION OR DAMAGE. PLANTS SHOULD BE VIGOROUS, WELL ESTABLISHED, FREE FROM DISEASE AND PESTS AND OF GOOD FORM CONSISTENT WITH THE SPECIES OR VARIETY. BEFORE PLANTING, PLANTS SHOULD BE HARDENED OFF, NOT SOFT OR FORCED, AND SUITABLE FOR PLANTING IN THE NATURAL CLIMATIC CONDITIONS PREVAILING AT THE SITE.
- GENERAL CONSIDERATIONS

REPLACE DAMAGED OR FAILED PLANTS WITH PLANTS OF THE SAME TYPE AND SIZE. SUPPLY PLANTS IN WEED-FREE CONTAINERS OF THE REQUIRED SIZE. LABEL AT LEAST ONE PLANT OF EACH SPECIES OR VARIETY IN A BATCH WITH A DURABLE, READABLE TAG. DELIVER PLANT MATERIAL TO THE SITE ON A DAY TO DAY BASIS, AND PLANT IMMEDIATELY AFTER DELIVERY. GIVE NOTICE OF PROPOSED CHANGES TO PLANT LOCATIONS AND SPACING, FOR EXAMPLE, TO AVOID SERVICE LINES, OR TO COVER THE AREA UNIFORMLY. DO NOT PLANT IN UNSUITABLE WEATHER CONDITIONS SUCH AS EXTREME HEAT, COLD, WIND OR RAIN. IN OTHER THAN SANDY SOILS, SUSPEND EXCAVATION WHEN THE SOIL IS WET, OR DURING FROST PERIODS.
- PLACEMENT

PLANTS ARE TO BE PLANTED AS INDICATED IN THE DRAWINGS. ADJACENT PLANTINGS OF GRASSES AND GROUND COVERS ARE TO BE BLENDED WITH A 0.5M MINIMUM OVERLAP INTO ADJACENT PLANTINGS SO AS TO BLUR / SOFTEN THE EDGES. PLANT SEDGES AND GRASSES IN AREAS NO SMALLER THAN 10 M² GROUPINGS OR AS INDICATED ON DRAWINGS. WHEREVER POSSIBLE, DIFFERENT SPECIES SHOULD BE PLACED ADJACENT TO EACH OTHER. TREES AND SHRUBS ARE TO BE ALTERNATELY PLANTED SO AS TO MAXIMISE THE DIVERSITY OF THE UPPER CANOPY AS MUCH AS POSSIBLE. REMOVE THE PLANT FROM THE CONTAINER WITH MINIMUM DISTURBANCE TO THE ROOT BALL, ENSURE THAT THE ROOT BALL IS MOIST AND PLACE IT IN ITS FINAL POSITION, IN THE CENTRE OF THE HOLE AND PLUMB, AND WITH THE TOP SOIL LEVEL OF THE PLANT ROOT BALL LEVEL WITH THE FINISHED SURFACE OF THE SURROUNDING SOIL.
- BACKFILLING

BACKFILL HOLES AFTER PLANTING USING TOPSOIL MIXTURE. LIGHTLY TAMP AND WATER TO ELIMINATE AIR POCKETS. ENSURE THAT TOPSOIL IS NOT PLACED OVER THE TOP OF THE ROOT BALL, SO THAT THE PLANT STEM REMAINS THE SAME HEIGHT ABOVE GROUND AS IT WAS IN THE CONTAINER.
- WATER CRYSTALS

INSTALL WATER CRYSTALS AS PER MANUFACTURER'S RECOMMENDATION. APPLICATION RATE (KG/HA): AS RECOMMENDED BY MANUFACTURER.
- TREE STAKES AND TIES

FOR ALL TREES AND SHRUBS INSTALL BAMBOO STAKES THIS WILL ALSO REDUCE PREDATION BY GRAZING WILDLIFE AND PREVENT TRAMPLING OF PLANTS.