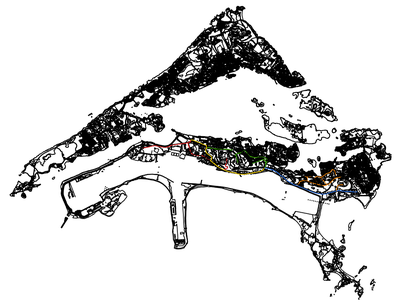
JOB: P-20-0914 | SHEET 01 OF 22

BLDC WATER AND WASTEWATER INFRASTRUCTURE - TENDERING PACKAGE #3A
SANITARY SEWER FORCE MAIN - SOUTHSIDE AREA

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

PROJECT AREA



KEY MAP

SHEET INDEX LIST

C-1001	COVER SHEET	C-1203	SOUTHSIDE SEWER PLAN AND PROFILE STA 83+25 TO STA 98+50		ABBREVIATIONS
C-1101	GENERAL NOTES			E-1000	ELECTRICAL SPECIFICATIONS
C-1102	GENERAL NOTES	C-1301	SOUTHSIDE SEWER GRAVITY AND FORCE MAIN STRUCTURES	E-1001	SOUTHSIDE LIFT STATION ELECTRICAL 52+82.86-67+00.00
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C-1201	SOUTHSIDE SEWER PLAN AND PROFILE STA 52+82.86 TO STA 66+50	C-1402	SOUTHSIDE CIVIL DETAILS	E-1003	SOUTHSIDE LIFT STATION ELECTRICAL 83+50.00-100+00.00
		C-1403	SOUTHSIDE CIVIL DETAILS		
C-1202	SOUTHSIDE SEWER PLAN AND PROFILE STA 66+50 TO STA 83+25	C-1404	SOUTHSIDE CIVIL DETAILS	E-1101	ELECTRICAL BLOCK DIAGRAM
		E-1000	ELECTRICAL SYMBOLS AND	E-1102	FIBER BLOCK DIAGRAM

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

COVER SHEET

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

C-1001

REDUCTION VERIFICATION SCALE 0 10 INCHES

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

CIVIL NOTES & SPECIFICATIONS
GENERAL

1. THESE NOTES APPLY TO ALL CIVIL AND ELECTRICAL DRAWINGS.
2. UNLESS NOTED OTHERWISE THE CONTRACTOR SHALL SUPPLY ALL NECESSARY MATERIALS TO COMPLETE THE WORK.
3. THE PLANS AND SPECIFICATIONS HAVE BEEN DESIGNED ACCORDANCE WITH THE 2014 BERMUDA BUILDING CODE.
4. CONSTRUCTION SHALL REMAIN WITHIN THE PROPERTY OF THE OWNER OR WITHIN THE RIGHT-OF-WAY OF DEDICATED STREETS. THE CONTRACTOR SHALL LIMIT OPERATIONS TO THE STREET RIGHT-OF-WAY, EASEMENT, OR BOUNDARY OF THE OWNER'S PROPERTY UNLESS HE MAKES A SEPARATE ARRANGEMENT WITH THE LANDOWNER FOR THE USE OF ADDITIONAL LAND.
5. THE CONTRACTOR SHALL CONSTRUCT THE WORKS IN STRICT ACCORDANCE TO THE PLAN LOCATIONS AND ELEVATION REQUIREMENTS AS SHOWN ON THE CONTRACT DRAWINGS.
6. THE LOCATIONS OF EXISTING UTILITIES IN THE VICINITY OF THE PROPOSED WORK ARE NOT NECESSARILY SHOWN ON THE PLANS AND WHERE SHOWN, ARE APPROXIMATE. THE CONTRACTOR SHALL, ON HIS OWN INITIATIVE, LOCATE ALL UNDERGROUND LINES AND STRUCTURES.
7. ADEQUATE TEMPORARY BRACING OF CONSTRUCTION ELEMENTS SHALL BE PROVIDED FOR FOUNDATIONS, ABOVE GRADE WALLS AND OTHER STRUCTURAL SYSTEMS FOR WIND AND/OR CONSTRUCTION LOADS. BRACING SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION OPERATIONS PRIOR TO STRUCTURAL ELEMENTS REACHING THEIR SPECIFIED DESIGN STRENGTH AND/OR REACHING THEIR COMPLETED FORM AS SHOWN ON THE CONTRACT DRAWINGS. DESIGN AND MAINTENANCE OF SAID BRACING SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

BLDC, HIGHWAYS, PARKS AND HOUSING, STANDARD CONDITIONS FOR TRENCH PERMITS - ANNEXURE 2 - TRENCHING PERMIT REQUIREMENTS, SPECIFICATIONS OF PIPEWORK & STANDARD TRENCH CROSS SECTION
GENERAL

1. THE CONTRACTOR SHALL COMPLY WITH ALL TRAFFIC MANAGEMENT REQUIREMENTS OF THE HIGHWAYS SECTION OF THE BLDC AND ANY OTHER GOVERNMENTAL AUTHORITY REQUIREMENTS OF APPLICABLE LAW.
2. FOR PURPOSES OF THIS SECTION THE FOLLOWING TERMS ARE DEFINED AS FOLLOWS:
   A. GRANTOR: BLDC, HIGHWAYS, PARKS AND HOUSING,
   B. GRANTEE: CONTRACTOR
3. THE CONTRACTOR SHALL AT ALL TIMES MAINTAIN AT LEAST ONE (1) LANE OF THE CARRIAGE WAY OPEN TO THE PUBLIC AND FREE OF ANY EXCAVATION MATERIALS
4. THE FOLLOWING SECTIONS ARE ADOPTED FOR PURPOSES OF THIS PROJECT:
   A. TRENCHING, PERMIT & TRAFFIC NOTICES
   B. SPECIFICATIONS OF TRENCH WORK
   C. STANDARD ACCEPTABLE TRENCH CROSS-SECTIONS
   D. HARD ROCK
   E. UNFORESEEN CONDITIONS
   F. PROTECTION OF PERSONS AND PROPERTY

TRENCHING PERMIT & TRAFFIC NOTICES

1 THE GRANTEE MUST CONTACT THE GRANTOR BEFORE WORK IS STARTED TO OBTAIN A TRENCHING PERMIT. THE TRENCHING PERMIT FORM MUST INCLUDE THE FOLLOWING ITEMS:

(a) A PLAN THAT INDICATES THE PROPOSED PIPE AND TRENCHING ALIGNMENT THAT INCLUDES THE SIZE, LENGTH AND TYPE OF PIPES AND ANY STRUCTURES WITHIN THE TRENCH.

(b) A TRENCH DETAIL THAT LABELS EACH PIPE/DUCT TO BE PLACED IN THE TRENCH WITH THEIR SPACING. THIS TRENCH DETAIL SHALL BE SIMILAR TO THE BLDC STANDARD TRENCH DETAIL PROVIDED OR MUST BE APPROVED BY GRANTOR.

(c) A DETAIL SHOWING PROPER CONSTRUCTION WARNING SIGNAGE.

(d) NAMES OF PROPERTY OR ROADWAY AND ADJACENT PROPERTY OWNERS.

2 THE GRANTEE MUST PROVIDE THE REQUIRED LISTED INFORMATION TO REQUEST A TRAFFIC NOTICE THAT THE BLDC WILL APPROVE AND PLACE ON GOVERNMENTS WEBSITE TO NOTIFY THE PUBLIC OF THE TRENCH WORKS. THIS NOTIFICATION PROCESS TAKES A MINIMUM OF TWO WEEKS TO BE PUBLICIZED. THE ANNOUNCEMENT MUST CONVEY THE FOLLOWING:

(a) WHEN THE WORK IS TO TAKE PLACE,

(b) WHERE THE WORK IS BEING CARRIED OUT,

(c) THE WORK HOURS AND DURATION OF THE PROJECT, AND

(d) WHAT COMPANY IS RESPONSIBLE FOR THE PROJECT

3 UPON APPROVAL OF THE TRENCH PERMIT AND TRAFFIC NOTICE, A BLDC TRENCH INSPECTOR WILL BE ASSIGNED TO THE WORKS AND WILL CONTACT THE GRANTEE.

SPECIFICATIONS OF TRENCH WORK:

1 PRIOR TO TRENCHING, THE GRANTEE IS RESPONSIBLE FOR CONTACTING AND RESEARCHING ANY POSSIBLE CONFLICTS WITH THE BERMUDA ELECTRIC LIGHT COMPANY, BERMUDA TELEPHONE COMPANY, WATLINGTON WATERWORKS, THE AIRPORT AUTHORITIES, BERMUDA CABLEVISION AN ANY OTHER UTILITY BEFORE EXCAVATION IS TO START. THIS IS TO ENSURE THAT THE GRANTEE IS AWARE OF THE POSITIONING OF ANY UTILITIES NEAR THE TRENCHING AREA.

2 THE GRANTEE MUST ERECT AT THE TRENCH SITE A TRAFFIC SIGN WITH THE FOLLOWING INFORMATION:

(a) NAME OF COMPANY CARRYING OUT THE TRENCH WORK

(b) THE EMERGENCY CONTACT NUMBER AND NAME OF COMPANY'S REPRESENTATIVE

(c) THE WORK HOURS AND DURATION OF THE PROJECT, AND

(d) WHICH COMPANY IS RESPONSIBLE FOR THE PROJECT, EXAMPLE PRIVATE PROPERTY OWNER OR UTILITY COMPANY

3 ALL TRENCH WORK BOUNDARIES MUST BE PROTECTED TO ALERT TRAFFIC OF THE CONSTRUCTION.

(a) THE GRANTEE SHALL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING ADEQUATE TRAFFIC CONTROL AND TEMPORARY SIGNING WHILE THE WORKS ARE IN PROGRESS.

(b) ANY HAZARDS LEFT AT ANY TIME MUST BE ADDITIONALLY PROTECTED BY SAFETY LAMPS, BARRICADES, REFLECTIVE MATERIAL OR ADEQUATE SAFEGUARDS.

(c) WHERE TRAFFIC CONTROL IS NECESSARY, EITHER TRAFFIC SIGNALS OR "STOP AND GO" BOARDS SHALL BE USED. (A RED FLAG IS NOT A LEGAL SIGN AND SHOULD NOT BE USED).

(d) NO OPEN EXCAVATION SHALL BE LEFT UNPROTECTED OR UNCOVERED AT NIGHT WITHOUT THE CONSENT OF THE GRANTOR. EVERY EFFORT SHOULD BE MADE TO BACKFILL AND REINSTATE EACH DAY'S WORK UNLESS SPECIAL CIRCUMSTANCES DO NOT ALLOW FOR IT AND IT WAS APPROVED BY THE GRANTOR.

(e) WHEN MULTIPLE PIPES ARE BEING INSTALLED IN PARTICULAR IN CONJUNCTION WITH HDPE PIPES, TRENCH WORK MAY TAKE PLACE WITHIN 200'-400' SECTIONS AFTER APPROVAL IS SOUGHT FROM GRANTOR.

(f) THE GRANTEE SHALL TAKE ALL STEPS TO CAUSE AS LITTLE DISTURBANCE TO THE PUBLIC AS POSSIBLE WHILE THE WORKS ARE BEING CARRIED OUT, AND IF NECESSARY IN SPECIFIC CASES **UPON APPROVAL FROM THE BLDC, SH**ALL AT THEIR OWN EXPENSE BE PREPARED TO WORK OVERTIME OVER PARTICULAR SECTIONS.

4 WHERE A HAZARD TO THE PUBLIC HAS BEEN CREATED BY THE WORKS AND **EMERGENCY** MEASURES ARE REQUIRED, THE GRANTEE MUST CONSULT WITH THE GRANTOR TO EXECUTE SUCH MEASURES AS ARE REQUIRED TO ABATE THE HAZARD AND RECOVER FROM THE GRANTEE ANY EXPENSES THAT INCURRED.

5 ANY CHANGES THAT NEED TO BE MADE AS TO THE LINE OR LEVEL OF THE SERVICES LAID, NEED TO BE APPROVED BY THE GRANTOR PRIOR TO SUCH CHANGES TO TAKE PLACE AND ANY FEES OCCURRED BY SUCH CHANGE SHALL BE COVERED BY THE GRANTEE.

6 THE TRENCH MUST BE OF ADEQUATE WIDTH BUT NO WIDER THAN NECESSARY TO PLACE SERVICES AND ENSURE PROPER BACKFILLING AND COMPACTION.

7 THE PAVEMENT SHALL BE CUT WITH A CIRCULAR SAW ALONG BOTH EDGES OF THE PROPOSED TRENCH WIDTH FOR THE ENTIRE LENGTH OF THE TRENCH TO PRODUCE A STRAIGHT EDGE.

(a) THE DEPTH OF CUT MUST NOT BE LESS THAN THE FULL ASPHALT PAVEMENT THICKNESS OR OTHERWISE AGREE TO BY THE GRANTOR.

(b) TO UTILIZE AN ALTERNATIVE METHOD TO SAW CUTTING, THE GRANTEE MUST CONTACT THE GRANTOR OR HIS/HER REPRESENTATIVE AND OBTAIN APPROVAL.

(c) IF NOT SPECIFIED IN THE PERMIT, THE SERVICE TO BE INSTALLED MUST BE LOCATED SO THAT A MINIMUM CLEARANCE OF NOT LESS THAN 0.6096 M (2'-0") WILL OCCUR BETWEEN THE TOP OF THE INSTALLED SERVICES AND THE FINAL CARRIAGEWAY GRADE. IN CASES WERE ELECTRICAL CABLES ARE BEING INSTALLED THERE MUST BE A MINIMUM OF 0.9144 M (3'-0") BETWEEN THE TOP OF THE CABLE TO THE FINAL CARRIAGEWAY GRADE. ANY DEVIATION FROM ABOVE WILL NEED TO BE APPROVED BY GRANTOR WITH A NEW TRENCH DETAIL.

8 ONCE TRENCHING HAS COMMENCED THE EXTRACTED MATERIAL SHOULD BE REMOVED FROM SITE OR PLACED AWAY FROM TRENCH, SO THAT IT DOES NOT BECOME A NUISANCE TO THE MOTORING PUBLIC OR PEDESTRIANS.

9 EXTRACTED MATERIAL MAY BE REUSED IN TRENCH AFTER IT HAS BEEN SIFTED AND PARTICLE SIZE IS EQUAL OR LESS THAN 0.0158 M (5/8") AND MUST BE WELL COMPACTED TO MEET THE 95% COMPACTION RATE.

10 THE WALLS OF THE TRENCH MUST REMAIN VERTICAL AT ALL TIMES. SHOULD THE ROAD SURFACE BE UNSUPPORTED AS A RESULT OF A CAVITY, THEN THE GRANTEE MUST BACKFILL THE CAVITY IMMEDIATELY AND THE WALLS OF THE TRENCH ARE TO BE SHORED UP TO PREVENT IT FROM HAPPENING AGAIN.

11 ALL CONDUITS SHALL BE PLACED ACCORDING TO UTILITY'S COMPANY TRENCH DETAIL THAT WAS APPROVED BY BLDC OF PUBLIC WORK'S CIVIL ENGINEER.

12 ALL CONDUITS PLACED WILL BE INSPECTED BY BLDC OF PUBLIC WORK'S TRENCHING INSPECTOR. CONDUITS PLACED WILL BE PHOTOGRAPHED AND STORED ON RECORD BY THE BLDC.

13 BACKFILLING MAY ONLY TAKE PLACE UPON BLDC OF PUBLIC WORK'S TRENCHING INSPECTOR HAS APPROVED THE CONDUIT PLACEMENT.

14 WHEN BACKFILLING THE TRENCH, THE MATERIAL SELECTED SHALL BE FREE OF ORGANIC DEBRIS AND PLACED IN 0.3048 M (12") LAYERS. EACH LAYER MUST BE HEAVILY WATERED BEFORE COMPACTION SHALL COMMENCE.

15 UP TO A POINT OF 0.2032 M (8") BENEATH THE FINAL CARRIAGEWAY GRADE, ONLY SAND AND AGGREGATE UP TO EQUAL OR LESS THAN 0.0158 M (5/8") DIMENSION MAY BE USED FROM THE INITIALLY EXTRACTED MATERIAL FROM THE TRENCH. ALL MATERIAL GREATER THAN LISTED ABOVE MUST BE REMOVED FROM THE SITE.

16 THE REMAINING 0.2032 M (8") DEPTH OF TRENCH TO BE BACKFILLED SHALL BE FILLED IN THE FOLLOWING SEQUENCE TO OBTAIN A TEMPORARY ASPHALT REINSTATED SURFACE.

(a) PLACE A 0.0762 M (3") THICK LAYER OF SUB-BASE MATERIAL OF 0.0158 M (5/8") SIZE GRAVEL MATERIAL IN THE TRENCH. THIS MUST BE HEAVILY WATERED AND COMPACTED.

(b) PLACE A 0.0508 M (5") THICK LAYER OF WEARING COURSE ASPHALT MATERIAL IN THE TRENCH AND COMPACT. THIS ASPHALT MATERIAL SHOULD BE OBTAINED FROM BLDC QUARRY ASPHALT PLANT OR ANY ASPHALT PLANT THAT IS APPROVED BY GRANTEE.

14 THE GRANTEE SHALL LAY FRESH WEARING COURSE ASPHALT MATERIAL AS STATED ABOVE AND COMPACT IT WITH A MECHANICAL ROLLER (MINIMUM 3 TON VIBRATORY OR STATIC ROLLER MUST BE USED).

15 PRIOR TO PLACING THE WEARING COURSE MATERIAL, THE BLDC'S TRENCHING INSPECTOR WILL UNDERTAKE NUMEROUS COMPACTION TEST WITH A CLEGG IMPACT SOIL TESTER 4.5KG MODEL AND REPORT THE COMPACTION % FOR THE BLDC'S RECORDS AND IF 95% COMPACTION HAS NOT BEEN ACHIEVED, BLDC WILL ADVISE ON FURTHER COMPACTION NEEDS. TRENCHING INSPECTOR WILL KEEP A WEEKLY LOG OF ALL TRENCHING INSPECTION VISITS BY COMPLETING THE TRENCHING INSPECTION CHECKLIST.

16 PRIOR TO PLACING THE WEARING COURSE MATERIAL, ONE OF THE TACK COAT TYPES SS-1, SS-1H, CSS-1 OR CSS-1H (REFER TO ASPHALT INSTITUTE MANUAL SERIES MS-5) SHALL BE APPLIED TO THE FRESH CUT EDGE. THE METHOD OF DILUTION AND APPLICATION SHALL COMPLY WITH THE MANUFACTURER'S SPECIFICATION.

17 THE WEARING COURSE SHALL BE LAID TO LEAVE A CONVEX FINISH, SLIGHTLY PROUD OF THE GENERAL ROAD SURFACE AFTER BEING ROLLED. THE APEX OF THE CONVEX SURFACE SHALL MEASURE NOT MORE THAN 0.01270 M (½") HIGHER THAN THE SURROUNDING SURFACE.

18 WHERE THE TRENCH IS IN CONCRETE PAVEMENT, THE BACKFILL SHALL BE BROUGHT UP TO THE UNDERSIDE OF THE CONCRETE AND IT SHALL BE STRUCK OFF AND COMPACTED, THEN THE PAVEMENT SHALL BE REINSTATED TO A CONDITION EQUIVALENT TO AND SIMILAR IN APPEARANCE TO THAT OF THE EXISTING PAVEMENT.

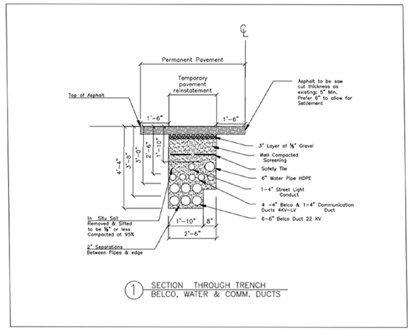
19 WHERE THE TRENCH IS IN A GRASS VERGE, TOP SOIL SHALL BE CUT IN TURFS OR IN BULK AND STORED SEPARATELY. AFTER BACKFILLING, THE TURFS SHALL BE NEATLY REINSTATED AND TOP-DRESSED SUCH THAT THE VERGE REGAINS ITS ORIGINAL APPEARANCE. ALTERNATIVELY, THE REPLACED TOP SOIL SHALL BE FERTILIZED, RE-SEEDED AND MAINTAINED FOR A PERIOD OF 2 MONTHS.

20 UPON PROJECT COMPLETION, THE GRANTEE IS REQUIRED TO SUBMIT TO GRANTOR AN AS-BUILT PLAN, INDICATED THE EXACT LOCATION OF UTILITY INSTALLED, PIPE SIZE AND TYPE FOR RECORDING INTO THE GOVERNMENT GIS SYSTEM.

21 AFTER THREE MONTHS MAINTENANCE PERIOD HAS ELAPSED FOR THE REINSTATED WEARING COURSE, THE BLDC WILL REVIEW TEMPORARY PAVEMENT FOR SETTLEMENT. IF WEARING COURSE HAS SETTLED, BLDC WILL REINSTATE A PERMANENT ROADWAY SURFACE TO THE FULL LANE WIDTH. THE GRANTEE WILL BE BILLED FOR THE PERMANENT REINSTATEMENT FOR THE TRENCH WIDTH AND 18" OF ASPHALT BEYOND THE TRENCH ON EACH SIDE.

STANDARD ACCEPTABLE TRENCH CROSS-SECTIONS:

1. GRANTEE MAY SUBMIT THEIR OWN TRENCHING DETAIL WITH SIMILAR INFORMATION TO BE REVIEWED AND APPROVED BY GRANTOR.
2. DUE TO THE LIMITED REAL ESTATE IN BERMUDA'S ROADWAYS, TRENCHING DETAIL MAY VARY FROM BELOW SHOWN AND WILL NEED TO BE REVIEWED AND APPROVED BY GRANTOR.
3. BLDC EXAMPLE OF A COMBINED UTILITY TRENCH DETAILS SHOWN BELOW:



1 SECTION THROUGH TRENCH BELCO, WATER & COMM. DUCTS

HARD ROCK

1. IN THE EVENT THAT THE TRENCHING MACHINE CANNOT REMOVE HARDER THAN NORMAL ROCK DURING EXCAVATIONS THEN, AFTER NOTIFICATION TO, AND BY AGREEMENT WITH, THE OWNER'S REPRESENTATIVE THIS ROCK SHALL BE REMOVED BY HAMMERING. THE RATES FOR HAMMERING SHALL BE CHARGED ON AN HOURLY BASIS.

UNFORESEEN CONDITIONS

1. IN THE EVENT THAT DURING EXCAVATIONS, THE CONTRACTOR ENCOUNTERS CONDITIONS THAT ARE DEEMED BY AGREEMENT WITH THE OWNER'S REPRESENTATIVE TO BE OUTSIDE THE CONDITIONS EXPECTED, IT MAY MAKE A CLAIM FOR BOTH AN EXTENSION OF TIME AND INCREASED COSTS TO CONTINUE WITH THE EXCAVATIONS.
2. HARD ROCK SHALL NOT BE DEEMED TO BE AN UNFORESEEN CONDITION.
3. UNFORESEEN CONDITIONS SHALL REQUIRE IMMEDIATE NOTIFICATION TO THE OWNER'S REPRESENTATIVE WHO SHALL INSPECT THE WORK IMMEDIATELY.

PROTECTION OF PERSONS AND PROPERTY

1. PROTECT AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS DURING EARTH MOVING OPERATIONS.
2. BARRICADE OPEN HOLES AND DEPRESSIONS OCCURRING AS PART OF THE WORK, AND POST WARNING LIGHTS ON PROPERTY ADJACENT TO OR WITH PUBLIC ACCESS.
3. OPERATE WARNING LIGHTS DURING HOURS FROM DUSK TO DAWN EACH DAY AND AS OTHERWISE REQUIRED.
4. PROTECT STRUCTURES, UTILITIES, SIDEWALKS, PAVEMENTS, AND OTHER FACILITIES FROM DAMAGE CAUSED BY SETTLEMENT, LATERAL MOVEMENT, WASHOUT, AND OTHER HAZARDS CREATED BY THE WORK.

DETAILED SPECIFICATIONS

EXCAVATION, EARTHWORK AND GRADING

1. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF EXISTING UTILITIES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF SITE CONDITIONS DIFFER FROM WHAT IS EXPECTED, CONSULT WITH BLDC OR OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL NOT INTERRUPT BURIED OR OVERHEAD UTILITIES SERVING FACILITIES OCCUPIED BY OWNER OR OTHERS UNLESS PERMITTED IN WRITING BY OWNER'S REPRESENTATIVE AND THEN ONLY AFTER ARRANGING TO PROVIDE TEMPORARY UTILITY SERVICES ACCORDING TO REQUIREMENTS INDICATED.
   A. UNLESS SHOWN TO BE REMOVED, PROTECT ACTIVE UTILITY LINES AS SHOWN ON THE DRAWINGS OR OTHERWISE MADE KNOWN TO THE CONTRACTOR PRIOR TO EXCAVATING. IF DAMAGED, REPAIR OR REPLACE AT NO ADDITIONAL COST TO THE OWNER.
   B. IF ACTIVE UTILITY LINES ARE ENCOUNTERED AND ARE NOT SHOWN ON THE DRAWINGS OR OTHERWISE MADE KNOWN TO THE CONTRACTOR, PROMPTLY TAKE NECESSARY STEPS TO ASSURE THAT SERVICE IS NOT INTERRUPTED.
   C. IF 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.
   D. IF EXISTING UTILITIES ARE FOUND TO INTERFERE WITH THE PERMANENT FACILITIES BEING CONSTRUCTED UNDER THIS SECTION, IMMEDIATELY NOTIFY BLDC AND SECURE HIS INSTRUCTIONS.
   E. DO NOT PROCEED WITH PERMANENT RELOCATION OF UTILITIES UNTIL WRITTEN INSTRUCTIONS ARE RECEIVED FROM BLDC.
2. EXCAVATION WORKS INCLUDE EXCAVATING, CLEARING, GRUBBING, HAULING, HANDLING AND PLACING, SHAPING, COMPACTING, AND TRIMMING OF EARTH, FILL, ROCK, ASPHALT, CONCRETE, SMALL TREES, STUMPS, BUSHES, TRASH, AND ALL OTHER MATERIALS OR OBJECTS ENCOUNTERED DURING CONSTRUCTION.
3. SUBMITTALS
   A. MANUFACTURER'S DATA SHEETS ON EACH PRODUCT TO BE USED, INCLUDING:
      i.PREPARATION INSTRUCTIONS AND RECOMMENDATIONS
      ii. STORAGE AND HANDLING REQUIREMENTS AND RECOMMENDATIONS
      iii.INSTALLATION METHODS
      iv. TEST REPORTS: SUBMIT FOR APPROVAL TEST REPORTS, LIST OF MATERIALS AND GRADATIONS PROPOSED FOR USE
      v.PROVIDE FOR EACH ON-SITE AND BORROW SOIL MATERIAL OR AGGREGATE
         1.1. NAME OF EACH MATERIAL SUPPLIER, SPECIFIC TYPE AND SOURCE OF EACH MATERIAL
         1.2. BILLS OF LADING DOCUMENTING MATERIALS SOURCE, INCLUDING SUPPLIER NAME AND RELATIONSHIP TO SOURCE, LOCATION WHERE MATERIALS WERE OBTAINED; INCLUDING STREET, TOWN, LOT AND BLOCK, COUNTRY AND STATE. INCLUDE PRESENT AND PAST USAGE OF SOURCE SITE.
         1.3. SUPPLIER'S STATEMENT THAT MATERIAL IS NOT CONTAMINATED AND IS FREE OF EXTRANEOUS DEBRIS OR SOLID WASTE, AND DESCRIPTION OF STEPS TAKEN TO CONFIRM
         1.4. PRODUCT WEIGHT SHIPPING TICKETS CERTIFIED BY SUPPLIER TICKET SHALL INCLUDE, BUT NOT BE LIMITED TO, NAME AND LOCATION OF SUPPLIER, AND TYPE AND AMOUNT OF MATERIAL DELIVERED.
   B. CERTIFICATES: PROVIDE CERTIFICATION STATING MATERIALS ARE VIRGIN MATERIALS FROM A COMMERCIAL OR NON-COMMERCIAL SOURCE.
   C. SOURCE AND FIELD QUALITY CONTROL SUBMITTALS: FIELD COMPACTION TESTING.
      i.SUBMIT DAILY FIELD REPORTS DOCUMENTING EARTHWORK ACTIVITY AND FIELD-TESTING FOR EACH DAY. AT MINIMUM, REPORTS SHALL INCLUDE
         1.1. DESCRIPTION OF DAY'S ACTIVITIES
         1.2. RESULTS OF IN-PLACE DENSITY TESTING INCLUDING IN-PLACE DRY DENSITY, MOISTURE CONTENT, PERCENT COMPACTION, ELEVATION OF TEST AND DESCRIPTION OF SOIL
         1.3. SKETCH INDICATING EXTENT OF EACH DAY'S WORK AND LOCATION OF TESTING
   A. DAILY RECORDS OF OVER-EXCAVATED VOLUMES INCLUDING
      i.BEGINNING AND END STATION OF OVER-EXCAVATION
      ii. PROPOSED ELEVATION OF SUBGRADE
      iii.ACTUAL ELEVATION OF SUBGRADE
      iv. CALCULATED VOLUME OF ADDITIONAL EXCAVATION IN BANK CUBIC YARDS (BCY)
   E. QUALIFICATION STATEMENTS: CONTRACTOR'S INDEPENDENT TESTING AGENCY, QUALIFIED FOR TESTING SPECIFIED IN ASTM E329 AND ASTM D3740
   F. PRODUCT DATA: FOR EACH TYPE OF THE FOLLOWING MANUFACTURED PRODUCTS REQUIRED:
      i.GEOTEXTILES.
      ii. CONTROLLED LOW-STRENGTH MATERIAL, INCLUDING DESIGN MIXTURE.
      iii.GEOFOAM.
      iv. WARNING TAPES.
   G. SAMPLES FOR VERIFICATION: FOR THE FOLLOWING PRODUCTS, IN SIZES INDICATED BELOW:
      v.GEOTEXTILE: 12 BY 12 INCHES (300 BY 300 MM).
      vi. WARNING TAPE: 12 INCHES (300 MM) LONG; OF EACH COLOR.
   H. PRE-EXCAVATION PHOTOGRAPHS OR VIDEOTAPE: SHOW EXISTING CONDITIONS OF ADJOINING CONSTRUCTION AND SITE IMPROVEMENTS, INCLUDING FINISH SURFACES THAT MIGHT BE MISCONSTRUED AS DAMAGE CAUSED BY EARTH MOVING OPERATIONS. SUBMIT BEFORE EARTH MOVING BEGINS.
4. OBSERVATION OF EXCAVATION AND GRADING SHALL BE PERFORMED BY THE OWNER'S REPRESENTATIVE. ALL EXCAVATED AREAS SHALL BE INSPECTED BY THE OWNER'S REPRESENTATIVE PRIOR TO THE PLACEMENT OF ANY FILL THEREON. NO EXCAVATIONS IN CUT AREAS SHALL BE EXTENDED BELOW PLAN GRADE OR PLAN SUBGRADE ELEVATION WITHOUT APPROVAL OF THE OWNER'S REPRESENTATIVE.
5. FIELD REQUIREMENTS

   THE CONTRACTOR SHALL FURNISH A GUARANTEE THAT FILLED AREAS WILL NOT SUFFER FROM PONDING OR SETTLEMENT IN EXCESS OF THE FOLLOWING LIMITATIONS FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE. FILL MATERIAL, WHICH SETTLES IN EXCESS OF THE FOLLOWING LIMITATIONS SHALL BE REMOVED AND REPLACED WITH SUITABLE MATERIAL AT NO COST TO THE OWNER. STRUCTURES, PAVING, LANDSCAPING, AND OTHER SITE IMPROVEMENTS DAMAGED BY SETTLEMENT, SHALL BE REMOVED AND REPLACED AT NO COST TO THE OWNER.
   A. PAVED AREAS AND AREAS WITHIN FIVE FEET OF STRUCTURES 0.05-FT.
   B. UNIMPROVED AREAS 0.50-FT SLOPED TO PROVIDE POSITIVE DRAINAGE.
   C. ALL OTHER AREAS 0.10-FT.
6. PLACING FILL MATERIAL AND PERFORMING EARTHWORK WILL BE SUBJECT TO CONTINUOUS INSPECTIONS AND ROUTINE TESTING.
   A. GEOTECHNICAL TESTING AGENCY TO MONITOR EARTHWORK: QUALIFIED PER ASTM 329 AND ASTM D3740.
   B. INDEPENDENT TESTING: MINIMUM OF 50 POUNDS OF MATERIAL IN AN AIRTIGHT CONTAINER TO TESTING LABORATORY.
   C. SAMPLES
      i.EACH TYPE OF SOIL OR AGGREGATE PROPOSED FOR USE ON PROJECT, A MINIMUM OF 14 DAYS PRIOR TO WORK.
      ii. SUBMIT ADDITIONAL MATERIAL SAMPLES AT LEAST EVERY 500 CUBIC YARDS THROUGHOUT COURSE OF WORK, IF REQUESTED BY BLDC TO EVALUATE CONSISTENCY OF SOURCE OR PROCESS.
7. TOPSOIL SHALL BE REMOVED AND STOCKPILED FOR USE. ALL SURPLUS MATERIAL SHALL BE DISPOSED OF AT LEGAL DUMPSITES OR SPECIFIED LOCATION AS DESIGNATED BY THE OWNER. STOCKPILE BORROW SOIL MATERIALS AND EXCAVATED SATISFACTORY SOIL MATERIALS WITHOUT INTERMIXING. PLACE, GRADE, AND SHAPE STOCKPILES TO DRAIN SURFACE WATER. COVER TO PREVENT WINDBLOWN DUST. STOCKPILE SOIL MATERIALS AWAY FROM EDGE OF EXCAVATIONS. DO NOT STORE WITHIN DRIP LINE OF REMAINING TREES.
8. EXCAVATION AND REMOVAL OPERATIONS SHALL BE PERFORMED IN SUCH A MANNER AS TO LEAVE UNDISTURBED ANY AREAS NOT DESIGNATED FOR CONSTRUCTION ON THE PLANS.
9. WHERE A REMOVAL OR EXCAVATED AREA REQUIRES FILLING OR A RESULTING TRENCH, HOLE, OR PIT, BACKFILLING SHALL BE TO THE REQUIRED GRADE USING EITHER SUITABLE EXCAVATED MATERIALS OR IMPORTED MATERIALS AS REQUIRED. BACKFILL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 6 INCHES CONFORMING TO THE SPECIFIED COMPACTION REQUIREMENTS.
10. SUITABLE MECHANICAL SAWING EQUIPMENT OR PAVEMENT MILLING EQUIPMENT, CAPABLE OF PRODUCING A STRAIGHT, CLEAN, VERTICAL FACE, SHALL BE USED FOR CUTTING THE FULL DEPTH PAVEMENT.
11. DURING PAVEMENT REMOVAL, CONTAMINATION WITH GRANULAR AND OTHER FOREIGN MATERIALS SHALL BE MINIMIZED.
12. ALL ROCK CUTS GREATER THAN 6 FEET IN HEIGHT SHALL BE CERTIFIED BY A REGISTERED STRUCTURAL ENGINEER.
13. ALL EARTH EMBANKMENTS SHALL BE BUILT USING A LAYER COMPACTION METHOD. EMBANKMENT MATERIAL SHALL BE SPREAD IN UNIFORM FULL WIDTH LAYERS NOT MORE THAN 12 INCHES IN DEPTH PRIOR TO COMPACTION. EACH LAYER SHALL BE SHAPED AND COMPACTED TO THE LINE AND CROSS SECTION SPECIFIED BEFORE THE SUCCEEDING LAYER IS PLACED. STONES GREATER THAN THE FULLY COMPACTED LAYER DEPTH SHALL BE REMOVED. MATERIAL IN EACH LAYER SHALL BE COMPACTED AT MOISTURE CONTENT DETERMINED BY BLDC TO BE SUITABLE FOR OBTAINING THE REQUIRED DENSITY.
14. AREAS TO BE TOPSOILED AND SEEDED SHALL BE PER UTILITY TRENCH DETAIL SHOWN ON DRAWINGS AND IN ACCORDANCE TO THE FOLLOWING:
   A. WHERE REQUIRED, PROVIDE 4-INCHES OF TOPSOIL CONSISTING OF FRIABLE, FERTILE SOIL OF LOAMY CHARACTER, CONTAINING AN AMOUNT OF ORGANIC MATTER NORMAL TO THE REGION, CAPABLE OF SUSTAINING HEALTHY PLANT LIFE AND REASONABLY FREE FROM SUBSOIL, ROOTS, HEAVY OR STIFF CLAY, STONES LARGER THAN 2-INCH IN GREATEST DIMENSION, NOXIOUS WEEDS, STICKS, BRUSH, LITTER, AND OTHER DELETERIOUS MATTER.
   B. OBTAIN TOPSOIL FROM SOURCES WITHIN THE PROJECT LIMITS, OR PROVIDE IMPORTED TOPSOIL OBTAINED FROM SOURCES OUTSIDE THE PROJECT LIMITS, OR FROM BOTH SOURCES.
   C. FERTILIZER SHALL BE A STANDARD QUALITY COMMERCIAL CARRIER OF AVAILABLE PLANT FOOD ELEMENTS. A COMPLETE PREPARED AND PACKAGED MATERIAL CONTAINING A MINIMUM OF 10 PERCENT NITROGEN, 20 PERCENT PHOSPHORIC ACID AND 10 PERCENT POTASH.

BLDC
BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

GENERAL NOTES

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

C-1101

REDUCTION VERIFICATION SCALE 0 10 INCHES

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

NOTES & SPECIFICATIONS (CONTINUED)

i. EACH BAG OF FERTILIZER SHALL BEAR THE MANUFACTURER'S GUAR-ANTEED STATEMENT OF ANALYSIS.

D. SEED MIXTURES SHALL BE OF COMMERCIAL STOCK OF THE CURRENT SEASON'S CROP AND SHALL BE DELIVERED IN UNOPENED CONTAINERS BEARING THE GUARANTEED ANALYSIS OF THE MIX.

i. ALL SEED SHALL MEET THE BLDC'S STANDARDS OF GERMINATION AND PURITY.

E. MULCH SHALL BE STALKS OF OATS, WHEAT, RYE OR OTHER APPROVED CROPS WHICH ARE FREE FROM NOXIOUS WEEDS.

F. CONTRACTOR SHALL REPLACE ANY LOCAL GRASS WITH LIKE KIND.

G. THE AREA TO RECEIVE TOPSOIL SHALL BE GRADED TO A DEPTH OF NOT LESS THAN 4-INCHES OR AS SPECIFIED, BELOW THE PROPOSED FINISHED SURFACE. IF THE DEPTH OF TOPSOIL EXISTING PRIOR TO CONSTRUCTION WAS GREATER THAN 4 INCHES, THE TOPSOIL SHALL BE REPLACED NOT LESS THAN THE GREATER DEPTH.

i. ALL DEBRIS AND INORGANIC MATERIAL SHALL BE REMOVED AND THE SURFACE LOOSENED FOR A DEPTH OF 2 INCHES PRIOR TO THE PLACING OF THE TOPSOIL.

ii. THE TOPSOIL SHALL NOT BE PLACED UNTIL THE SUBGRADE IS IN SUITABLE CONDITION AND SHALL BE FREE OF EXCESSIVE MOISTURE AND FROST.

H. SATISFACTORY TOPSOIL REMOVED FROM THE EXCAVATIONS SHALL BE PLACED ON THE PREPARED SUBGRADE TO THE DEPTH REQUIRED.

ij. IN THE EVENT THE TOPSOIL REMOVED DURING EXCAVATION IS UNSATISFACTORY OR INADEQUATE TO OBTAIN THE REQUIRED FINISH GRADES, THE CONTRACTOR SHALL FURNISH THE REQUIRED QUANTITY OF SATISFACTORY TOPSOIL FROM APPROVED SOURCES OFF SITE.

ii. ALL TOPSOIL SHALL BE FREE FROM STONES, ROOTS, STICKS AND OTHER FOREIGN SUBSTANCES AND SHALL NOT BE PLACED IN A FROZEN OR MUDDY CONDITION.

iii. THE FINISHED SURFACE SHALL CONFORM TO THE LINES AND GRADES OF THE AREA BEFORE DISTURBED OR AS SHOWN ON THE CONTRACT DRAWINGS. ANY IRREGULARITIES SHALL BE CORRECTED BEFORE THE PLACEMENT OF FERTILIZER AND SEED.

I. AGRICULTURAL GRADE LIMESTONE SHALL BE APPLIED AT THE RATE OF 90 POUNDS PER 1,000 SQUARE FEET, INCORPORATED INTO THE TOP 4 -6 INCHES. THE FERTILIZER SHALL BE APPLIED UNIFORMLY AT THE RATE OF 20 POUNDS PER 1000 SQ. FT. .

i. FOLLOWING THE APPLICATION OF THE FERTILIZER AND PRIOR TO APPLICATION OF THE SEED, THE TOPSOIL SHALL BE SCARIFIED TO A DEPTH OF AT LEAST 2 INCHES WITH A DISC OR OTHER SUITABLE METHOD TRAVELING ACROSS THE SLOPE IF POSSIBLE.

J. WHEN THE TOPSOIL SURFACE HAS BEEN FINE GRADED, THE SEED MIXTURE SHALL BE UNIFORMLY APPLIED UPON THE PREPARED SURFACE WITH A MECHANICAL SPREADER AT A RATE OF NOT LESS THAN 10 POUNDS PER 1000 SQ. FT.

i. THE SEED SHALL BE RAKED LIGHTLY INTO THE SURFACE AND ROLLED WITH A LIGHT HAND LAWN ROLLER.

ii. SEEDING AND MULCHING SHALL NOT BE DONE DURING WINDY WEATHER.

K. THE MULCH SHALL BE HAND OR MACHINE SPREAD TO FORM A CONTINUOUS BLANKET OVER THE SEED BED, APPROXIMATELY 2 INCHES UNIFORM THICKNESS AT LOOSE MEASUREMENT. EXCESSIVE AMOUNTS OR BUNCHING OF MULCH WILL NOT BE PERMITTED.

i. MULCH SHALL BE ANCHORED BY AN ACCEPTABLE METHOD.

ii. UNLESS OTHERWISE SPECIFIED, MULCH SHALL BE LEFT IN PLACE AND ALLOWED TO DISINTEGRATE.

iii. ANY ANCHORAGE OR MULCH THAT HAS NOT DISINTEGRATED AT TIME OF FIRST MOWING, SHALL BE REMOVED. ANCHORS MAY BE REMOVED OR DRIVEN FLUSH WITH GROUND SURFACE.

L. SEEDED AREAS SHALL BE WATERED AS OFTEN AS REQUIRED TO OBTAIN GERMINATION AND TO OBTAIN AND MAINTAIN A SATISFACTORY SOD GROWTH. WATERING SHALL BE IN SUCH A MANNER AS TO PREVENT WASHING OUT OF SEED.

M. HYDRO SEEDING MAY BE ACCEPTED AS AN ALTERNATIVE METHOD OF APPLYING FERTILIZER, SEED AND MULCH. THE CONTRACTOR SHALL SUBMIT ALL DATA REGARDING MATERIALS AND APPLICATION RATES TO BLDC FOR REVIEW.

N. FOLLOWING THE ESTABLISHMENT OF A GOOD STAND OF GRASS, ACCEPTABLE TO THE PRIVATE OWNER, AND THE FIELD INSPECTOR, THE CONTRACTOR'S OBLIGATION SHALL END EXCEPT FOR THE REPAIR OF SETTLEMENT OR DAMAGE. CONTRACTOR SHALL PROTECT AND MAINTAIN SEEDED AREA UNTIL ACCEPTANCE BY THE BLDC, INCLUDING ALL WATERING AND MAINTENANCE REQUIRED. ALL WASHOUTS SHALL BE REPAIRED TO THE SATISFACTION OF THE INSPECTOR.

15. EXCAVATION OPERATIONS SHALL BE CONDUCTED TO CAREFULLY EXPOSE ALL EXISTING UNDERGROUND STRUCTURES WITHOUT DAMAGE. WHEREVER EXCAVATION EXTENDS UNDER OR APPROACHES CLOSE TO AN EXISTING STRUCTURE AS TO ENDANGER IT IN ANY WAY, PRECAUTIONS AND PROTECTIVE MEASURES SHALL BE TAKEN AS NECESSARY TO PRESERVE THE STRUCTURE AND PROVIDE TEMPORARY SUPPORT. HAND METHODS OF EXCAVATING SHALL BE UTILIZED TO PROBE FOR AND EXPOSE SUCH CRITICAL OR HAZARDOUS INSTALLATIONS AS GAS PIPE AND POWER OR TELEPHONE CABLES.

16. TRENCH EXCAVATING SHALL BE TO A DEPTH THAT WILL PERMIT PREPARATION OF FOUNDATION, AS SPECIFIED, AND INSTALLATION OF THE PIPELINE AND APPURTENANCES AT THE PRESCRIBED LINE AND GRADE EXCEPT WHERE ALTERATIONS ARE SPECIFICALLY AUTHORIZED. TRENCH WIDTHS SHALL BE SUFFICIENT TO PERMIT THE PIPE TO BE LAID AND JOINED PROPERLY AND THE BACKFILL TO BE PLACED AND COMPACTED AS SPECIFIED. EXTRA WIDTH SHALL BE PROVIDED AS NECESSARY TO PERMIT CONVENIENT PLACEMENT OF SHEETING AND SHORING AND TO ACCOMMODATE PLACEMENT OF APPURTENANCES.

A. SHEETING, SHORING AND BRACING MATERIALS SHALL BE TIMBER, STEEL OR ALUMINUM, OR A COMBINATION THEREOF, DESIGNED AS REQUIRED, TO RETAIN THE EARTH AROUND STRUCTURES, PREVENT CAVE-IN AND SETTLEMENTS, AND TO FULFILL ALL SAFETY REQUIREMENTS.

B. TIMBER SHALL BE STRUCTURAL GRADE WITH MINIMUM WORKING STRESS OF 1,100 PSI.

C. STEEL SHEET PILING SHALL CONFORM TO REQUIREMENTS OF ASTM A 328, CONTINUOUS INTERLOCKING TYPE. STRUTS, BRACING, AND ALL OTHER ACCESSORIES REQUIRED FOR THE SHEET PILING SYSTEM SHALL MEET REQUIREMENTS OF ASTM A36

17. EXCAVATIONS SHALL BE EXTENDED BELOW THE BOTTOM OF STRUCTURE GRADE, AS NECESSARY TO ACCOMMODATE REQUIRED GRANULAR BEDDING MATERIAL. WHEN UNSTABLE FOUNDATION MATERIALS ARE ENCOUNTERED AT THE ESTABLISHED GRADE, ADDITIONAL MATERIALS SHALL BE REMOVED AS SPECIFIED OR ORDERED BY BLDC OR OWNER'S REPRESENTATIVE TO PRODUCE AN ACCEPTABLE FOUNDATION. ALL EXCAVATIONS BELOW GRADE SHALL BE TO A MAXIMUM WIDTH EQUAL TO THE OUTSIDE PIPE DIAMETER PLUS 2 FEET.

18. TRENCH WIDTHS SHALL ALLOW FOR AT LEAST 6-INCHES OF CLEARANCE ON EACH SIDE OF THE JOINT HUBS. THE MAXIMUM ALLOWABLE WIDTH OF THE TRENCH AT THE TOP OF PIPE LEVEL SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS 2 FEET. THE WIDTH OF THE TRENCH AT THE GROUND SURFACE SHALL BE HELD TO A WIDTH TO PREVENT UNNECESSARY DESTRUCTION OF SURFACE STRUCTURES WHILE MAINTAINING SAFE WORKING CONDITIONS.

19. THE MAXIMUM ALLOWABLE TRENCH WIDTH AT THE LEVEL OF THE TOP OF PIPE MAY BE EXCEEDED ONLY BY APPROVAL OF BLDC OR OWNER'S REPRESENTATIVE, AFTER CONSIDERATION OF PIPE STRENGTH AND LOADING RELATIONSHIPS. ANY ALTERNATE PROPOSALS MADE BY THE CONTRACTOR SHALL BE IN WRITING, GIVE THE PERTINENT SOIL WEIGHT DATA AND PROPOSED PIPE STRENGTH ALTERNATE, AND SHALL BE MADE IN A TIMELY MANNER SO AS NOT TO DELAY PROGRESS OF THE WORK. APPROVAL OF ALTERNATE PIPE DESIGNS SHALL BE WITH THE UNDERSTANDING THAT NO EXTRA COMPENSATION WILL BE ALLOWED FOR ANY INCREASE IN MATERIAL OR CONSTRUCTION COSTS.

GRANULAR MATERIAL

1. BACKFILL MATERIAL SHALL BE FREE FROM ORGANIC MATTER, CONSTRUCTION DEBRIS AND LARGE ROCKS (GREATER THAN 3 INCHES DIAMETER). THE BACKFILL SHALL BE PLACED IN LAYERS, NOT GREATER THAN 6 INCHES, WATERED AND COMPACTED.
2. USE OF EXCAVATED MATERIAL AS BACKFILL IN NON-ROADWAY AREAS SHALL BE AT THE DISCRETION OF BLDC. USE OF EXCAVATED MATERIAL AS BACKFILL IN ROADWAY AREAS SHALL ONLY BE APPROVED BY BLDC IF CONTRACTOR IS ABLE TO DEMONSTRATE THE MATERIAL MEETS THE SPECIFICATION FOR SELECT FILL.

BACKFILLING AND COMPACTION

1. ALL PIPELINE EXCAVATIONS SHALL BE BACKFILLED TO RESTORE PRE-EXISTING CONDITIONS AS THE MINIMUM REQUIREMENT, AND FULFILL ALL SUPPLEMENTARY REQUIREMENTS INDICATED IN THE PLANS AND SPECIFICATIONS. BACKFILLING OPERATIONS SHALL BE STARTED AS SOON AS CONDITIONS WILL PERMIT ON EACH SECTION OF PIPELINE, SO AS TO PROVIDE CONTINUITY IN SUBSEQUENT OPERATIONS AND RESTORE PUBLIC SERVICE AS SOON AS PRACTICABLE ON A SECTION-BY-SECTION BASIS. ALL OPERATIONS SHALL BE PURSUED DILIGENTLY, WITH PROPER AND ADEQUATE EQUIPMENT, AS WILL ASSURE ACCEPTABLE RESULTS.
2. BACKFILL MATERIALS SHALL BE CAREFULLY PLACED IN UNIFORM LAYERS SPREAD OVER THE FULL WIDTH AND LENGTH OF THE TRENCH SECTION TO PROVIDE SIMULTANEOUS SUPPORT ON BOTH SIDES OF THE PIPELINE. EACH LAYER SHALL BE COMPACTED EFFECTIVELY, BY APPROVED MECHANICAL METHODS BEFORE PLACING MATERIAL FOR A SUCCEEDING LAYER THEREON. WITHIN THE PIPE BEDDING/ENCASEMENT ZONE COMPACTION SHALL BE IN A MINIMUM OF THREE LIFTS: INVERT TO SPRING LINE, SPRING LINE TO TOP OF PIPE, AND TOP OF PIPE TO 12 INCHES OVER TOP OF PIPE. MAXIMUM THICKNESS OF ANY COMPACTION LIFT SHALL BE 6 INCHES COMPACTED THICKNESS.
3. UNLESS SPECIFIED OTHERWISE, BACKFILLING SHALL BE IN MAXIMUM 12 INCH LIFTS (COMPACTED THICKNESS).
4. BACKFILL MATERIAL BEHIND RETAINING WALLS SHALL BE FREE FROM ORGANIC MATTER, CONSTRUCTION DEBRIS AND LARGE ROCKS (GREATER THAN 3 INCHES). THE BACKFILL SHALL BE PLACED IN LAYERS, NOT GREATER THAN 6 INCHES, WATERED AND COMPACTED.
5. DO NOT BACKFILL AGAINST WALLS RETAINING EARTH UNTIL ELEMENTS PROVIDING LATERAL SUPPORT ARE COMPLETED. PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES OF OTHER WALLS BELOW GRADE
6. COMPACTION REQUIREMENTS ARE:

95%	SPMDD	GENERAL SUBGRADE
95%	SPMDD	LANDSCAPED AREAS (TOP 6 INCHES)
95%	SPMDD	SUBGRADE UNDER PADS
95%	SPMDD	PIPE BEDDING
95%	SPMDD	PIPE ENCASEMENT ZONE
95%	SPMDD	WITHIN UPPER 5 FEET BELOW ROAD SUBBASE
95%	SPMDD	WITHIN UPPER 2 FEET BELOW ROAD SUBBASE
95%	SPMDD	ROAD SUBBASE
95%	SPMDD	ROAD BASE
95%	MD	ASPHALT PAVING

SPMDD - STANDARD PROCTOR MAXIMUM DRY DENSITY

MD - MARSHALL DENSITY

A. REQUIRED TESTING AND FREQUENCY SHALL CONSIST OF:

i. MINIMUM ONE IN-PLACE DENSITY AND MOISTURE TEST PER 12 INCH LIFT PER 2000 SF OF FILL AREAS. ONE STANDARD PROCTOR TEST SHALL BE PERFORMED PER TYPE OF MATERIAL BACKFILL.

ii. MINIMUM ONE IN-PLACE DENSITY AND MOISTURE TEST PER 150 LF OF TRENCH. ONE STANDARD PROCTOR TEST SHALL BE PERFORMED PER TYPE OF MATERIAL BACKFILL.

iii. MINIMUM ONE IN-PLACE DENSITY AND MOISTURE TEST PER 500 LF OF TRENCH. ONE STANDARD PROCTOR TEST SHALL BE PERFORMED PER BASE AND SUBBASE MATERIAL.

7. THE MOISTURE CONTENT OF ALL BACKFILL MATERIALS WHEN TESTED SHALL NOT BE LESS THAN 1% BELOW AND NOT MORE THAN 3% ABOVE THE OPTIMUM MOISTURE CONTENT.
8. ALL SURPLUS OR WASTE MATERIALS REMAINING AFTER COMPLETION OF THE BACKFILLING OPERATIONS SHALL BE DISPOSED OF IN AN ACCEPTABLE MANNER AFTER COMPLETING THE BACKFILL WORK. DISPOSAL AT ANY LOCATION WITHIN THE PROJECT LIMITS SHALL BE AS SPECIFIED, OR AS APPROVED IN WRITING BY BLDC; OTHERWISE, DISPOSAL SHALL BE ACCOMPLISHED OUTSIDE THE PROJECT LIMITS AT THE CONTRACTOR'S OWN DUMP SITE.
9. COMPACTION TESTING OF ALL BACKFILLED MATERIALS SHALL BE VIA THE NUCLEAR DENSOMETER METHOD. THE CONTRACTOR SHALL PROVIDE AND COORDINATE WITH AN INDEPENDENT THIRD PARTY TESTING AGENCY TO PERFORM COMPACTION TESTING. ALL TESTING SHALL BE WITNESSED AND CERTIFIED BY THE OWNER'S REPRESENTATIVE

FINISHED GRADE SETTLEMENT LIMITATIONS.

1. GRADE AREAS DISTURBED DURING WORK TO EXISTING GRADE BEFORE DISTURBANCE, UNLESS OTHERWISE NOTED ON DRAWINGS, STANDARD DETAILS, OR WITH BLDC'S APPROVAL.
2. UNIFORMLY GRADE AREAS TO A SMOOTH SURFACE, FREE OF IRREGULAR SURFACE CHANGES. COMPLY WITH COMPACTION REQUIREMENTS AND GRADE TO CROSS SECTIONS, LINES, AND ELEVATIONS INDICATED.
3. PROVIDE A SMOOTH TRANSITION BETWEEN ADJACENT EXISTING GRADES AND NEW GRADES.
4. CUT OUT SOFT SPOTS, FILL LOW SPOTS, AND TRIM HIGH SPOTS TO COMPLY WITH REQUIRED SURFACE TOLERANCES.

A. SLOPE GRADES TO DIRECT WATER AWAY FROM BUILDINGS AND TO PREVENT PONDING. FINISH SUBGRADES TO REQUIRED ELEVATIONS WITHIN THE FOLLOWING TOLERANCES:

i. TURF OR UNPAVED AREAS: +/- 1-INCH

ii. WALKS: +/- 1-INCH

iii. PAVEMENTS: +/- 1/2-INCH

B. SLOPE SURFACE TO DRAIN, TO PROVIDE POSITIVE DRAINAGE IN TYPE I, II, AND III AREAS.

C.

DESIGNATION	SETTLEMENT	LOCATION
TYPE I	0.05 FOOT	PAVED AREAS AND PUBLIC RIGHTS OF WAY
TYPE II	WITH POSITIVE DRAINAGE	UNIMPROVED AREAS
TYPE III	0.10 FOOT	NONPAVED IMPROVED AREAS
TYPE IV	0.00 FOOT	WETLANDS OR WETLANDS BUFFER

i. REMOVE AND REPLACE TRENCH BACKFILL WHICH SETTLES IN EXCESS OF ABOVE LIMITATIONS WITH SUITABLE MATERIAL AT NO COST TO THE COMMISSION.

ii. REMOVE AND REPLACE PIPING, STRUCTURES, PAVING, LANDSCAPING, AND OTHER SITE IMPROVEMENTS DAMAGED BY SETTLEMENT OR REPAIR FOLLOWING CONTRACT DOCUMENTS, AT NO COST TO THE COMMISSION.

RESTORATION

1. A SCHEDULE OF RESTORATION OPERATIONS SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL. AFTER AN ACCEPTED SCHEDULE HAS BEEN AGREED UPON IT SHALL BE ADHERED TO UNLESS OTHERWISE REVISED WITH THE APPROVAL OF BLDC. RESTORATION TIME FRAME SHALL BE PER BLDC REQUIREMENTS AS STATED HEREIN, UNDER TRENCH WORK SECTION OF THESE NOTES
2. IN ADDITION, WORK PERFORMED ON PRIVATE PROPERTY SHALL BE CONFINED TO THE EASEMENTS OBTAINED.
3. TEMPORARY PAVEMENT

A. ALL TRENCH BACKFILL UNDER PAVEMENT SHALL BE WITH #21B STONE.

B. IMMEDIATELY UPON COMPLETION OF BACKFILLING OF THE TRENCH OR EXCAVATION, THE CONTRACTOR SHALL PLACE A TEMPORARY PAVEMENT OVER ALL DISTURBED AREAS OF STREETS, DRIVEWAYS, SIDEWALKS, AND OTHER TRAVELED PLACES WHERE THE ORIGINAL SURFACE HAS BEEN DISTURBED AS A RESULT OF HIS OPERATIONS.

C. UNLESS OTHERWISE SPECIFIED OR DIRECTED THE TEMPORARY PAVEMENT SHALL CONSIST OF COMPACTED CRUSHER RUN AGGREGATE (LIMESTONE) TO SUCH A DEPTH AS REQUIRED TO WITHSTAND THE TRAFFIC TO WHICH IT WILL BE SUBJECTED.

D. WHERE CONCRETE PAVEMENTS ARE REMOVED, THE TEMPORARY PAVEMENT SHALL BE SURFACED WITH "COLD PATCH". THE SURFACE OF THE TEMPORARY PAVEMENT SHALL CONFORM TO THE SLOPE AND GRADE OF THE AREA BEING RESTORED.

E. THE CONTRACTOR SHALL PATCH THE TRENCH:

i. AT THE END OF EACH WEEK, FOR THE ALL STREETS IMPACTED BY WORK.

F. THE CONTRACTOR SHALL TREAT ALL SURFACES, NOT COVERED WITH COLD PATCH, FOR DUST PREVENTION, AND AS FREQUENTLY AS MAY BE REQUIRED.

G. THE TEMPORARY PAVEMENT SHALL BE MAINTAINED BY THE CONTRACTOR IN A SAFE AND SATISFACTORY CONDITION UNTIL SUCH TIME AS THE PERMANENT PAVING IS COMPLETED. THE CONTRACTOR SHALL IMMEDIATELY REMOVE AND RESTORE ALL PAVEMENTS THAT HAVE BECOME UNSATISFACTORY.

4. ASPHALT PAVEMENT

A. THE PERMANENT ASPHALT PAVEMENT FOR STREETS, DRIVEWAYS AND PARKING AREA SURFACES SHALL BE OF BITUMINOUS MATERIALS OF THE SAME DEPTH AND KIND AS THE EXISTING PAVEMENT UNLESS OTHERWISE SPECIFIED.

B. PRIOR TO PLACING OF ANY BITUMINOUS PAVEMENT, A SEALER SHALL BE APPLIED TO THE EDGES OF THE EXISTING PAVEMENT AND OTHER FEATURES.

C. ASPHALT MIX DESIGN SHALL BE AS INDICATED IN THESE GENERAL CIVIL NOTES.

5. STONE OR GRAVEL PAVEMENT

A. ALL PAVEMENT AND OTHER AREAS SURFACED WITH STONE OR GRAVEL SHALL BE REPLACED WITH MATERIAL TO MATCH THE EXISTING SURFACE UNLESS OTHERWISE SPECIFIED.

i. THE DEPTH OF THE STONE OR GRAVEL SHALL BE AT LEAST EQUAL TO THE EXISTING.

ii. AFTER COMPACTION THE SURFACE SHALL CONFORM TO THE SLOPE AND GRADE OF THE AREA BEING REPLACED.

6. CONCRETE WALK, CURB AND GUTTER, AND DITCH REPLACEMENT

A. CONCRETE WALKS, CURBS AND GUTTERS, AND DITCHES REMOVED OR DAMAGED IN CONNECTION WITH OR AS A RESULT OF THE CONSTRUCTION OPERATIONS SHALL BE REPLACED WITH NEW CONSTRUCTION.

i. DESIGN SHALL BE AS SPECIFIED HEREIN.

7. LAWNS AND IMPROVED AREAS

A. THE AREA TO RECEIVE TOPSOIL SHALL BE GRADED TO A DEPTH AS SPECIFIED BUT NOT LESS THAN 4-INCHES BELOW THE PROPOSED FINISHED SURFACE.

i. IF THE DEPTH OF EXISTING TOPSOIL PRIOR TO CONSTRUCTION WAS GREATER THAN 4-INCHES, TOPSOIL SHALL BE REPLACED TO THAT DEPTH.

8. OTHER TYPES OF RESTORATION

A. TREES, SHRUBS AND LANDSCAPE ITEMS DAMAGED OR DESTROYED AS A RESULT OF THE CONSTRUCTION OPERATIONS SHALL BE REPLACED IN LIKE SPECIES AND SIZE.

i. ALL PLANTING AND CARE THEREOF SHALL MEET THE STANDARDS OF LOCAL GOVERNING BODY.

B. WATER COURSES SHALL BE RESHAPED TO THE ORIGINAL GRADE, CROSS-SECTION AND HAVE ALL DEBRIS REMOVED. WHERE REQUIRED TO PREVENT EROSION, THE BOTTOM AND SIDES OF THE WATERCOURSE SHALL BE PROTECTED.

C. CULVERTS DESTROYED OR REMOVED AS A RESULT OF THE CONSTRUCTION OPERATIONS SHALL BE REPLACED IN LIKE SIZE, MATERIAL, AND SHALL BE REPLACED AT THE ORIGINAL LOCATION WITH THE PROPER GRADE. WHEN THERE IS MINOR DAMAGE TO A CULVERT, WITH THE CONSENT OF BLDC, A REPAIR MAY BE UNDERTAKEN. SATISFACTORY RESULTS OF THE REPAIR MUST BE OBTAINED.

D. SHOULD BRICK PAVEMENTS BE ENCOUNTERED IN THE WORK, THE RESTORATION SHALL BE AS DIRECTED BY THE OWNER.

9. MAINTENANCE: THE FINISHED PRODUCTS OF RESTORATION SHALL BE MAINTAINED IN AN ACCEPTABLE CONDITION FOR AND DURING A PERIOD OF ONE-YEAR FOLLOWING THE DATE OF FINAL COMPLETION OR AS SPECIFIED BY THE BLDC OR PUBLIC WORKS.

CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO ACI 301 (LATEST EDITION), SPECIFICATION FOR STRUCTURAL CONCRETE FOR BUILDINGS AND ACI 318, "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" OR APPROVED EQUIVALENT STANDARD.
2. CONTRACTOR SHALL SUBMIT REQUIRED SUBMITTALS TO BLDC OF RECORD AS OUTLINED IN ACI 301 PRIOR TO CONCRETE MANUFACTURING.
3. CONCRETE SHALL BE MECHANICALLY COMPACTED IN AN APPROVED MANNER.
4. CEMENT FOR STRUCTURES SUBJECT TO SEAWATER OR SALT SPRAY:

A. ASTM C150, TYPE II (MODERATE SULFATE RESISTANCE) CEMENT PROVIDED THAT IT DOES NOT EXCEED 10 PERCENT BY MASS OF TRICALCIUM ALUMINATE, OR

B. ASTM C595, BLENDED CEMENTS MS DESIGNATIONS IP AND IS (<70), OR

C. ASTM C150 TYPE V CEMENT (SULFATE RESISTANT PORTALAND CEMENT)

ALL OTHER STRUCTURES SHALL UTILIZE ASTM C150; TYPE I - CAN3-A23.1, TYPE 10.

5. NORMAL WEIGHT CONCRETE SHALL CONTAIN FINE AND COARSE AGGREGATES COMPLYING WITH ASTM C-33. THE MAXIMUM SIZE OF COARSE AGGREGATES SHALL BE OF SIZES SUITABLE FOR PLACEMENT IN STRUCTURAL ELEMENTS CONSIDERING THEIR SIZE AND REINFORCEMENT CONFIGURATION.
6. NO ADMIXTURES SHALL BE PERMITTED UNLESS APPROVED BY BLDC.
7. STRUCTURAL CONCRETE SHALL ACHIEVE A MINIMUM CUBE COMPRESSIVE STRENGTH AT 28 DAYS AND W/C RATIO AS FOLLOWS UNLESS NOTED OTHERWISE:

	COMP. STRENGTH	MAX W/C RATIO
VAULT CONSTRUCTION CONCRETE	4000 PSI	0.40
CONCRETE SUBMERGED IN SEAWATER	4000 PSI	0.40
FOOTINGS	3000 PSI	0.40
SLABS ON GRADE	4000 PSI	0.40
RETAINING WALLS	4000 PSI	0.40
THRUST BLOCKS	3000 PSI	0.40
MISCELLANEOUS FILL	2000 PSI	

8. CONCRETE COVER TO BARS SHALL BE AS FOLLOWS, UNLESS NOTED OTHERWISE:

A. 3 INCH FOR CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH, FOUNDATIONS, RETAINING WALLS

B. 2 INCH FOR CONCRETE EXPOSED TO WEATHER

C. 1.5 INCH FOR CONCRETE NOT EXPOSED TO WEATHER OR NOT IN CONTACT WITH GROUND. SLABS, WALLS, BEAMS, COLUMNS

9. THROUGHOUT THEIR ENTIRE LENGTH, FORMS SHALL BE SET TRUE TO THE LINES AND GRADES SPECIFIED IN THE PLANS AND IN DIRECT CONTACT WITH THE SUBGRADE OR GRANULAR BASE.
10. CONCRETE SHALL BE PLACED, CONSOLIDATED, AND FINISHED IN A MANNER THAT ENSURES UNIFORM CONSISTENCY.
11. AT CONSTRUCTION JOINTS, PROVIDE DOWELS AND 1/4" ROUGHENED SURFACE WITH BONDING AGENT. ALSO PROVIDE A TENSION CLASS "B" LAP OF REINFORCING. USE ROUGHENED JOINT WHERE INDICATED ON THE DRAWINGS.
12. CONCRETE HAULING TIME SHALL NOT EXCEED 120 MINUTES.
13. CONCRETE SHALL BE PLACED BY A CONTINUOUS POUR METHOD. PUMPING OF CONCRETE IS PERMITTED WITH APPROVED EQUIPMENT AND MIX.
14. CONCRETE SHALL NOT BE PLACED AGAINST ANY MATERIAL WHICH IS AT A TEMPERATURE ABOVE 35 DEGREES CELSIUS.
15. CONTRACTOR SHALL ENSURE THAT REINFORCEMENT AND INSERTS (CHAIRS) ARE NOT DISTURBED DURING CONCRETE PLACEMENT.
16. DEVELOPMENT OF COLD JOINTS IS NOT PERMITTED.
17. LOCALIZED DEFECTS SHALL BE REPAIRED USING CONCRETE.
18. CURING OF CONCRETE SHALL COMMENCE AS SOON AS FREE WATER HAS DISAPPEARED FROM CONCRETE SURFACE AFTER PLACING AND FINISHING. CURING MATERIALS AND PROCEDURES SHALL BE AS FOLLOWS:

A. SLABS/MATS/MANHOLE COVERS: COVER CONCRETE SURFACES WITH MOISTURE-RETAINING COVER MEETING ASTM C171, EITHER POLYETHYLENE FILM OR WHITE BURLAP-POLYETHYLENE SHEET. PLACE IN WIDEST PRACTICAL WIDTH WITH SIDES AND ENDS LAPPED A MINIMUM OF 3 INCHES AND SEALED BY WATERPROOF TAPE OR ADHESIVE. IMMEDIATELY REPAIR ANY HOLES OR TEARS DURING CURING PERIOD USING COVER MATERIAL AND WATERPROOF TAPE. KEEP CONTINUOUSLY WET FOR NOT LESS THAN 7 DAYS.

19. CONCRETE TESTING FOR POURED IN PLACE CONCRETE SHALL CONSIST OF COMPRESSIVE CYLINDER TESTS AT 7 DAYS, 14 DAYS, AND 28 DAYS. TEST RESULTS SHALL BE SUBMITTED TO BLDC FOR REVIEW WITHIN 48 HOURS OF COMPLETION OF RESPECTIVE TESTS.

REINFORCING STEEL

1. ALL STEEL BARS SHALL BE GALVANIZED WITH A YIELD STRESS OF 60,000 PSI UNLESS NOTED OTHERWISE.
2. WHERE CONTINUOUS REINFORCEMENT IS CALLED FOR, REINFORCEMENT SHALL BE EXTENDED CONTINUOUSLY AROUND CORNERS AND LAPPED AT NECESSARY SPLICES OR HOOKED AT DISCONTINUOUS ENDS.
3. LAPS SHALL BE CLASS "B" TENSION LAP SPLICES, UNLESS NOTED OTHERWISE.
4. LOCATION OF ALL LAPS SHALL BE SHOWN ON REINFORCEMENT STEEL SHOP DRAWINGS AND SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.
5. STEEL REINFORCING SHALL CONFORM TO ASTM-767 GRADE 60 GALV. WELDED WIRE FABRIC (MESH) SHALL CONFORM TO ASTM-A-185.
6. WELDING OF REINFORCMENT SHALL NOT BE PERMITTED.

MASONRY WALLS

1. MASONRY CONSTRUCTION SHALL CONFORM TO SPECIFICATION FOR MASONRY STRUCTURES (ACI 530.1), UNLESS OTHERWISE NOTED.
2. STRENGTH OF MASONRY MATERIALS SHALL BE AS FOLLOWS:

A. CONCRETE MASONRY UNITS SHALL BE NORMAL WEIGHT, GRADE N, TYPE 1, CONFORMING TO ASTM C90 AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 1900 PSI ON THE NET AREA.

B. MORTAR SHALL CONFORM TO ASTM C270 TYPE M OR S.

C. SELF-CONSOLIDATING GROUT SHALL CONFORM TO ASTM C476 WITH A MAXIMUM AGGREGATE SIZE OF 3/8 INCH AND A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI GROUT. TESTS SHALL BE CONDUCTED IN ACCORDANCE WITH ACI 530.

D. REINFORCED MASONRY SHALL HAVE A COMPRESSIVE STRENGTH AT 28 DAYS, f_m' = 1,500 PSI, AS DETERMINED BY THE UNIT STRENGTH METHOD.

3. ALL VERTICAL REINFORCEMENT FOR CONCRETE MASONRY SHALL BE GALV. ASTM-767 GRADE 60. ALL SPLICES SHALL BE LAPPED 48 BAR DIAMETERS MINIMUM.
4. REINFORCED MASONRY WALLS SHALL HAVE BOND BEAMS AS INDICATED. BOND BEAM REINFORCING SHALL EXTEND INTO AND BE CONTINUOUS WITH INTERSECTING BOND BEAMS. FILL BOND BEAMS WITH COARSE GROUT.
5. FILL BLOCK CORES CONTAINING REINFORCEMENT FULL WITH GROUT. CROSS WEBS OF CORES CONTAINING REINFORCEMENT SHALL BE MORTAR BEDDED.
6. THE BASE OF EACH CELL IN WHICH A VERTICAL BAR IS PLACED SHALL HAVE A CLEAN-OUT HOLE MEASURING A MINIMUM OF 2 INCHES BY 3 INCHES.
7. DO NOT GROUT CELLS UNTIL INSPECTION AND REINFORCEMENT OF CELLS IS COMPLETE.
8. MINIMUM REINFORCING AT MASONRY WALLS: PROVIDE ONE (1) #4 VERTICAL REINFORCING BAR AS FOLLOWS:

A. AT CORNERS.

B. WITHIN 16 INCHES OF EACH SIDE OF WALL OPENINGS.

C. WITHIN 8 INCHES OF EACH SIDE OF CONTROL JOINTS.

D. WITHIN 8 INCHES OF ENDS OF WALLS.

PROVIDE TWO (2) #5 REINFORCING BARS AS FOLLOWS:

E. HORIZONTAL IN BOND BEAMS AT MASONRY WALLS PROVIDE MINIMUM VERTICAL.

9. BONDING METHODS, TIES, LINTELS AND ACCESSORIES SHALL BE APPROVED BY BLDC OF RECORD.
10. ADEQUATE TEMPORARY BRACING FOR WIND AND CONSTRUCTION LOADS SHALL BE PROVIDED AT ALL TIMES DURING INSTALLATION OF MASONRY UNTIL SUCH TIME AS THE MASONRY HAS REACHED ITS DESIGN STRENGTH AND THE STRUCTURE IS IN ITS COMPLETED FORM. DESIGN, STAGING, AND INSTALLATION OF TEMPORARY BRACING SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

SIDEWALKS

1. CONCRETE SHALL CONFORM TO THE FOLLOWING:

CLASS OF CONCRETE:	3,500 PSI AT 28 DAYS
COARSE AGGREGATE:	1/2 INCH NOMINAL MAX SIZE
MAXIMUM SLUMP:	2-1/2 INCH +/- 3/4 INCH

2. CURING COMPOUND SHALL CONFORM TO ASTM C309-93.
3. SUBGRADE TOLERANCE: FINISHED SUBGRADE SHALL BE WITHIN A 1/2 INCH DEVIATION MEASURED AT ANY POINT ON A 10 FOOT LONG STRAIGHT EDGE.

REDUCTION VERIFICATION SCALE 0 — 10 INCHES

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

GENERAL NOTES

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1102

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

NOTES & SPECIFICATIONS (CONTINUED)

4. SIDEWALK TOLERANCE: FINISHED SIDEWALK SHALL BE WITHIN A 1/4 INCH DEVIATION MEASURED AT ANY POINT ON A 10 FOOT LONG STRAIGHT EDGE.
5. THE MINIMUM ACCEPTABLE THICKNESS OF THE SIDEWALK SHALL BE THE SPECIFIED THICKNESS MINUS 5/8 INCH. IF THE THICKNESS DEFICIENCY EXCEEDS 5/8 INCH, THE SIDEWALK SHALL BE REMOVED AND REPLACED.
6. BEFORE PLACING CONCRETE ON GRANULAR BASE, THE GRANULAR BASE IMMEDIATELY AHEAD OF THE CONCRETE PLACING OPERATION SHALL BE WETTED DOWN THOROUGHLY. THE WETTING DOWN SHALL BE CARRIED OUT WITHOUT LEAVING STANDING WATER.
7. ALTERNATIVELY, A SUBGRADE MOISTURE VAPOR BARRIER MAY BE PLACED TO COMPLETELY COVER THE SUBGRADE UNDER THE SIDEWALK. ADJACENT STRIPS SHALL BE LAPPED 4 INCH MINIMUM AND ENDS SHALL BE LAPPED 12 INCH MINIMUM.
8. THROUGHOUT THEIR ENTIRE LENGTH, FORMS SHALL BE SET TRUE TO THE LINES, GRADES, AND THICKNESS SPECIFIED IN THE CONTRACT DOCUMENTS AND IN DIRECT CONTACT WITH THE SUBGRADE OR GRANULAR BASE.
9. WORK DONE ON ADJUSTMENT OF MANHOLES, VALVE CHAMBERS AND CATCH BASINS SHALL CONFORM TO SPECIFICATION FOR THESE STRUCTURES. UTILITY APPURTENANCES SHALL BE ADJUSTED FLUSH WITH THE SURFACE OF THE NEW SIDEWALK. FRAME TOPS AND GRATE SURFACES SHALL BE THOROUGHLY CLEANED.
10. CONCRETE SHALL BE PLACED, CONSOLIDATED AND FINISHED IN A MANNER THAT ENSURES UNIFORM CONSISTENCY. ANY EXCESS CONCRETE BEYOND THE SIDEWALK EDGE SHALL BE REMOVED.
11. CONCRETE SHALL BE PLACED BY A CONTINUOUS POUR METHOD. WHERE CONCRETE PLACING IS INTERRUPTED FOR MORE THAN 45 MINUTES, A THICK BITUMINOUS FIBERBOARD JOIN FILLER SHALL BE INSTALLED VERTICALLY ACROSS THE SIDEWALK WIDTH BEFORE RESUMING CONCRETE PLACING.
12. CONCRETE SHALL NOT BE PLACED AGAINST ANY MATERIAL WHICH IS AT A TEMPERATURE ABOVE 35 DEGREES CELSIUS.
13. FINISHING OF THE CONCRETE SURFACE SHALL TAKE PLACE WHILE IT IS SUFFICIENTLY TO ACHIEVE THE DESIRED GRADES, ELEVATIONS AND TEXTURE.
14. THE SURFACE SHALL BE UNIFORM, DENSE, FREE FROM UNDULATIONS AND PROJECTIONS, AND SHALL BE STRUCK OFF TRUE TO GRADE AND CROSS SECTION AND SHALL BE FINISHED WITH A FLOAT. EXCESSIVE FINES AND WATER SHALL NOT BE DRAWN TO THE SURFACE.
15. SURFACE RETARDERS SHALL NOT BE USED AS AN AID FOR FINISHING CONCRETE.
16. THE APPLICATION OF WATER, CEMENT, OR A COMBINATION OF SIMILAR MIXTURES TO THE CONCRETE SURFACE WILL NOT BE PERMITTED AS A FINISHING AID.
17. LOCALIZED DEFECTS SHALL BE REPAIRED USING CONCRETE.
18. THE TOP SURFACE OF SIDEWALKS SHALL BE GIVEN A BROOMED FINISH.
19. THE PRESENCE OF FOOTPRINTS OR OTHER MARKS IN THE COMPLETED SIDEWALK SHALL REQUIRE SAWCUTTING, REMOVAL AND REPLACEMENT OF THE COMPLETE SIDEWALK BAY.
20. LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE CONSTRUCTED OF THAT TYPE AND AT THE LOCATIONS SPECIFIED IN THE CONTRACT. THE CONCRETE ADJACENT TO ALL FORMWORK AND JOINTS SHALL BE FINISHED WITH A TOOL THAT PRODUCES A 1/8 INCH ROUNDED EDGE AND A SMOOTH, HORIZONTAL SURFACE WITH A MAXIMUM WIDTH OF 2 INCH. ALL TOOLING SHALL BE UNIFORM AND STRAIGHT AND SHALL BE DEPRESSED TO A MAXIMUM OF 1/16 INCH BELOW THE ADJACENT SURFACE. ANY RIDGES ALONG THE TOOLED MARKS SHALL BE REMOVED.
21. DUMMY JOINTS SHALL BE HAND FORMED USING A 1/8 INCH RADIUS DUMMY JOINT TOOL.
22. CONTRACTION JOINTS SHALL BE PLACED AT EVERY THIRD DUMMY JOINT AND SHALL BE SAWCUT OR FORMED TO A DEPTH WHICH IS 0.25 OF THE SIDEWALK THICKNESS.
23. WHEN THE SIDEWALK WIDTH IS 8 FEET OR GREATER, AS IT IS BEHIND EACH NEW BUS LAY-BY, A LONGITUDINAL CONTRACTION JOINT SHALL BE SAWN OR FORMED AT A MAXIMUM SPACING INTERVAL OF 5 FEET.
24. EXPANSION JOINTS SHALL BE CONSTRUCTED TO THE FULL DEPTH OF THE SLAB.
25. EXPANSION JOINTS SHALL BE FILLED WITH EXPANSION JOINT MATERIAL AND SHALL BE CLEAN AND DRY AT THE TIME OF CONSTRUCTION.
26. EXPANSION JOINTS SHALL BE CONSTRUCTED WHERE THE SIDEWALK ABUTS A RIGID OBJECT OR CHANGES DIRECTION.
27. CONCRETE CURING SHALL BE APPLIED TO ALL EXPOSED FACES AS SOON AFTER THE TEXTURIZING OPERATION AS CAN ACHIEVED WITHOUT DAMAGING THE SURFACE. THE SIDES OF EXPOSED FACES SHALL BE SPRAYED WITH THE WHITE PIGMENTED CURING COMPOUND.
28. VEHICULAR AND PEDESTRIAN TRAFFIC SHALL BE RESTRICTED FROM CROSSING THE SIDEWALK AFTER THE CONCRETE HAS BEEN PLACED FOR A MINIMUM PERIOD OF THREE DAYS.
29. CORE SAMPLES OF THE FINISHED CONCRETE MAY BE TAKEN TO ESTABLISH THE ACTUAL THICKNESS OF THE SLAB AT LOCATIONS DETERMINED BY BLDC OR OWNER'S REPRESENTATIVE.
30. UNACCEPTABLE AREAS OF SIDEWALK IDENTIFIED BY BLDC OR OWNER'S REPRESENTATIVE SHALL REQUIRE SAWCUTTING, REMOVAL AND REPLACEMENT OF THE COMPLETE BAY OF THE SIDEWALK BY THE CONTRACTOR.

ASPHALT PAVING

1. ASPHALT MIX DESIGN SHALL CONFORM TO LATEST BLDC OF WORKS & ENGINEERING STANDARDS.
2. MECHANICAL PAVERS SHALL BE SELF-PROPELLED AND CAPABLE OF LAYING A CONSISTENT, SATISFACTORY WHICH IS TRUE TO THE SPECIFIED GEOMETRY, CROSS-SECTION AND ALIGNMENT. PAVERS SHALL BE EQUIPPED WITH HOPPERS AND DISTRIBUTING SCREWS CAPABLE OF PLACING THE MIXTURE EVENLY IN FRONT OF THE SCREEDS. SCREEDS SHALL BE CAPABLE OF BEING HEATED AND BEING ADJUST ABLE AS TO LEVEL AND CROWN. PAVERS SHALL BE CAPABLE OF SIMULTANEOUSLY PLACING THE SHOULDER PAVEMENT AND ROADWAY PAVEMENT WHERE THE SHOULDER PAVEMENT IS AT A DIFFERENT CROSSFALL FROM THE ROADWAY PAVEMENT.100. IN ALL CASES, PAVERS SHALL BE EQUIPPED WITH AUTOMATIC LONGITUDINAL AND TRANSVERSE GRADE AND SLOPE CONTROLS WHICH ARE CAPABLE OF BEING OPERATED FROM EITHER SIDE OF THE PAVER. THE LONGITUDINAL GRADE CONTROL SHALL BE READILY ADJUSTABLE FOR MAT THICKNESS IN SMALL INCREMENTS WITHOUT THE NECESSITY TO STOP THE PAVER AND SHALL BE EQUIPPED TO OPERATE FROM EITHER A SKI WITH MAXIMUM LENGTH OF 9 M OR FLOATING BEAM, A 3 M SKI, OR A JOINT MATCHING SHOE AS REQUIRED, WHERE THE SKI IS A FLEXIBLE UNIT, IT SHALL BE EQUIPPED WITH A SPRING-TENSIONED WIRE EXTENDING BETWEEN BRACKETS FITTED ON AND SLIGHTLY ABOVE EACH END OF THE SKI. THE SENSING GRID SHALL RIDE ON THE WIRE, NOT ON THE SKI.
3. PLOWS OR OTHER EDGE RAMPING DEVICES WHICH ARE ATTACHED TO OR TOWED BY THE SCREED PORTION OF THE PAVER SHALL NOT BE PERMITTED TO AVOID SEGREGATION OF THE MIXTURE DURING HAND SPREADING.
4. ALL ROLLERS SHALL BE CAPABLE OF REVERSING WITHOUT BACKLASH.
5. PRIOR TO PLACING ANY COURSE OF HOT MIX ON A GRADE, A CONVENTIONAL STEEL-TIRED ROLLER HAVING A MINIMUM MASS OF 7 TON, OR AN EQUIVALENT VIBRATORY ROLLER WITH A DRUM WIDTH OF AT LEAST 1.2 M, SHALL BE USED TO FINISH ROLL THE GRADE AHEAD OF THE PAVER TO ENSURE A COMPACTED, SMOOTH AND FLOAT-FREE SURFACE. THIS ROLLER SHALL OPERATE CONTINUOUSLY WITHIN 300 M OF THE PAVER.
6. PRIOR TO PLACING PADDING, PATCHING OR PAVEMENT, ALL EXISTING ASPHALT AND CONCRETE SURFACES AND PREVIOUSLY LAID COURSES SHALL BE CLEANED OF ALL LOOSE, BROKEN AND FOREIGN MATERIAL.
7. ALL PAVEMENT SURFACES WHICH ARE TO BE COVERED WITH HOT MIX SHALL BE TACK COATED WITH SS-I ASPHALT EMULSION DILUTED WITH AN EQUAL VOLUME OF WATER. THE DILUTED SS-I EMULSION SHALL BE APPLIED TO THE SURFACE IMMEDIATELY FOLLOWING THE CLEANING OF THE SURFACE, AT THE RATE OF 0.35 KG/M2. THE EMULSION SHALL BE APPLIED EVENLY, BY MEANS OF A PRESSURE DISTRIBUTOR.
8. TACK COAT SHALL BE APPLIED AHEAD OF THE PAVER TO ACCOMMODATE NO MORE THAN 2 H OF PRODUCTION OF THE HOT MIX AND TRAFFIC SHALL BE PREVENTED FROM TRAVELING UPON THE TACK COAT. HOT MIX SHALL NOT BE PLACED UPON THE TACK COATED AREAS UNTIL THE TACK COAT HAS DRIED TO A CONDITION OF TACKINESS.
9. DELIVERY OF HOT MIX TO THE SITE SHALL BE SCHEDULED SUCH THAT SPREADING AND COMPACTING OF THE HOT MIX IS COMPLETED BY ONE-HALF HOUR AFTER SUNSET. COMMUNICATION BETWEEN THE PAVING OPERATION AND THE PLANT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND INABILITY TO CONTROL THE DELIVERY OF THE MIXTURE OR TO MAKE CHANCES IN THE COMPOSITION OF THE MIXTURE WILL NOT BE CAUSE FOR ACCEPTANCE OF THE WORK WHICH DOES NOT CONFORM TO REQUIREMENTS OF THE CONTRACT, NOR WILL IT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY FOR REJECTED LOADS.
10. PADDING SHALL BE CARRIED OUT TO CORRECT GEOMETRIC DEFICIENCIES ON THE SURFACE OF THE EXISTING PAVEMENT.
11. THE MIXTURE SHALL BE LAID ONLY UPON A BASE WHICH IS FREE OF STANDING WATER. NOT LESS THAN 300M OF PREPARED GRADE SHALL BE MAINTAINED AHEAD OF THE PAVER. THIS REQUIREMENT SHALL BE WAIVED AT THE END OF THE LANE, OR AT THE END OF THE PAVING OPERATION FOR THAT DAY.
12. THE SURFACE OF THE EXISTING PAVEMENT OR PREVIOUS LAID COURSE, UPON WHICH HOT MIX IS TO BE PLACED SHALL BE DRY AT THE TIME OF PLACING THE HOT MIX.
13. THE TEMPERATURE OF THE MIXTURE IMMEDIATELY AFTER SPREADING AND PRIOR TO INITIAL ROLLING SHALL NOT BE LESS THAN 115 DEGREES CELSIUS.
14. IMMEDIATELY AFTER EACH COURSE LAD AND BEFORE ROLLER COMPACTION IS STARTED, DEFICIENCIES THE SURFACE GEOMETRICS AND MATERIAL TEXTURE SHALL BE CORRECTED. IRREGULARITIES IN ALIGNMENT AND GRADE ALONG THE OUTSIDE EDGES SHALL BE CORRECTED.
15. BINDER AND SURFACE COURSES SHALL BE LAID BY MEANS OF MECHANICAL SELF-PROPELLED PAVERS.
16. THE LONGITUDINAL ALIGNMENT OF THE SPREADER SHALL BE CONTROLLED BY FOLLOWING A STRING LINE WHICH IS SET FROM THE ALIGNMENT STAKES. THIS MEANS OF CONTROL SHALL BE PLACED AT EACH OUTER EDGE OF THE PAVEMENT SO THAT THE SPREADER IS DIRECTED AT ALL TIMES BY THE ALIGNMENT STAKES AND NOT BY THE EDGE OF THE PRECEDING COURSE EXCEPT FOR THE RAILING PAVER WHEN PAVERS ARE OPERATED IN ECHELON.
17. THE AUTOMATIC SCREED CONTROLS AND ALL COMPACTION AIDS ON THE PAVER SHALL BE IN OPERATION WHILE THE MIXTURE IS BEING PLACED.
18. SINGLE PAVERS, OR THE LEAD PAVER WHEN PAVERS ARE OPERATED IN ECHELON, SHALL BE CONTROLLED AS TO LONGITUDINAL GRADE BY A 12 M SKI OR FLOATING BEAM.
19. THE PAVERS SHALL OPERATE CONTINUOUSLY AT A UNIFORM SPEED NECESSARY TO MATCH THE OUTPUT OF THE PLANT; HOWEVER, IN NO CASE SHALL THE SPEED OF THE PAVER EXCEED 18 M/MIN.
20. IF THE MIXTURE FOR SURFACE COURSE PAVING COME FROM MORE THAN ONE MIXING PLANT, THE MIXTURE FROM EACH PLANT SHALL BE PLACED BY A SEPARATE PAVER.
21. AT JUNCTIONS, TURN-OUTS, DRIVEWAYS, AND OTHER IRREGULAR SECTIONS WHERE IT IS IMPRACTICAL TO SPREAD AND FINISH THE BINDER, LEVELING OR SURFACE MIXTURES BY MACHINE METHODS, THE CONTRACTOR SHALL USE OTHER SPREADING EQUIPMENT OR SHALL SPREAD THE MIXTURE BY HAND.
22. WHEN LAYING SURFACE COURSES, THE USE OF FEED AUGERS FOR PLACING MIX IN THESE AREAS, ETC. IS PERMITTED ONLY WHEN SUPPLYING MATERIALS TO A HYDRAULIC STRIKE-OFF DEVICE.
23. WHEN IT IS NECESSARY TO HAND-SPREAD THE MIXTURE IN SECTIONS ADJACENT TO MACHINE-LAID AREAS, SUCH HAND-SPREADING SHALL BE CARRIED OUT CONCURRENT WITH MACHINE-LAYING.122.ALL JOINTS SHALL BE MADE TO ENSURE A THOROUGH AND CONTINUOUS BOND AND TO PROVIDE A SMOOTH RIDING SURFACE.
24. ALL DIRT OR OTHER FOREIGN MATERIAL AND ALL LOOSE MATERIAL SHALL BE REMOVED FROM ALL FACES AT WHICH JOINTS ARE MADE.
25. WHEN MATCHING A COMPACTED JOINT, THE DEPTH OF THE UNCOMPACTED SHALL BE SET TO ALLOW FOR COMPACTION AND THE PAVER SCREED SHALL OVERLAP THE ADJOINING MAT BY AT LEAST 2 INCH.
26. ALL FACES AT WHICH JOINTS ARE MADE SHALL PAINTED WITH A THIN UNIFORM AND CONTINUOUS COATING OF JOINT PAINTING MATERIAL.
27. LONGITUDINAL JOINTS SHALL BE PROPERLY SET UP WITH THE BACK OF A RAKE OR LUTE, OR BOTH, AT PROPER HEIGHT AND GRADE PRIOR TO ROLLING.
28. LONG BUTT JOINTS BETWEEN THE BINDER COURSE OF THE BITUMINOUS PAVEMENT LAID UNDER THIS CONTRACT AND EXISTING BITUMINOUS PAVEMENT SHALL BE CONSTRUCTED BY TRIMMING THE EXISTING PAVEMENT EDGE TO A STRAIGHT, CLEAN, VERTICAL FACE.

PVC CONDUIT FOR COMMUNICATION LINE

1. PVC CONDUIT FOR COMMUNICATION LINE SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:
   - A. INSTALLATION OF PVC CONDUIT SHALL CONFORM TO ASTM D 2321.
   - B. PVC PIPE JOINTS SHALL BE IN ACCORDANCE WITH AWWA MANUAL NO. M123.
   - C. PROVIDE SCHEDULE 40 PVC CONDUIT OF THE SIZES SHOWN ON THE CONSTRUCTION DRAWINGS.
   - D. PVC CONDUIT SHALL BE LISTED TO UL 651 AND MANUFACTURED IN ACCORDANCE WITH NEMA TC2.
   - E. PVC CONDUIT SHALL BE LABELED OR MARKED SHOWING EVIDENCE OF THIRD-PARTY LISTING TO PRODUCT STANDARD.
   - F. PVC CONDUIT SHALL BE LISTED AS SUNLIGHT RESISTANT.
   - G. PVC CONDUIT SHALL BE LISTED FOR USE WITH 90° CONDUCTORS.
   - H. INTEGRAL COUPLINGS SHALL BE LISTED TO UL 651 AND MANUFACTURED IN ACCORDANCE WITH NEMA TC-2.
   - I. ELBOWS SHALL BE LISTED TO UL 651 AND MANUFACTURED IN ACCORDANCE WITH NEMA TC-3.
   - J. FITTINGS, INCLUDING FABRICATED FITTINGS, JUNCTION-BOX ADAPTERS, EXPANSION FITTINGS, THREADED ADAPTERS AND SERVICE ENTRANCE HEADS SHALL BE LISTED TO UL 651 AND MANUFACTURED IN ACCORDANCE WITH NEMA TC-3. B. FITTINGS FOR USE IN WET LOCATIONS SHALL BE LISTED FOR USE IN WET-LOCATIONS.
   - K. SCHEDULE 40 PVC CONDUIT, ELBOWS AND FITTINGS SHALL BE INSTALLED IN COMPLIANCE WITH THE LATEST VERSION OF THE NATIONAL ELECTRICAL CODE® (NEC®) AND OTHER APPLICABLE CODES AND STANDARDS AS INDICATED ELSEWHERE IN THESE SPECIFICATIONS.
   - L. SCHEDULE 40 PVC CONDUIT, ELBOWS AND FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH NECA NATIONAL ELECTRICAL INSTALLATION STANDARD (NEIS) 111, STANDARD FOR INSTALLING NONMETALLIC RACEWAYS.
   - M. SCHEDULE 40 PVC CONDUIT SHALL BE ACCEPTABLE WHERE SUBJECT TO PHYSICAL DAMAGE.
   - N. CONTRACTOR TO FIELD VERIFY AND COORDINATE WITH OWNER LOCATION AND LAYOUT OF PULL BOXES AND BENDING RADIUS REQUIREMENTS.
   - O. CONTRACTOR SHALL PROVIDE CONDUIT BENDS THAT DO NOT EXCEED THE COMMUNICATION CABLE MINIMUM BENDING RADIUS.
   - P. TOTAL NUMBER OF CONDUIT BENDS AND OFFSETS IN A SINGLE CONDUIT RUN SHALL NOT EXCEED 270 DEGREES WITHOUT A PULL FITTING, OR PULL BOX.
2. ALL PIPING TO SHALL BE FURNISHED BY BLDC. CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL FITTINGS AND BENDS.
3. CONTRACTOR TO INSTALL PULL STRING THROUGH PVC COMMUNICATIONS CONDUIT DURING INSTALLATION.

SCHEDULE 80 PVC PIPE

1. COMPLY WITH ALL ASTM AND MANUAL SANITATION FOUNDATION REQUIREMENTS.
2. MATERIAL SHALL BE TYPE 1 GRADE 1, CELL CLASSIFICATION 12454, TRADE DESIGNATION H707 PVC, GRAY COLOR.
3. MANUFACTURER IN ACCORDANCE WITH D1785, ASTM D-2672, NSF STANDARD 14, CSA STANDARD B137.3 AND FLARE SPREAD PER CAN/ULC-S102-2-M88.
4. PRIME SURFACES TO BE JOINED WITH OATLEY CLEAN INDUSTRIAL PRIMER OR APPROVED EQUAL UTILIZE OATLEY EXTRA HEAVY DUTY GRAY CEMENT RATED 140° OR APPROVED EQUAL.

PIPE EXPANSION FITTINGS

1. REQUIRED FOR ALL OUT DOOR ABOVE GRADE CONDUIT AND PIPING.
2. SPACE 100-FEET APART MAXIMUM IN ANY PIPE RUN AND IN ALL PIPE RUNS LONGER THAN FORTY-FEET.
3. +/- 6" EXPANSION CONTRACTION CAPACITY.
4. TRIPLE O-RING SEALS
5. 235 PSI PRESSURE RATING MINIMUM.
6. FLEXICRAFT MODEL P OR APPROVED EQUAL

SANITARY FORCE MAIN, POTABLE WATER AND RECLAIMED WATER PIPING

1. THIS NOTE SECTION INCLUDES, BUT IS NOT LIMITED TO, HIGH-DENSITY POLYETHYLENE (HDPE) (PE 3408) (DUCTILE IRON PIPE SIZE (DIPS) OUTSIDE DIAMETER) PRESSURE PIPE PRIMARILY INTENDED FOR THE TRANSPORTATION OF POTABLE WATER, SEWAGE, RECLAIMED WATER AND SEWAGE EFFLUENT EITHER BURIED OR ABOVE GRADE.
2. THE BERMUDA LAND DEVELOPMENT CORPORATION (BLDC) HAS STOCKPILED HDPE PIPE FOR USE ON THIS PROJECT. NOT ALL REQUIRED PIPE AND NONE OF THE REQUIRED PIPE FITTINGS OR ACCESSORIES ARE AVAILABLE FROM BLDC STOCKPILE. PIPES TO BE FURNISHED BY BLDC ARE CALLED OUT ON THE CONTRACT PLANS, THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL OTHER PIPES, FITTINGS, MATERIALS AND EQUIPMENT REQUIRED FOR A COMPLETE INSTALLATION.
3. ALL PIPE TO PIPE CONNECTIONS SHALL BE PROVIDED UTILIZING THE BUTT FUSION WELDING PROCESS. MINIMAL ELECTROFUSION COUPLINGS MAY BE UTILIZED BY WRITTEN APPROVAL FROM BLDC.
4. ELECTROFUSION PIPE FITTINGS MAY BE UTILIZED ONLY WHERE THE BUTT FUSION PROCESS CANNOT BE PERFORMED. SHOW ALL ELECTROFUSION COUPLING LOCATIONS ON SHOP DRAWINGS SUBMITTED FOR APPROVAL PRIOR TO INSTALLATION.
5. ALL ELECTROFUSION CONNECTIONS SHALL BE GPS LOCATED AND CLEARLY IDENTIFIED ON THE CONTRACTOR'S AS-BUILT DRAWINGS.
6. THE FOLLOWING REFERENCE ARE APPLICABLE TO HDPE PIPE USED IN THIS PROJECT:
   - A. AWWA C901 POLYETHYLENE (PE) PRESSURE PIPE & TUBING, ½ INCH THROUGH 3 INCH FOR WATER
   - B. AWWA C906 POLYETHYLENE (PE) PRESSURE PIPE & FITTINGS, 4 INCH THROUGH 63 INCH FOR WATER
   - C. ASTM D3035 STANDARD SPEC FOR PE PIPE (DR-PR) BASED ON CONTROLLED OUTSIDE DIAMETER
   - D. ASTM D3261 BUTT HEAT FUSION PE FITTINGS FOR PE PIPE & TUBING
   - E. ASTM D3350 STANDARD SPECIFICATION FOR PE PIPE & FITTINGS MATERIALS
   - F. ASTM D1238 MELT FLOW INDEX
   - G. ASTM D1505 DENSITY OF PLASTICS
   - H. ASTM D2837 HYDROSTATIC DESIGN BASIS
   - I. NSF STANDARD #14 PLASTIC PIPING COMPONENTS & RELATED MATERIALS
   - J. TR-33/2005 GENERIC BUTT FUSION JOINING PROCEDURE FOR FIELD JOINING OF PE PIPE
7. ALL MATERIAL USED IN THE PRODUCTION OF POTABLE WATER MAIN PIPING SHALL BE APPROVED BY THE NATIONAL SANITATION FOUNDATION (NSF).
8. MATERIALS SHALL CONSIST OF A BLACK HIGH-DENSITY POLYETHYLENE COPOLYMER RESIN DEIGNED FOR EXTRUSION FOR POTABLE WATER, RECLAIMED WATER AND WASTEWATER APPLICATIONS PER ASTM D3350 AND ASTM F714.
9. THE RESIN SHALL HAVE A PE 4710 RATING. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FROM THE RESIN'S MANUFACTURER SHOWING RESULTS OF THE FOLLOWING TESTS FOR RESIN IDENTIFICATION:
   - A. MELT FLOW INDEX PER ASTM D1238
   - B. DENSITY PER ASTM D1505
10. THE MANUFACTURER SHALL BE ISO 9001 CERTIFIED. ALL PIPE SHALL BE IN ACCORDANCE WITH AWWA C901/C906 SUITABLE TO BE JOINED USING BUTT FUSION OR ELECTROFUSION.
11. HDPE PIPE AND ACCESSORIES 4-INCH DIAMETER AND LARGER, SHALL BE 140 PSI AT 73.4^{O}F MEETING THE REQUIREMENTS OF STANDARD DIMENSION RATION (SDR) 11 AS MINIMUM STRENGTH PER ASTM D3350 AND ASTM F714. ABOVE GRADE FORCE MAIN SHALL BE UV RESISTANT HDPE DR 11 PIPE.
12. THE BASE POLYMER SHALL BE A SINGLE GRADE OF POLYETHYLENE, PE 4710 WITH A DERIVED DENSITY GREATER THAN 0.93G/CM3 TESTED AT 20°C. NO REWORK MATERIAL IS ALLOWED TO BE USED FOR THE MANUFACTURE OF THE PIPES. NO ADDITIVES THAT CAN CONTRIBUTE TO TOXIC HAZARD, IMPAIR THE FABRICATION OF PROPERTIES AND CHEMICAL AND PHYSICAL PROPERTIES IN PARTICULAR TO LONG TERM MECHANICAL AND STRENGTH ARE ALLOWED.
13. THE COLOR OF THE PIPES SHALL BE BLACK. EACH PIPE SHALL CONTAIN MINIMUM TWO (2) EQUI-SPACED FACTORY COLOR CODED LONGITUDINAL STRIPES ON OPPOSITE SIDES OF THE PIPE DESIGNATING THE PIPE USE. THE MATERIAL FOR STRIPES SHALL BE OF THE SAME TYPE OF RESIN AS USED IN THE COMPOUND FOR THE PIPE.
   - A. BLUE STRIPES - POTABLE WATER MAIN
   - B. GREEN STRIPES - SANITARY SEWER FORCE MAIN
   - C. LILAC STRIPES - RECLAIMED WATER MAIN
14. THE PIPE SHALL BE MARKED AT LEAST EVERY 4-FT OF THE PIPE. ALL PIPES MUST HAVE THE MARKINGS AT LEAST WITH THE FOLLOWING INFORMATION:
   - A. 'HDPE' LETTERS
   - B. MONTH AND YEAR OF MANUFACTURE
   - C. BRAND
   - D. NOMINAL DIAMETER
   - E. MINIMUM WALL THICKNESS
   - F. THE MATERIAL GRADE (PE100)
   - G. NOMINAL PRESSURE (PN)
15. WALL THICKNESS AND NOMINAL DIAMETER SHALL BE HDPE DUCTILE IRON PIPE SIZE
16. THE INTERNAL DIAMETER AND EXTERNAL SURFACES OF PIPES MUST SMOOTH, CLEAN AND FREE FROM SCORING, CAVITIES AND OTHER SURFACE DEFECTS WHICH MAY AFFECT PIPE PERFORMANCE. THE ENDS OF PIPE SHALL CUT CLEANLY AND SQUARE TO THE AXIS OF THE PIPE. APPEARANCE SHALL BE CHECKED AT THE POINT OF MANUFACTURE.
17. MATERIALS USED FOR THE MANUFACTURE OF POLYETHYLENE PIPE AND FITTINGS SHALL BE MADE FROM A PE 3408 HIGH DENSITY POLYETHYLENE RESIN COMPOUND MEETING CELL CLASSIFICATION 345434C PER ASTM D3350; AND MEETING TYPE LLL, CLASS C, CATEGORY 5, GRADE P34 PER ASTM D1238.
18. HIGH DENSITY POLYETHYLENE (HDPE) PIPE SHALL COMPLY WITH AWWA SPECIFICATIONS C906.
19. IF REWORK COMPOUNDS ARE REQUIRED, ONLY THOSE GENERATED IN THE MANUFACTURER'S OWN PLANT FROM RESIN COMPOUNDS OF THE SAME CLASS AND TYPE FROM THE SAME RAW MATERIAL SUPPLIER SHALL BE USED.
20. DIMENSIONS AND WORKMANSHIP SHALL BE AS SPECIFIED BY ASTM F714. HDPE FITTINGS AND TRANSITIONS SHALL MEET ASTM D3261. HDPE PIPE SHALL HAVE A MINIMUM DENSITY OF 0.955 GRAMS PER CUBIC CENTIMETER. ALL HDPE PIPE AND FITTINGS SHALL HAVE A HYDROSTATIC DESIGN BASIS (HDB) OF 1,600 PSI.
21. THE PIPE MANUFACTURER MUST CERTIFY COMPLIANCE WITH THE ABOVE REQUIREMENTS.

Push on Gravity Sewer Piping

Comply with the Following Standards

ASTM D3034 “Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings” ASTM D3212 “Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals” ASTM F679 “Standard Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings” ASTM F1336 “Standard Specification for Polyvinyl Chloride (PVC) Gasketed Sewer Fittings” CSA B182.2 “PSM Type Polyvinyl Chloride (PVC) Sewer Pipe and Fittings” .

Install in Accordance With

ASTM D2321 “ Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications” CSA B182.11 “Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings” Specifications PVC sewer pipe shall conform to ASTM D3034 (3-inch through 15-inch), ASTM F679 (18-inch through 60-inch), or CSA B182.2 (4-inch through 60-inch).

Fittings

PVC fittings shall conform to ASTM 3034, ASTM F1336, or CSA B182.2. PVC bell-and-spigot push-on type joints shall be gasketed, conforming to ASTM D3212. All PVC sewer pipe and fittings shall be installed in accordance with ASTM D2321 or CSA B182.11.

HDPE FITTINGS AND SERVICE CONNECTIONS

1. ALL HDPE PIPE AND FITTINGS SHALL BE FROM A SINGLE MANUFACTURER, WHO IS FULLY EXPERIENCED, REPUTABLE AND QUALIFIED IN THE MANUFACTURE OF THE HDPE PIPE TO BE FURNISHED. THE PIPE SHALL BE DESIGNED, CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH THE BEST PRACTICES AND METHODS AND SHALL COMPLY WITH THESE SPECIFICATIONS QUALIFIED MANUFACTURERS SHALL BE: PLEXCO DIVISION OF CHEVRON CHEMICAL COMPANY, DRISCOPIPE AS MANUFACTURED BY PHILLIPS PRODUCTS CO., INC., ISCO INDUSTRIES OF KENTUCKY OR EQUAL AS APPROVED BY BLDC.
2. STANDARD HDPE FITTINGS SHALL BE PREFABRICATED, STANDARD COMMERCIAL PRODUCTS MANUFACTURED BY INJECTION MOLDING OR BY EXTRUSION AND MACHINING, OR, SHALL BE FABRICATED FROM HDPE PIPE CONFORMING TO THIS SPECIFICATION. FITTINGS SHALL BE FULLY PRESSURE RATED BY THE MANUFACTURER TO PROVIDE A WORKING PRESSURE EQUAL TO THE PIPE FOR 50 YEARS' SERVICE AT 73.4 DEGREES FAHRENHEIT WITH AN INCLUDED SAFETY FACTOR. NO CONTRACTOR FABRICATED FITTINGS SHALL BE USED UNLESS APPROVED BY BLDC. THE FITTINGS SHALL BE MANUFACTURED FROM THE SAME RESIN TYPE, GRADE, AND CELL CLASSIFICATION AS THE PIPE ITSELF. THE MANUFACTURE OF THE FITTINGS SHALL BE IN ACCORDANCE WITH GOOD COMMERCIAL PRACTICE TO PROVIDE FITTINGS HOMOGENEOUS THROUGHOUT AND FREE FROM CRACKS, HOLES, FOREIGN INCLUSIONS, VOIDS, OR OTHER INJURIOUS DEFECTS. FITTINGS SHALL BE AS UNIFORM AS COMMERCIALLY PRACTICABLE IN COLOR, OPACITY, DENSITY, AND OTHER PHYSICAL PROPERTIES. THE MINIMUM 'QUICK-BURST' STRENGTH OF THE FITTINGS SHALL NOT BE LESS THAN THAT OF THE PIPE WITH WHICH THE FITTING IS TO BE USED.
3. THE MANUFACTURER OF THE HDPE PIPE, OR BLDC APPROVED EQUAL, SHALL SUPPLY ALL HDPE FITTINGS AND ACCESSORIES AS WELL AS ANY ADAPTERS AND/OR SPECIALS REQUIRED TO PERFORM THE WORK.
4. ALL FITTINGS SHALL BE INSTALLED USING BUTT-FUSED FITTINGS, THERMO-FUSED FITTINGS/COUPLINGS, OR FLANGED ADAPTERS AND MUST BE APPROVED BY BLDC IN WRITING.
5. ALL TRANSITION FROM HDPE PIPE TO DUCTILE IRON OR PVC SHALL BE MADE PER THE APPROVAL OF BLDC AND PER THE HDPE PIPE MANUFACTURERS' RECOMMENDATIONS AND SPECIFICATIONS. A MOLDED FLANGE CONNECTOR ADAPTER WITHIN A CARBON STEEL BACK-UP RING ASSEMBLY SHALL BE USED FOR PIPE TYPE TRANSITIONS. DUCTILE IRON BACK-UP RINGS SHALL MATE WITH CAST IRON FLANGES PER ANSI B16.1. A 316 STAINLESS STEEL BACK-UP RING SHALL MATE WITH A 316 STAINLESS STEEL FLANGE PER ANSI B16.1.
   - A. TRANSITION FROM HDPE TO DUCTILE IRON FITTINGS AND VALVES SHALL BE APPROVED BY BLDC BEFORE INSTALLATION.
   - B. NO SOLID SLEEVES SHALL BE ALLOWED BETWEEN SUCH MATERIAL TRANSITIONS.
   - C. FITTINGS AND TRANSITIONS SHALL BE AS MANUFACTURED BY PHILLIPS DRISCOPIPE, INC., 1000 SERIES PRESSURE PIPE, CHEVRON CHEMICAL COMPANY PLEXCO/SPIRALITE PIPE, OR EQUAL.
   - D. THE PIPE SUPPLIER MUST CERTIFY COMPLIANCE WITH THE ABOVE REQUIREMENTS.
6. ALL SERVICE CONNECTIONS TO HDPE MAIN SHALL BE WITH ELECTROFUSION SADDLE WITH GASKETED OUTLET. SADDLES FOR HDPE PIPE SHALL BE FULL CIRCUMFERENCE WIDE BAND WITH STAINLESS STEEL BAND, NUTS, BOLTS AND OUTLET. BAND SHALL BE TYPE 304 STAINLESS STEEL OF MINIMUM 18 GAUGE THICKNESS.
7. ELECTROFUSION TAPPING SLEEVE AND VALVE
   - A. VALVES FOR TAPPING SERVICE SHALL MEET ALL THE REQUIREMENTS FOR GATE VALVES PER SECTION 40 05 61 - VALVES AND ACCESSORIES. IN ADDITION, THE BODY SEAT RINGS SHALL HAVE CLEAR INSIDE OPENINGS SUFFICIENT TO PASS A CUTTER OF FULL DIAMETER AND EQUAL TO THE NOMINAL SIZE OF THE TAPPING VALVE.
   - B. TAPPING VALVES FOR HDPE PIPE SHALL PRODUCE FROM A PRE-BLENDED VIRGIN RESIN THAT HAS A PPI LISTING OF PE3408 WHICH COMPLIES WITH ASTM D3350. THIS RESIN CARRIES A NSF STANDARD 61 LISTING FOR USE WITH POTABLE WATER. THE OUTLET PIPE SIZE SHALL BE HDPE SDR 11 (DIPS).

MANUFACTURER'S FINISHED PRODUCT EVALUATION FOR HDPE PIPES

1. PRODUCTION STAFF SHALL CHECK EACH LENGTH OF PIPE PRODUCED FOR THE ITEMS LISTED BELOW. THE RESULTS OF ALL MEASUREMENTS SHALL BE RECORDED ON PRODUCTION SHEETS WHICH BECOME PART OF THE MANUFACTURER'S PERMANENT RECORDS.
2. PIPE IN PROCESS SHALL BE CHECKED VISUALLY, INSIDE AND OUT FOR COSMETIC DEFECTS (GROOVES, PITS, HOLLOWS, ETC.)
3. PIPE OUTSIDE DIAMETER SHALL BE MEASURED USING A SUITABLE PERIPHERY
4. TAPE TO ENSURE CONFORMANCE WITH ASTM F714 OR ASTM D3035, WHICHEVER IS APPLICABLE.
   - A. PIPE WALL THICKNESS SHALL BE MEASURED AT 12 EQUALLY SPACED LOCATIONS AROUND THE CIRCUMFERENCE AT BOTH ENDS OF THE PIPE TO ENSURE CONFORMANCE WITH ASTM F714 OR ASTM D3035, WHICHEVER IS APPLICABLE.

REDUCTION VERIFICATION SCALE 0 — 10 INCHES

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER TENDER PACKAGE #3A

GENERAL NOTES

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

NOTES & SPECIFICATIONS (CONTINUED)

i. PIPE LENGTH SHALL BE MEASURED.

ii. PIPE MARKING SHALL BE EXAMINED AND CHECKED FOR ACCURACY.

iii. PIPE ENDS SHALL BE CHECKED TO ENSURE THEY ARE CUT SQUARE AND CLEAN. SUBJECT INSIDE SURFACE TO A "REVERSE BEND TEST" TO ENSURE THE PIPE IS FREE OF OXIDATION (BRITTLENESS).

5. STRESS REGRESSION TESTING: THE POLYETHYLENE PIPE MANUFACTURER SHALL PROVIDE CERTIFICATION THAT STRESS REGRESSION TESTING HAS BEEN PERFORMED ON THE SPECIFIC POLYETHYLENE RESIN BEING UTILIZED IN THE MANUFACTURE OF THIS PRODUCT. THIS STRESS REGRESSION TESTING SHALL HAVE BEEN DONE IN ACCORDANCE WITH ASTM D2837 AND THE MANUFACTURER SHALL PROVIDE A PRODUCT SUPPLYING A MINIMUM HYDROSTATIC DESIGN BASIS (HDB) OF 1,600 PSI AS DETERMINED IN ACCORDANCE WITH ASTM D2837.

HDPE PIPE CERTIFICATION

1. MANUFACTURER OR SUPPLIER ARE REQUIRED TO PROVIDE A COPY OF RAW MATERIAL APPROVAL CERTIFICATE PRIOR TO SHIPPING
2. MANUFACTURER OR SUPPLIER ARE REQUIRED TO PROVIDE A COPY OF MILL CERTIFICATE FOR EACH BATCH OF PIPES PRIOR TO SHIPPING.
3. MANUFACTURER OR SUPPLIER ARE REQUIRED TO PROVIDE A COPY OF THE CERTIFICATE AND TESTING REPORT FROM RECOGNIZED CERTIFICATION BODY PRIOR TO SHIPPING.

PIPE WARRANTY

1. THE PIPE MANUFACTURER SHALL PROVIDE A WARRANTY AGAINST MANUFACTURING DEFECTS OF MATERIAL AND WORKMANSHIP FOR A PERIOD OF TEN YEARS AFTER THE FINAL ACCEPTANCE OF THE PROJECT BY THE OWNER. THE MANUFACTURER SHALL REPLACE AT NO EXPENSE TO BLDC ANY DEFECTIVE PIPE/FITTING MATERIAL WITHIN THE WARRANTY PERIOD.

PIPE TRACING AND MARKING

1. TRACING WIRE SHALL BE T.W.U., NUMBER EIGHT GAUGE, STRANDED, INSULATED COPPER WIRE WITH 60 MIL OF BLACK, CROSS-LINKED POLYETHYLENE (XLPE) INSULATION SPECIFICALLY MANUFACTURED FOR DIRECT BURIAL APPLICATIONS.
2. MARKING TAPE SHALL BE INSTALLED PER BLDC APPROVAL. PROVIDE FOR EACH BURIED HDPE FORCE MAIN ALONG THE ENTIRE PIPE LENGTH. INCLUDE TEXT "BURIED SEWER FORCE MAIN BELOW" OR SIMILAR DESCRIPTION.
   A. COLOR: GREEN
   B. SOLID ALUMINUM CORE 0.35 MIL MIN. THICKNESS AND MINIMUM WIDTH OF 6-INCHES
   C. MINIMUM THICKNESS: 5 MIL
   D. MINIMUM TENSILE STRENGTH: 35LBS./INCH

PIPE INSPECTION, DELIVERY, HANDLING, AND STORAGE

1. THE CONTRACTOR SHALL SCHEDULE POLICE DETAILS AS NECESSARY IN ACCORDANCE LOCAL REQUIREMENTS. COORDINATE TRAFFIC MANAGEMENT AT ALL WORK LOCATIONS WITH OWNER.
2. PROPER AND ADEQUATE IMPLEMENTS, TOOLS, AND FACILITIES SHALL BE PROVIDED AND USED BY THE CONTRACTOR FOR THE SAFE AND CONVENIENT PROSECUTION OF THE WORK. UNLOADING, DISTRIBUTION, AND STORAGE OF PIPE AND APPURTENANT MATERIALS ON THE JOB SITE SHALL BE AT A LOCATION APPROVED BY BLDC OR OWNER'S REPRESENTATIVE. ALL MATERIALS SHALL BE HANDLED CAREFULLY, AS WILL PREVENT DAMAGE TO PROTECTIVE COATINGS, LININGS, AND JOINT FITTINGS; PRECLUDE CONTAMINATION OF INTERIOR AREAS; AND TO AVOID JOLTING CONTACT, DROPPING OR DUMPING.
3. BEFORE BEING LOWERED INTO LAYING POSITION, THE CONTRACTOR SHALL MAKE A THOROUGH VISUAL INSPECTION OF EACH PIPE SECTION AND APPURTENANT UNITS TO DETECT DAMAGE OR UNSOUND CONDITIONS THAT MAY NEED CORRECTIVE ACTION OR BE CAUSE FOR REJECTION. INSPECT EXTERIOR AND INTERIOR OF EACH PIPE AND FITTING FOR DAMAGE AND DISCOLORATION. INSPECTION PROCEDURE SHALL BE AS APPROVED BY BLDC OR OWNER'S REPRESENTATIVE, WITH SPECIAL METHODS BEING REQUIRED, AS HE DEEMS NECESSARY TO CHECK OUT SUSPECTED DEFECTS MORE DEFINITELY. THE CONTRACTOR SHALL INFORM BLDC OR OWNER'S REPRESENTATIVE OF ANY DEFECTS DISCOVERED AND BLDC OR OWNER'S REPRESENTATIVE WILL PRESCRIBE THE REQUIRED CORRECTIVE ACTION OR ORDER REJECTION.
4. IMMEDIATELY BEFORE PLACEMENT, THE JOINT SURFACES OF EACH PIPE SECTION AND FITTING SHALL BE INSPECTED FOR THE PRESENCE OF FOREIGN MATTER, COATING BLISTERS, ROUGH EDGES OR PROJECTIONS, AND ANY IMPERFECTIONS SO DETECTED SHALL BE CORRECTED BY CLEANING, TRIMMING, OR REPAIRS AS NEEDED.
5. CLOSE OPEN ENDS OF PIPE AND FITTINGS WITH A WATERTIGHT SEAL DURING PERIODS WHEN WORK IS NOT IN PROGRESS.
6. STORE MATERIALS AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PIPE SHALL HAVE END CAPS FOR SHIPPING. PIPE SHALL BE INSPECTED UPON DELIVERY, IMPROPER OR DAMAGED PIPE SHALL BE REJECTED AND IMMEDIATELY REMOVED FROM THE PROJECT SITE.
7. PIPE SHOULD BE STORED, IF POSSIBLE, AT THE JOB SITE IN UNIT PACKAGES PROVIDED BY THE MANUFACTURER. CAUTION SHOULD BE EXERCISED TO AVOID COMPRESSION DAMAGE OR DEFORMATION TO BELL ENDS OF THE PIPE. PIPE SHOULD BE STORED IN SUCH A WAY AS TO PREVENT SAGGING OR BENDING AND PROTECTED FROM EXPOSURE TO DIRECT SUNLIGHT BY COVERING WITH AN OPAQUE MATERIAL WHILE PERMITTING ADEQUATE AIR CIRCULATION ABOVE AND AROUND THE PIPE. GASKETS SHOULD BE STORED IN A COOL, DARK PLACE OUT OF THE DIRECT RAYS OF THE RUN, PREFERABLY IN ORIGINAL CARTONS.
8. HANDLING: PIPE, FITTINGS AND ACCESSORIES SHALL BE CAREFULLY INSPECTED BEFORE AND AFTER INSTALLATION AND THOSE FOUND DEFECTIVE SHALL BE REJECTED. PIPE AND FITTINGS SHALL BE FREE FROM FINS AND BURRS. BEFORE BEING PLACED IN POSITION, PIPE, FITTINGS, AND ACCESSORIES SHALL BE CLEANED, AND SHALL BE MAINTAINED IN A CLEAN CONDITION. PROPER FACILITIES SHALL BE PROVIDED FOR LOWERING SECTIONS OF PIPE INTO TRENCHES. UNDER NO CIRCUMSTANCES SHALL PIPE, FITTINGS OR ANY OTHER MATERIAL BE DROPPED OR DUMPED INTO TRENCHES.

PIPE PLACEMENT AND LAYING

1. HIGH DENSITY POLYETHYLENE (HDPE) PIPE SHALL BE INSTALLED IN ACCORDANCE WITH THE INSTRUCTION OF THE MANUFACTURER, AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.
2. A FACTORY QUALIFIED JOINING TECHNICIAN AS DESIGNATED BY PIPE MANUFACTURER OR A TECHNICIAN WITH A CURRENT FUSION WELDING CERTIFICATION OR COMPLETION OF A BLDC TRAINING CLASS SHALL PERFORM ALL HEAT FUSION JOINTS IN THE PRESENCE OF THE BLDC INSPECTOR.
3. HDPE SHALL BE INSTALLED BY OPEN TRENCH CONSTRUCTION.
4. CARE SHALL BE TAKEN IN LOADING, TRANSPORTING AND UNLOADING TO PREVENT DAMAGE TO THE PIPE. PIPE OR FITTING SHALL NOT BE DROPPED. ALL PIPE OR FITTING SHALL BE EXAMINED BEFORE INSTALLATION, AND NO PIECE SHALL BE INSTALLED WHICH IS FOUND TO BE DEFECTIVE. IF ANY DEFECTIVE PIPE IS DISCOVERED AFTER IT HAS BEEN INSTALLED, IT SHALL BE REMOVED AND REPLACED WITH A SOUND PIPE IN A SATISFACTORY MANNER BY THE CONTRACTOR, AT HIS OWN EXPENSE.
5. UNDER NO CIRCUMSTANCES SHALL THE PIPE OR ACCESSORIES BE DROPPED INTO THE TRENCH.
6. CARE SHALL BE TAKEN DURING TRANSPORTATION OF THE PIPE SUCH THAT IT WILL NOT BE CUT, KINKED OR OTHERWISE DAMAGED.
7. ROPES, FABRIC OR RUBBER PROTECTED SLINGS AND STRAPS SHALL BE USED WHEN HANDLING PIPES. CHAINS, CABLES OR HOOKS INSERTED INTO THE PIPE ENDS SHALL NOT BE USED. TWO SLINGS SPREAD APART SHALL BE USED FOR LIFTING EACH LENGTH OF PIPE.
8. STACKING OF THE POLYETHYLENE PIPE SHALL BE LIMITED TO A HEIGHT THAT WILL NOT CAUSE EXCESSIVE DEFORMATION OF THE BOTTOM LAYERS OF PIPES UNDER ANTICIPATED TEMPERATURE CONDITIONS. WHERE NECESSARY DUE TO GROUND CONDITIONS, THE PIPE SHALL BE STORED ON WOODEN SLEEPERS, SPACED SUITABLY AND OF SUCH WIDTH AS NOT TO ALLOW DEFORMATION OF THE PIPE AT THE POINT OF CONTACT WITH THE SLEEPER OR BETWEEN SUPPORTS.
9. PIPE SHALL BE STORED ON CLEAN LEVEL GROUND TO PREVENT UNDUE SCRATCHING OR GOUGING. THE HANDLING OF THE PIPE SHALL BE IN SUCH A MANNER THAT THE PIPE IS NOT DAMAGED BY DRAGGING IT OVER SHARP AND CUTTING OBJECTS. THE MAXIMUM ALLOWABLE DEPTH OF CUTS, SCRATCHES OR GOUGES ON THE EXTERIOR OF THE PIPE IS 5 PERCENT OF WALL THICKNESS. THE INTERIOR PIPE SURFACE SHALL BE FREE OF CUTS, GOUGES OR SCRATCHES.
10. PIPE SHALL BE LAID TO LINES AND GRADE SHOWN ON THE DRAWINGS WITH BEDDING AND BACKFILL AS SHOWN ON THE DRAWINGS.
11. WHEN LAYING IS NOT IN PROGRESS, INCLUDING LUNCHTIME, THE OPEN ENDS OF THE PIPE SHALL BE CLOSED BY FABRICATED PLUGS, OR BY OTHER APPROVED MEANS.
12. SECTIONS OF PIPE WITH CUTS, SCRATCHES OR GOUGES EXCEEDING 5 PERCENT OF THE PIPE WALL THICKNESS SHALL BE REMOVED COMPLETELY AND THE ENDS OF THE PIPELINE REJOINED.
13. THE PIPE SHALL BE JOINED BY THE METHOD OF THERMAL BUTT FUSION. ALL JOINTS SHALL BE MADE IN STRICT COMPLIANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
14. MECHANICAL CONNECTIONS OF THE POLYETHYLENE PIPE TO AUXILIARY EQUIPMENT SUCH AS VALVES, PUMPS AND TANKS SHALL BE THROUGH FLANGED CONNECTIONS WHICH SHALL CONSISTS OF THE FOLLOWING:
    A. A POLYETHYLENE FLANGE SHALL BE THERMALLY BUTT-FUSED TO THE PIPE STUB END.
    B. A 316 STAINLESS STEEL BACK UP RING SHALL MATE WITH A 316 STAINLESS STEEL FLANGE.
    C. A 316 STAINLESS STEEL BOLTS AND NUTS SHALL BE USED.
15. FLANGE CONNECTIONS SHALL BE PROVIDED WITH A FULL-FACE NEOPRENE GASKET.
16. ALL HDPE PIPE MUST BE AT THE TEMPERATURE OF THE SURROUNDING SOIL AT THE TIME OF BACKFILLING AND COMPACTION.
17. IF A DEFECTIVE PIPE IS DISCOVERED AFTER IT HAS BEEN INSTALLED, IT SHALL BE REMOVED AND REPLACED WITH A SOUND PIPE IN A SATISFACTORY MANNER AT NO ADDITIONAL COST TO THE OWNER.
18. ALL PIPE AND FITTINGS SHALL BE THOROUGHLY CLEANED BEFORE INSTALLATION, SHALL BE KEPT CLEAN UNTIL THEY ARE USED IN THE WORK AND WHEN LAID, SHALL CONFORM TO THE LINES AND GRADES REQUIRED KINKED OR OTHERWISE DAMAGED.
19. THE CONTRACTOR IS RESPONSIBLE FOR COMPATIBILITY BETWEEN PIPE MATERIALS, FITTINGS AND APPURTENANCES.
20. PIPE LAYING OPERATIONS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, AND AS SUPPLEMENTED AS FOLLOWS:
    A. TRENCH EXCAVATION AND BEDDING PREPARATIONS SHALL PROCEED AHEAD OF PIPE PLACEMENT AS WILL PERMIT PROPER LAYING AND JOINING OF THE UNITS AT THE PRESCRIBED GRADE AND ALIGNMENT WITHOUT UNNECESSARY DEVIATION OR HINDRANCE.
    B. ALL FOREIGN MATTER OR DIRT SHALL BE REMOVED FROM THE INSIDE OF THE PIPE AND FITTINGS BEFORE THEY ARE LOWERED INTO POSITION IN THE TRENCH AND THEY SHALL BE KEPT CLEAN BY APPROVED MEANS DURING AND AFTER LAYING. THE PIPE MATERIALS SHALL BE CAREFULLY LOWERED INTO POSITION BY THE USE OF SUITABLE RESTRAINING DEVICES. UNDER NO CIRCUMSTANCES SHALL THE PIPE BE DROPPED INTO THE TRENCH.
    C. AT THE TIME OF PIPE PLACEMENT, THE BEDDING CONDITIONS SHALL BE SUCH AS TO PROVIDE UNIFORM AND CONTINUOUS SUPPORT FOR THE PIPE BETWEEN BELL HOLES. BELL HOLES SHALL BE EXCAVATED AS NECESSARY TO MAKE THE JOINT CONNECTIONS, BUT THEY SHALL BE NO LARGER THAN WOULD BE ADEQUATE TO SUPPORT THE PIPE THROUGHOUT ITS LENGTH. NO PIPE MATERIAL SHALL BE LAID IN WATER OR WHEN THE TRENCH OR BEDDING CONDITIONS ARE OTHERWISE UNSUITABLE OR IMPROPER. WHEN PLACEMENT OR HANDLING PRECAUTIONS PROVE INADEQUATE, IN BLDC'S OPINION, THE CONTRACTOR SHALL PROVIDE AND INSTALL SUITABLE PLUGS OR CAPS EFFECTIVELY CLOSING THE OPEN ENDS OF EACH PIPE SECTION BEFORE IT IS LOWERED INTO THE LAYING POSITION, AND THEY SHALL REMAIN SO COVERED UNTIL REMOVAL IS NECESSARY FOR CONNECTION OF AN ADJOINING UNIT.
    D. UNLESS OTHERWISE PERMITTED BY BLDC OR OWNER'S REPRESENTATIVE, BELL AND SPIGOT PIPE SHALL BE LAID WITH THE BELL ENDS FACING UPGRADE AND THE LAYING SHALL START ON THE DOWNGRADE END AND PROCEED UPGRADE. AS EACH LENGTH OF BELL AND SPIGOT PIPE IS PLACED IN LAYING POSITION, THE SPIGOT END SHALL BE CENTERED IN THE BELL AND THE PIPE FORCED HOME AND BROUGHT TO CORRECT LINE AND GRADE. THE PIPE SHALL BE SECURED IN PLACE WITH APPROVED BACKFILL MATERIAL, WHICH SHALL BE THOROUGHLY COMPACTED BY TAMPING AROUND THE PIPE OUT TO THE TRENCH WALL.
    E. AT ALL TIMES WHEN PIPE LAYING IS NOT IN PROGRESS, INCLUDING NOON HOUR AND OVERNIGHT PERIODS, ALL OPEN ENDS OF THE PIPELINE SHALL BE CLOSED BY WATERTIGHT PLUGS OR OTHER MEANS APPROVED BY BLDC OR OWNER'S REPRESENTATIVE. IF WATER IS PRESENT IN THE TRENCH, THE SEALS SHALL REMAIN IN PLACE UNTIL THE TRENCH IS PUMPED COMPLETELY DRY.

OPEN INSTALLATION FOR HDPE PIPE

1. TRENCH EXCAVATION AND BACKFILL SHALL CONFORM TO THE REQUIREMENTS HEREIN.
2. THE CENTERLINE OF THE PIPE SHALL NOT DEVIATE FROM A STRAIGHT LINE DRAWN BETWEEN THE CENTERS OF THE OPENINGS AT THE ENDS OF THE PIPE BY MORE THAN 1/16-IN PER FOOT OF LENGTH. IF A PIECE OF PIPE FAILS TO MEET THIS REQUIREMENT CHECK FOR STRAIGHTNESS, IT SHALL BE REJECTED AND REMOVED FROM THE SITE. LAYING INSTRUCTIONS OF THE MANUFACTURER SHALL BE EXPLICITLY FOLLOWED.
3. GOOD ALIGNMENT SHALL BE PRESERVED DURING INSTALLATION. DEFLECTION OF THE PIPE SHALL OCCUR ONLY AT THOSE PLACES ON DESIGN DRAWINGS AND AS APPROVED BY BLDC. PIPE SHALL BE GRADED IN STRAIGHT LINES, TAKING CARE TO AVOID THE FORMATION OF ANY DIPS OR LOW POINTS. PIPE SHALL NOT BE LAID WHEN THE CONDITIONS OF TRENCH OR WEATHER ARE UNSUITABLE. WITH THE EXCEPTION OF WELDING PROCESSES AND AT THE END OF EACH DAY'S WORK, OPEN ENDS OF PIPE SHALL BE CLOSED TEMPORARILY WITH BULKHEADS.
4. TRENCHES SHALL BE KEPT FREE OF WATER UNTIL JOINTS HAVE BEEN PROPERLY MADE. THE MAXIMUM COMBINED DEFLECTION AT ANY COUPLING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. FITTINGS, IN ADDITION TO THOSE SHOWN ON THE DRAWINGS, SHALL BE USED ONLY IF NECESSARY OR REQUIRED BY BLDC.
5. JOINTS SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. THE PIPE SHALL BE JOINED WITH BUTT, HEAT FUSION JOINTS AS OUTLINED IN ASTM D2657 AND CONFORM TO THE GENERIC BUTT FUSION JOINING PROCEDURE FOR FIELD JOINING OF POLYETHYLENE PIPE, TECHNICAL REPORT TR-33/2005, PUBLISHED BY THE PLASTIC PIPE INSTITUTE (PPI). ALL JOINTS SHALL BE MADE IN STRICT COMPLIANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. A FACTORY QUALIFIED JOINING TECHNICIAN AS DESIGNATED BY PIPE MANUFACTURER OR EXPERIENCED, TRAINED TECHNICIAN SHALL PERFORM ALL HEAT FUSION JOINTS IN THE PRESENCE OF BLDC INSPECTOR.
6. JOINTS SHALL BE BUTT FUSED OR FLANGED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
   A. EACH WELD SHALL HAVE THE FOLLOWING LOGGED BY THE WELDER:
      i. WELD NUMBER.
      ii. TEMPERATURE OF HEATER.
      iii. PRESSURE APPLIED DURING THE WELD.
      iv. TIME PRESSURE WAS HELD FOR.
      v. DATE OF WELD.
7. LENGTHS OF PIPE SHALL BE ASSEMBLED INTO SUITABLE INSTALLATION LENGTHS BY THE BUTT-FUSION PROCESS. ALL PIPES SO JOINED SHALL BE MADE FROM THE SAME CLASS AND TYPE OF RAW MATERIAL MADE BY THE SAME RAW MATERIAL SUPPLIER. PIPE SHALL BE FURNISHED IN STANDARD LAYING LENGTHS NOT TO EXCEED 50-FEET AND NO SHORTER THAN 40-FEET.
8. ON DAYS BUTT FUSIONS ARE TO BE MADE, THE FIRST FUSION SHALL BE A TRIAL FUSION IN THE PRESENCE OF BLDC INSPECTOR. THE FOLLOWING SHALL APPLY:
   A. HEATING PLATE SURFACES SHALL BE INSPECTED FOR CUTS AND SCRAPES AND SHALL BE FREE OF DIRT AND RESIDUE. HEATER SURFACES SHOULD BE BETWEEN 400°F (MINIMUM) TO 450°F (MAXIMUM). MEASURE THE TEMPERATURE @ 12:00,3:00, 6:00 AND 9:00 O'CLOCK POSITIONS USING A PYROMETER OF INFRARED THERMOMETER AT LOCATIONS WHERE THE HEATING PLATE WILL CONTACT THE PIPE/FITTING ENDS. THE MAXIMUM TEMPERATURE DIFFERENCE BETWEEN ANY TWO POINTS ON A SINGLE HEATING SURFACE MUST NOT EXCEED 24°F. IF THESE TEMPERATURES ARE EXCEEDED, THE HEATING PLATE SHALL BE CLEANED PER THE MANUFACTURER'S RECOMMENDATIONS.
   B. THE FUSION OR TEST SECTION SHALL BE CUT OUT AFTER COOLING COMPLETELY FOR INSPECTION.
   C. THE TEST SECTION SHALL BE 12-INCHES OR 30 TIMES (MINIMUM) THE WALL THICKNESS IN LENGTH AND 1-INCH OR 1.5 TIMES THE WALL THICKNESS IN WIDTH (MINIMUM).
   D. THE JOINT SHALL BE VISUALLY INSPECTED AS TO CONTINUITY OF "BEADS" FROM THE MELTED MATERIAL, AND FOR ASSURANCE OF "COLD JOINT" PREVENTION (I.E. - JOINT SHALL HAVE VISIBLE MOLDED MATERIAL BETWEEN WALLS OF PIPE). JOINT SPACING BETWEEN THE WALLS OF THE TWO ENDS SHALL BE A MINIMUM OF 1/16-INCH TO A MAXIMUM 3/16-INCH.
9. THE POLYETHYLENE FLANGE ADAPTERS AT PIPE MATERIAL TRANSITIONS SHALL BE BACKED UP BY STAINLESS STEEL FLANGES CONFORMING TO ANSI B16.1 AND SHAPED AS NECESSARY TO SUIT THE OUTSIDE DIMENSIONS OF THE PIPE. THE FLANGE ADAPTER ASSEMBLIES SHALL BE CONNECTED WITH CORROSION RESISTING BOLTS AND NUTS OF TYPE 316 STAINLESS STEEL AS SPECIFIED IN ASTM A726 AND ASTM A307. ALL BOLTS SHALL BE TIGHTENED TO THE MANUFACTURERS SPECIFIED TORQUES. BOLTS SHALL BE TIGHTENED ALTERNATIVELY AND EVENLY. AFTER INSTALLATION, APPLY A BITUMASTIC COATING TO BOLTS AND NUTS.
10. EACH LENGTH OF THE PIPE SHALL HAVE THE ASSEMBLY MARK ALIGNED WITH THE PIPE IN PLACE. JOINTS SHALL NOT BE "PULLED" OR "CRAMPED".
11. PRECAUTIONS SHALL BE TAKEN TO PREVENT FLOTATION OF THE PIPE IN THE TRENCH.
12. WHEN MOVEABLE TRENCH BRACING SUCH AS TRENCH BOXES, MOVEABLE SHEETING, SHORING OR PLATES ARE USED TO SUPPORT THE SIDES OF THE TRENCH, CARE SHALL BE TAKEN IN PLACING AND MOVING THE BOXES OR SUPPORTING BRACING TO PREVENT MOVEMENT OF THE PIPE, OR DISTURBANCE OF THE PIPE BEDDING AND THE BACKFILL. TRENCH BOXES, MOVEABLE SHEETING, SHORING OR PLATES SHALL NOT BE ALLOWED TO EXTEND BELOW TOP OF THE PIPE. AS TRENCH BOXES, MOVEABLE SHEETING, SHORING OR PLATES ARE MOVED, PIPE BEDDING SHALL BE PLACED TO FILL ANY VOIDS CREATED AND THE BACKFILL SHALL BE RECOMPACTED TO PROVIDE UNIFORM SIDE SUPPORT FOR THE PIPE.
13. RESTRAINED JOINTS SHALL BE INSTALLED WHERE SHOWN ON THE DRAWINGS OR AS DIRECTED BY BLDC.
14. PIPE SHALL BE CUT BY MEANS OF SAWS, POWER DRIVEN ABRASIVE WHEELS OR PIPE CUTTERS, WHICH WILL PRODUCE A SQUARE CUT. NO WEDGE-TYPE ROLLER CUTTERS WILL BE PERMITTED. AFTER CUTTING, THE END OF THE PIPE SHALL BE BEVELED USING A BEVELING TOOL, PORTABLE TYPE SANDER OR ABRASIVE DISC. PIPE INSTALLED BY THE CONTRACTOR SHALL AT THE END OF THE COMPLETION OF WORKS EACH DAY BE CAPPED WITH A TEMPORARY PROTECTION CAP TO KEEP THE PIPE FREE OF DEBRIS AND VERMIN.
15. TRACER WIRE SHALL BE LAID FLAT AND SECURELY AFFIXED TO THE PIPE AT TEN FOOT INTERVALS. THE WIRE SHALL BE PROTECTED FROM DAMAGE DURING THE EXECUTION OF THE WORKS. NO BREAKS OR CUTS IN THE TRACER WIRE OR TRACER WIRE INSULATION SHALL BE PERMITTED. AT WATER SERVICE SADDLES, THE TRACER WIRE SHALL NOT BE ALLOWED TO BE PLACED BETWEEN THE SADDLE AND THE WATER MAIN. EXCEPT FOR APPROVED SPLICED IN CONNECTIONS, TRACER WIRE SHALL BE CONTINUOUS AND WITHOUT SPLICES FROM TEST BOX TO TEST BOX. TRACER WIRE SHALL BE LOOPED AT EVERY LIFT STATION CONTROL PANEL.
16. WARNING TAPE SHALL BE INSTALLED OVER EACH PIPE IN THE BACKFILL MATERIALS. WARNING TAPE SHALL BE INSTALLED DIRECTLY ABOVE PIPE AND NO LESS THAN 12-INCHES BELOW THE EXISTING PAVED ASPHALT WEARING COURSE OR FINISHED GRADE FOR THE FULL LENGTH OF THE BURIED SECTIONS AS SHOWN ON CONTRACT DRAWINGS.
17. CONNECTIONS TO EXISTING PIPELINES AND MANHOLES:
    A. THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND IMPROVEMENTS AND INSTALL THE PIPELINES TO THE DEPTHS SHOWN ON THE DRAWINGS. WHERE THE NEW WORK IS TO BE CONNECTED TO EXISTING PIPELINES, THE CONTRACTOR SHALL MAKE ITS ARRANGEMENTS WITH THE SERVING UTILITY WELL IN ADVANCE OF THE CONNECTIONS, TO ALLOW ADEQUATE TIME FOR DEWATERING OF THE EXISTING LINE, IF NECESSARY.
    B. ALL SERVICES SHALL HAVE A MINIMUM COVER AS SHOWN ON TRENCH DETAILS. TRENCHING AND EARTHWORK SHALL BE PER NOTES.
    C. ALL FITTINGS INCLUDING CONNECTION SADDLE MATERIALS ARE TO BE "NO LEAD" OR LEAD FREE.
    D. ALL SERVICE CONNECTIONS TO BE UNDERTAKEN UPON COMPLETION OF THE LAYING OF THE NEW SEWER, RECLAIM WATER AND WATER MAINS AND AFTER THE COMMISSIONING AND TESTING OF THE NEW PIPELINE. ALL SERVICE CONNECTIONS TO EXISTING METERS SHALL BE LAID PERPENDICULAR TO THE MAIN AND EXTENDED TO THE EXISTING SHUT OFF VALVE ATTACHED TO A METER OR AS DIRECTED BY BLDC OR OWNER'S REPRESENTATIVE. EACH SERVICE SHALL BE TAPPED INTO THE MAIN AT LEAST 45 DEGREES ABOVE THE HORIZONTAL. TAPS SHOULD BE AT LEAST 12-INCHES APART AND STAGGERED AROUND THE TOP SECTION OF THE PIPE. TAPPING IS TO BE MADE WET BY THE CONTRACTOR. CONNECTION SADDLES ARE REQUIRED TO SATISFY THIS REQUIREMENT. TRACING WIRE IS TO EXTEND TO THE BODY OF THE WATER METER.
    E. CONNECTION OF PIPE TO EXISTING LINES OR PREVIOUSLY CONSTRUCTED MANHOLES SHALL BE ACCOMPLISHED AS SHOWN IN THE PLANS OR AS OTHERWISE APPROVED BY BLDC OR OWNER'S REPRESENTATIVE. ALL STRUCTURE PENETRATIONS SHALL BE MADE WITH THE USE OF WATER STOP SEALS.
18. CONTRACTOR SHALL KEEP AN ACCURATE RECORD OF THE LOCATION, DEPTH AND SIZE OF EACH SERVICE CONNECTION AND OTHER PERTINENT DATA SUCH AS THE LOCATION OF STOPS, PIPE ENDINGS, AND ALL WELD LOCATIONS. TAP LOCATIONS SHALL BE RECORDED IN REFERENCE TO SURVEY LINE STATIONING. CURB BOXES SHALL BE TIED TO DEFINABLE LANDMARKS SUCH AS BUILDING CORNERS, FIRE HYDRANTS, MANHOLES AND TELEPHONE PEDESTALS. PIPE TERMINALS AT THE PROPERTY LINE SHALL BE MARKED ON THE GROUND SURFACE WITH A 2 INCH X 4 INCH X 8 FOOT WOOD POST EXTENDING 3 FEET ABOVE GRADE WITH THE TOP 2 FEET PAINTED BLUE.
19. WATER SERVICE LINES SHALL BE INSTALLED IN ACCORDANCE WITH LOCAL STANDARDS. WHERE WATER SERVICE LINES ARE INSTALLED ALONGSIDE OF SANITARY OR STORM SEWER SERVICE LINES, INSTALLATION SHALL MAINTAIN THE SPECIFIED CLEARANCES BETWEEN PIPELINES AND PROVIDE PROPER AND ADEQUATE BEARING FOR ALL PIPES AND APPURTENANCES. FOR SEPARATE INSTALLATION, THE TRENCH WIDTH SHALL NOT BE LESS THAN TWO FEET. SUBJECT TO MINIMUM CLEARANCES, THE WATER LINES MAY BE LAID IN A COMMON TRENCH EXCAVATED PRINCIPALLY FOR SEWER INSTALLATION, EITHER BY WIDENING THE TRENCH AS NECESSARY OR BY PROVIDING A SHELF IN THE TRENCH WALL WHERE GROUND STABILITY WILL PERMIT.
20. UNLESS OTHERWISE SPECIFIED, INSTALLATION OF WATER SERVICE LINES SHALL PROVIDE FOR NOT LESS THAN 18 INCHES OF CLEARANCE BETWEEN PIPELINES. ALSO, AT LEAST 6 INCHES OF CLEARANCE SHALL BE MAINTAINED IN CROSSING OVER OR UNDER OTHER STRUCTURES.
21. THE PRIMARY LINE AND GRADE WILL BE ESTABLISHED FROM THE PLANS. THE CONTRACTOR SHALL SET LINE AND GRADE STAKES PARALLEL TO THE PROPOSED PIPELINE AT AN APPROPRIATE OFFSET AND INTERVAL AS WILL SERVE THE CONTRACTOR'S OPERATIONS WHEREVER PRACTICAL, AT EACH CHANGE IN LINE OR GRADE, AND AS NEEDED FOR PIPELINE APPURTENANCES AND SERVICE LINES.
22. THE CONTRACTOR SHALL ARRANGE OPERATIONS TO AVOID UNNECESSARY INTERFERENCE WITH THE ESTABLISHED PRIMARY LINE AND GRADE STAKES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRESERVATION OF THE PRIMARY STAKES AND SHALL RESTAKE AS NECESSARY.
23. IN CERTAIN LOCATIONS WHERE WATER MAIN IS IN DIRECT CONFLICT WITH STORM OR SANITARY SEWER, THE WATER MAIN SHALL BE CONSTRUCTED UNDER THE SEWER. VERTICAL BENDS SHALL BE USED WHEN NECESSARY.
24. NO DEVIATION SHALL BE MADE FROM THE REQUIRED LINE OR GRADE WITHOUT THE CONSENT OF BLDC OR OWNER'S REPRESENTATIVE.
25. PROVIDE ADEQUATE STRUCTURAL SUPPORT FOR ALL HDPE PIPE TO PREVENT EXCESSIVE DEFLECTION OF JOINTS, SETTLING AND BREAKING OF THE PIPELINE
26. WHENEVER POSSIBLE, WATER MAINS SHALL BE LAID AT LEAST 10 FEET HORIZONTALLY FROM ANY SANITARY SEWER, STORM SEWER OR SEWER MANHOLE. WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF 10 FEET A WATER MAIN MAY BE LAID CLOSER TO A STORM OR SANITARY SEWER PROVIDED THAT:
    A. THE BOTTOM OF THE WATER MAIN IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER;
    B. WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF MATERIALS WITH JOINTS THAT ARE EQUIVALENT TO WATER MAIN STANDARDS OF CONSTRUCTION AND SHALL BE PRESSURE TESTED TO ASSURE WATER TIGHTNESS PRIOR TO BACKFILLING.
27. EXCAVATING OPERATIONS SHALL PROCEED ONLY SO FAR IN ADVANCE OF PIPE AS WILL SATISFY THE NEEDS FOR COORDINATION OF WORK AND PERMIT ADVANCE VERIFICATION OF UNOBSTRUCTED LINE AND GRADE AS PLANNED. WHERE INTERFERENCE WITH EXISTING STRUCTURES IS POSSIBLE OR IN ANY WAY INDICATED, AND WHERE NECESSARY TO ESTABLISH ELEVATION OR DIRECTION FOR CONNECTIONS TO IN PLACE STRUCTURES, THE EXCAVATING SHALL BE DONE AT THOSE LOCATIONS IN ADVANCE OF THE MAIN OPERATION SO ACTUAL CONDITIONS WILL BE EXPOSED IN SUFFICIENT TIME TO MAKE ADJUSTMENTS WITHOUT RESORTING TO EXTRA WORK OR UNNECESSARY DELAY.
28. ALL INSTALLATIONS SHALL BE ACCOMPLISHED BY OPEN TRENCH CONSTRUCTION EXCEPT WHERE BORING AND JACKING OR TUNNEL CONSTRUCTION METHODS SHALL BE EMPLOYED AS SPECIFICALLY REQUIRED BY THE PLANS OR APPROVED BY BLDC. SURFACE STRUCTURES SHALL BE PROPERLY SUPPORTED AND THE BACKFILL RESTORED TO THE SATISFACTION OF BLDC. EXCAVATION SHALL PROCEED AS SPECIFIED IN THESE GENERAL NOTES.
29. FOUNDATION PREPARATIONS SHALL BE CONDUCTED TO PRODUCE A STABLE FOUNDATION AND PROVIDE CONTINUOUS AND UNIFORM PIPE BEARING BETWEEN BELL HOLES.
30. IN EXCAVATIONS MADE BELOW GRADE TO REMOVE UNSUITABLE MATERIALS, THE BACKFILLING TO GRADE SHALL BE MADE WITH GRANULAR MATERIAL. PLACEMENT OF THE BACKFILL SHALL BE RELATIVELY UNIFORM LAYERS NOT EXCEEDING 12 INCHES IN LOOSE THICKNESS. EACH LAYER OF BACKFILL SHALL BE COMPACTED THOROUGHLY, BY MEANS OF APPROVED MECHANICAL COMPACTION EQUIPMENT, TO PRODUCE UNIFORM PIPE SUPPORT THROUGHOUT THE FULL PIPE LENGTH AND FACILITATE PROPER SHAPING OF THE PIPE BED.
31. CARE SHALL BE TAKEN DURING FINAL SUBGRADE SHAPING TO PREVENT ANY OVER EXCAVATION. SHOULD ANY LOW SPOTS DEVELOP, THEY SHALL ONLY BE FILLED WITH GRANULAR MATERIAL, WHICH SHALL BE COMPACTED THOROUGHLY. THE FINISHED SUBGRADE SHALL NOT BE DISTURBED DURING PIPE LOWERING OPERATIONS EXCEPT AS NECESSARY TO REMOVE PIPE SLINGS. DISCHARGE OF TRENCH DEWATERING PUMPS SHALL BE DIRECTED TO NATURAL DRAINAGE CHANNELS OR STORM DRAINS IN A MANNER WHICH DOES NOT CAUSE DAMAGE TO PRIVATE OR PUBLIC PROPERTY. ANY DEBRIS LEFT BY DEWATERING OPERATION SHALL BE CLEANED UP IMMEDIATELY BY THE CONTRACTOR. DRAINING TRENCH WATER INTO SANITARY SEWERS OR COMBINED SEWERS WILL NOT BE PERMITTED.
32. THE CONTRACTOR SHALL INSTALL AND OPERATE A DEWATERING SYSTEM TO MAINTAIN PIPE TRENCHES FREE OF WATER WHENEVER NECESSARY OR AS DIRECTED BY BLDC TO MEET THE INTENT OF THESE SPECIFICATIONS.
    A. WHETHER OR NOT THE PRESENCE OF WATER IS INDICATED WITHIN THE CONTRACT DOCUMENTS, THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN INVESTIGATION TO DETERMINE IF WATER IS PRESENT. THE PRESENCE OR ABSENCE OF WATER SHALL NOT ENTITLE THE CONTRACTOR TO ADDITIONAL COMPENSATION.
    B. IF WATER IS ENCOUNTERED IN THE EXCAVATION, PROVIDE AND MAINTAIN DEWATERING SYSTEM OF SUFFICIENT CAPACITY TO REMOVE WATER WHILE EXCAVATION IS BEING MADE, PIPE IS PLACED AND BACKFILLED, OR FOR STRUCTURES UNTIL THE CONCRETE FOOTINGS HAVE BEEN POURED AND CURED, THE FOUNDATION WALLS OR OTHER PORTIONS OF THE STRUCTURE ARE ERECTED TO GRADE OR UNTIL THE EXCAVATION HAS BEEN BACKFILLED. DO NOT ALLOW SEDIMENT LADEN WATER TO FLOW INTO ANY WATER COURSE OR DRAINAGEWAY OR OVER LAND WITHOUT FIRST FILTERING IT THROUGH AN APPROVED DESILTING DEVICE.
    C. METHODS OF DEWATERING EXCAVATIONS SHALL BE AT THE CONTRACTOR'S DISCRETION. CONTINUOUS INVESTIGATIONS AND CHECKS SHALL BE MADE BY THE CONTRACTOR TO ASSURE THAT THE DEWATERING SYSTEM EMPLOYED IS FUNCTIONING PROPERLY, AND NOT CAUSING DAMAGE OR SETTLEMENT TO ADJACENT SURFACES OR STRUCTURES. THE SYSTEM SHALL BE MODIFIED AS REQUIRED AND DAMAGE CAUSED BY THE SYSTEM SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR OR RESTORE.
    D. PROVIDE NECESSARY TEMPORARY SURFACE DRAINAGE AND KEEP THE SAME OPERATING TO THE SATISFACTION OF BLDC UNTIL PERMANENT DRAINAGE OR FINISH GRADING HAS BEEN COMPLETED. DO NOT ALLOW DAMMING OR PONDING OF WATER IN GUTTERS OR STORM DRAINS.

HDPE PIPE PRESSURE TESTING

1. INSTALLED PIPELINES SHALL BE SUBJECTED TO A PRESSURE TEST PRIOR TO ACCEPTANCE. TESTING SHALL BE FOR A 2 HOUR DURATION WITH VALVES CLOSED.
   A. THE CONTRACTOR SHALL FURNISH THE PUMP, PIPE CONNECTIONS, TEMPORARY PLUGS, GAUGES, AND MEASURING EQUIPMENT, AND SHALL PERFORM THE TESTING IN THE PRESENCE OF BLDC. WHERE PERMANENT AIR VENTS ARE NOT PROVIDED, THE CONTRACTOR SHALL PROVIDE AND INSTALL CORPORATION COCKS AT THE HIGH POINTS AS NEEDED FOR RELEASE OF AIR AS THE LINE IS FILLED WITH WATER.
   B. WHERE CONCRETE REACTION BLOCKING IS PLACED, THE FORCE MAIN SHALL NOT BE SUBJECTED TO HYDROSTATIC PRESSURE UNTIL AT LEAST 5 DAYS HAVE ELAPSED AFTER THE CONCRETE PLACEMENT, WITH THE EXCEPTION THAT THIS PERIOD MAY BE REDUCED TO 2 DAYS WHERE HIGH EARLY STRENGTH CONCRETE IS USED.
   C. ANY DEFECTIVE JOINTS, PIPE, FITTINGS OR VALVES REVEALED DURING THE TESTING OR BEFORE FINAL ACCEPTANCE OF THE WORK SHALL BE SATISFACTORILY CORRECTED AND THE TEST REPEATED UNTIL THE SPECIFIED REQUIREMENTS HAVE BEEN MET.
2. THE SECTION BEING TESTED SHALL BE SLOWLY FILLED WITH WATER AND THE SPECIFIED TEST PRESSURE SHALL BE APPLIED AFTER ALL AIR HAS BEEN EXPELLED FROM THE PIPE. A HYDROSTATIC PRESSURE OF 1.5 TIMES THE MAXIMUM DESIGN PRESSURE, OR AT A MINIMUM OF 150 POUNDS PER SQUARE INCH GAUGE PRESSURE, MEASURED AT THE LOWEST POINT OF ELEVATION, SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A SATISFACTORY MANNER.
3. THE GAUGE PRESSURE SHALL BE CHECKED AFTER A MINIMUM OF TWO HOURS. A PRESSURE DROP OF 1 PSI OR LESS OVER A 2-HOUR PERIOD SHALL BE CONSIDERED ACCEPTANCE FOR

REDUCTION VERIFICATION SCALE 0 — 10 INCHES

BLDC
BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER TENDER PACKAGE #3A

GENERAL NOTES

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1104

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

NOTES & SPECIFICATIONS (CONTINUED)

THE TEST SECTION. IF THE PRESSURE DROP IS GREATER THAN 1 PSI THE CONTRACTOR SHALL INVESTIGATE THE CAUSE AND TAKE CORRECTIVE ACTION. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO EXPEL ALL AIR IN THE TEST SECTION, WHICH MAY BE CAUSING A TEST FAILURE. THIS MAY REQUIRE THE CONTRACTOR TO TAP A CORPORATION AT A HIGH POINT OF THE MAIN ON THE TOP OF THE PIPE TO RELEASE TRAPPED AIR. ONLY IF SEVERAL CONSECUTIVE TESTS INDICATE A CONSISTENT PRESSURE DROP AND ONLY AFTER THE CONTRACTOR HAS MADE NUMEROUS ATTEMPTS TO RESOLVE THE PROBLEM, ACCEPTABLE TO BLDC OR OWNER'S REPRESENTATIVE, MAY BLDC OR OWNER'S REPRESENTATIVE CONSIDER THE USE OF THE LEAKAGE TEST AS ACCEPTANCE. THE LEAKAGE TEST MAY BE PERFORMED BY THE CONTRACTOR TO DETERMINE THE MAGNITUDE OF THE LEAK: HOWEVER, MEETING THE LEAKAGE ALLOWANCE SHALL NOT AUTOMATICALLY BE CONSIDERED ACCEPTANCE, IN LIEU OF THE PRESSURE TEST, FOR THE SECTION BEING TESTED.

HDPE PIPE LEAKAGE TESTING

1. AFTER AN UNSATISFACTORY PRESSURE TEST, AND IF AUTHORIZED IN WRITING BY BLDC OR OWNER'S REPRESENTATIVE, A LEAKAGE TEST SHALL BE PERFORMED ON EACH VALVE SECTION OF PIPELINE TO DETERMINE THE QUANTITY OF WATER THAT MUST BE SUPPLIED INTO THE SECTION TO MAINTAIN A TEST PRESSURE OF 1.5 TIMES THE MAXIMUM DESIGN PRESSURE OR 150 POUNDS PER SQUARE INCH AFTER THE AIR IN THE PIPELINE HAS BEEN EXPELLED AND THE PIPE HAS BEEN FILLED WITH WATER. THE WATER ADDED SHALL BE RECORDED TO THE NEAREST FLUID OUNCE.
2. AFTER FILLING THE PIPE WITH WATER AND EXPELLING ALL AIR IN THE LINE, A PRESSURE OF 1.5 TIMES THE MAXIMUM DESIGN PRESSURE OR A MINIMUM OF 150 PSIG MEASURED AT THE LOWEST POINT OF ELEVATION SHALL BE APPLIED IN THE SAME MANNER AS PRESCRIBED FOR THE SECTION TO MAINTAIN THE PRESSURE FOR A TEST DURATION OF 3 HOURS.
3. EACH PIPE SECTION TESTED WILL BE ACCEPTED IF THE LEAKAGE DOES NOT EXCEED THE QUANTITY DETERMINED BY THE FORMULA AS SHOWN IN THE TABLE.

$$L = \frac{S \times D \times (P^{0.5})}{148{,}000}$$

L = MAXIMUM PERMISSIBLE LEAKAGE IN GALLONS PER HOUR

S = LENGTH OF PIPE TESTED

D = NOMINAL DIAMETER OF PIPE IN INCHES

P = AVERAGE TEST PRESSURE DURING THE TEST, IN POUNDS PER SQUARE INCH, GAUGE PRESSURE.

ALLOWABLE LEAKAGE PER 1000 FEET OF PIPE (GALLONS PER HOUR)

AVG.TEST PRESSURE	NOMINAL PIPE DIAMETER - INCHES				
PSI	4	6	8	10	12
200	0.43	0.64	0.85	1.06	1.28
175	0.40	0.59	0.80	0.99	1.19
150	0.37	0.55	0.74	0.92	1.10
125	0.34	0.50	0.67	0.84	1.01
100	0.30	0.45	0.60	0.75	0.90
75	0.25	0.38	0.50	0.63	0.75

4. ALLOWABLE LEAKAGE WILL BE THE SUM OF COMPUTED LEAKAGE FOR EACH SIZE IF PIPELINE UNDER TEST CONTAINS SECTIONS OF VARIOUS DIAMETERS. IF THE PIPE SECTION UNDER TEST CONTAINS PIPE OF VARIOUS DIAMETERS, THE ALLOWABLE LEAKAGE WILL BE THE SUM OF THE COMPUTED LEAKAGE FOR EACH SIZE.
5. IF ALLOWABLE LEAKAGE IS EXCEEDED, PLASTIC PIPE INSTITUTE, TN-46 MAY BE USED AS AN ALTERNATE TESTING METHOD. REFER TO "ATTACHMENT 1", HEREIN FOR TESTING PROCEDURES.
6. THE CONTRACTOR SHALL FURNISH A WRITTEN REPORT OF THE RESULTS OF LEAKAGE TESTS, WHICH SHALL IDENTIFY THE SPECIFIC TEST SECTION, THE AVERAGE PRESSURE, THE DURATION OF TEST, AND THE AMOUNT OF LEAKAGE.

HYDROSTATIC TESTING OF HDPE PIPE

1. EACH VALVED SECTION SHALL BE SUBJECTED TO A SEPARATE 3-HOUR PRESSURE TEST. TESTING FOR THE 3-HOUR DURATION SHALL BE WITH HYDRANTS CLOSED, AND VALVES ON HYDRANT LEADS AND DEAD END LINES OPEN. WHEN SERVICE LINES HAVE STUBS EXTENDING BEYOND THE CURB, THE CURB STOPS SHALL BE IN THE OPEN POSITION AND THE PRESSURE TEST CONDUCTED AGAINST THE CAPPED EXTENSION. ONCE THIS PORTION OF THE TEST IS COMPLETE, THE VALVE ON THE HYDRANT LEADS AND DEAD END WATER LINES SHALL BE CLOSED AND HYDRANTS OPENED. THE SPECIFIED TEST PRESSURE SHALL BE APPLIED, AND THE TEST REPEATED FOR 15 MINUTES TO ESTABLISH THE CONDITION OF THE HYDRANT LEAD VALVES.
2. CONDUCT HYDROSTATIC TESTING METHODS PER ASTM F2164
   A. TEST DURATION: 3 HOURS.
   B. TEST PRESSURE: 150 PERCENT OF THE MAXIMUM OPERATING PRESSURE OR 150 POUNDS PER SQUARE INCH, WHICHEVER IS GREATER; DO NOT EXCEED DESIGN PRESSURE RATING OF THE PIPE.
   C. ALLOWABLE PRESSURE LOSS: PRESSURE SHALL NOT VARY MORE THAN PLUS OR MINUS 5 POUNDS PER SQUARE INCH FOR THE DURATION OF THE PRESSURE TEST.
3. THE CONTRACTOR SHALL INCLUDE IN THE SCHEDULE THE POINTS IN TIME AT WHICH IT INTENDS TO PERFORM HYDROSTATIC TESTING OF THE INSTALLED PIPE PER "ATTACHMENT 1". THE CONTRACTOR SHALL INCLUDE IN HIS PROJECT METHOD STATEMENT A DETAILED DESCRIPTION OF HOW IT INTENDS TO CONDUCT THE HYDROSTATIC TESTS. MAXIMUM LENGTH OF PIPE TO BE TESTED AT ANY TIME SHALL BE NO MORE THAN 750 FEET.
4. CONTACTOR SHALL SUBMIT MAINTENANCE OF TRAFFIC AND SAFETY PLANS FOR APPROVAL PRIOR TO THE START OF EXCAVATION.
5. AT A MINIMUM, NO PIPE SHALL BE BURIED AT THE WELDS UNTIL HYDROSTATIC TESTING HAS BEEN PERFORMED AND THE RESULTS APPROVED BY BLDC. THE PIPE SHALL BE EXPOSED AT EACH WELD AROUND ITS ENTIRE CIRCUMFERENCE FOR THE DURATION OF THE HYDROSTATIC TEST.
6. THE CONTRACTOR MAY ELECT TO LEAVE THE ENTIRE UN-TESTED SECTION EXPOSED FOR THE HYDROSTATIC TESTS AS APPROVED BY BLDC.
7. ATT**ACHMENT 1: PRESSURE TESTING OUTSIDE THE TRENCH**
   A. PRESSURE TESTING MAY BE CONDUCTED PRIOR TO PIPE INSTALLATION.
   B. AFTER THE PIPE HAS BEEN JOINED, FILL IT WITH WATER, CAREFULLY BLEED OFF ANY TRAPPED AIR. SUBJECT THE PIPE TO A HYDROSTATIC TEST PRESSURE OF 150 PSI FOR A MAXIMUM OF 3 HOURS. DURING THIS TIME, ADD WATER PERIODICALLY TO MAINTAIN THE TEST PRESSURE; THIS COMPENSATES FOR THE INITIAL STRETCHING OF THE PIPE. THE LINE PRESSURE TIGHTNESS IS DETERMINED BY VISUAL OBSERVATION; THEREFORE, IT IS NOT NECESSARY TO MEASURE THE MAKE-UP WATER. EXAMINE EVERY FUSED JOINT; ANY LEAKAGE MUST BE REPAIRED AND THEN RETESTED.

      NOTE: IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT APPROPRIATE SAFETY PRECAUTIONS ARE OBSERVED DURING HYDROSTATIC TESTING ABOVE GROUND.
8. **ATTACHMENT 1: PRESSURE TESTING IN THE TRENCH**
   A. FILL THE PIPELINE WITH WATER AFTER IT HAS BEEN LAID; BLEED OFF ANY TRAPPED AIR. SUBJECT THE LOWEST ELEMENT IN THE SYSTEM TO TEST PRESSURE OF 150 PSI AND CHECK FOR ANY LEAKAGE. WHEN IN THE OPINION OF BLDC, LOCAL CONDITIONS REQUIRE THAT THE TRENCHES BE BACKFILLED IMMEDIATELY AFTER THE PIPE HAS BEEN LAID, APPLY THE PRESSURE TEST AFTER BACKFILLING HAS BEEN COMPLETED BUT NOT SOONER THAN A TIME WHICH WILL ALLOW SUFFICIENT CURING OF ANY CONCRETE THAT MAY HAVE BEEN USED. TYPICAL MINIMUM CONCRETE CURING TIMES ARE 36 HOURS FOR EARLY STRENGTHS AND 7 DAYS FOR NORMAL STRENGTHS.
   B. THE TEST PROCEDURES CONSIST OF TWO STEPS; THE INITIAL EXPANSION AND THE TEST PHASE. WHEN TEST PRESSURE IS APPLIED TO A WATER FILLED PIPE, THE PIPE EXPANDS. DURING THE INITIAL EXPANSION OF THE PIPE UNDER TEST, SUFFICIENT MAKE-UP WATER MUST BE ADDED TO THE SYSTEM AT HOURLY INTERVALS FOR 3 HOURS TO MAINTAIN THE TEST PRESSURE. AFTER ABOUT 4 HOURS, INITIAL EXPANSION SHOULD BE COMPLETE AND THE ACTUAL TEST CAN START.
   C. WHEN THE TEST IS TO BEGIN, THE PIPE IS FULL OF WATER AND IS SUBJECTED TO A CONSTANT TEST PRESSURE OF 150 PSI. THE TEST PHASE SHOULD NOT EXCEED 3 HOURS, AFTER WHICH TIME ANY WATER DEFICIENCY MUST BE REPLACED AND MEASURED. ADD AND MEASURE THE AMOUNT OF MAKE-UP WATER REQUIRED TO RETURN TO THE TEST PRESSURE AND COMPARE THIS TO THE MAXIMUM ALLOWANCE IN THE TABLE BELOW.
   D. AN ALTERNATE LEAKAGE TEST CONSISTS OF MAINTAINING THE TEST PRESSURE (DESCRIBED ABOVE) OVER A PERIOD OF 4 HOURS AND THEN DROPPING THE PRESSURE BY 10 PSI (0.69 MPA). IF THE PRESSURE THEN REMAINS WITHIN 5% OF THE TARGET VALUE FOR 1 HOUR, THIS INDICATES THERE IS NO LEAKAGE IN THE SYSTEM.

      NOTES: AIR TESTING IS NOT RECOMMENDED. ADDITIONAL SAFETY PRECAUTIONS MAY BE REQUIRED. ABOVE PROCEDURE TAKEN FROM PPI TECHNICAL REPORT TR-31 BY THE PLASTIC PIPE INSTITUTE.
   E. CONTRACTOR TO SUPPLY TEST REPORT FORMAT FOR APPROVAL ONE WEEK PRIOR TO PERFORMING TESTS.
   F. THE TEST TECHNICIAN TO HAVE COMPLETED TRAINING AS APPROVED BY BLDC.
   G. THE TEST TECHNICIAN TO BE PRESENT AT THE SITE AT THE START AND COMPLETION OF THE TEST.
   H. BLDC SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF THE INTENT TO PERFORM A HYDROSTATIC TEST AND MAY ELECT TO BE PRESENT FOR THE DURATION OF THE TEST.
   I. ALL JOINTS IN THE TESTED SECTION SHALL BE INSPECTED AT LEAST TWICE DURING THE TEST PERIOD.
   J. IN THE EVENT THAT THE TESTED SECTION FAILS THE HYDROSTATIC TEST, THE TEST PRESSURE SHALL BE MAINTAINED BY OPERATING THE PUMP UNTIL THE LEAK IS FOUND.
   K. ON COMPLETION OF THE REPAIR OF ANY LEAKS, THE PIPE SHALL BE RETESTED, UNTIL IT HAS PASSED THE TEST.
   L. ALLOWANCE FOR EXPANSION SHALL BE AS FOLLOWS:

ALLOWANCE FOR EXPANSION UNDER TEST PRESSURE

NOMINAL PIPE SIZE (IN)	U.S. GALLONS/ 100-FT OF PIPE(2)		
	1 HOUR	2 HOURS	3 HOURS
2"	0.08	0.12	0.15
3"	0.1	0.15	0.25
4"	0.13	0.25	0.4
5"	0.21	0.41	0.63
6"	0.3	0.6	0.9
8"	0.5	1	1.5

Notes:
(1) mm= 0.03937 inches
(2) multiply by 11.53 to convert to liters/100 meters of pipe

   M. ALL HDPE PIPES IN THE SCOPE OF WORKS WILL BE DISINFECTED UNDER ANOTHER CONTRACT AT THE COMPLETION OF ALL CONNECTED POTABLE WATER TRANSFER MAIN. CONTRACTOR SHALL PROVIDE ASSISTANCE AS REQUIRED TO SUPPORT PROCESS.
   N. FOLLOWING THE TESTING AND COMPLETE INSTALLATION OF PIPES THE POTABLE WATER TRANSFER MAIN SHALL BE DISINFECTED.

COATINGS & WRAPPINGS

1. UPON COMPLETING THE INSTALLATION ALL EXPOSED BOLTS AND NUTS SHALL BE COMPLETELY COATED WITH AN APPROVED BITUMINOUS RUST PREVENTATIVE COAL TAR MATERIAL. THE ENTIRE TAPPING SLEEVE AND VALVE ASSEMBLY SHALL BE POLYETHYLENE ENCASED.
2. WHENEVER SO REQUIRED BY THE PLANS OR SPECIFIC REQUIREMENTS, VALVES, FITTING, AND APPURTENANCES, SHALL BE FULLY ENCASED IN POLYETHYLENE FILM OF 8-MIL NOMINAL THICKNESS. THE FILM SHALL BE FURNISHED IN TUBE FORM FOR INSTALLATION ON PIPE AND ALL PIPE SHAPED APPURTENANCES SUCH AS BENDS, REDUCERS, OFFSETS, ETC. SHEET FILM SHALL BE PROVIDED AND USED FOR THE ENCASING ALL ODD-SHAPED APPURTENANCES SUCH AS VALVES, TEES, CROSSES, ETC. INSTALLATION SHALL BE IN ACCORDANCE WITH AWWA C105, TYPE A.

PIPE CLEANING

1. AT THE CONCLUSION OF THE WORK, THOROUGHLY CLEAN ALL OF THE NEW PIPELINES TO REMOVE ALL DIRT, STONES, PIECES OF WOOD OR OTHER MATERIAL WHICH MAY HAVE ENTERED DURING THE CONSTRUCTION PERIOD BY FORCING A CLEANING SWAB THROUGH ALL MAINS 4-INCHES OR GREATER. FLUSHING VELOCITIES SHALL BE A MINIMUM OF 2.5 FEET PER SECOND. ALL FLUSHING SHALL BE COORDINATED WITH BLDC INSPECTOR AND WATER RESOURCES DEPARTMENT. DEBRIS CLEANED FROM THE LINES SHALL BE COLLECTED AND REMOVED FROM THE JOB SITE.

DISINFECTION

1. CHLORINATION OF WATER MAINS IS NOT REQUIRED UNDER THIS CONTRACT. UPON COMPLETION OF POTABLE WATER MAINS INSTALLED UNDER THIS CONTRACT, THOROUGHLY FLUSH WATER MAIN WITH POTABLE WATER TO ENSURE REMOVAL OF DIRT, DEBRIS, AND LIQUIDS PRIOR TO PROJECT COMPLETION. AFTER FLUSHING, INSTALL TEMPORARY CAPS ON BOTH ENDS OF NEWLY INSTALLED POTABLE WATER MAINS. FINAL FLUSHING AND CHLORINATION OF ALL WATER MAINS INSTALLED UNDER THIS PROGRAM WILL BE PERFORMED BY OTHERS UPON COMPLETION AND INTERCONNECTION OF ALL WATER MAINS.

EROSION AND SEDIMENT CONTROL

1. CONTRACTOR SHALL SUBMIT TO THE OWNER AN EROSION AND SEDIMENT CONTROL PLAN SHOWING DETAILS OF EROSION AND SEDIMENT CONTROL DEVICES AND LOCATIONS, AND TECHNICAL PRODUCT LITERATURE FOR ALL COMMERCIAL PRODUCTS TO BE USED FOR EROSION AND SEDIMENT CONTROL.
2. CONTRACTOR SHALL SUBMIT COPIES OF APPROVED EROSION AND SEDIMENT CONTROL PERMITS FROM APPROPRIATE GOVERNING AGENCIES.
3. CONTRACTOR SHALL OBTAIN ALL EROSION AND SEDIMENT CONTROL PERMITS REQUIRED PRIOR TO ANY LAND-DISTURBING OPERATIONS.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR THE TIMELY INSTALLATION AND MAINTENANCE OF ALL SEDIMENTATION CONTROL MEASURES NECESSARY TO PREVENT THE MOVEMENT OF SEDIMENT FROM THE CONSTRUCTION SITE TO OFF-SITE AREAS OR INTO THE STREAM SYSTEM VIA SURFACE RUNOFF OR UNDERGROUND DRAINAGE SYSTEMS. MEASURES IN ADDITION TO THOSE SHOWN ON THE EROSION AND SEDIMENT CONTROL PLAN NECESSARY TO PREVENT THE MOVEMENT OF SEDIMENT OFF-SITE SHALL BE INSTALLED, MAINTAINED, REMOVED, AND CLEANED UP AT NO ADDITIONAL COST TO THE OWNER. SHOULD THE CONTRACTOR FAIL TO CONTROL THE MOVEMENT OF SEDIMENT FROM THE CONSTRUCTION AREA INTO THE STORM SEWER SYSTEM, THE OWNER MAY AT ITS DISCRETION REQUIRE THE CONTRACTOR TO CLEAN THE SEDIMENT FROM THE AFFECTED REACHES OF THE STORM SEWER SYSTEM AT THE CONTRACTOR'S EXPENSE.
5. WOOD FOR TRENCH EROSION CHECKS SHALL BE PINE TREATED WITH COPPER QUATERNARY ARSENATE IN ACCORDANCE WITH AWPA C2.
6. WHERE CONTRACTOR'S EFFORTS TO CONTROL EROSION HAVE BEEN DEMONSTRATED TO BE INEFFECTIVE OR POTENTIALLY INEFFECTIVE IN THE OPINION OF THE OWNER, THE OWNER MAY ORDER THAT THE EROSION CONTROL PLAN BE AMENDED AND THAT ADDITIONAL EROSION CONTROL MEASURES BE CONSTRUCTED AT NO ADDITIONAL COST TO THE OWNER.
7. ONCE THE SITE HAS BEEN FULLY STABILIZED AGAINST EROSION, REMOVE SEDIMENT CONTROL DEVICES AND ALL ACCUMULATED SILT. DISPOSE OF SILT AND WASTE MATERIALS IN PROPER MANNER. RE-GRADE ALL AREAS DISTURBED DURING THIS PROCESS AND STABILIZE AGAINST EROSION WITH SURFACING MATERIALS AS SPECIFIED HEREIN.

UV PROTECTION

1. ALL EXPOSED PVC PIPE TO BE COATED WITH WATER BASED WITH WATER BASED LATEX PAINT SHERWIN WILLIAMS "WEATHER SHIELD" OR APPROVED EQUAL.
2. CLEAN PIPE SURFACES THOROUGHLY PRIOR TO PAINTING.
3. MATCH COLORS AS FOLLOWS:
   A. BLUE STRIPES - PORTABLE WATER
   B. GREEN STRIPES - SANITARY SEWER FORCE MAIN
   C. LILAC STRIPES - RECLAIMED WATER

FINAL CLEAN UP

1. DO NOT DISPOSE OF ANY LIQUIDS, SLURRY, SPOILS OR CHEMICALS ON SITE EXCEPT AS DIRECTED BY THE OWNER'S REPRESENTATIVE AND APPROVED BY THE DEPARTMENT OF ENVIRONMENT OR OTHER AGENCIES HAVING JURISDICTION.
2. REMOVE SURPLUS SATISFACTORY SOIL AND WASTE MATERIAL, INCLUDING UNSATISFACTORY SOIL, TRASH, AND DEBRIS, AND LEGALLY DISPOSE OF IT.
3. WHEREVER THE WORK IS CARRIED OUT ON PUBLIC ROADS OR PROPERTY, DEBRIS SHALL NOT BE ALLOWED TO ACCUMULATE AND THE CONTRACTOR SHALL REMOVE ANY DEBRIS AT THE INSTRUCTION OF THE EMPLOYER'S REPRESENTATIVE SHOULD HE DEEM IT TO BE A HAZARD TO THE PUBLIC.
4. FINAL DISPOSAL OF DEBRIS, WASTE MATERIALS, AND OTHER REMAINS OR CONSEQUENCES OF CONSTRUCTION, SHALL BE PERFORMED PRIOR TO FINAL ACCEPTANCE OF ALL WORK. THE OWNER MAY WITHHOLD PARTIAL PAYMENTS UNTIL SUCH WORK HAS BEEN SATISFACTORILY COMPLETED OR MAY DEDUCT THE ESTIMATED COST OF THIS WORK FROM THE CONTRACT VALUE.

DEFINITIONS

BLDC BERMUDA LAND DEVELOPMENT CORPORATION
HH HANDHOLE
PC POWER CENTER
P POWER CONDUIT
F COMMUNICATIONS CONDUIT

Low Pressure Air Test - Sanitary Sewer Lines

1. General.
   (1) Scope. The Contractor shall furnish all labor, tools, and equipment and perform all operations in connection with low-pressure air testing on completed sanitary sewer lines. Testing shall be completed after the gravity sewer line has been laid and backfilled, but prior to replacement of pavement, subject line to low-pressure air test. Test shall be performed using equipment denoted hereinafter.
   (2) Related Requirements. Pipe per applicable pipe specified within Specification Section(s) included with these Contract Documents and/or as shown on Plans.
   (3) References. The publications listed below form a part of this Specification Referenced. The publications are referred to in the text by basic designation only.
   American Society for Testing and Materials (ASTM)
   ASTM C828 1990 Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
   ASTM F1417 1992 Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.
2. Execution.
   (1) Erection/Installation/Application and/or Construction.
   (a) General. The procedure for low-pressure air test shall conform to the procedures described in ASTM C828 and F1417, or other appropriate procedures except for testing.
   The Contractor shall take such precautions as necessary to prevent damage to lines and appurtenances being tested and shall repair any damage resulting from testing, at his expense, with no additional cost to the owner. All testing shall be completed in presence of the Engineer.
   (b) Equipment.
   1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe tested.
   2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
   3. One of the pneumatic plugs shall have an inlet tap or other provisions for connecting air supply to introduce low-pressure air into the line for testing.
   4. All air used shall pass through a single control panel.
   A. From control panel to pneumatic plugs for inflation.
   B. From control panel to a sealed line for introducing low-pressure air.
   C. From sealed line to control panel for continuous monitoring air pressure in sealed line.
   5. Air supply system shall have necessary valves and gauges to control rate at which air enters test section and for reading test results.
   6. Pressure gauges shall have minimum gradations of 0.1 psig and accuracy of plus or minus 0.05 psig.
   (c) Pretesting Procedures.
   1. The Contractor shall determine groundwater levels that may exist above the pipe to be tested. Acceptable methods of determination of groundwater levels shall consist of piezometers or open excavation (when authorized by the Engineer). The total number of installations, regardless of methods selected, shall be sufficient enough so as to adequately conclude the groundwater height above the invert of the segment or segments of gravity sewer being tested.
   2. Upon determination of stabilized static groundwater depth level, the height above the pipe invert shall be divided by 2.3 ft. to establish psi of back pressure and added to all readings as described in Subsection 2.(1)e)5.
   3. No low pressure air test shall be conducted until such time that it has been demonstrated that the groundwater level has fully stabilized.
   4. When piezometer method has been selected it shall be temporarily capped after initial installation and fully protected from damage until completion and acceptance of low pressure air test.
   5. When pre-approved open excavation method is implemented it shall be installed in accordance with all federal, state, and local safety and health regulations, laws, and or ordinances. The open excavation method shall not be conducted in any area that may affect or disturb the structural integrity of the gravity line being tested or any adjacent structure(s) or utilities.
   6. Upon completion and acceptance of low pressure air test(s), the Contractor shall be responsible for removal, backfilling, and restoration of areas affected by piezometers or in the case of open cut method, shall be responsible for backfill, compaction and restoration of affected areas. In each case backfilling, compaction and restoration shall be in accordance with applicable specifications.
   (d) Preparations of Sewer Lines. The Contractor shall flush and clean sewer line prior to testing, providing a wet pipe surface and removing any debris prior to testing. The Contractor shall plug all pipe outlets to resist test pressure.
   (e) Testing Procedures.
   1. The Contractor shall seal test all pneumatic plugs before using in test installation. He shall then lay 1 length of pipe on ground and seal it at both ends, with pneumatic plugs to be checked. The Contractor shall introduce air into pneumatic plugs at 25 psig. The sealed pipe shall be pressurized to 5 psig. Plugs shall hold against this pressure without external bracing.
   2. The Contractor shall carefully observe safety precautions during air testing, recognizing damages from plugs blowing out. No one shall be allowed in manholes during test.
   3. Place pneumatic plugs in line at each manhole and inflate to 25 psig. Introduce low pressure air into sealed line until internal air pressure reaches a pressure of 5 psig plus the average groundwater backpressure. Allow 2 minutes for internal air pressure to stabilize.
   4. When internal air pressure has stabilized and is at or above test pressure (3.5 psig minimum plus groundwater backpressure), commence test. Disconnect air hose from control panel to air supply. Record pressure drop for test period. If pressure drops more than 1 psig during test period, line is presumed to have failed. Test may be discontinued when prescribed test time has been reached even though 1 psig drop has not occurred.
   5. Time required for pressure to decrease from 3.5 psig to 2.5 psig (greater than average groundwater backpressure over pipe) shall not be less than time shown for given diameter in the following table. Times shown are based on loss of air not to exceed 0.0015 cu. ft. per min. per sq. ft. of internal pipe surface tested at an average pressure of 3 psi greater than groundwater back pressure.

Allowable Time Table

Pipe Dia	Time for Longer Length (Seconds)	Length for Min Time (Feet)`	Minimum Test Time (Minutes:Seconds)
6"	0.855 (L)	398	5:40
8"	1.120 (L)	298	7:33

   (f) Retesting. Sanitary sewers failing to meet requirements of low pressure air test shall be tested again after the Contractor has located and remedied defects causing failure. No sanitary sewer will be accepted until the limits of test procedures are satisfied.
3. Measurement and Payment. This Item shall be considered subsidiary to the various bid items of the Contract and will not be paid for directly.

REDUCTION VERIFICATION SCALE 0 10 INCHES

BLDC
BERMUDA LAND DEVELOPMENT COMPANY LIMITED
MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

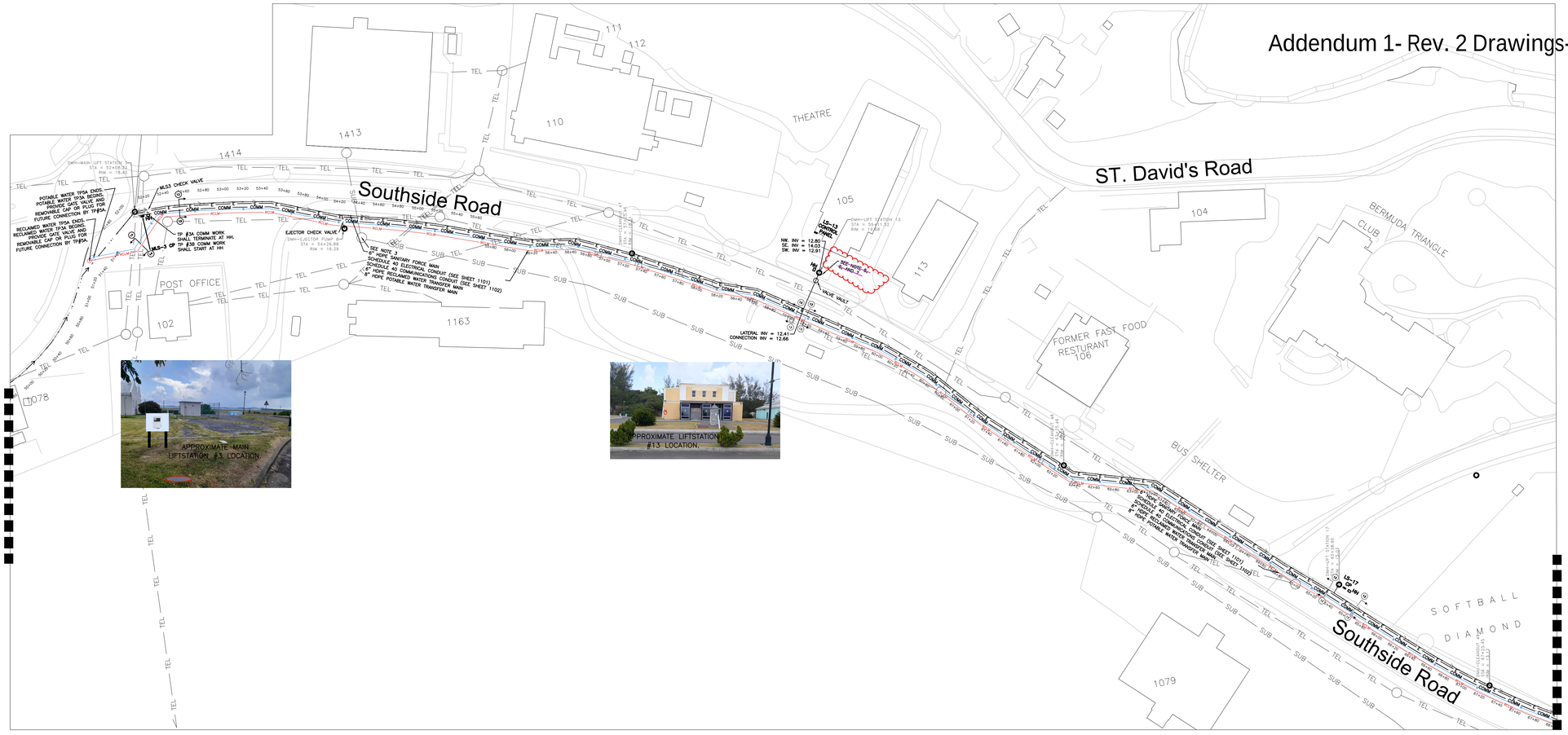
GENERAL NOTES

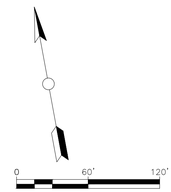
SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

C-1105

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

C-2203





LEGEND

COMMUNICATIONS	COMM
ELECTRIC	E E
FLOWLINE	
PROPOSED FORCED MAIN	
EXISTING TELECOM	TEL TEL
EXISTING BELCO	BELCO
EXISTING SUBMARINE CABLE	SUB SUB
PROPOSED POTABLE WATER	W
PROPOSED RECLAIMED WATER	RCLW

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

NOTES

1. CONTRACTOR TO ARRANGE FOR THE MARKING/LOCATING ALL EXISTING UTILITIES PRIOR TO BEGINNING EXCAVATION.

2. CONTRACTOR TO AVOID AND/OR PROTECT ALL EXISTING UTILITIES IN CONFORMANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS.

3. A HIGHLY SENSITIVE GLOBAL UNDERGROUND FIBER OPTIC CABLE EXISTS ALONG SOUTHSIDE ROAD. CONTRACTOR TO HAND DIG ALL EXCAVATION WITHIN FIVE FEET OF THIS GLOBAL UNDERGROUND FIBER OPTIC CABLE.

4. CONTROL PANEL INSTALLATION NOT INCLUDED IN THIS PACKAGE.

~~5. CONTRACTOR RESPONSIBLE FOR CCTV INSPECTION TO DETERMINE ACTUAL LOCATIONS BY EITHER FILED INSPECTIONS OR VIDEO INSPECTION OF THE EXISTING SEWER. EXISTING LATERALS CANNOT BE DEMOLISHED UNTIL THE FORCE MAIN IS IN AND THE WWTP IS FUNCTIONAL. CONTRACTOR TO ACCOUNT FOR 10 FT OF NEW LATERAL PIPE.~~

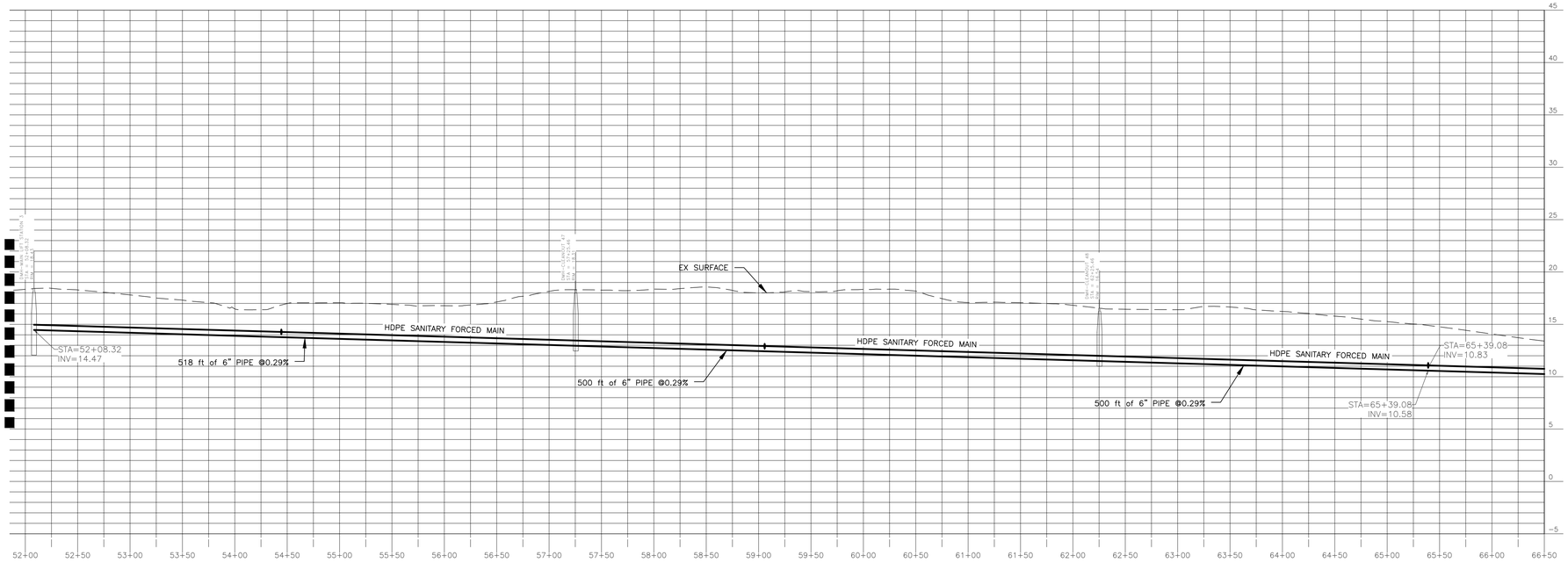
~~6. CONTRACTOR TO INVESTIGATE AND LOCATE EXISTING MAIN SANITARY LATERAL THAT CONNECTS INTO EXISTING COMBINED SEWER. EXISTING SANITARY LATERALS THAT ARE AT A HIGHER ELEVATION THAN THE NEW SANITARY SEWER SHALL BE CONNECTED TO THE NEW SANITARY SEWER. EXISTING SANITARY LATERALS THAT ARE AT A LOWER ELEVATION THAN THE NEW SANITARY SEWER TO BE REPLACED.~~

~~7. CONTRACTOR TO COORDINATE LATERAL WORK WITH TENDER PACKAGE #6~~
~~CONTRACTOR SEQUENCING OF WORK TO BE AS FOLLOWS:~~
~~A. TENDER PACKAGE 3A CONTRACTOR TO INSTALL SANITARY GRAVITY SEWER HEADER 1413 TO LS 13 AND FROM BERMUDA TRIANGLE CLUB TO LS-13 LEAVING ALL EXISTING LATERALS TO EXISTING SEWERS IN PLACE.~~
~~B. INSTALL LS-13 PUMPS, MANHOLE, CONDUITS, WIRING TROUGH AND CONDUCTORS FROM PUMPS TO WIRING TROUGH.~~
~~C. HALT WORK UNTIL TENDER PACKAGE 6 PLACES LS-13 INTO SUCCESSFUL SERVICE.~~
~~D. PROVIDE TEMPORARY 4" HDPE FROM LS-13 TO EXISTING SANITARY SEWER.~~
~~E. MIGRATE EXISTING LATERALS FROM EXISTING COMBINED SEWER TO NEW GRAVITY HEADER~~

~~8. EJECTOR PUMP WIRING SHALL BE RAN FROM THE SERVICING BUILDING TO THE EJECTOR PUMP IN THE SAME SANITARY SERVICE LATERAL TRENCH.~~

9. COORDINATE TERMINATION OF HDPE PIPE AND PVC CONDUIT INTO MLS-3 WITH TENDER PACKAGE 3B CONTRACTOR.

C-1202



REDUCTION VERIFICATION SCALE 0 10 INCHES

WORK BEFORE STA 52+08.32 INCLUDED IN TP#3B. MLS 3 AND SUPPORTING STRUCTURES SHALL BE INSTALLED BY TP#3A CONTRACTOR. TP#3A CONTRACTOR TO COORDINATE WITH CONNECTING TP CONTRACTOR

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

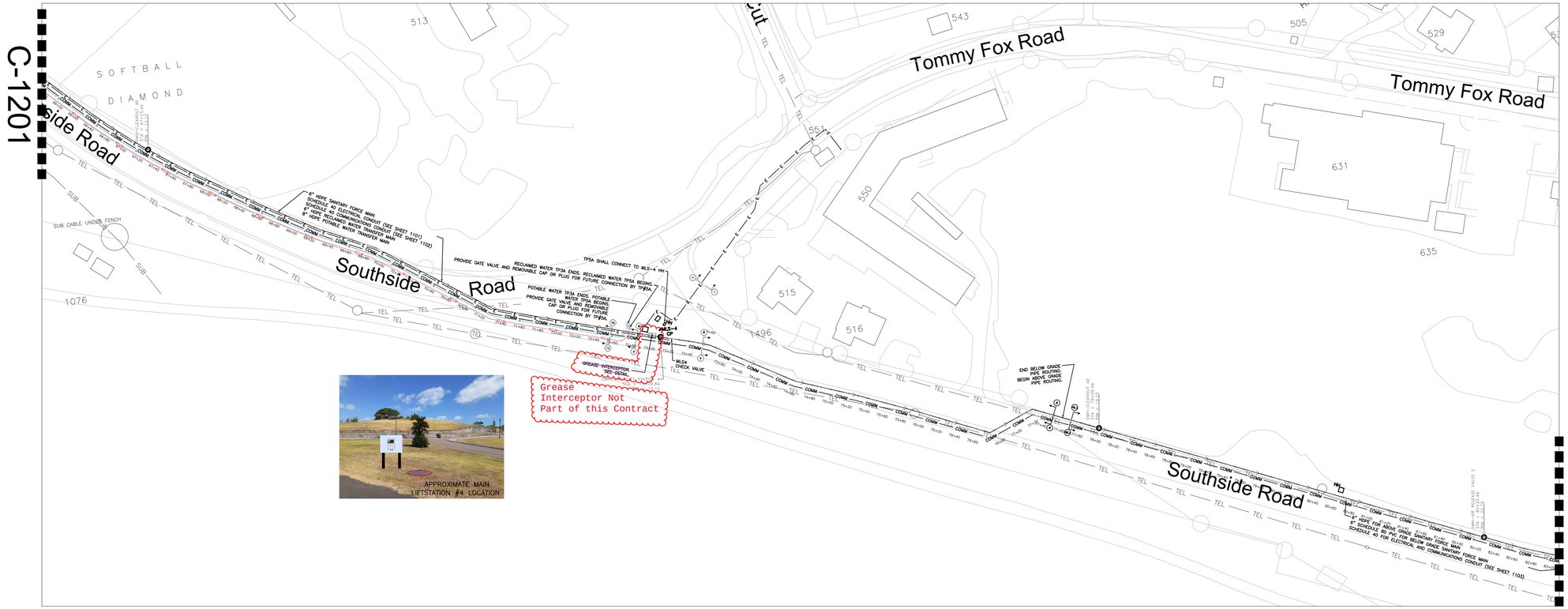
SOUTHSIDE SEWER PLAN AND PROFILE
52+08.32 – 66+50

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1201

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

JOB: P-20-0914	SHEET 08 OF 21



LEGEND

- COMMUNICATIONS — COMM —
- ELECTRIC — E — E —
- FLOWLINE
- PROPOSED FORCED MAIN
- EXISTING TELECOM — TEL — TEL —
- EXISTING BELCO — BELCO —
- EXISTING SUBMARINE CABLE — SUB — SUB —
- PROPOSED POTABLE WATER — W —
- PROPOSED RECLAIMED WATER — RCLM —

0 60' 120'

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

NOTES

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2. CONTRACTOR TO AVOID AND/OR PROTECT ALL EXISTING UTILITIES IN CONFORMANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS.
3. A HIGHLY SENSITIVE GLOBAL UNDERGROUND FIBER OPTIC CABLE EXISTS ALONG SOUTHSIDE ROAD. CONTRACTOR TO HAND DIG ALL EXCAVATION WITHIN FIVE FEET OF THIS GLOBAL UNDERGROUND FIBER OPTIC CABLE
4. CONTROL PANEL INSTALLATION NOT INCLUDED IN THIS PACKAGE.
5. ASSUMED LOCATION OF EXISTING SANITARY LATERAL. CONTRACTOR TO DETERMINE ACTUAL LOCATIONS BY EITHER FILED INSPECTIONS OR VIDEO INSPECTION OF THE EXISTING SEWER. EXISTING LATERALS CANNOT BE DEMOLISHED UNTIL THE FORCE MAIN IS IN AND THE WWTP IS FUNCTIONAL. CONTRACTOR TO ACCOUNT FOR 10 FT OF NEW LATERAL PIPE.
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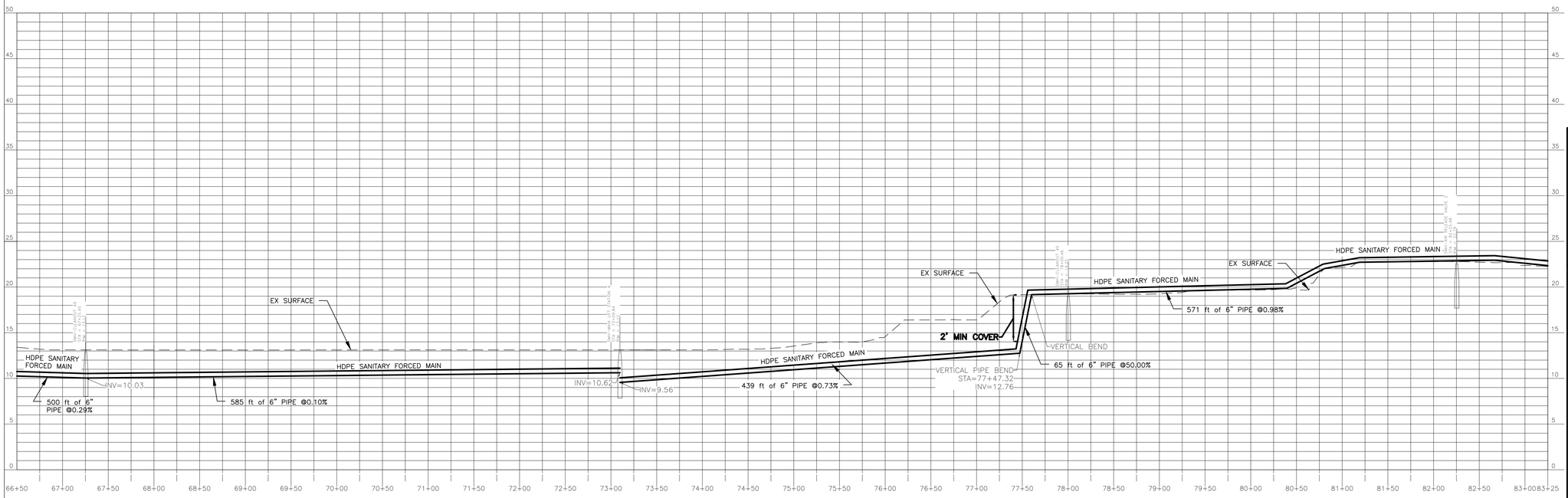

REDUCTION VERIFICATION SCALE 0 10 INCHES

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BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE SEWER PLAN AND PROFILE 66+50 – 83+25

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1202

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

JOB: P-20-0914 | SHEET 09 OF 21

LEGEND

- COMMUNICATIONS — COMM —
- ELECTRIC — E — E —
- FLOWLINE
- PROPOSED FORCED MAIN
- EXISTING TELECOM — TEL — TEL —
- EXISTING BELCO — BELCO —
- EXISTING SUBMARINE CABLE — SUB — SUB —
- PROPOSED POTABLE WATER — W —
- PROPOSED RECLAIMED WATER — RCLM —

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

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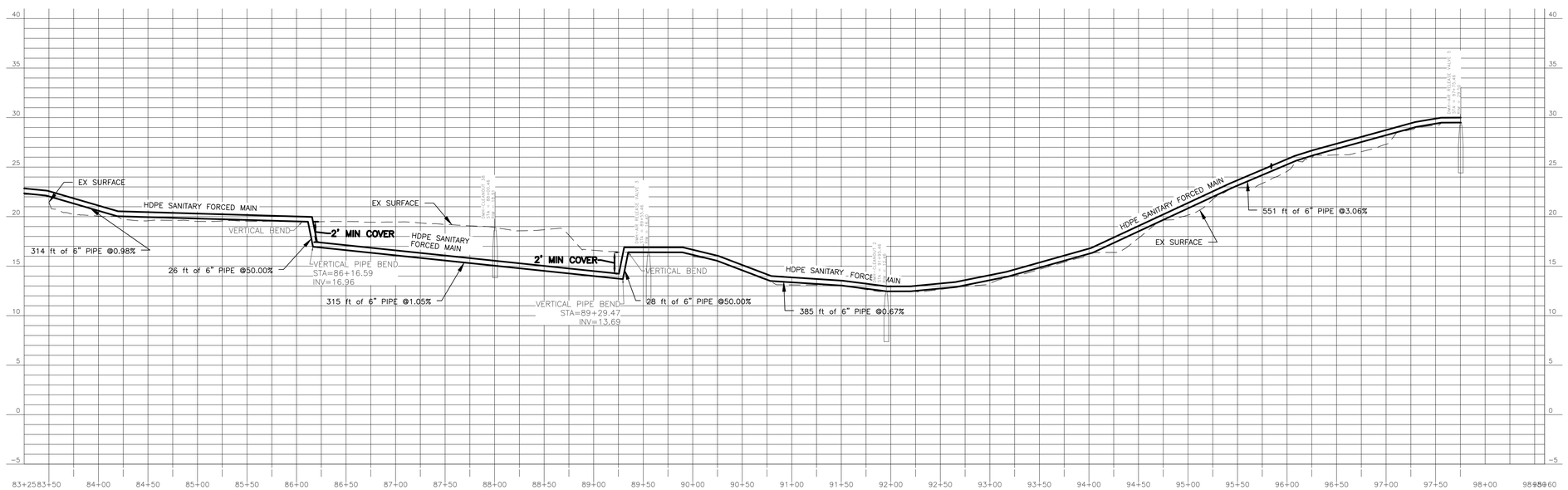

REDUCTION VERIFICATION SCALE 0 10 INCHES

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE SEWER PLAN AND PROFILE 83+25 – 98+50

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1203

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

CLEANOUT TABLE				
Structure Name	STRUCTURE RIM	ALIGNMENT STATION	OFFSET	TENDERING PACKAGE
CLEANOUT 2	RIM = 12.46	91+95.46	0.00	#3A
CLEANOUT 5	RIM = 18.36	53+74.16	-55.96L	#3A
CLEANOUT 47	RIM = 18.31	57+25.46	0.00	#3A
CLEANOUT 48	RIM = 16.54	62+25.46	0.00	#3A
CLEANOUT 49	RIM = 13.12	67+25.45	0.00	#3A
CLEANOUT 36	RIM = 104.54	1600+00.00	0.00	#3A
CLEANOUT 38	RIM = 18.91	88+00.46	0.00	#3A
CLEANOUT 40	RIM = 19.25	78+00.46	0.00	#3A

LIFT STATION TABLE				
Structure Name	STRUCTURE RIM	ALIGNMENT STATION	OFFSET	TENDERING PACKAGE
LIFT STATION 13	RIM = 19.68	59+11.52	40.39L	#3A
LIFT STATION 17	RIM = 15.03	65+38.90	9.70 L	#3A
MAIN LIFT STATION 3	RIM = 18.43	52+08.32	0.00	#3A
MAIN LIFT STATION 4	RIM = 13.12	73+09.84	0.00	#3A

AIR RELEASE VALVE TABLE				
Structure Name	STRUCTURE RIM	ALIGNMENT STATION	OFFSET	TENDERING PACKAGE
AIR RELEASE VALVE 2	RIM = 22.79	82+25.46	0.00	#3A
AIR RELEASE VALVE 3	RIM = 16.40	89+55.46	0.00	#3A
AIR RELEASE VALVE 5	RIM = 29.50	97+75.46	0.00	#3A

EJECTOR PUMP TABLE				
Structure Name	STRUCTURE RIM	ALIGNMENT STATION	OFFSET	TENDERING PACKAGE
EJECTOR PUMP 8	RIM = 16.38	54+22.43	10.00R	#3A
EJECTOR PUMP 9	RIM = 25.84	95+84.38	-9.45L	#3A

HAND HOLES			
Structure Name	APPROX. STATION	APPROX. OFFSET	TENDERING PACKAGE
HANDHOLE (HH)	52+21.26	6.00 R	#3A
HANDHOLE (HH)	56+46.84	60.42 L	#3A
HANDHOLE (HH)	59+05.52	41.39 L	#3A
HANDHOLE (HH)	65+51.40	10.08 L	#3A
HANDHOLE (HH)	73+12.04	14.09 L	#3A
HANDHOLE (HH)	80+65.71	6.89 L	#3A
HANDHOLE (HH)	86+26.37	7.69 L	#3A
HANDHOLE (HH)	89+35.37	6.52 L	#3A
HANDHOLE (HH)	95+63.07	6.49 L	#3A

MANHOLES			
Structure Name	APPROX. STATION	APPROX. OFFSET	TENDERING PACKAGE
MANHOLE 1	1600+54.62	0.00	#3A

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE SEWER GRAVITY
AND FORCE MAIN STRUCTURES

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

C-1301

REDUCTION VERIFICATION SCALE 0 10 INCHES

SOUTHSIDE CIVIL MAIN LINE DATA

FROM	TO	PIPE DISTANCE (ft)	LANDSCAPE LENGTH (ft)	LANDSCAPE AREA (sq ft)	PAVEMENT LENGTH (ft)	PAVEMENT AREA (sq ft)	SIDEWALK LENGTH (ft)	SIDEWALK AREA (sq ft)	CLEARING AND GRUBBING?	PIPE DIA	PIPE SUPPLIED BY	APPROX TOTAL EXCAVATION OF DOWNSTREAM IN CU. FT	APPROX TOTAL EXCAVATION OF DOWNSTREAM IN ACRE-FEET	LENGTH OF PIPE (ft)
52+82.86	97+75.46	4567	2100	8039	-	-	360	1022	YES	6"	BLDC	59,187	1.36	5,100

TRENCHING QUANTITIES

TRENCH DETAIL #	TRENCH LENGTH (LF)
1	338
2	92
3	11
4	103
7	80
8	775
9	50
13	2,076
14	95

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
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1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

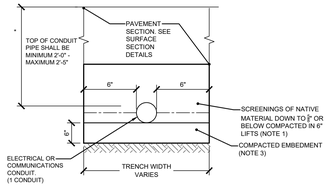
SOUTHSIDE CIVIL LATERAL DATA

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

C-1302

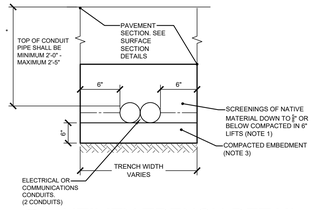
REDUCTION VERIFICATION SCALE 0 10 INCHES

Addendum 1- Rev. 2 Drawings- Date 11/30/2021



1 UTILITY TRENCH DETAIL

NOT TO SCALE
* REFER TO CONDUIT SIZING DIAGRAM FOR CONDUIT SIZES
* CONDUITS MAY BE COMMUNICATIONS OR ELECTRICAL
* COMMUNICATIONS TO BE TOP LEFT



2 UTILITY TRENCH DETAIL

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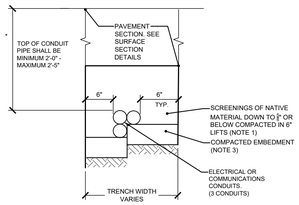

3 UTILITY TRENCH DETAIL

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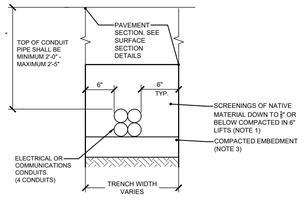

4 UTILITY TRENCH DETAIL

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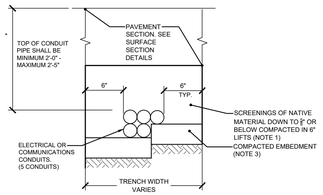

5 UTILITY TRENCH DETAIL

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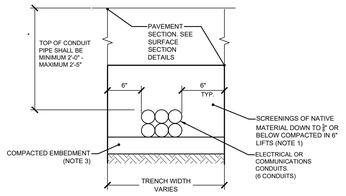

6 UTILITY TRENCH DETAIL

NOT TO SCALE
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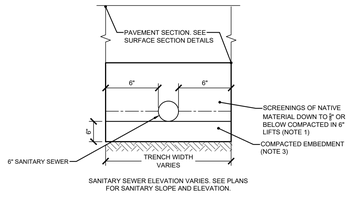
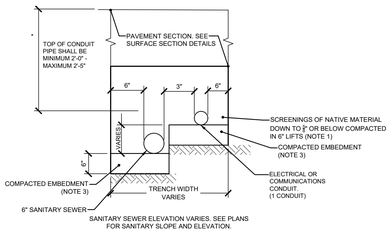


SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

7 UTILITY TRENCH DETAIL

NOT TO SCALE



SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

8 UTILITY TRENCH DETAIL

NOT TO SCALE
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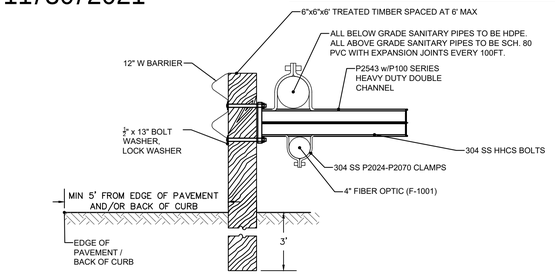
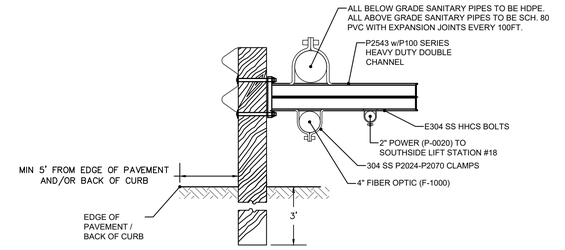


AG.1 ABOVE GRADE SUPPORT SYSTEM

NOT TO SCALE
OVERSIZE PIPE CLAMPS TO ALLOW FOR PIPE MOVEMENT.

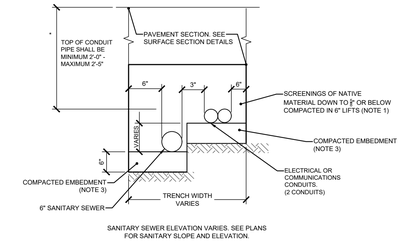


AG.2 ABOVE GRADE SUPPORT SYSTEM

NOT TO SCALE
OVERSIZE PIPE CLAMPS TO ALLOW FOR PIPE MOVEMENT.

A.G. NOTES:

1. CONTRACTOR MAY ELECT TO ROUTE PIPES/CONDUITS SHOWN ABOVE GRADE, BELOW GRADE IN THAT CASE PROVIDE SHOP DRAWING DETAILED PER SHEET C-1401 WITH APPROPRIATE ASPHALT OR LANDSCAPE DETAIL FOR APPROVAL.
2. Above Grade Support System: The Above Grade support system consists of (contractor may elect to install HDPE pipe and schedule 40 PVC conduit below grade) :
   a. 6" x 6" treated lumber wooden support posts spaced no further than 6 feet apart. Post shall be pressure treated with a mixture of oxides of copper, chromium, and arsenic and known as CCA in the industry. Wooden posts
   b. Guard Rail
   i. 12" Height, 12 Gauge
   ii. Class A, Type II galvanized coating.
   iii. Lap rail in direction of traffic in adjacent lane.
   iv. May be furnished in lengths of 12'6" or 25'.
   v. Comply with AASHTO M 111.
   vi. Provide cured end plates at each end.
   vii. Bolts, Nuts, Washers and Hardware: All materials to be 304 stainless steel.
   c. Mounting Bracket: Unistrut P-2543 or approved equal heavy duty double channel for mounting pipes and conduits. Hot dip galvanized coating.
   i. Unistrut pipe clamps sized to allow for pipe movement. P-2060 for 4" conduit and P-2070-70 for 6" HDPE or approved equal). Hot dipped galvanized coating.
   d. Expansion Joints: Flexicraft Model P or approved equal expansion joints spaced 100 feet maximum on PVC sewage pipes and PVC conduits.
   e. Pull boxes: 12" x 12" x 8" pull boxes spaced 400 feet apart maximum for fiber optic conduits. Meyers hub PVC connectors at each conduit entry into the box.
   f. All above grade pipe to be schedule 80 PVC.
   g. All below grade conduit to be schedule 40 PVC.



SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

9 UTILITY TRENCH DETAIL

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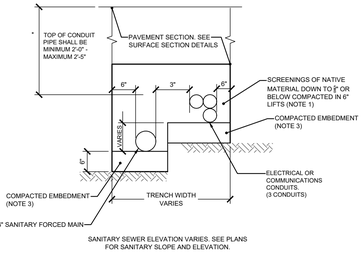

SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

10 UTILITY TRENCH DETAIL

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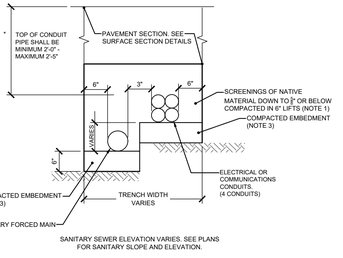

SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

11 UTILITY TRENCH DETAIL

NOT TO SCALE
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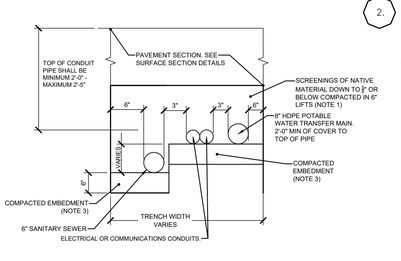

ELECTRICAL OR COMMUNICATIONS CONDUITS

SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

12 UTILITY TRENCH DETAIL

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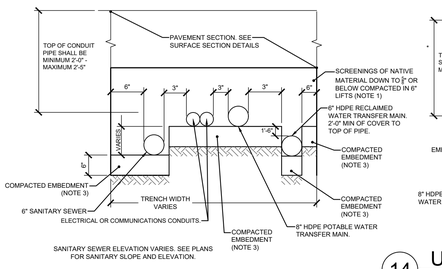

SANITARY SEWER ELEVATION VARIES. SEE PLANS FOR SANITARY SLOPE AND ELEVATION.

13 UTILITY TRENCH DETAIL

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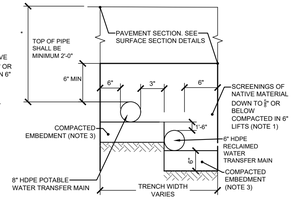
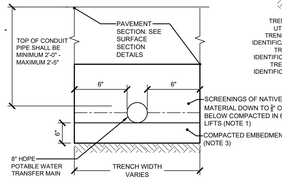


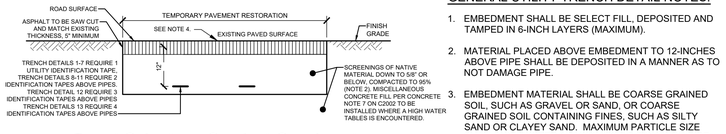
14 UTILITY TRENCH DETAIL

NOT TO SCALE



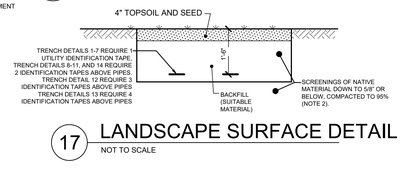
15 UTILITY TRENCH DETAIL

NOT TO SCALE



16 ASPHALT SURFACE DETAIL

NOT TO SCALE



17 LANDSCAPE SURFACE DETAIL

NOT TO SCALE

GENERAL UTILITY TRENCH DETAIL NOTES:

1. EMBEDMENT SHALL BE SELECT FILL, DEPOSITED AND TAMPED IN 6-INCH LAYERS (MAXIMUM).
2. MATERIAL PLACED ABOVE EMBEDMENT TO 12-INCHES ABOVE PIPE SHALL BE DEPOSITED IN A MANNER AS TO NOT DAMAGE PIPE.
3. EMBEDMENT MATERIAL SHALL BE COARSE GRAINED SOIL, SUCH AS GRAVEL OR SAND, OR COARSE GRAINED SOIL CONTAINING FINES, SUCH AS SILTY SAND OR CLAYEY SAND. MAXIMUM PARTICLE SIZE SHALL NOT EXCEED 1/2"-INCH FOR 2- TO 4-INCH PIPE, 3/4-INCH FOR 6- TO 8-INCH PIPE AND 1-INCH FOR LARGER PIPE SIZES. EMBEDMENT SHALL BE PLACED IN LAYERS OR LIFTS, NOT EXCEEDING 6-INCHES IN THICKNESS, FOLLOW BY MECHANICAL TAMPING TO ACHIEVE AT LEAST 85% STANDARD PROCTOR DENSITY UNDER NON-TRAFFIC AREAS AND 95% DENSITY UNDER STREETS AND ROADS (SEE ASTM C698, STANDARD TEST METHODS FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT).
4. PROVIDE TEMPORARY PAVEMENT TO MATCH EXISTING PAVEMENT THICKNESS, 4" MINIMUM.
5. ADJUST PIPE DEPTH AT VALVES AND STRUCTURES AS REQUIRED TO ACCOMMODATE INSTALLATION REQUIREMENTS.
6. ANY DISTURBANCE WITH A CONCRETE SURFACE SHALL BE REPLACED IN KIND.

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MILHOUSE ENGINEERING & CONSTRUCTION

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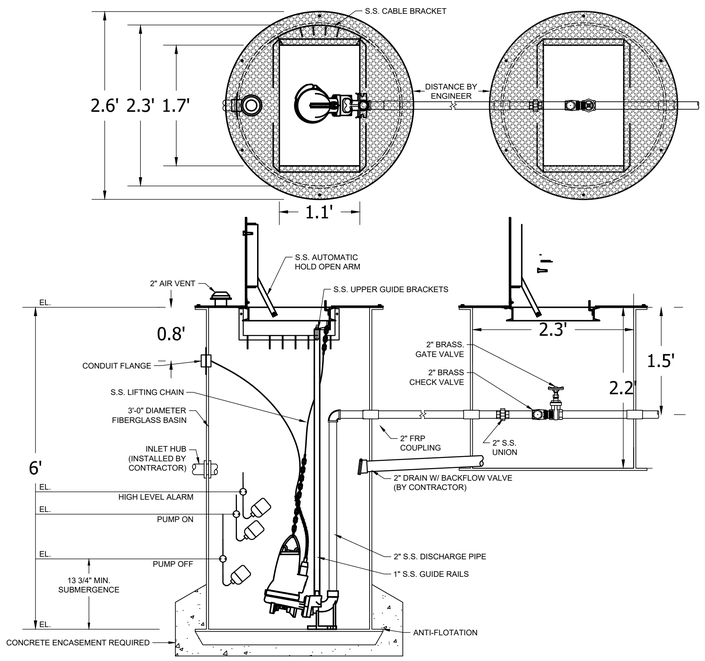
BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE CIVIL DETAILS

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

REDUCTION VERIFICATION SCALE 0 10 INCHES

C-1401

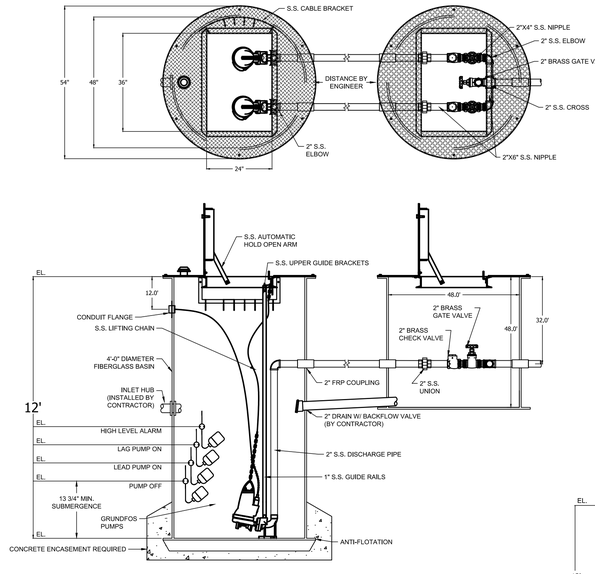


EJECTOR PUMPS

EJECTOR PUMP 8
EJECTOR PUMP 9

INCLUDED IN THIS TENDER PACKAGE IS: THE INSTALLATION OF THE LIFT STATIONS, LIFT STATION PUMPS AND THE LIFT STATION PUMP WIRING INTO THE ADJACENT CONTROL PANEL WIRING TROUGH.

LIFT STATION CONTROL PANELS WILL BE INSTALLED BY OTHERS.

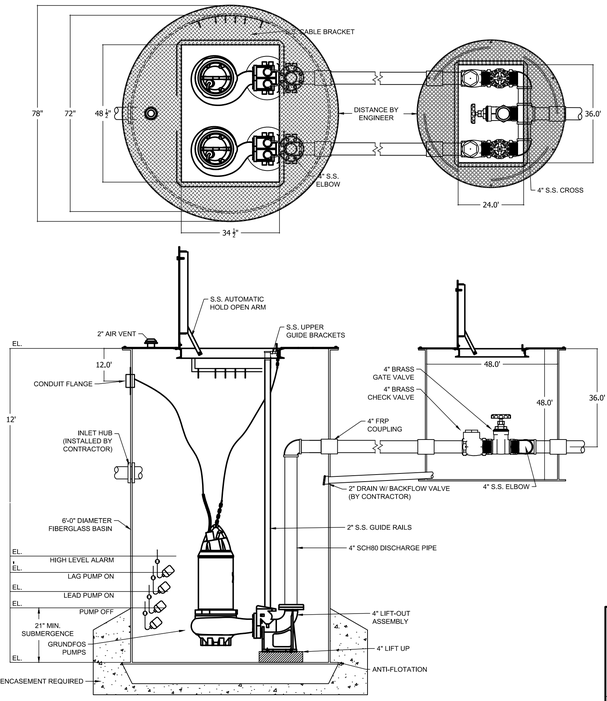


LIFT STATIONS

LIFT STATION 13
LIFT STATION 17

NOTES

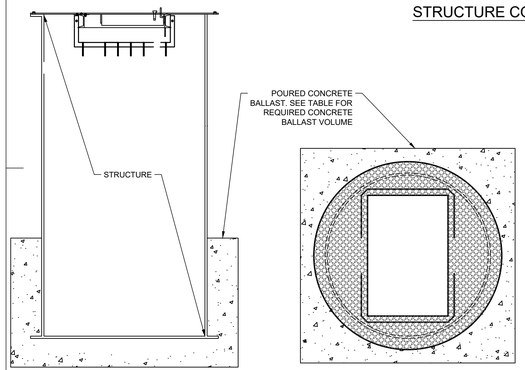
1. ELEVATIONS OF FLOAT OPERATIONS TO PUMPS AS FOLLOWS:
   A. PUMPS OFF = 13"-14"
   B. LEAD PUMP ON = 28"
   C. LAG PUMP ON = 36"
   D. HIGH ALARM = 42"



MAIN LIFT STATIONS

MAIN LIFT STATION 3
MAIN LIFT STATION 4

STRUCTURE CONCRETE ENCASEMENT



STRUCTURE CONCRETE ENCASEMENT 3500 PSI MINIMUM	
TYPE	VOLUME OF CONCRETE REQUIRED (cu ft.)
EJECTOR PUMPS	30
LIFT STATIONS	110
MAIN LIFT STATIONS	350

10 INCHES

REDUCTION VERIFICATION SCALE 0

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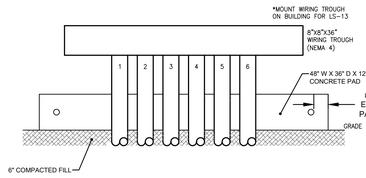
BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE CIVIL DETAILS

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

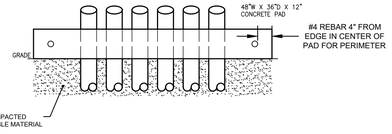
C-1402



EX1 LIFT STATION AND CONTROL PANEL STUB UPS

NOT TO SCALE

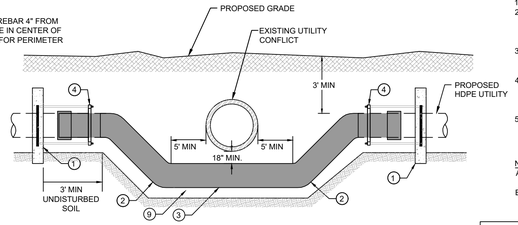
NOTE ALL LIFT STATION CONDUITS TO STUB UP INTO WIRING TROUGH. TERMINATE CONDUIT WITH THREADED TERMINAL ADAPTER AND SEALING LOCKNUT



EX2 POWER CENTER STUB UPS

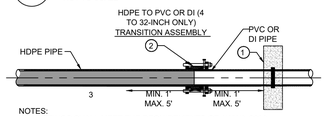
NOT TO SCALE

POWER CENTER 1, 2 & 3 CONDUITS TO STUB UP THROUGH CONCRETE PAD AND BE CAPPED



A EXISTING UTILITY CONFLICT

NOT TO SCALE



NOTES:

A. FITTINGS SHALL MEET THE REQUIREMENTS OF AWWA C906.
B. MECHANICAL FITTINGS USED SHALL BE SPECIFICALLY DESIGNED FOR USE WITH HDPE PIPE.
C. STAINLESS STEEL INTERNAL STIFFENERS SHALL BE INSTALLED IN THE END OF THE HDPE PIPE WHEN HDPE PIPE IS INSERTED INTO THE BELL END OF NON-HDPE PIPE, VALVE, FITTING, OR INTO THE HUB OF A BOLTED COUPLING
D. RESTRAINT COUPLER SLEEVE SHALL BE ASTM A513 WITH FUSION BONDED EPOXY. LOW ALLOY STEEL BOLTS CONFORM TO AWWA C111.4
E. WHEN PVC BELL END IS ENCOUNTERED, FIELD CUT PVC TO FORM PLAIN END PER MANUFACTURER'S INSTRUCTIONS.

C HDPE TO PVC TRANSITION ASSEMBLY

NOT TO SCALE

NO. DESCRIPTION

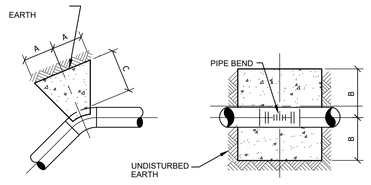
1. CONCRETE WALL BLOCKING (REFER TO DETAIL A, THIS SHEET)
2. TO PREVENT THE OVER-BENDING OF HDPE, A MIN. 1.50 TIMES THE MANUFACTURER SPECIFIED BEND RADIUS IS ALLOWED. IF BEND RADIUS REQUIREMENTS CANNOT BE MET, THEN BUTT FUSED LONG RADIUS BEND FITTINGS ARE ALLOWED.
3. HDPE PIPE - MINIMUM LENGTH IS 10 FEET PLUS DIAMETER OF STORM PIPE OF STRAIGHT RUN OF PIPE AND CENTERED UNDER STORM DRAIN PIPE.
4. ROD BEND TO WALL BLOCK IF TRANSITION IS NOT SELF-RESTRAINED. ROD MATERIAL MUST BE CORROSION-RESISTANT AND COVERED IN CORROSION INHIBITING SUBSTANCE.
5. TIE ROD - THE CONNECTING TIE RODS THAT JOIN THE TWO RINGS SHALL BE MADE OF LOW ALLOY STEEL THAT CONFORMS TO ANSI/AWWA C111/A21.11.

NOTES

A. ALL HDPE PIPE SHALL HAVE BUTT FUSED JOINT OR ELECTROFUSED FITTINGS.
B. EMBEDMENT OF MAIN SHALL BE PER TRENCH UTILITY DETAIL.

BEND RADIUS TABLE	
MAIN SIZE (INCHES)	MINIMUM BEND RADIUS (FEET)
4	90
6	133
8	173

TIE ROD TABLE	
MAIN SIZE (INCHES)	TIE ROD SIZE (COUNT - INCH)
4	4 - $\frac{3}{4}$ X 13
6	6 - $\frac{3}{4}$ X 13
8	6 - $\frac{3}{4}$ X 13



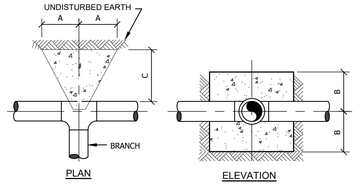
DETAIL NOTES:

1. MAXIMUM DEFLECTION AT A HORIZONTAL JOINT WITHOUT A CONCRETE THRUST BLOCK SHALL BE 50% OF THE PIPE MANUFACTURER'S ALLOWABLE FOR THAT TYPE JOINT.
2. THRUST BLOCK DESIGN BASED ON SOIL LATERAL BEARING CAPACITY = 1200 PSF AND MAXIMUM LEAK TEST PRESSURE.
3. WHERE THRUST BLOCKS ARE INSTALLED AGAINST SOUND ROCK, THE BEARING AREA SHOWN IN THE SCHEDULE MAY BE REDUCED BY 50% WITH THE ENGINEERS APPROVAL.

HORIZONTAL BENDS						
PIPE SIZE	BEND	DIMENSION A	DIMENSION B	DIMENSION C	TEST PRESSURE (PSI)	THRUST (LBS.)
4"	22.5°	10"	3"	1'-6"	150	692
4"	45°	10"	5"	1'-8"	150	1,357
4"	90°	10"	8"	1'-9"	150	2,507
6"	22.5°	11"	4"	1'-9"	150	1,427
6"	45°	11"	8"	1'-10"	150	2,798
6"	90°	11"	1'-3"	1'-10"	150	5,170
8"	22.5°	1'-0"	7"	1'-11"	150	2,453
8"	45°	1'-0"	1'-0"	1'-11"	150	4,812
8"	90°	1'-0"	1'-11"	2'-0"	150	8,891

B TYPICAL THRUST BLOCK DETAIL FOR HORIZONTAL BENDS

NOT TO SCALE



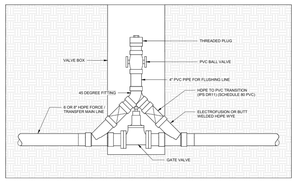
TEES / DEAD ENDS					
BRANCH PIPE SIZE	DIMENSION A	DIMENSION B	DIMENSION C	TEST PRESSURE (PSI)	THRUST (LBS.)
4"	10"	6"	1'-6"	150	1,773
6"	11"	11"	1'-10"	150	3,656
8"	1'-0"	1'-5"	1'-11"	150	6,287

DETAIL NOTES:

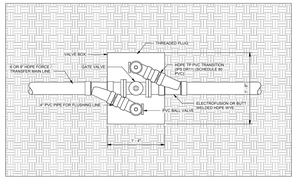
1. END CAP NOT SHOWN.
2. THRUST BLOCK DESIGN BASED ON SOIL LATERAL BEARING CAPACITY = 1500 PSF, MAXIMUM LEAK TEST PRESSURE SPECIFIED AND A SAFETY FACTOR = 1.5.
3. WHERE THRUST BLOCKS ARE INSTALLED AGAINST SOUND ROCK, THE BEARING AREA SHOWN IN THE SCHEDULE MAY BE REDUCED BY 50% WITH THE ENGINEERS APPROVAL.

D TYPICAL THRUST BLOCK DETAIL FOR TEE, WYE AND END CAP

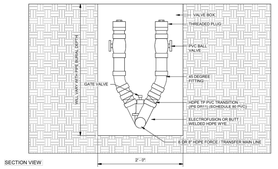
NOT TO SCALE



ELEVATION VIEW



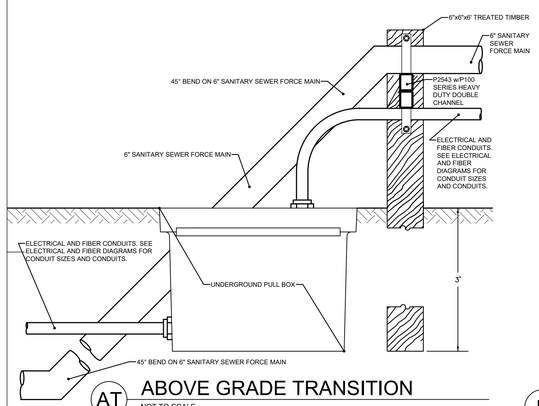
PLAN VIEW



SECTION VIEW

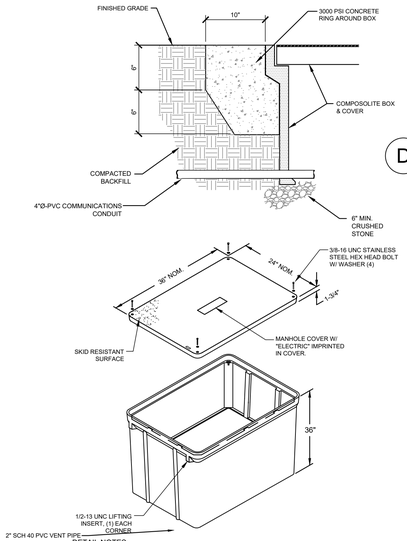
E FORCED MAIN CLEANOUT

NOT TO SCALE



AT ABOVE GRADE TRANSITION

NOT TO SCALE

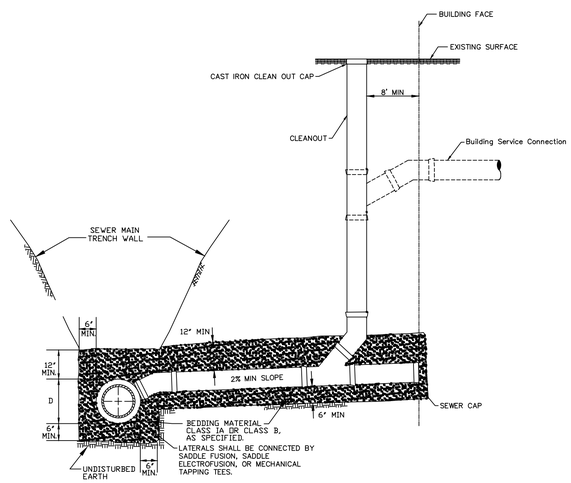


DETAIL NOTES:

1. ENCLOSURE SHALL BE HUBBELL/QUAZITE PG STYLE 24"x36"x36" DEEP W/ BOLTED, TRAFFIC RATED COVER.

F COMMUNICATIONS HANDHOLE DETAIL

NOT TO SCALE



G SERVICE & SERVICE CLEANOUT RISER

NOT TO SCALE

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

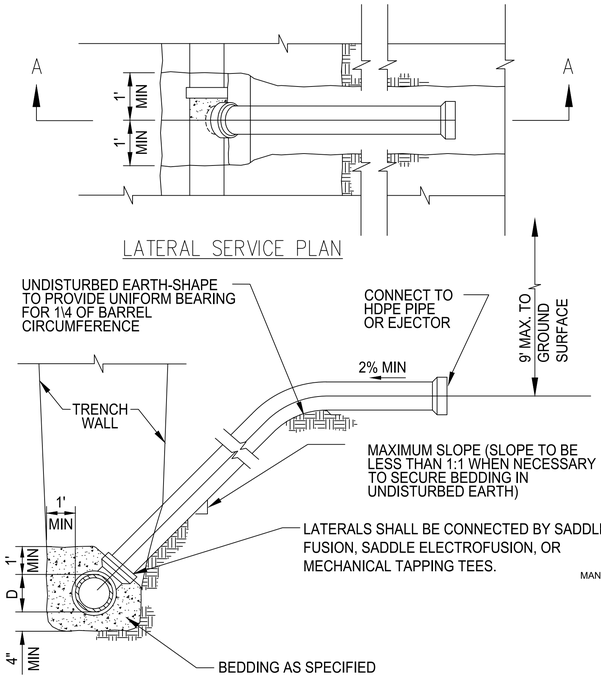
BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE CIVIL DETAILS

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

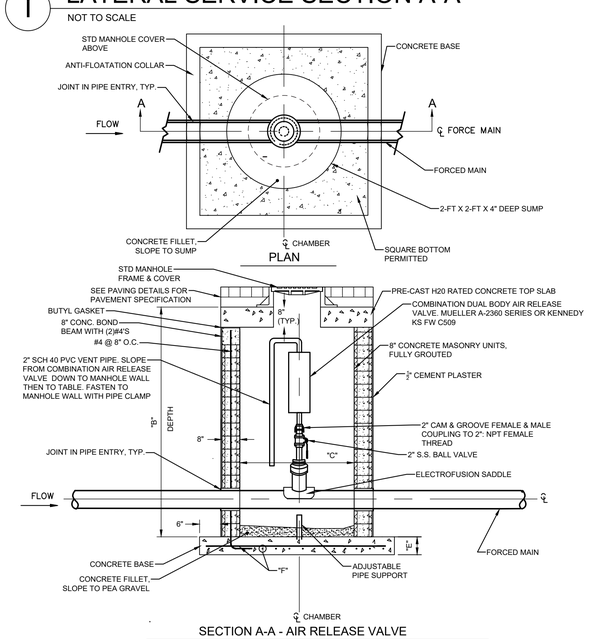
C-1403

REDUCTION VERIFICATION SCALE 0 10 INCHES



I LATERAL SERVICE SECTION A-A

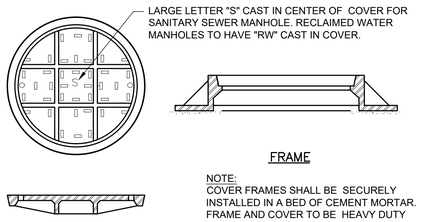
NOT TO SCALE



	A	B	C	D	E	F
Shallow 0'- 4'		4' Max	3'-6"	24" Max	8"	#4 at 8" E.W.
Standard 4.1'- 6'		6' Max	4'	30" Max	8"	#5 at 10" E.W.

J AIR VALVE CHAMBER

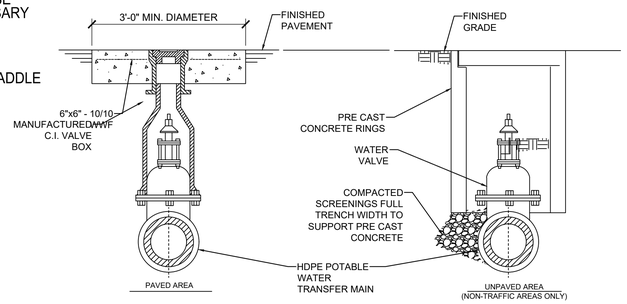
NOT TO SCALE



NOTE:
COVER FRAMES SHALL BE SECURELY INSTALLED IN A BED OF CEMENT MORTAR. FRAME AND COVER TO BE HEAVY DUTY H-20 LOADING

K MANHOLE FRAME AND COVER DETAIL

NOT TO SCALE

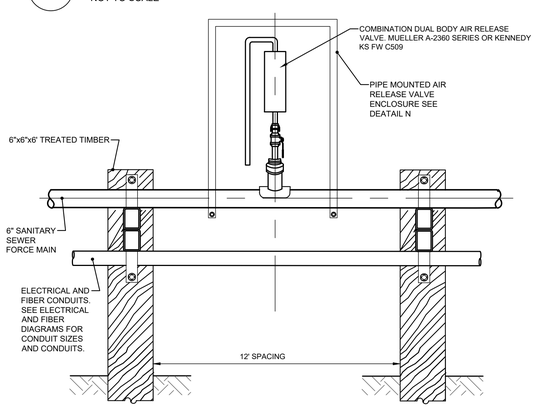


DETAIL NOTES:

1. MJ ADAPTER KIT SHALL INCLUDE BOLTS AND NUTS, GRADE 3 OR HIGHER AND LONG ENOUGH TO ACCOMMODATE THE ADDED LENGTH OF HDPE FITTING TO ATTACH THE VALVES.
2. IF VALVE OPERATING NUT IS MORE THAN 3 FEET BELOW FINISHED GRADE, PROVIDE EXTENSION STEM WITH STANDARD 2-INCH SQUARE OPERATING NUT IN TOP SECTION OF VALVE BOX.

L GATE VALVE IN HDPE PIPE

NOT TO SCALE

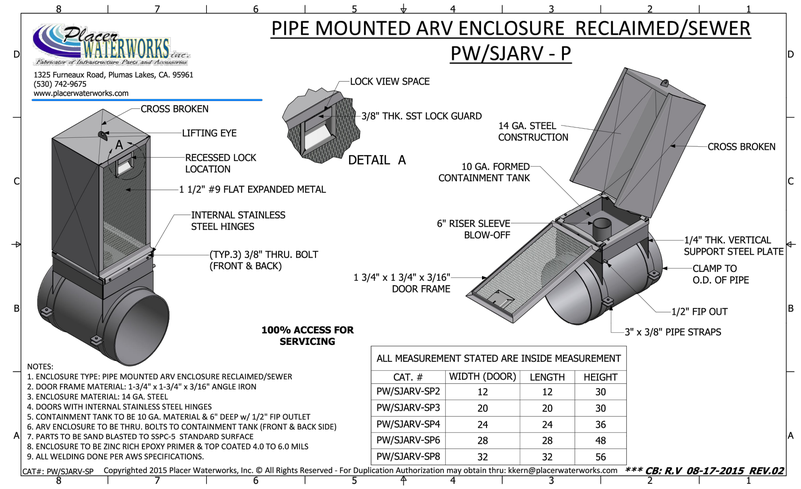


M ABOVE GRADE AIR RELEASE VALVE (ARV)

NOT TO SCALE

PIPE MOUNTED ARV ENCLOSURE RECLAIMED/SEWER PW/SJARV - P

Placer WATERWORKS, Inc.
Fabricator of Infrastructure, Parts and Accessories
1325 Furneaux Road, Plumas Lakes, CA. 95961
(530) 742-9675
www.placerwaterworks.com



100% ACCESS FOR SERVICING

NOTES:
1. ENCLOSURE TYPE: PIPE MOUNTED ARV ENCLOSURE RECLAIMED/SEWER
2. DOOR FRAME MATERIAL: 1-3/4" x 1-3/4" x 3/16" ANGLE IRON
3. ENCLOSURE MATERIAL: 14 GA. STEEL
4. DOORS WITH INTERNAL STAINLESS STEEL HINGES
5. CONTAINMENT TANK TO BE 10 GA. MATERIAL & 6" DEEP w/ 1/2" FIP OUTLET
6. ARV ENCLOSURE TO BE THRU. BOLTS TO CONTAINMENT TANK (FRONT & BACK SIDE)
7. PARTS TO BE SAND BLASTED TO SSPC-5 STANDARD SURFACE
8. ENCLOSURE TO BE ZINC RICH EPOXY PRIMER & TOP COATED 4.0 TO 6.0 MILS
9. ALL WELDING DONE PER AWS SPECIFICATIONS.

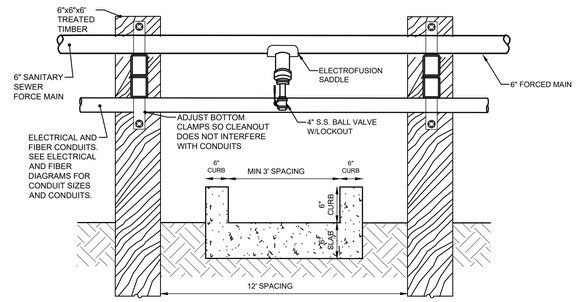
ALL MEASUREMENT STATED ARE INSIDE MEASUREMENT

CAT. #	WIDTH (DOOR)	LENGTH	HEIGHT
PW/SJARV-SP2	12	12	30
PW/SJARV-SP3	20	20	30
PW/SJARV-SP4	24	24	36
PW/SJARV-SP6	28	28	48
PW/SJARV-SP8	32	32	56

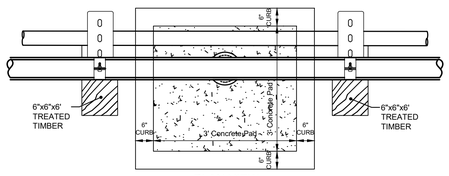
CAT#: PW/SJARV-SP Copyrighted 2015 Placer Waterworks, Inc. © All Rights Reserved - For Duplication Authorization may obtain thru: kkern@placerwaterworks.com *** CB: R.V 08-17-2015 REV.02

N ABOVE GRADE ARV ENCLOSURE

NOT TO SCALE



SECTION VIEW



PLAN VIEW

O ABOVE GRADE CLEANOUT

NOT TO SCALE

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE CIVIL DETAILS

SCALE		DRAWN	CM
INTERCEPTOR		CHECKED	RJB
SYSTEM		SUBMITTED	
SURVEYED			
DATE	02/05/2021	RECOMMENDED	
CADD FILE			

C-1404

REDUCTION VERIFICATION SCALE 0 10 INCHES

JOB P-20-2014 | SHEET OF

AREA CLASSIFICATION TABLE

LOCATION	RACEWAY SYSTEMS	ENCLOSURES	ALARMS	OSHA CLASSIFICATION	HAZZARD CLASSIFICATION	NOTES
SOUTHSIDE WWTP BUILDING	NEMA 12	NEMA 12	GAS, FIRE	NOT CLASSIFIED	NFPA-820-12-A-C	6, 2, 3
PUMPING STATION 609	NEMA 4X	NEMA 12	NONE	NOT CLASSIFIED	NOT CLASSIFIED	
PUMPING STATION 701	NEMA 4X	NEMA 12	NONE	NOT CLASSIFIED	NOT CLASSIFIED	
RESERVOIR 14A/B WET WELLS	N/A	N/A	NONE	CONFINED SPACE	NFPA-820-CLASS1 DIV1	

ELECTRICAL PLAN SYMBOLS

- 6"X2' SURFACE MOUNTED LED LIGHT FIXTURE (FB)
- WALL MOUNTED LED LIGHT FIXTURE (FA)
- EMERGENCY/EGRESS LIGHT (FC)
- EQUIPMENT TO BE DEMOLISHED
- EXISTING EQUIPMENT TO REMAIN
- NEW EQUIPMENT

} EXAMPLES

- (W) WELDING RECEPTACLE
- EXISTING LIGHT FIXTURE
- EF EXHAUST FAN
- SF SUPPLY FAN
- (SD) SMOKE DETECTOR
- (G) GENERATOR
- AFS AIR FLOW SWITCH
- (T) THERMOSTAT
- AV FIRE ALARM OR VENTILATION FAILURE AUDIO/VISIO
- A ANTENNA
- LIGHT SWITCH (X DENOTES #)
- ETM ELAPSED TIME METER
- GFCI 20 AMP, 1 PHASE HEAVY DUTY RECEPTACLE IN WEATHER PROOF ENCLOSURE (GFCI INDICATED GROUND FAULT TYPE)

SINGLE LINE DIAGRAM SYMBOLS

- 150AF / 70AT — MOLDED CASE CIRCUIT BREAKER NON-AUTOMATIC, 3 POLE UNLESS NOTED OTHERWISE. UPPER NUMBER INDICATES FRAME SIZE AND LOWER NUMBER INDICATES TRIP RATING
- MCP / 15A — MOTOR CIRCUIT PROTECTOR TYPE CIRCUIT BREAKER (LOWER NUMBER INDICATES TRIP RATING)
- FUSE
- TRANSFORMER, SIZE AS NOTED ON DRAWING
- STARTER OR CONTACTOR CONTACTS
- THERMAL OVERLOAD
- 30A — SAFETY DISCONNECT SWITCH, NON-FUSED; NUMBER INDICATES RATING IN AMPS
- PMT — POWER MONITORING TRANSMITTER/DEVICE
- AUTOMATIC TRANSFER SWITCH
- EXISTING EQUIPMENT
- WORK IN THIS CONTRACT EXPOSED RACEWAY
- SPD — SURGE PROTECTION DEVICE
- EUH — ELECTRICAL UNIT HEATER

ABBREVIATIONS

ø	PHASE
A	AMMETER, AUTO TRANSFORMER
AFF	ABOVE FINISHED FLOOR
AFS	AIR FLOW SWITCH
AI	ANALOG INPUT
AIC	AMPERE INTERRUPTING CAPACITY
AMP	AMPERES
ANN	ANNUNCIATOR
AO	ANALOG OUTPUT
AP	AUXILARY PANEL
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILARY PANEL
BKR	BREAKER
BLR	BLOWER
CB	CIRCUIT BREAKER
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH C - CLOSE POSITION T - TRIP POSITION
CT	CURRENT TRANSFORMER
CTRL	CONTROL
DH	DUCT HEATER
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
DP	DEWATERING PUMP
DWP	DEWATERING PUMP
EF	EXHAUST FAN
EQPT	EQUIPMENT
EXT	EXTERIOR
EUH	ELECTRICAL UNIT HEATER
F/A	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FATB	FIRE ALARM TERMINAL BOX
FD	FLOOR DRAIN
FDR	FEEDER
FE	FLOW ELEMENT
FIT	FLOW INDICATING TRANSMITTER
FL	FLOW
FR	FIRE
FVNR	FULL VOLTAGE NON REVERSING
G	GENERATOR
GFI	GROUND FAULT INTERCEPTER
GND	GROUND
GRA	GENERATOR REMOTE ANNUNCIATOR
HH	HAND HOLE
HMI	HUMAN MACHINE INTERFACE
HPU	HYDRAULIC POWER UNIT
HZ	HERTZ
I/O	INPUT/OUTPUT
JB	JUNCTION BOX, PULL BOX
KCMIL	1000 CIRCULAR MIL
KW	KILOWATT
KVA	KILOVOLT AMPERES
LCS, LCP	LOCAL CONTROL STATION, PANEL
L-O-R	LOCAL-OFF-REMOTE SELECTOR
LLFS	LOW LEVEL FLOAT SWITCH
LSI	
M	MOTOR, MAIN CONTACTOR
MCC	MOTOR CONTROL CENTER
MPR	MOTOR PROTECTION RELAY
MTR	METER, METERING
MOV	MOTOR OPERATED VALVE
MTS	MANUAL TRANSFER SWITCH
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NO	NORMALLY OPEN
OH	OVER HEAD
P	PHASE, POLE, PUMP
PB	PULL BOX, JUNCTION BOX
PCP	PUMP CONTROL PANEL
PCS	PUMP CONTROL STATION
PLC	PROGRAMMABLE LOGIC CONTROLLER
PMT	POWER MONITORING TRANSMITTER
PNL	PANEL
PP	POWER PANELBOARD
PSCP	PUMPING STATION CONTROL PANEL
PT	POTENTIAL TRANSFORMER
PVC	POLY VYNAL CHLORIDE
PWR	POWER
R	RUN CONTACTOR
RCWP	RECLAIMED WATER PUMP
RGC	RIGID GALVANIZED CONDUIT
RGPVC	RIGID PVC COATED CONDUIT
RIO	REMOTE INPUT/OUTPUT
RM	ROOM
RSP	RAW SEWAGE PUMP
RTD	RESISTANCE TEMPERATURE DETECTOR
RTRN	RETURN
RVSS	REDUCED VOLTAGE SOFT STARTER
S	SMOKE DETECTOR, SWITCH
SBV	SUCTION BUTTER VALVE
SD	SMOKE DETECTOR
SF	SUPPLY FAN
SP	SUMP PUMP
SPD	SURGE PROTECTION DEVICE
SS	SAFETY SWITCH
SW	SWITCH
SWPS	STORMWATER PUMPING STATION
TA	TRIP AMPS
TD	TIME DELAY
TDR	TIME DELAY RELAY
TRANS	TRANSFORMER
TRNSFR	TRANSFER
TSP, TSH	TWISTED SHIELDED PAIR
(TYP.)	TYPICAL
UL	UNDERWRITERS LABORATORY
UPS	UN-INTERRUPTABLE POWER SUPPLY
V	VOLT, VOLTMETER
WTR	WATER
XFMR	TRANSFORMER
XFRSW	TRANSFER SWITCH
Z	IMPEDANCE

GENERAL NOTES:

1. CONTRACTOR TO COMPLY WITH ALL OSHA REQUIREMENTS WHEN WORKING IN CONFINED SPACE.
2. CONTRACTOR TO COMPLY WITH ALL NFPA 820 REQUIREMENTS IN CLASS 1 DIVISION 2 AREAS.
3. AREA IS NON-CLASSIFIED IF SUPPLIED WITH 6 AIR CHANGES PER HOUR IN ACCORDANCE WITH NFPA-820.

100% ISSUED FOR TENDER

NO.	DESCRIPTION	BY	DATE

SOUTHSIDE WASTEWATER TREATMENT FACILITY
PLANT UPGRADES AND PHASE 1 TELEMETRY

SOUTHSIDE WASTEWATER TREATMENT PLANT

SYMBOLS AND ABBREVIATIONS

ELECTRICAL

SCALE	NTS	DRAWN
LOCATION	BERMUDA	CHECKED
SYSTEM	SOUTHSIDE WWTP	SUBMITTED J.ZURAD
SURVEYED	FALL 2020	
DATE	02/12/2021	RECOMMENDED
CADD FILE	E-0001.dwg	

MILHOUSE ENGINEERING & CONSTRUCTION

REDUCTION VERIFICATION SCALE 0 10 INCHES

E-0001

Plotted By: KANI GILMORE Date: 10/12/2021 1:16:32 PM
Drawing ID: P:\2020\0914 - BERMUDA WATER WASTEWATER\04-CADD\02-WORKING\ELECTRICAL\E-0001.DWG

ELECTRICAL SPECIFICATIONS

PART 1 – GENERAL

1-1. SCOPE. This specification covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract.

This section covers the installation schedule 40 PVC conduit, conductors from BLDC furnished pumps and handholes provided by BLDC.

Detailed apparatus specifications are provided in equipment schedules as shown on the plans. Substitutions of apparatus which meet the exact requirements of the apparatus part numbers may be submitted for review.

1-2. GENERAL. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

Electrical materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the BLDC.

1-2.01. Coordination. Electrical work shall conform to the construction schedule and the progress of other trades.

1-2.02. Anchor Bolts and Expansion Anchors. All anchor bolts, nuts, washers, and expansion anchors shall comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.

1-2.05. Drawings. Supplementing this section, the Drawings indicate locations of equipment and enclosures and provide one_line and schematic diagrams regarding the connection and interaction with other equipment.

1-3. CODES AND PERMITS. All work shall be performed and materials shall be furnished in accordance with the NEC – National Electrical Code, the NESC – National Electrical Safety Code, and the following standards where applicable:

AEIC	The Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
FedSpec	Federal Specification
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEIS	National Electrical Installation Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories

Equipment specified by this section shall be listed by UL, or by a nationally recognized third party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. If no third-party testing laboratory provides the required listing, an independent test shall be performed at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to be used.

1-4. SEISMIC DESIGN REQUIREMENT.

1-4.01. Seismic Design Requirements. Submit confirmation of compliance with the requirements of normal Bermuda requirements.

1-5. IDENTIFICATION.

1-5.01. Conduit. Conduits in handholes, building entrance pull boxes, junction boxes, and at equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel, with 1/2 inch stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible. Identification tags shall display circuit identification as indicated on one line diagrams.

1-5.02. Submittal Identification. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

- Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
- Sheets or drawings covering more than the item being considered shall have all inapplicable information crossed out.

Within 30 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of equipment to be provided.

PART 2 – PRODUCTS

2-1. CONDUIT. Conduit and raceways shall be as described in the following paragraphs:

2-1.01 Rigid Nonmetallic (PVC) Conduit. Conduit shall be heavy wall, Schedule 40, UL labelled for aboveground and underground uses, and shall conform to NEMA TC_2 and UL 651. All direct buried and exposed conduit and fittings on this project to be Schedule 40 PVC, provide adapters as required.

2-1.02 Wiring Devices, Boxes, and Fittings (NOT USED). Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface_mounted switches and convenience outlets.

2-1.03 Junction Boxes, Pull Boxes, and Wiring Gutters. Outdoor junction boxes, pull boxes, and wiring troughs shall be NEMA Type 4X rated and shall be constructed from Type 304 Stainless Steel. Outdoor boxes and troughs shall be rigidly supported by stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel.

2-2. HANDHOLES. All electrical handholes shall be Quazite type, rated for 15,000 pounds, open bottom 24"L x 36" W x 36" D.

PART 3 – EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3-2. CABLE INSTALLATION.

a. 3-2.01. General. Pull manufacturer supplied pump motor cables from pump to wiring trough

3-3. CONDUIT INSTALLATION. Contractor shall be responsible for routing all conduits. This shall include all conduits indicated on the one-lines, riser diagrams, and home-runs shown on the plan Drawings. Where conduit routing is shown on plans, it shall be considered a general guideline and shall be field verified to avoid interferences.

Provide couplings and meyers hubs for all conduits into control panel wiring troughs. Utilize Centex 99, or approved equal, clear low VOC conduit solvent cement for all coupling and Meyers hub connections, thoroughly clean all surfaces from oil and dirt before applying cement.

Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

3-3.01. Underground Conduit Installation. All excavation, backfilling, and concrete work shall conform to the respective sections of these Specifications. Underground conduit shall conform to the following requirements:

a. Underground conduits indicated not to be concrete encased shall be rigid Schedule 40 PVC.
b. Underground conduit bend radius shall be at least 2 feet at vertical risers and at least 3 feet elsewhere.
c. Underground conduits and conduit banks shall have at least 2 feet of earth cover, except where indicated otherwise.
d. Underground conduits shall be sloped to drain into handholes where possible.
e. Conduit stub ups into equipment pads to not have any part of the radius exposed.
f. All underground conduits shall be provided with a nylon pull string. The string shall be pulled attached to a mandrill sized per the conduit to verify conduit run integrity.

3-4. Handhole Installation. Handholes supplied by BLDC shall be installed at locations as shown on the plans, but not spanned more than 500' and at all 90 Degree turn in direction. Utilize hole saws to provide for penetrations of raceways which are sized no larger than ½" larger than the conduit outside diameter. Conduits to project 6" into the handhole and reamed to prevent damage to conductors.

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

ELECTRICAL SPECIFICATIONS

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1000

REDUCTION VERIFICATION SCALE 0 10 INCHES

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

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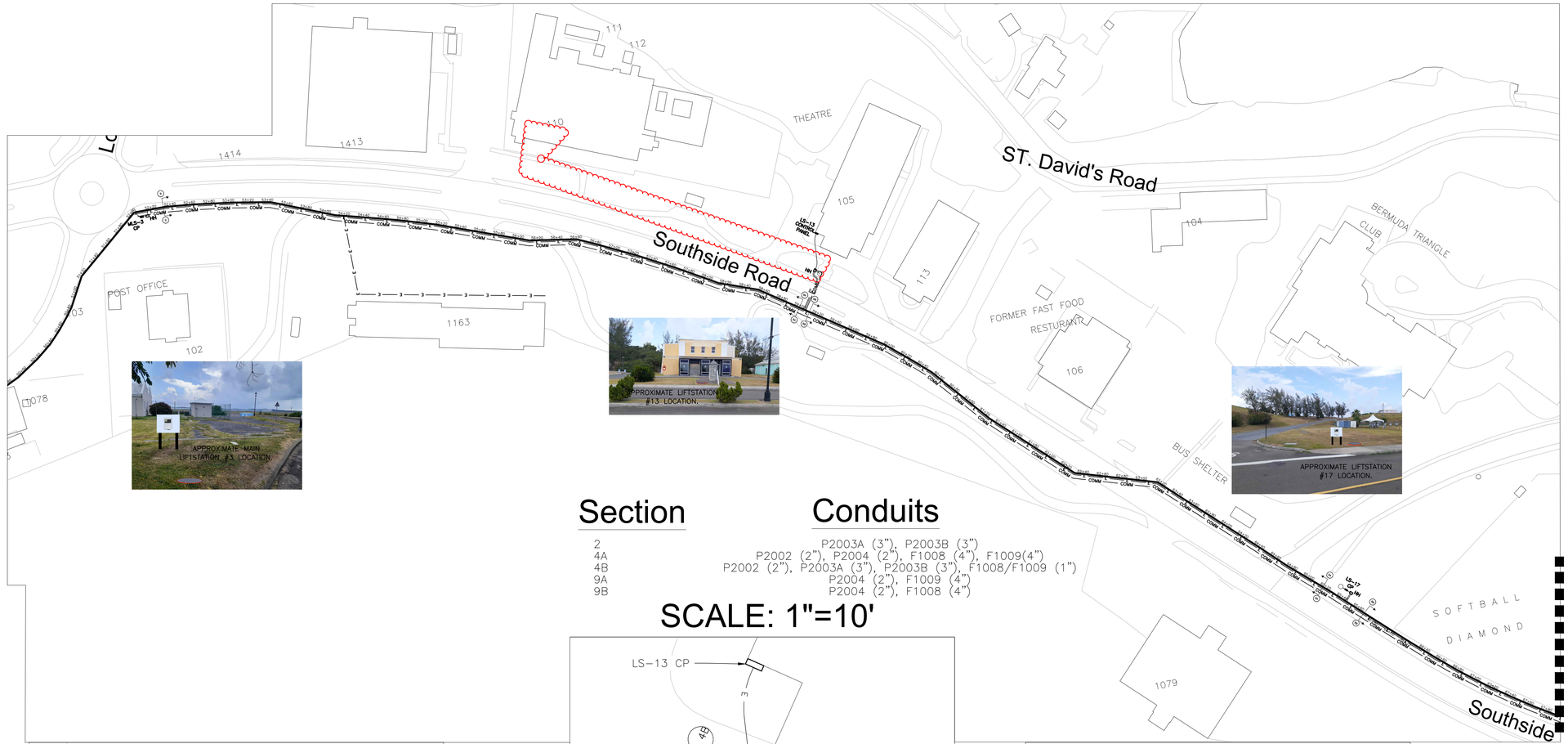
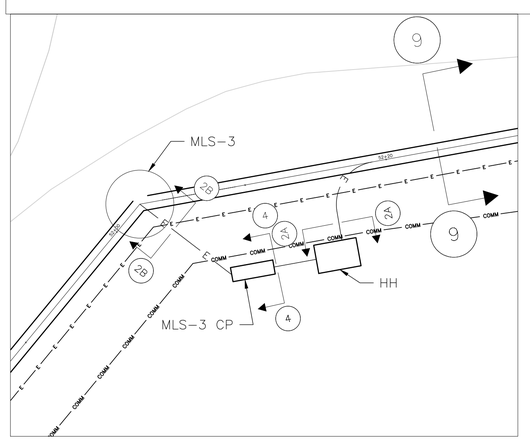


SCALE: 1"=10'

Section — Conduits

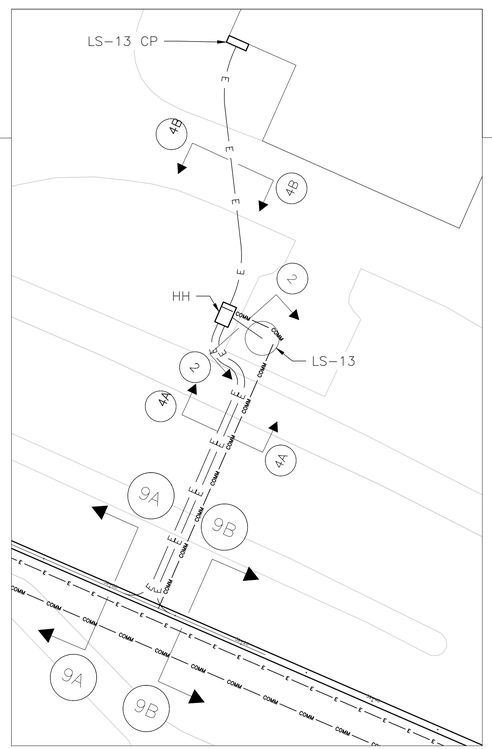
Section	Conduits
2	P2003A (3"), P2003B (3")
4A	P2002 (2"), P2004 (2"), F1008 (4"), F1009(4")
4B	P2002 (2"), P2003A (3"), P2003B (3"), F1008/F1009 (1")
9A	P2004 (2"), F1009 (4")
9B	P2004 (2"), F1008 (4")

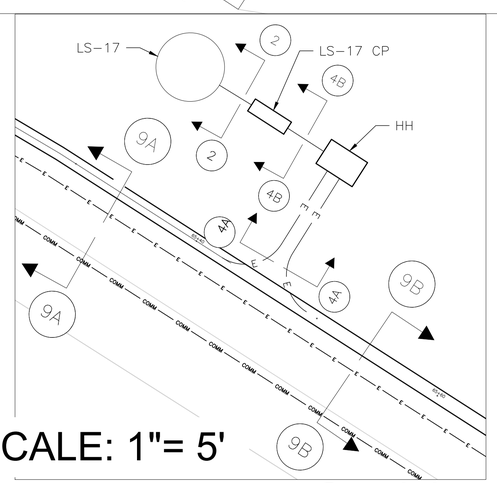


SCALE: 1"=5'

Section — Conduits

Section	Conduits
2A	P2004 (2"), F1009 (4")
2B	P2005A (3"), P2005B (3")
4	P2004 (2"), P2005A (3"), P2005B (3"), F1009 (1")
9	P2004 (2"), F1009 (4")

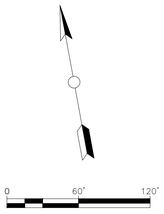




SCALE: 1"= 5'

Section — Conduits

Section	Conduits
2	P2002A (3"), P2002B (3")
4A	P2000 (2"), P2002 (2"), F1007 (4"), F1008 (4")
4B	P2000 (2"), P2002A (3"), P2002B (3"), F1007/F1008 (1")
9A	P2002 (2"), F1008 (4")
9B	P2000 (2"), F1007 (4")



LEGEND

COMMUNICATIONS	COMM
ELECTRIC	E E
FLOWLINE	
PROPOSED FORCED MAIN	
EXISTING TELECOM	TEL TEL
EXISTING BELCO	BELCO
EXISTING SUBMARINE CABLE	SUB SUB
PROPOSED POTABLE WATER	W
PROPOSED RECLAIMED WATER	RCLW

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

REDUCTION VERIFICATION SCALE 0 10 INCHES

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
2	ISSUED FOR TENDER	CM	11/30/2021
1	ISSUED FOR REVIEW	CM	11/08/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE LIFT STATION ELECTRICAL
52+82.86 – 67+00

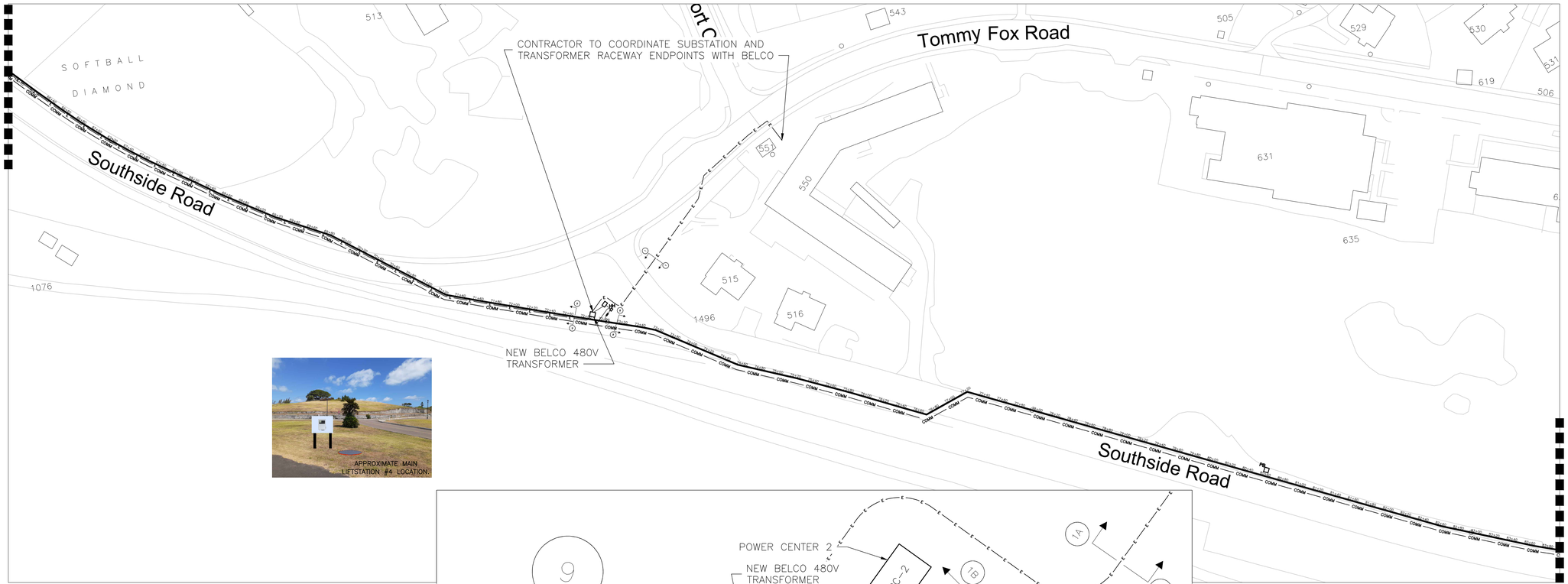
SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1001

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

JOB: P-20-0914 | SHEET 19 OF 22

E-1001



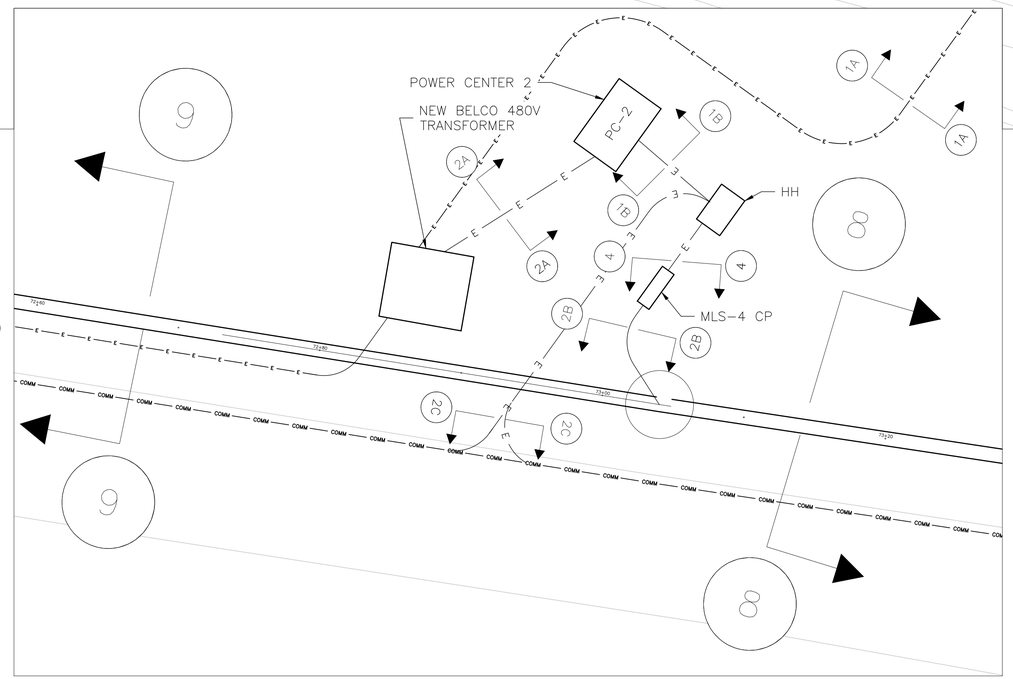
LEGEND

- COMMUNICATIONS — COMM —
- ELECTRIC — E — E —
- FLOWLINE
- PROPOSED FORCED MAIN
- EXISTING TELECOM — TEL — TEL —
- EXISTING BELCO — BELCO —
- EXISTING SUBMARINE CABLE — SUB — SUB —
- PROPOSED POTABLE WATER — W —
- PROPOSED RECLAIMED WATER — RCLW —

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

0 60' 120'



SCALE: 1"=5'

Section — Conduits

1A	P3000 (3")
1B	P3001 (1")
2A	P3000 (3"), P3001 (1")
2B	P3002A (3"), P3002B (3")
2C	F1001 (4"), F1007 (4")
4	P3001 (1"), P3002A (3"), P3002B (3"), F1001/F1007 (1")
8	F1001 (4")
9	P2000 (2"), F1007 (4")

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

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BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE LIFT STATION ELECTRICAL
67+00 – 83+50

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1002

REDUCTION VERIFICATION SCALE 0 10 INCHES

Addendum 1- Rev. 2 Drawings- Date 11/30/2021

JOB: P-20-0914 | SHEET 20 OF 22

E-1002

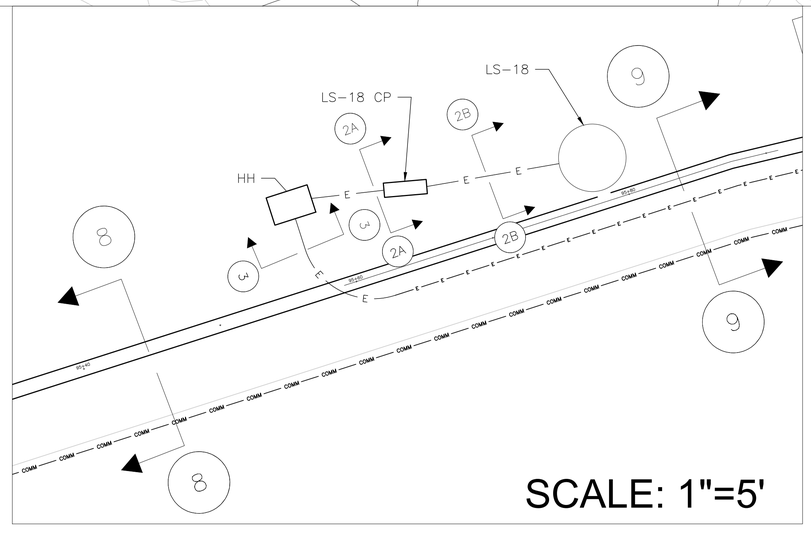
LEGEND

COMMUNICATIONS — COMM —
ELECTRIC — E — E —
FLOWLINE
PROPOSED FORCED MAIN
EXISTING TELECOM — TEL — TEL —
EXISTING BELCO — BELCO —
EXISTING SUBMARINE CABLE — SUB — SUB —
PROPOSED POTABLE WATER — W —
PROPOSED RECLAIMED WATER — RCLM —

ABBREVIATIONS

HAND HOLE	HH
LIFT STATION	LS
CONTROL PANEL	CP
MANHOLE	MH
TENDER PACKAGE	PKG
POWER CENTER	PC
WASTE WATER TREATMENT PLANT	WWTP

0 60' 120'



SCALE: 1"=5'

Section

2A
2B
3
8
9

Conduits

P4000 (2"), F1000/F1001 (1")
P4001A (3"), P4001B (3")
P4000 (2"), F1000 (2"), F1001 (4")
F1001 (4")
P4000 (2"), 41000 (2")

REDUCTION VERIFICATION SCALE 0 10 INCHES

BLDC

BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

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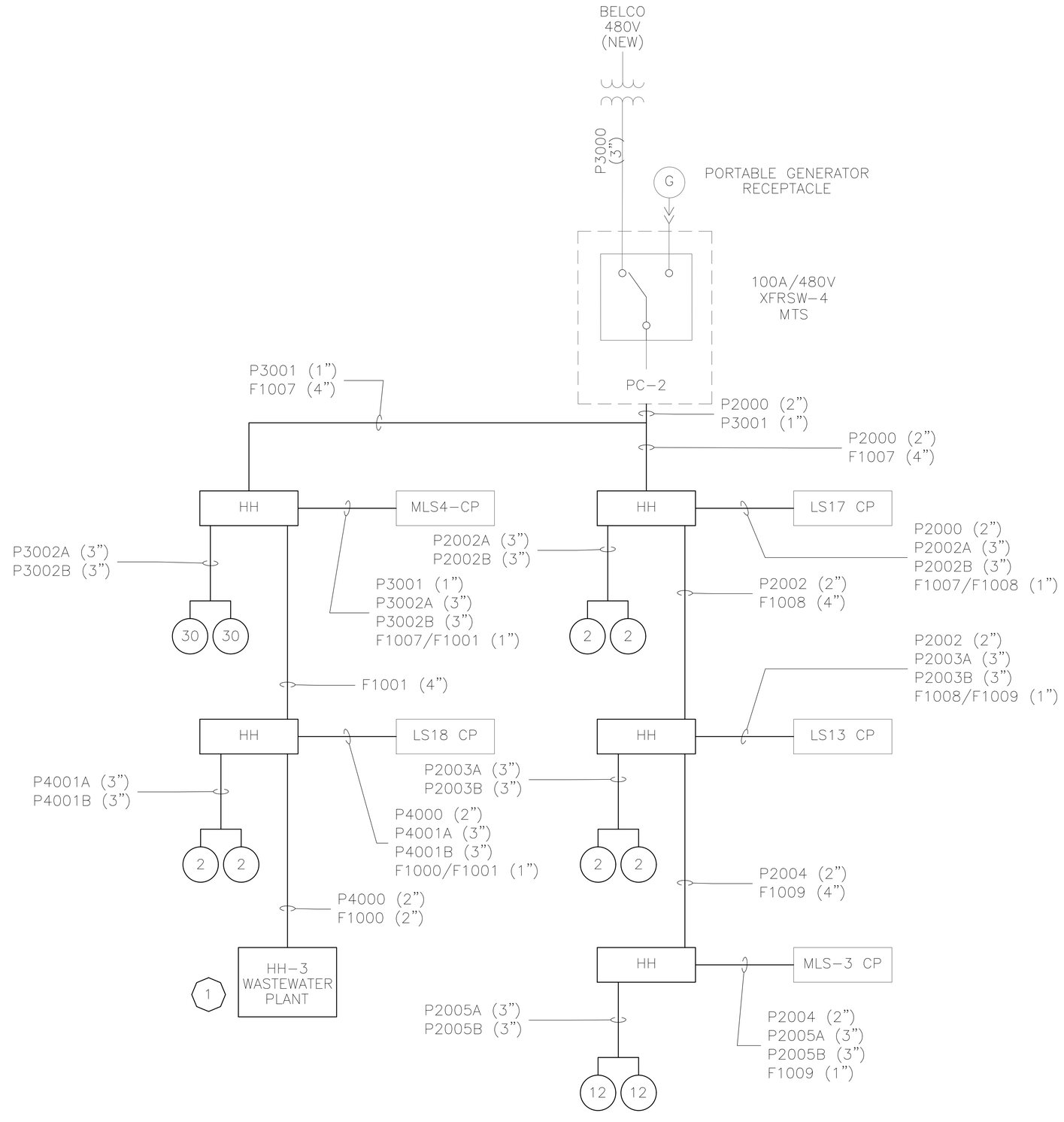
BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

SOUTHSIDE LIFT STATION ELECTRICAL
83+50 – 100+00

SCALE	DRAWN CM
INTERCEPTOR	CHECKED RJB
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1003



GENERAL NOTES:

1. REFER TO SHEET E-0001 FOR SYMBOL AND ABBREVIATIONS LIST.
2. BLOCK DIAGRAM FOR REFERENCE ONLY.
3. ALL CONDUITS TO BE SCHEDULE 40 PVC SIZED AS SHOWN.
4. HEAVY WEIGHT LINES INDICATE CONDUITS TO BE INSTALLED UNDER TENDER PACKAGE 3A. ALL OTHER INFORMATION IS FOR REFERENCE ONLY.
5. LIFT STATION PUMPS TO BE INSTALLED IN LIFT STATIONS UNDER THIS CONTRACT. PUMPS WILL BE SUPPLIED WITH 2 2 CORDS EACH, ONE POWER CORD AND ONE CONTROL MONITORING CORD. ROUTE ALL CORDS FROM LIFT STATION THROUGH HANDHOLE TO LIFT STATION CONTROL PANEL WIRING TROUGH. COIL EXCESS CONDUCTORS IN WIRING TROUGH.
6. INTERMEDIATE HANDHOLES NOT SHOWN. DISTANCE BETWEEN HANDHOLES TO BE 500 FEET MAX.

DETAIL 1E-1101
PUMP STATION SYSTEM ONE-LINE DIAGRAM E-1101
SCALE: NOT TO SCALE

REDUCTION VERIFICATION SCALE 0 10 INCHES

BLDC
BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

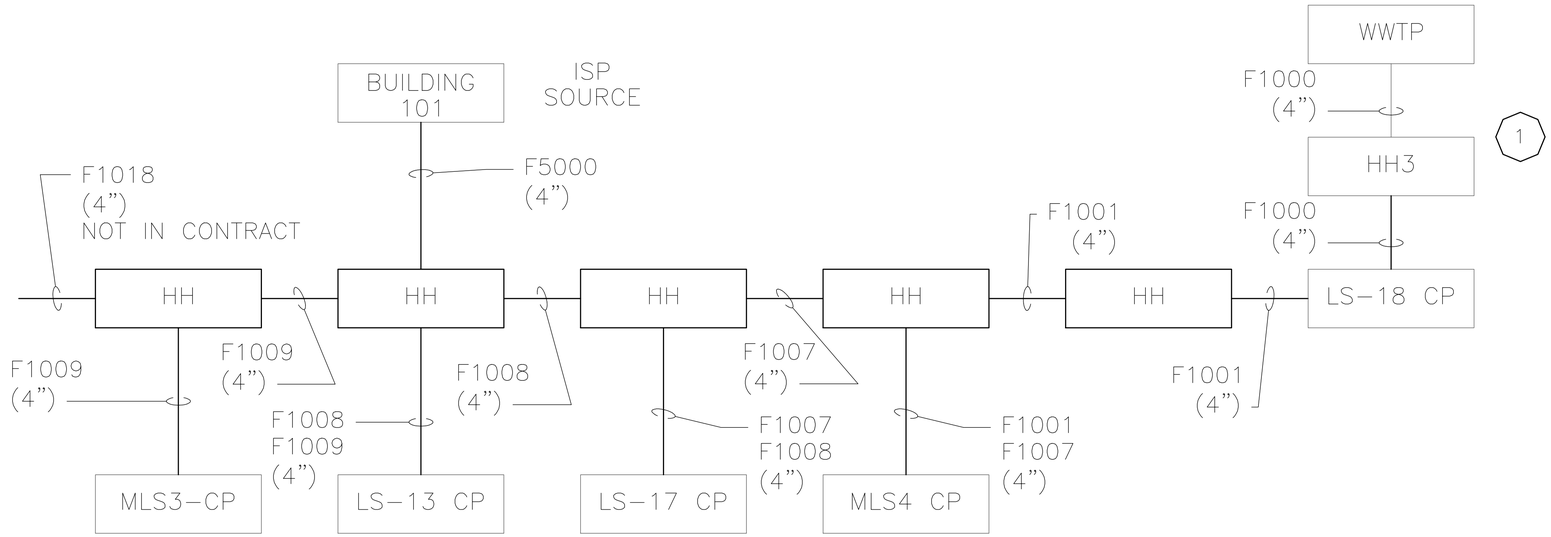
NO.	DESCRIPTION	BY	DATE
1	ISSUED FOR TENDER	CM	02/05/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

ELECTRICAL BLOCK DIAGRAM

SCALE	DRAWN
INTERCEPTOR	CHECKED
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1101



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5. INTERMEDIATE HANDHOLES NOT SHOWN. DISTANCE BETWEEN HANDHOLES TO BE 500 FEET MAX.

SHEET NOTES:

1. HH-3 IS LOCATED AT THE SOUTHSIDE WASTEWATER TREATMENT PLANT AND IS BEING INSTALLED UNDER TENDER PACKAGE 4. THIS CONTRACT TO INSTALL 4" BLDC FURNISHED PVC CONDUIT FROM HH-3 TO LS-18 CP.

DETAIL 1E-1102 / E-1102
PUMP STATION SYSTEM BLOCK DIAGRAM
SCALE: NOT TO SCALE

BLDC
BERMUDA LAND DEVELOPMENT COMPANY LIMITED

MILHOUSE ENGINEERING & CONSTRUCTION

NO.	DESCRIPTION	BY	DATE
1	ISSUED FOR TENDER	CM	02/05/2021

BERMUDA WATER AND WASTEWATER
TENDER PACKAGE #3A

FIBER BLOCK DIAGRAM

SCALE	DRAWN
INTERCEPTOR	CHECKED
SYSTEM	SUBMITTED
SURVEYED	
DATE 02/05/2021	RECOMMENDED
CADD FILE	

E-1102

REDUCTION VERIFICATION SCALE 0 10 INCHES