Town of Surfside

ITB 2023-01

Abbott Avenue Stormwater Improvements Project

Addendum No. 6

Date Issued: April 11, 2023

To All Proposers:

Proposers for the above-referenced ITB shall take note of the following changes, additions, deletions or clarifications to ITB No. 2023-01, which in accordance with the ITB Documents shall become a part of and have precedence over anything shown or described otherwise in the ITB.

THE FOLLOWING CHANGES ARE MADE TO THE ITB:

1. Deadline to Submit Sealed Bids – Submission extended until **Thursday April 27, 2023, at 2:00 PM.**

2. **What is the engineer's estimate/budget for this project?**
   Response: Refer to Addendum #2.

3. **Do any Electrical Plans and Geotechnical Investigation Report for this project exist, and if so, if they could please be posted for all participants to see and consider for this proposal.**
   Response: The electrical plans were made part of Addendum #3, please refer to that attachment. Attached please find the geotechnical investigation report.

4. **The pump station has many specialized electrical and mechanical components and responses from subcontractors has taken longer than normal, is a time extension for price submittal possible?**
   Response: The bid submission deadline has been extended until **Thursday April 27, 2023, at 2:00 PM,** this is when all required bid documents are due by.

5. **We have been thoroughly analyzing the project plans and noticed that they have some specialty items like Sluice Gates, Aluminum Bar Grating and 16" Flap Gate Valves. Could the Town please advise what vendor(s) has the Town approached to quote these special items in order for us to contact them to get pricing? We have attached the drawing with the items highlighted for further clarification.**
   Response: It is the Contractor's responsibility to reach out to vendor(s) for pricing. Contractor is advised to provide shop drawings for review by the Town and the EOR prior to ordering any material. All materials (including the specialty items referenced

above) shall follow the specifications outlined in the construction drawings. Refer to the latest plan sheets with Delta #1 revision.

6. **Please provide us with information on the Liquidated Damages set for the ITB No. 2023-01 Abbott Avenue Stormwater Improvements Project. We are required that information for ordering Bid Bond/Bid Security for the same.**
   Response: To be determined during contracting.

7. **The pump station Secondary pump would be supplied in a "Pump Can", there's no mention of what material? Being storm water, I would like to assume 316SS to keep the can structure from rotting. The pump details listed on sheet CP-408 do not show the pump can that the pump operates in. I have also attached sheet CP-404 in which I circled the part I am talking about the "Can". Lastly, I have attached a recent submittal sample only can drawing. This is a pretty important piece for longevity of the equipment.**
   Response: As suggested, the "pump can" can be 3166 SS (or approved equivalent) to prevent rotting. The pump station profile on Sheet CP-401 and CP-404 has been updated to better fit the proposed pump can. Refer to the latest plan sheets with Delta #1 revision.

8. **<u>Update to Response Relating to Previously Answered Question</u>: Regarding the sets of plans received, we went over them and found the design plans for Pump Station #1, yet the project indicates there will be a second pump stations. Could you please advise if these plans are forthcoming?**
   Response: ITB Plan Set includes Sheets CP-401 and CP-404, which include the plan and profiles for both pump stations. Please note sheets CP-401 and CP-404 have been updated and are hereto attached.

PROPOSER:

NAME: _____

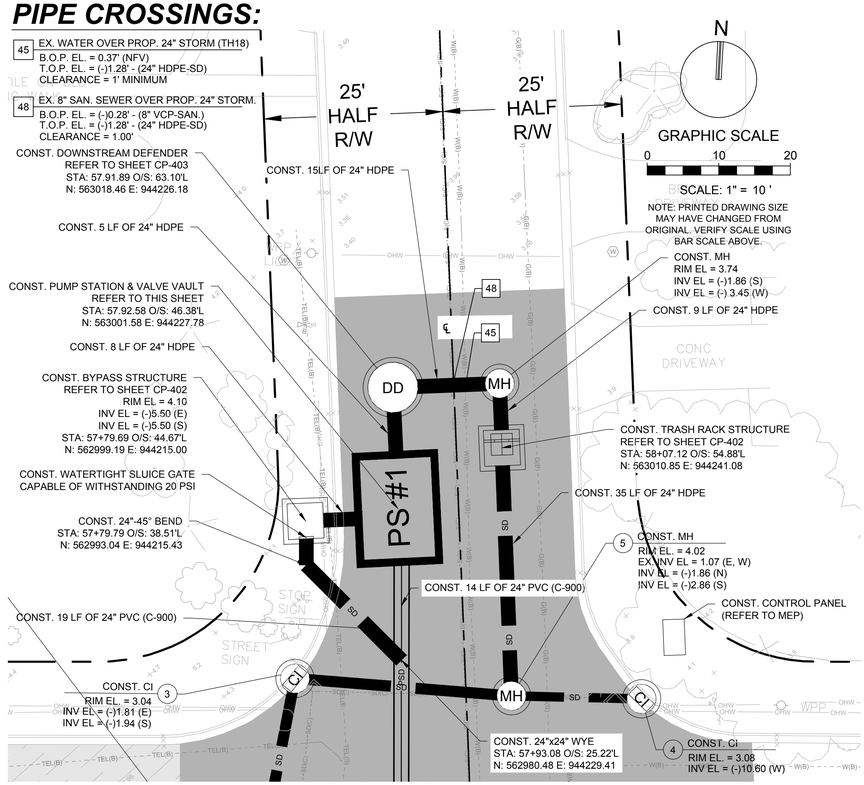
TITLE: _____

DATE: _____

PIPE CROSSINGS:

45 EX. WATER OVER PROP. 24" STORM (TH18)
B.O.P. EL. = 0.37' (NFV)
T.O.P. EL. = (-)1.28' - (24" HDPE-SD)
CLEARANCE = 1' MINIMUM

48 EX. 8" SAN. SEWER OVER PROP. 24" STORM.
B.O.P. EL. = (-)0.28' - (8" VCP-SAN.)
T.O.P. EL. = (-)1.28' - (24" HDPE-SD)
CLEARANCE = 1.00'



1 STORMWATER PUMP STATION LOCATION PLAN (92ND STREET)

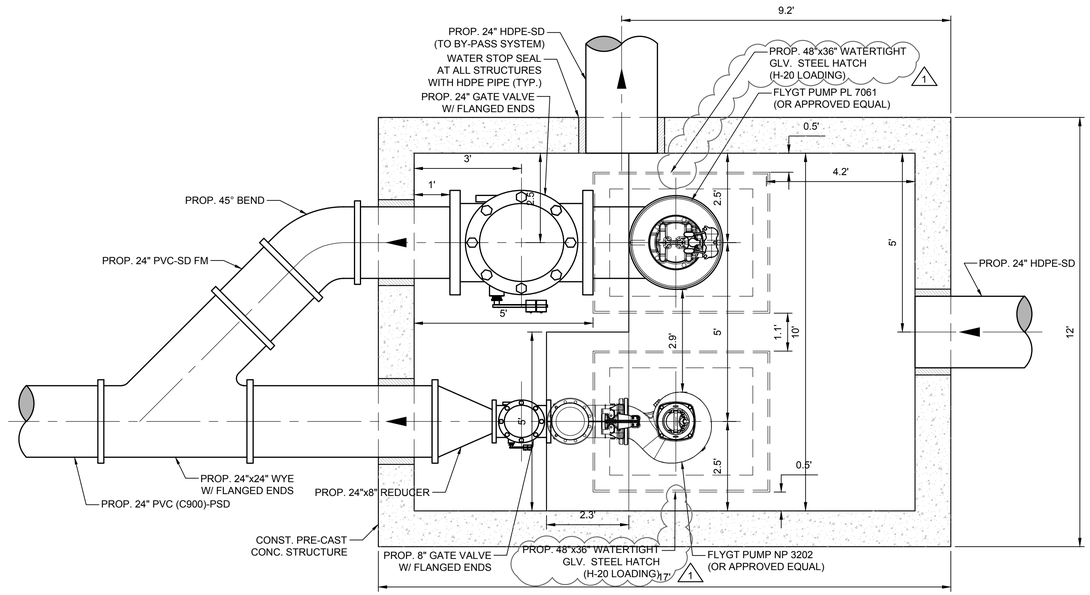
SCALE: 1"=10'

NOTES:

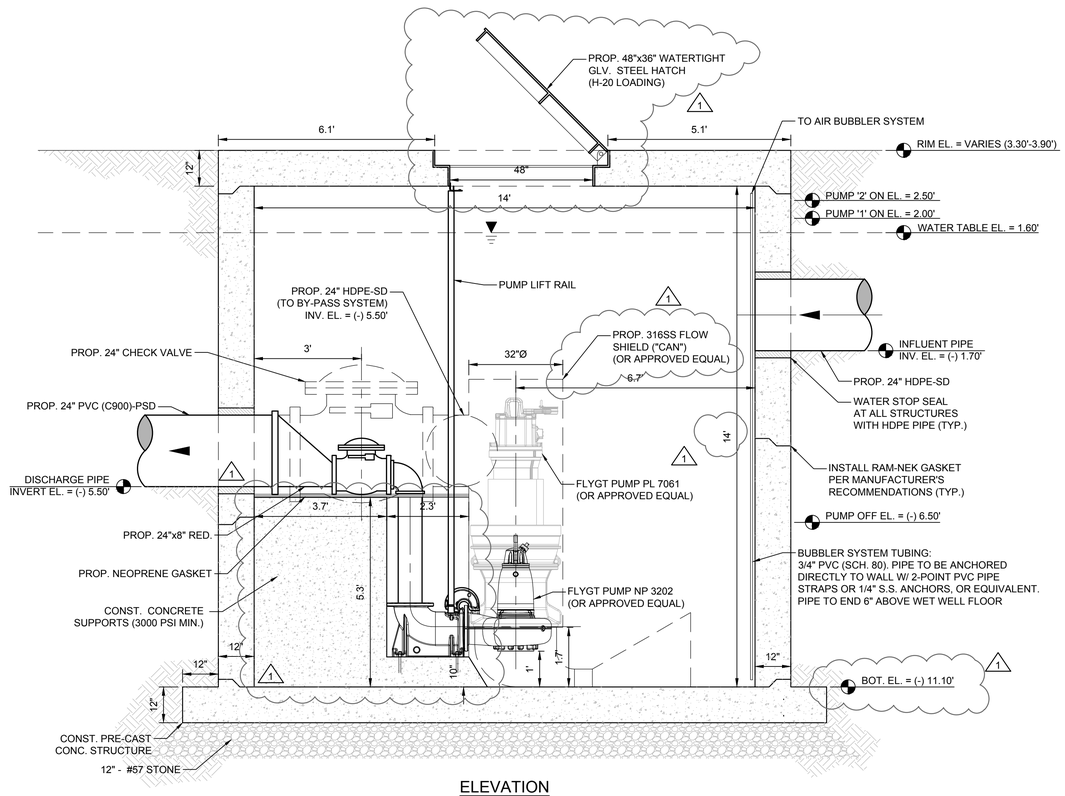
1. ALL ELEVATIONS ARE REFERENCING THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD).
2. ALL CONSTRUCTION SHALL CONFORM TO THE TOWN OF SURFSIDE AND MIAMI-DADE COUNTY WATER & SEWER UTILITY DEPARTMENT STANDARDS AND FLORIDA BUILDING CODE, LATEST REVISION.
3. CONCRETE SHALL HAVE NOT LESS THAN 3000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS. PRE-CAST CONCRETE SHALL BE 4000 P.S.I. CLASS II MINIMUM.
4. REINFORCING STEEL SHALL CONFORM TO A.S.T.M. SPEC. A-615 AND SHALL BE DEFORMED ACCORDING TO A.S.T.M. SPEC. 305.
5. ALL PIPING SHALL BE DUCTILE IRON PER AWWA C151, 40 MIL, EPOXY LINED, FLANGED JOINTS UNLESS OTHERWISE NOTED. ALL FITTING SHALL BE DUCTILE IRON OR CAST IRON PER AWWA C110, FLANGED JOINTS UNLESS OTHERWISE NOTED.
6. ALL PIPE OPENINGS SHALL BE CAST AT TIME OF FABRICATION.
7. STORMWATER PUMPS SHALL BE THE FOLLOWING (OR APPROVED EQUIVALENT):
   A. LAG PUMP: FLYGT SUBMERSIBLE, MODEL PL 7061/675 WITH P0675.000 35-45-6AA-W 140 HP MOTORS, 460 VOLTS, 3 PHASE, CAPABLE OF DELIVERING 11,100 GALLONS PER MINUTE AT A TOTAL DYNAMIC HEAD OF 33.3 FEET TDH.
   B. LEAD PUMP: FLYGT SUBMERSIBLE, MODEL NP 3202 WITH N3202.670 30-18-6AA-W 35 HP MOTORS, 460 VOLTS, 3 PHASE, CAPABLE OF DELIVERING 2,130 GALLONS PER MINUTE AT A TOTAL DYNAMIC HEAD OF 37.8 FEET TDH.
8. OPENINGS AROUND PIPES SHALL BE SEALED WITH EMBECO MORTAR.
9. ALL UNSUITABLE MATERIAL SHALL BE REMOVED FROM WITHIN THE LIMITS OF CONSTRUCTION.
10. SHOP DRAWING FOR COMPLETE LIFT STATION SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL AND THEN SUBMITTED TO THE TOWN OF SURFSIDE UTILITY DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO DELIVERY TO SITE.
11. CONTRACTOR SHALL ENSURE NO FLOATATION OF WET WELL DURING CONSTRUCTION.
12. CHECK VALVE SHALL BE KENNEDY, IRON BODY, BRONZE MOUNTED, SWING CHECK, LEVER & WEIGHT, OR APPROVED EQUAL.
13. PIPE COUPLING SHALL BE CAST IRON, DRESSER STYLE 127 OR APPROVED EQUAL.
14. SIX (6) COPIES OF THE OPERATIONAL AND MAINTENANCE MANUAL AND COPIES OF ELECTRICAL CONTROL PANEL SCHEMATIC, IN 24"X36" FORMAT TOGETHER WITH A PDF DOCUMENT, SHALL BE SUBMITTED TO THE TOWN OF SURFSIDE.
15. ALL FITTINGS INSIDE WETWELL AND VALVE PIT SHALL BE FLANGED, AND ALL HARDWARE INSIDE WETWELL SHALL BE STAINLESS STEEL # 316.
16. ELECTRICAL CONTROL PANEL SHALL BE PROVIDED WITH A UL LABEL, AND BE MANUFACTURED BY A UL 508 MANUFACTURER.
17. A BAKELITE PLAQUE SHALL BE PROVIDED, NOT SMALLER THAN 60 SQUARE INCHES, WITH WHITE ENGRAVED LETTERS ON A RED BACKGROUND, WITH THE FOLLOWING NOTATIONS:

    TOWN OF SURFSIDE, FLORIDA
    STORMWATER PUMP STATION
    PLEASE REPORT RED FLASHING ALARM LIGHT
    CALL TELEPHONE NO. 305-861-4863
    TO REPORT POLLUTION CALL MDC-DERM

18. MOTOR STARTERS, CIRCUIT BREAKERS AND ELECTRICAL CONTROL DEVICES SHALL BE SQUARE-D #8536 AND SHALL BE SIZED PER N.E.C. CODE (2002).
19. ELECTRICAL PANEL MUST HAVE A STORAGE COMPARTMENT INSIDE PANEL DOOR FOR OPERATIONAL AND MAINTENANCE MANUAL.
20. ELECTRICAL SYSTEM SHALL BE PROTECTED BY A LIGHTNING ARRESTOR AND SURGE CAPACITOR.
21. POWER TOOL OUTLET TO BE MOUNTED IN DEAD FRONT AND MUST BE A G.F.I. RECEPTACLE.
22. HIGH-LEVEL ALARM LIGHT TO BE WIRED SEPARATE FROM CONTROL WIRING AND BE CIRCUIT BREAKER PROTECTED. THE THREE (3) FLASHING ALARM LIGHTS SHALL BE MANUFACTURED BY INGRAM PRODUCTS PART NO. LX40F WITH LEXAN ALARM GLOBE (RED - HIGH WATER ALARM, YELLOW/AMBER - AUXILARY POWER, GREEN - FP&L POWER) WITH L.E.D. LAMP OF EQUIVALENT WATTAGE.
23. SEAL OFFS TO BE PROVIDED ON ALL ELECTRICAL CONDUITS ENTERING CONTROL PANEL FROM WET WELL TYPE ES SEALING HUBS.
24. PROVIDE TWO (2) HOUR METERS.
25. SELECTOR SWITCHES SHALL BE SQARE-D 9001-KS43BH1 TO BE PROVIDED. ROUND TYPE 120V CRAMER 635G TO BE PROVIDED.
26. PILOT LIGHTS SHALL BE SQUARE-D 9001-KP38R9.
27. LIGHTNING ARRESTOR SHALL BE GENERAL ELECTRIC.
28. SURGE ARRESTOR SHALL BE GENERAL ELECTRIC.
29. CUT OFF LIFTING HOOKS BELOW SLABS AND GROUT HOLES FLUSH.
30. BY AIR FLOW ROTAMETER SHALL BE SCHURTLE AND KOERTING MODEL 20-7010V, OR EQUIVALENT.
31. ACCESS HATCH, FRAMES, AND COVERS SHALL BE HEAVY-DUTY ALUMINUM W. STAINLESS STEEL HINGES AND BOLTS, CAPABLE TO RESIST AASHTO H-20-44 WHEEL LOAD PER AASHOTO M306. HATCHES SHALL BE WATERTIGHT AND EQUIPPED WITH SPRING LOADED COVERS FOR EASY OPENING.



PLAN



ELEVATION

2 STORMWATER PUMP STATION DETAIL (92ND STREET)

NOT TO SCALE

ALL ELEVATIONS ARE BASED ON NGVD1929

NOTES:

1. ALL UNPROTECTED STEEL SHALL BE FACTORY COATED WITH ACRYLIC DISPERSION ZINC PHOSPHATE PRIMER AND NOT LESS THAN TWO (2) 5-MIL COATS OF POLYESTER RESIN PAINT.
2. DESIGN, FABRICATION AND ERECTION OF PRECAST CONCRETE SHALL BE IN ACCORDANCE WITH ACI 318-99 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE AND PCI DESIGN NOTEBOOK. DESIGN OF CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH ACI 319-99
3. THE TOP SLAB OF STRUCTURE SHALL BE DESIGNED TO CARRY TRAFFIC LOADS (HS 20 LOADING)
4. SOIL BEARING PRESSURE UNDER STRUCTURE ASSUMED TO BE AT MINIMUM 2000 PSF. PRIOR TO INSTALLATION OF DRAINAGE STRUCTURE THE SOIL BEARING CAPACITY OF THE FOUNDATION MUST BE CONFIRMED BY THE CONTRACTOR, THROUGH A CERTIFIED GEOTECHNICAL LABORATORY.
5. CONCRETE SHALL BE NORMAL WEIGHT, AND SHALL ATTAIN A 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI AND SHALL MEET THE REQUIREMENT OF ASTM C478. CONCRETE COVER FOR REINFORCEMENTS SHALL BE 2-IN EXCEPT FOOTING BOTTOM BARS SHALL HAVE 3" COVER.
6. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, AND SHALL BE U.S. MANUFACTURE.
7. GROUT TO SEAL THE PIPE, TOP SLABS, AND LEVELING COURSE SHALL BE EPOXY TYPE AND OF SUCH MIX THAT SHRINKAGE WILL NOT CAUSE LEAKAGE INTO OR OUT OF THE UNIT. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR GROUT FOR ENGINEER REVIEW AND APPROVAL.
8. ALL PVC PIPE CONNECTIONS TO BE MADE USING FLEXIBLE BOOT ADAPTER AND EPOXY GROUT SEAL. ALL RCP PIPE CONNECTIONS TO BE MADE USING EPOXY GROUT SEAL ONLY. (TYPICAL FOR ALL STRUCTURES)
9. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, SIGNED AND SEALED BY A FLORIDA LICENSED ENGINEER, FOR PRECAST STRUCTURES TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE CONSTRUCTION OF STRUCTURE.
10. ALL MANHOLE RING AND COVERS SHALL HAVE THE WORD "STORM SEWER" CAST ON COVER.
11. CONTRACTOR TO PROVIDE 18" SUMP MIN. WITHIN ALL STRUCTURE.

KEITH
5808 Blue Lagoon Drive, Suite 218
Miami, Florida 33126
PH: (305) 667-5474
Florida Engineering Business License: CA7928
Florida Surveyor and Mapper Business License: LB6860
Florida Landscape Architecture Business License: LC26000457

REVISIONS

NO.	DESCRIPTION	DATE
1	BID RFI RESPONSES	04/10/23

RESPONSIBILITY FOR THE USE OF THESE PLANS PRIOR TO OBTAINING PERMITS FROM ALL AGENCIES HAVING JURISDICTION OVER THE PROJECT WILL FALL SOLELY UPON THE USER.

ISSUE DATE:	02/03/23
DESIGNED BY:	CM
DRAWN BY:	MB
CHECKED BY:	MC
BID-CONTRACT:	

STEPHEN D. WILLIAMS, P.E.
FLORIDA REG. NO. 32090
(FOR THE FIRM)

CLIENT

TOWN OF SURFSIDE FLORIDA MIAMI-DADE COUNTY

PROJECT

ABBOTT AVENUE DRAINAGE IMPROVEMENTS

SHEET TITLE

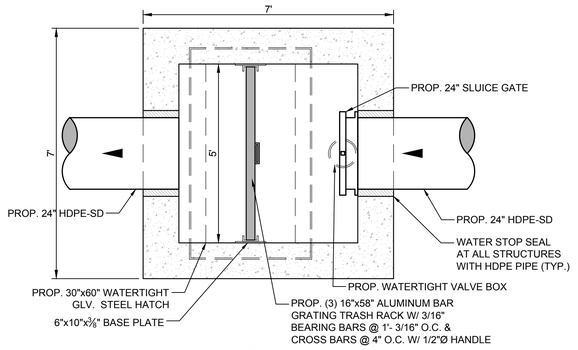
PUMP STATION PLAN - 92ND STREET

SHEET NUMBER	CP-401
PROJECT NUMBER	11494.01

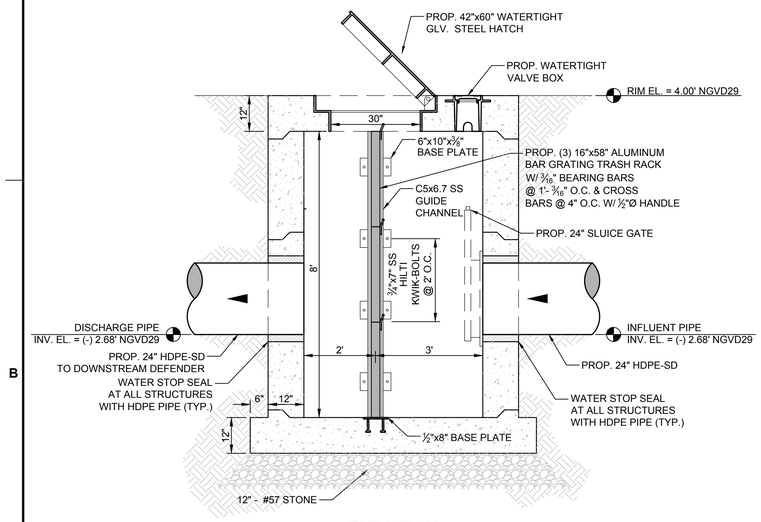
STATUS: CONSTRUCTION DOCUMENTS

Plotted by: cmorales On 4/11/2023 2:39 PM

Drawing name: S:\11494.01 - Abbott Avenue Stormwater Drainage Design Phase II – Town of Surfside\Engineering\Cadd\11494.01 CP-1XX - 92nd.dwg



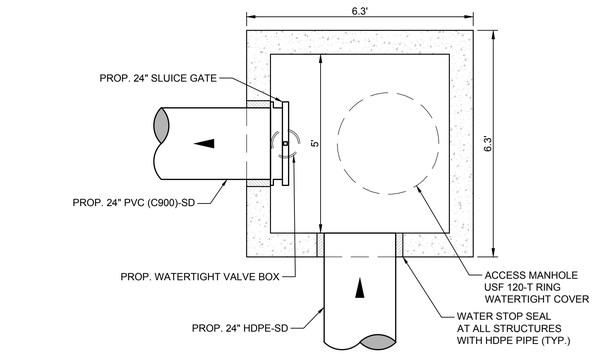
PLAN



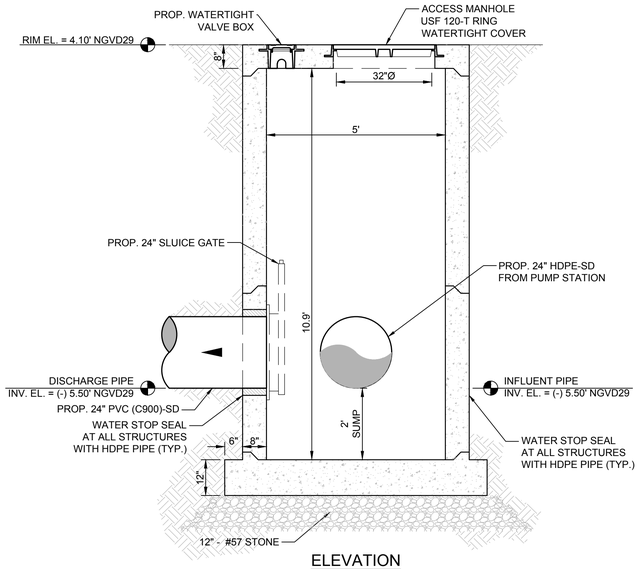
ELEVATION

1 TRASH RACK STRUCTURE DETAIL (92nd STREET)

NOT TO SCALE



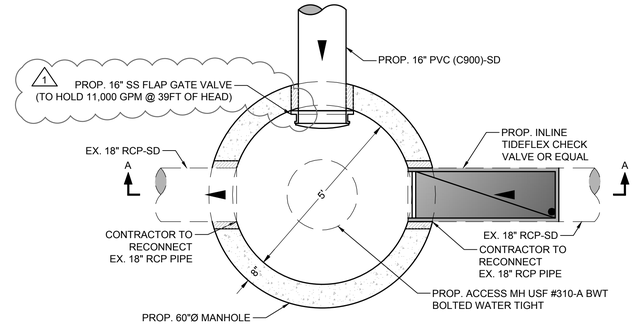
PLAN



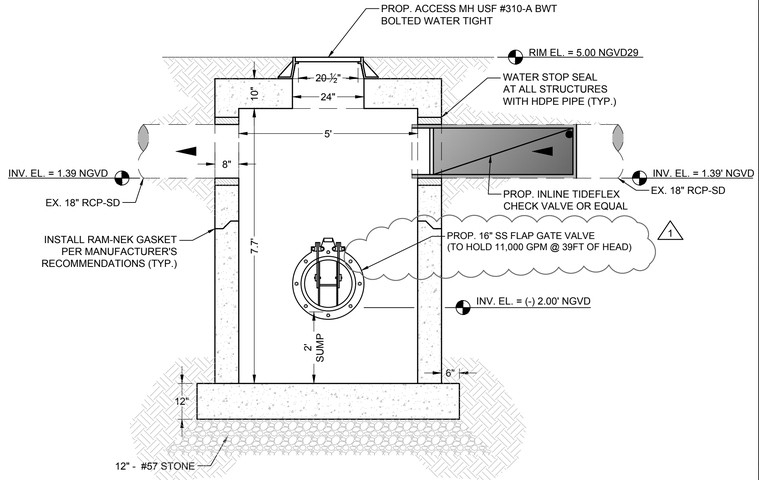
ELEVATION

2 BY-PASS STRUCTURE #1 (92nd STREET) DETAIL

NOT TO SCALE



PLAN VIEW



SECTION A-A

3 CONTROL STRUCTURE #1 (92nd STREET)

NOT TO SCALE

KEITH
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Miami, Florida 33126
PH: (305) 667-5474

Florida Engineering Business License: CA7928
Florida Surveyor and Mapper Business License: LB6860
Florida Landscape Architecture Business License: LC26000457

REVISIONS

NO.	DESCRIPTION	DATE
1	BID RFI RESPONSES	04/10/23

RESPONSIBILITY FOR THE USE OF THESE PLANS PRIOR TO OBTAINING PERMITS FROM ALL AGENCIES HAVING JURISDICTION OVER THE PROJECT WILL FALL SOLELY UPON THE USER.

ISSUE DATE:	02/03/23
DESIGNED BY:	CM
DRAWN BY:	MB
CHECKED BY:	MC
BID-CONTRACT:	

STEPHEN D. WILLIAMS, P.E.
FLORIDA REG. NO. 32090
(FOR THE FIRM)

CLIENT

PROJECT

ABBOTT AVENUE DRAINAGE IMPROVEMENTS

SHEET TITLE

PUMP STATION DETAILS -92ND STREET

SHEET NUMBER	CP-402
PROJECT NUMBER	11494.01

STATUS: CONSTRUCTION DOCUMENTS

Plotted by: cmorales On 4/10/2023 6:22 PM

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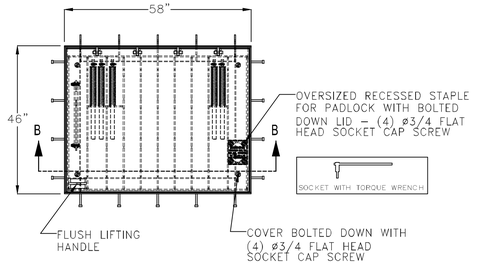
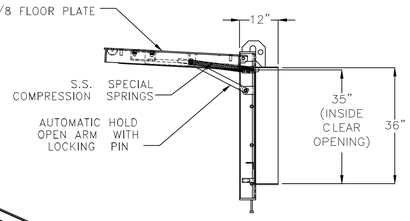
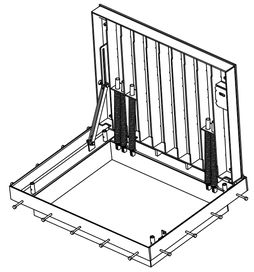
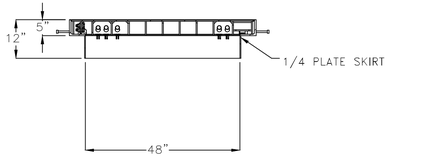


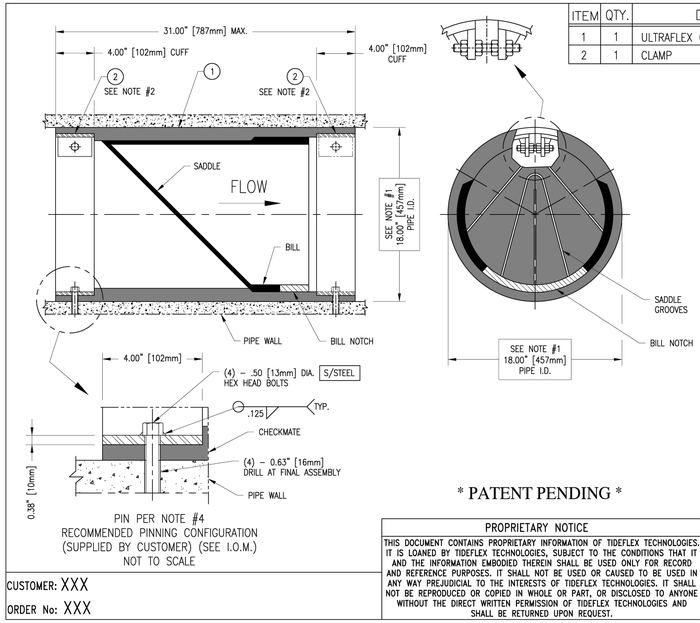




NOTES:
1–MATERIAL: STEEL A36, HOT DIP GALVANIZED AFTER FABRICATION
2– AASHTO HL–93 WHEEL LOADING DESIGNED FOR A MAXIMUM WHEEL LOAD OF 16000–LBS PLUS 33% IMPACT FACTOR. (EQUIVALENT TO H–20)
3– IT IS ESSENTIAL THAT ALL BOLTS ARE IN PLACE WHENEVER COVER IS EXPOSED TO TRAFFIC
"LOCTITE 242 BLUE", MUST BE APPLIED TO ALL BOLTS AFTER EACH USE.
4–SUITABLE FOR USE IN TRAFFIC PER ASTM C1802–14 LOAD LEVEL 7
5– APPROXIMATE WEIGHT:1043.86 lbs.



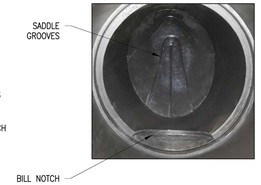
SECTION B-B



PIN PER NOTE #4
RECOMMENDED PINNING CONFIGURATION
(SUPPLIED BY CUSTOMER) (SEE I.O.M.)
NOT TO SCALE

ITEM	QTY.	DESCRIPTION	MAT'L
1	1	ULTRAFLEX CHECKMATE CHECK VALVE	MUST BE SUPPLIED
2	1	CLAMP	MUST BE SUPPLIED

NOTES:
1. PIPE INSIDE DIAMETER – MUST BE SUPPLIED (MINIMUM ALLOWABLE PIPE DIAMETER – 17.25 INCHES)
2. CLAMP INSTALLED IN UPSTREAM OR DOWNSTREAM CUFF DEPENDING ON INSTALLATION ORIENTATION
3. MAXIMUM ALLOWABLE BACK PRESSURE – 56.0 FEET
4. IT IS RECOMMENDED TO BOLT OR PIN CHECKMATE TO PIPE AS SHOWN, 4 PLACES 90° APART



PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

* PATENT PENDING *

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CUSTOMER: XXX
ORDER No: XXX

OPPORTUNITY No: XXXXX | SALES ORDER No: TXX–XXXX

Tideflex® Technologies
A Division of Red Valve Company, Inc.
750 HOLIDAY DR. STE.400
PITTSBURGH, PA. 15220
info@redvalve.com
412.279.0044
fax 412.279.5410

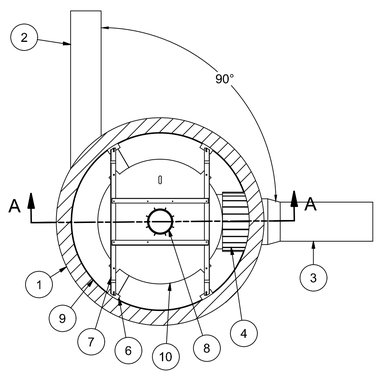
TT PRODUCT: 18" ULTRAFLEX CHECKMATE CHECK VALVE
TT PART No: CMCBUF–180–APPROVAL
DR. BY: TLM DATE: 2–9–17 CHKD. BY: DATE:
CAD SCALE: FULL
PLOT SCALE: 1 = 1
REV —
DWG No: TTS–XXXX

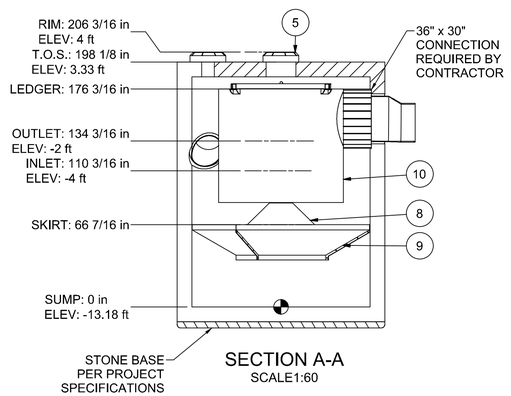
DIMENSIONS IN INCHES AND TOLERANCES PER ASME Y14.5M
FINISH: AS SPECIFIED
TOLERANCES UNLESS OTHERWISE SPECIFIED:
<10° = ± 1/8
>10° = ± 1/4

U.S.F. FABRICATION INC.
HIALEAH, FLORIDA

HATCH DT93AHS 36X48 A1G2K12n7
GENERAL ARRANGEMENT

DRAWN BY:	SCALE: 1:20	SHEET 1 OF 2	DATE: 07/27/22
APP'D BY: SBOB	DWG. NO. 1000210054	SIZE: B	0





SECTION A-A
SCALE1:60

PIPE DETAILS					
PIPE	MATERIAL	LENGTH	INV UP	INV DOWN	SLOPE
INLET	PVC	20.0 ft	-2.00 ft	-4.00 ft	10.00
OUTLET	PVC	13.0 ft	-2.00 ft	-2.10 ft	0.77

PARTS LIST		
ITEM	DESCRIPTION	SIZE (in)
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	144
2	INLET PIPE (BY OTHERS)	24
3	OUTLET PIPE (BY OTHERS)	30
4	PIPE COUPLING (BY OTHERS)	
5	FRAME AND COVER	24
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	CENTER SHAFT AND CONE	
9	BENCHING SKIRT	
10	DIP PLATE	

DD SIZE	4'	6'	8'	10'	12'
OUTLET STUB ID	12"	18"	24"	30"	36"
OUTLET STUB OD	12.5"	18.7"	24.8"	36"	42"

EQUIPMENT PERFORMANCE
The stormwater treatment unit shall adhere to the hydraulic parameters given in the chart below and provide the removal efficiencies and storage capacities as follows:

1. Performance objectives: The unit shall be capable of treating the peak flow rate listed below.
2. Peak Hydraulic Capacity: 38.0 cfs (1076 l/s)
3. Sediment Storage Capacity: 14.70 cu. yd. (11.13 cu. m)
4. Continuous Oil Storage Capacity: 1770 gal. (6700 liters)
5. Sediment shall be stored in a zone that is isolated from the main flow path and protected from reintrainment by a benching skirt.

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.
4. CONTRACTOR IS RESPONSIBLE FOR MATERIALS AND LABOR TO BRING CASTINGS TO FINISHED GRADE

REVISION HISTORY			
REV	BY	DESCRIPTION	DATE
-	KSM	FIRST RELEASE	3/30/2022

PROJECTION

IF IN DOUBT ASK

DATE: 3/30/2022	SCALE: 1:60	
DRAWN BY: KSM	CHECKED BY:	APPROVED BY

Title:
12-ft DIAMETER
DOWNSTREAM DEFENDER

WQU - 92ND STREET
PUMP STATION - 91ST STREET
SURFSIDE, FL

Patent: www.hydro-int.com/patents

Hydro International
hydro-int.com

WEIGHT:	MATERIAL:
STOCK NUMBER: 2	
DRAWING NO.: 22_12_1161-12ftDD-2	
SHEET SIZE: B	SHEET: 1 OF 3
Rev: -	

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Florida Landscape Architecture Business License: LC26000457

REVISIONS

NO.	DESCRIPTION	DATE
1	BID RFI RESPONSES	04/10/23

RESPONSIBILITY FOR THE USE OF THESE PLANS PRIOR TO OBTAINING PERMITS FROM ALL AGENCIES HAVING JURISDICTION OVER THE PROJECT WILL FALL SOLELY UPON THE USER.

ISSUE DATE:	02/03/23
DESIGNED BY:	CM
DRAWN BY:	MB
CHECKED BY:	MC
BID-CONTRACT:	

STEPHEN D. WILLIAMS, P.E.
FLORIDA REG. NO. 32090
(FOR THE FIRM)

CLIENT

PROJECT
ABBOTT AVENUE DRAINAGE IMPROVEMENTS

SHEET TITLE
PUMP STATION DETAILS-92ND STREET

SHEET NUMBER CP-403

PROJECT NUMBER 11494.01

STATUS: CONSTRUCTION DOCUMENTS

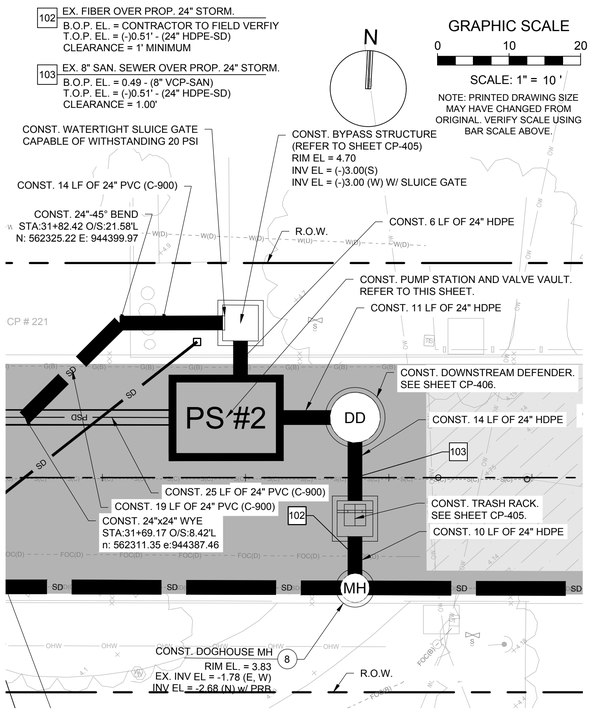
Plotted by: cmorales On 4/10/2023 6:22 PM

Drawing name: S:\11494.01 - Abbott Avenue Stormwater Drainage Design Phase II – Town of Surfside\Engineering\Cad\11494.01 CP-4XX - Pump Station Details.dwg

PIPE CROSSINGS:

102 EX. FIBER OVER PROP. 24" STORM.
B.O.P. EL. = CONTRACTOR TO FIELD VERFIY
T.O.P. EL. = (-)0.51' - (24" HDPE-SD)
CLEARANCE = 1' MINIMUM

103 EX. 8" SAN. SEWER OVER PROP. 24" STORM.
B.O.P. EL. = 0.49 - (8" VCP-SAN)
T.O.P. EL. = (-)0.51' - (24" HDPE-SD)
CLEARANCE = 1.00'



STORMWATER PUMP STATION LOCATION PLAN (91st STREET)

1

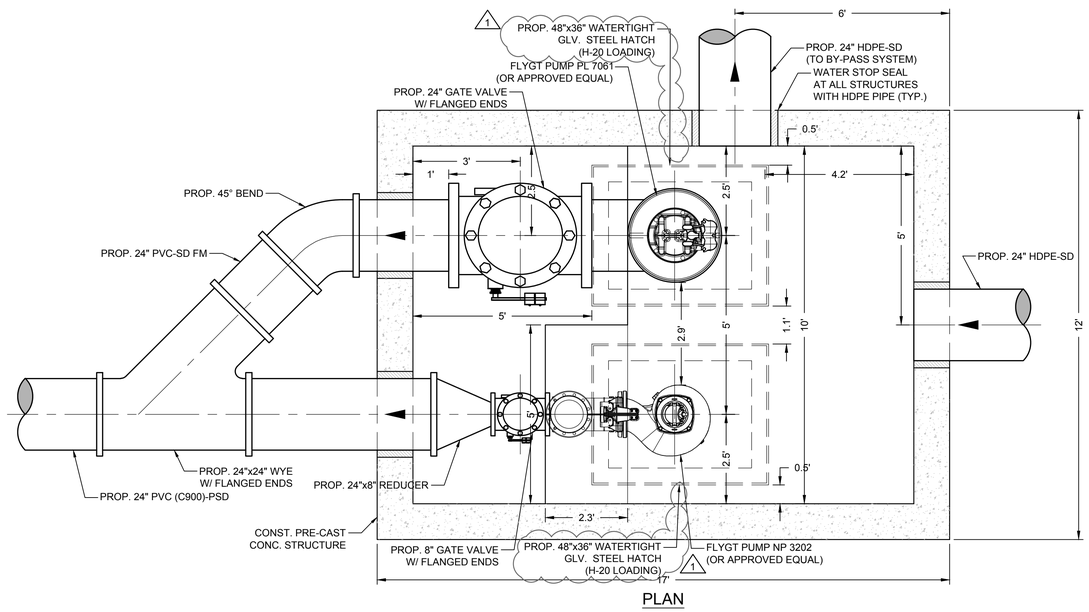
SCALE: 1"=10'

NOTES:

1. ALL ELEVATIONS ARE REFERENCING THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD).
2. ALL CONSTRUCTION SHALL CONFORM TO THE TOWN OF SURFSIDE AND MIAMI-DADE COUNTY WATER & SEWER UTILITY DEPARTMENT STANDARDS AND FLORIDA BUILDING CODE, LATEST REVISION.
3. CONCRETE SHALL HAVE NOT LESS THAN 3000 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS. PRE-CAST CONCRETE SHALL BE 4000 P.S.I. CLASS II MINIMUM.
4. REINFORCING STEEL SHALL CONFORM TO A.S.T.M. SPEC. A-615 AND SHALL BE DEFORMED ACCORDING TO A.S.T.M. SPEC. 305.
5. ALL PIPING SHALL BE DUCTILE IRON PER AWWA C151, 40 MIL, EPOXY LINED, FLANGED JOINTS UNLESS OTHERWISE NOTED. ALL FITTING SHALL BE DUCTILE IRON OR CAST IRON PER AWWA C110, FLANGED JOINTS UNLESS OTHERWISE NOTED.
6. ALL PIPE OPENINGS SHALL BE CAST AT TIME OF FABRICATION.
7. STORMWATER PUMPS SHALL BE THE FOLLOWING (OR APPROVED EQUIVALENT):
   A. LAG PUMP: FLYGT SUBMERSIBLE, MODEL PL 7061/675 WITH P0675.000 35-45-6AA-W 140 HP MOTORS, 460 VOLTS, 3 PHASE, CAPABLE OF DELIVERING 11,100 GALLONS PER MINUTE AT A TOTAL DYNAMIC HEAD OF 33.3 FEET TDH.
   B. LEAD PUMP: FLYGT SUBMERSIBLE, MODEL NP 3202 WITH N3202.670 30-18-6AA-W 35 HP MOTORS, 460 VOLTS, 3 PHASE, CAPABLE OF DELIVERING 2,130 GALLONS PER MINUTE AT A TOTAL DYNAMIC HEAD OF 37.8 FEET TDH.
8. OPENINGS AROUND PIPES SHALL BE SEALED WITH EMBECO MORTAR.
9. ALL UNSUITABLE MATERIAL SHALL BE REMOVED FROM WITHIN THE LIMITS OF CONSTRUCTION.
10. SHOP DRAWING FOR COMPLETE LIFT STATION SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL AND THEN SUBMITTED TO THE TOWN OF SURFSIDE UTILITY DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO DELIVERY TO SITE.
11. CONTRACTOR SHALL ENSURE NO FLOATATION OF WET WELL DURING CONSTRUCTION.
12. CHECK VALVE SHALL BE KENNEDY, IRON BODY, BRONZE MOUNTED, SWING CHECK, LEVER & WEIGHT, OR APPROVED EQUAL.
13. PIPE COUPLING SHALL BE CAST IRON, DRESSER STYLE 127 OR APPROVED EQUAL.
14. SIX (6) COPIES OF THE OPERATIONAL AND MAINTENANCE MANUAL AND COPIES OF ELECTRICAL CONTROL PANEL SCHEMATIC, IN 24"X36" FORMAT TOGETHER WITH A PDF DOCUMENT, SHALL BE SUBMITTED TO THE TOWN OF SURFSIDE.
15. ALL FITTINGS INSIDE WETWELL AND VALVE PIT SHALL BE FLANGED, AND ALL HARDWARE INSIDE WETWELL SHALL BE STAINLESS STEEL # 316.
16. ELECTRICAL CONTROL PANEL SHALL BE PROVIDED WITH A UL LABEL, AND BE MANUFACTURED BY A UL 508 MANUFACTURER.
17. A BAKELITE PLAQUE SHALL BE PROVIDED, NOT SMALLER THAN 60 SQUARE INCHES, WITH WHITE ENGRAVED LETTERS ON A RED BACKGROUND, WITH THE FOLLOWING NOTATIONS:

    TOWN OF SURFSIDE, FLORIDA
    STORMWATER PUMP STATION
    PLEASE REPORT RED FLASHING ALARM LIGHT
    CALL TELEPHONE NO. 305-861-4863
    TO REPORT POLLUTION CALL MDC-DERM

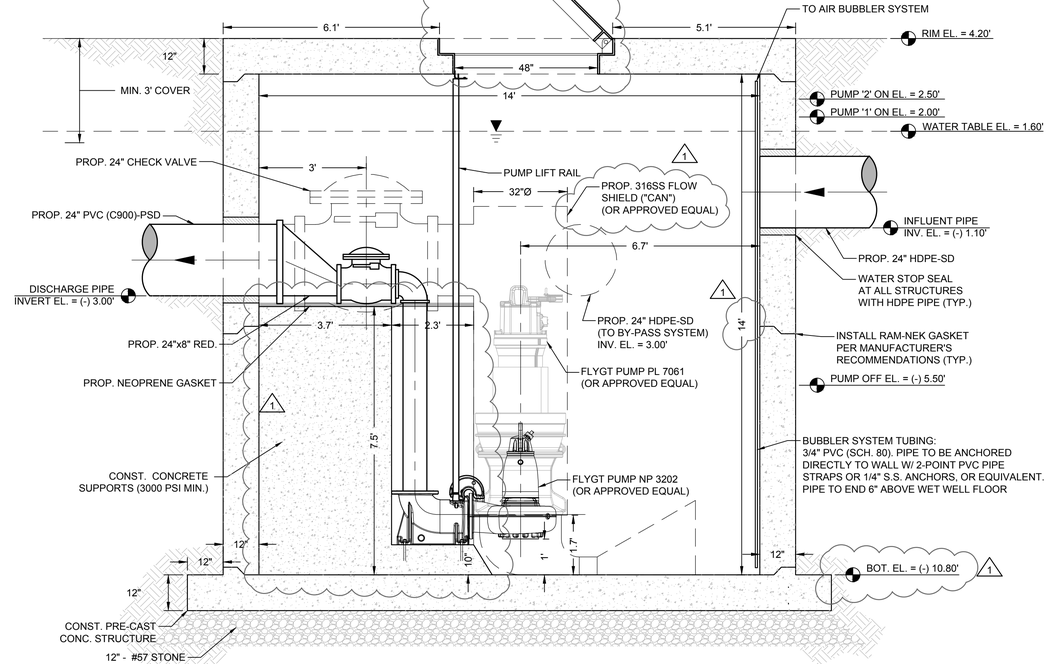
18. MOTOR STARTERS, CIRCUIT BREAKERS AND ELECTRICAL CONTROL DEVICES SHALL BE SQUARE-D #8536 AND SHALL BE SIZED PER N.E.C. CODE (2002).
19. ELECTRICAL PANEL MUST HAVE A STORAGE COMPARTMENT INSIDE PANEL DOOR FOR OPERATIONAL AND MAINTENANCE MANUAL.
20. ELECTRICAL SYSTEM SHALL BE PROTECTED BY A LIGHTNING ARRESTOR AND SURGE CAPACITOR.
21. POWER TOOL OUTLET TO BE MOUNTED IN DEAD FRONT AND MUST BE A G.F.I. RECEPTACLE.
22. HIGH-LEVEL ALARM LIGHT TO BE WIRED SEPARATE FROM CONTROL WIRING AND BE CIRCUIT BREAKER PROTECTED. THE THREE (3) FLASHING ALARM LIGHTS SHALL BE MANUFACTURED BY INGRAM PRODUCTS PART NO. LX40F WITH LEXAN ALARM GLOBE (RED - HIGH WATER ALARM, YELLOW/AMBER - AUXILARY POWER, GREEN - FP&L POWER) WITH L.E.D. LAMP OF EQUIVALENT WATTAGE.
23. SEAL OFFS TO BE PROVIDED ON ALL ELECTRICAL CONDUITS ENTERING CONTROL PANEL FROM WET WELL TYPE ES SEALING HUBS.
24. PROVIDE TWO (2) HOUR METERS.
25. SELECTOR SWITCHES SHALL BE SQARE-D 9001-KS43BH1 TO BE PROVIDED. ROUND TYPE 120V CRAMER 635G TO BE PROVIDED.
26. PILOT LIGHTS SHALL BE SQUARE-D 9001-KP38R9.
27. LIGHTNING ARRESTOR SHALL BE GENERAL ELECTRIC.
28. SURGE ARRESTOR SHALL BE GENERAL ELECTRIC.
29. CUT OFF LIFTING HOOKS BELOW SLABS AND GROUT HOLES FLUSH.
30. BY AIR FLOW ROTAMETER SHALL BE SCHURTLE AND KOERTING MODEL 20-7010V, OR EQUIVALENT.
31. ACCESS HATCH, FRAMES, AND COVERS SHALL BE HEAVY-DUTY ALUMINUM W. STAINLESS STEEL HINGES AND BOLTS, CAPABLE TO RESIST AASHTO H-20-44 WHEEL LOAD PER AASHOTO M306. HATCHES SHALL BE WATERTIGHT AND EQUIPPED WITH SPRING LOADED COVERS FOR EASY OPENING.



PLAN

NOTES:

1. ALL UNPROTECTED STEEL SHALL BE FACTORY COATED WITH ACRYLIC DISPERSION ZINC PHOSPHATE PRIMER AND NOT LESS THAN TWO (2) 5-MIL COATS OF POLYESTER RESIN PAINT.
2. DESIGN, FABRICATION AND ERECTION OF PRECAST CONCRETE SHALL BE IN ACCORDANCE WITH ACI 318-99 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE AND PCI DESIGN NOTEBOOK. DESIGN OF CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH ACI 319-99
3. THE TOP SLAB OF STRUCTURE SHALL BE DESIGNED TO CARRY TRAFFIC LOADS (HS 20 LOADING)
4. SOIL BEARING PRESSURE UNDER STRUCTURE ASSUMED TO BE AT MINIMUM 2000 PSF. PRIOR TO INSTALLATION OF DRAINAGE STRUCTURE THE SOIL BEARING CAPACITY OF THE FOUNDATION MUST BE CONFIRMED BY THE CONTRACTOR, THROUGH A CERTIFIED GEOTECHNICAL LABORATORY.
5. CONCRETE SHALL BE NORMAL WEIGHT, AND SHALL ATTAIN A 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI AND SHALL MEET THE REQUIREMENT OF ASTM C478. CONCRETE COVER FOR REINFORCEMENTS SHALL BE 2-IN EXCEPT FOOTING BOTTOM BARS SHALL HAVE 3" COVER.
6. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, AND SHALL BE U.S. MANUFACTURE.
7. GROUT TO SEAL THE PIPE, TOP SLABS, AND LEVELING COURSE SHALL BE EPOXY TYPE AND OF SUCH MIX THAT SHRINKAGE WILL NOT CAUSE LEAKAGE INTO OR OUT OF THE UNIT. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR GROUT FOR ENGINEER REVIEW AND APPROVAL.
8. ALL PVC PIPE CONNECTIONS TO BE MADE USING FLEXIBLE BOOT ADAPTER AND EPOXY GROUT SEAL. ALL RCP PIPE CONNECTIONS TO BE MADE USING EPOXY GROUT SEAL ONLY. (TYPICAL FOR ALL STRUCTURES)
9. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, SIGNED AND SEALED BY A FLORIDA LICENSED ENGINEER, FOR PRECAST STRUCTURES TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE CONSTRUCTION OF STRUCTURE.
10. ALL MANHOLE RING AND COVERS SHALL HAVE THE WORD "STORM SEWER" CAST ON COVER.
11. CONTRACTOR TO PROVIDE 18" SUMP MIN. WITHIN ALL STRUCTURE.



ELEVATION

STORMWATER PUMP STATION DETAIL

2

NOT TO SCALE

ALL ELEVATIONS ARE BASED ON NGVD1929

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REVISIONS

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STEPHEN D. WILLIAMS, P.E.
FLORIDA REG. NO. 32090
(FOR THE FIRM)

CLIENT

TOWN OF SURFSIDE FLORIDA MIAMI-DADE COUNTY

PROJECT

ABBOTT AVENUE DRAINAGE IMPROVEMENTS

SHEET TITLE

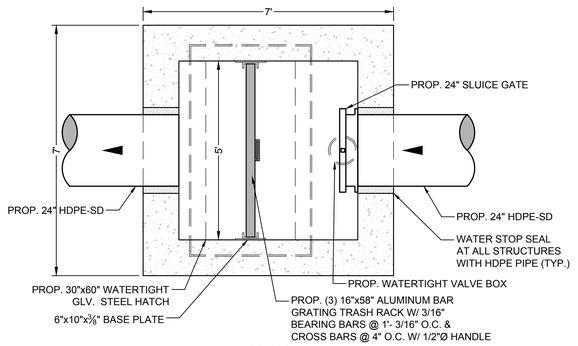
PUMP STATION PLAN - 91ST STREET

SHEET NUMBER	CP-404
PROJECT NUMBER	11494.01

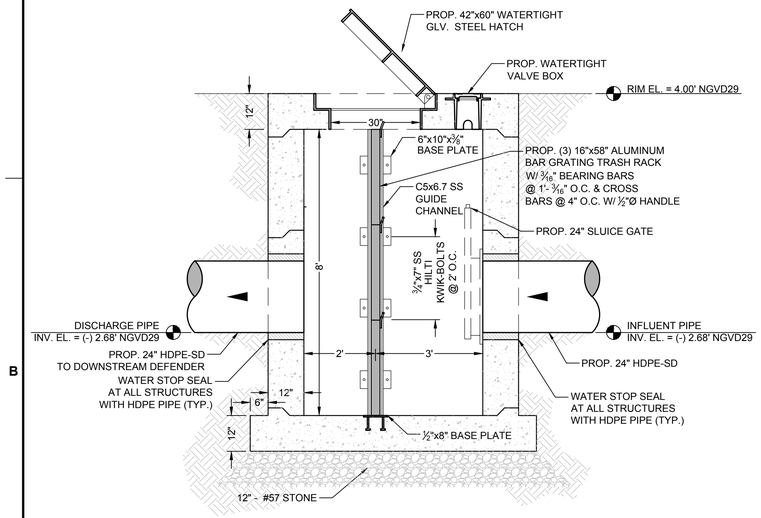
STATUS: CONSTRUCTION DOCUMENTS

Plotted by: cmorales On 4/11/2023 2:41 PM

Drawing name: S:\11494.01 - Abbott Avenue Stormwater Drainage Design Phase II – Town of Surfside\Engineering\Cadd\11494.01 CP-1\2X - 91st.dwg



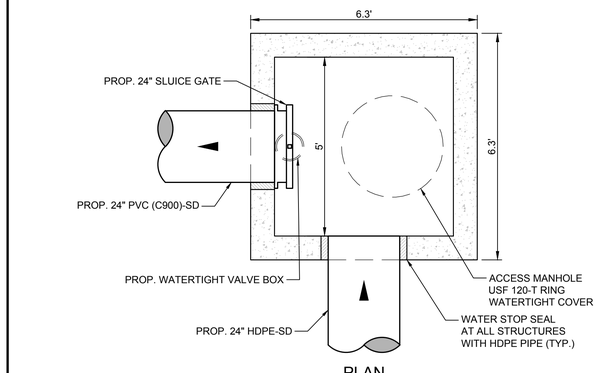
PLAN



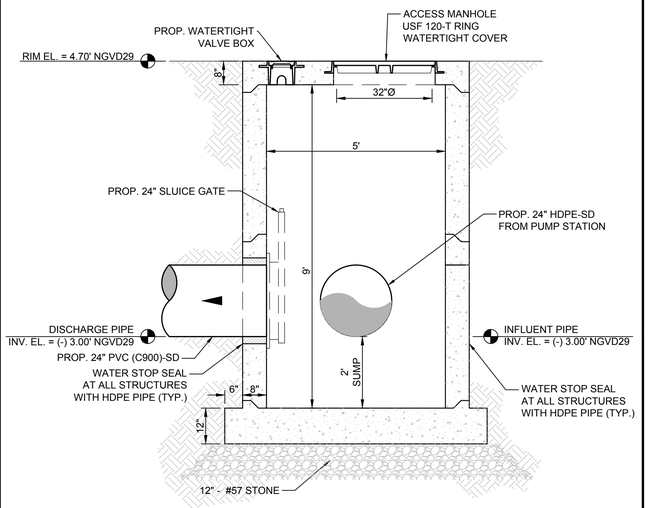
ELEVATION

1 TRASH RACK STRUCTURE DETAIL (91st STREET)

NOT TO SCALE



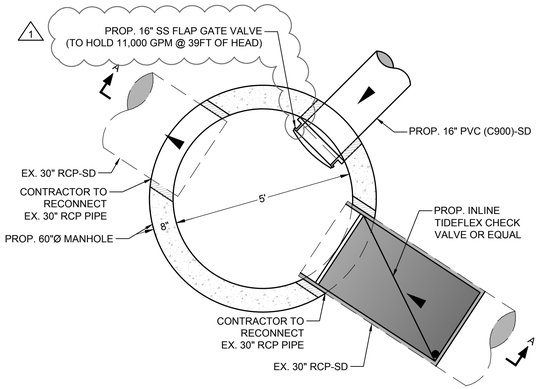
PLAN



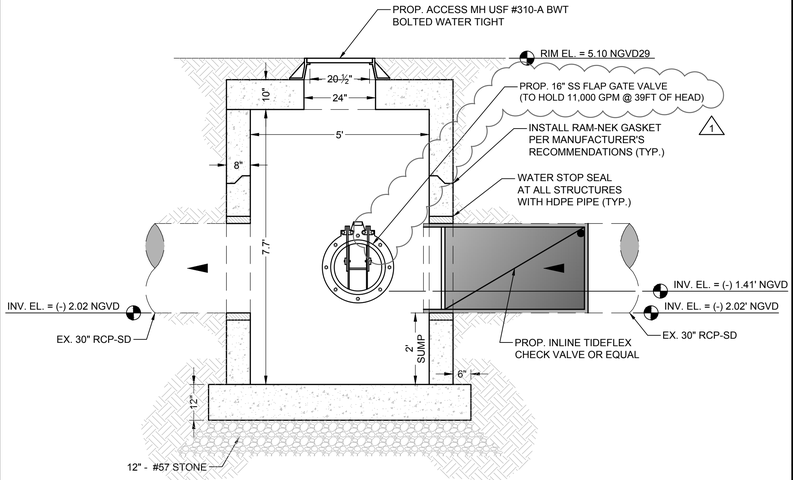
ELEVATION

2 BY-PASS STRUCTURE (91st STREET) DETAIL

NOT TO SCALE



PLAN VIEW



ELEVATION

3 CONTROL STRUCTURE #2 (91st STREET)

NOT TO SCALE

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REVISIONS

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DESIGNED BY:	CM
DRAWN BY:	MB
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BID-CONTRACT:	

STEPHEN D. WILLIAMS, P.E.
FLORIDA REG. NO. 32090
(FOR THE FIRM)

CLIENT

PROJECT

ABBOTT AVENUE DRAINAGE IMPROVEMENTS

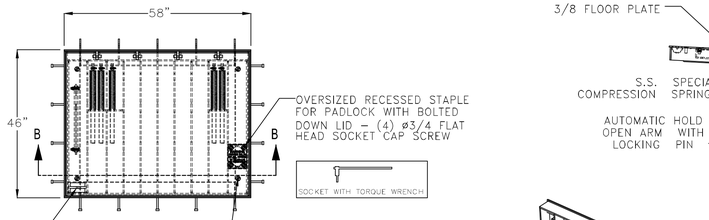
SHEET TITLE

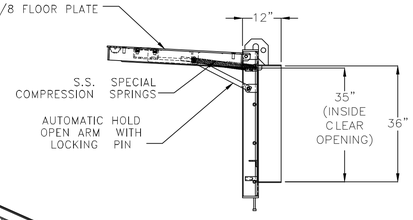
PUMP STATION DETAILS -91ST STREET

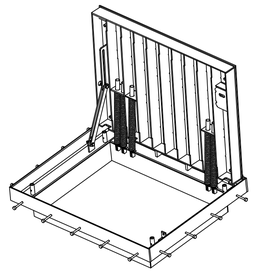
SHEET NUMBER	CP-405
PROJECT NUMBER	11494.01

STATUS: CONSTRUCTION DOCUMENTS

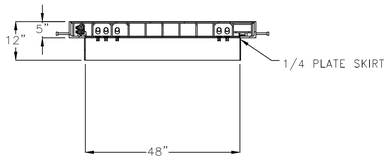
Drawing name: S:\11494.01 - Abbott Avenue Stormwater Drainage Design Phase II – Town of Surfside\Engineering\Cadd\11494.01 CP-4XX - Pump Station Details.dwg







NOTES:
1–MATERIAL: STEEL A36, HOT DIP GALVANIZED AFTER FABRICATION
2– AASHTO HL–93 WHEEL LOADING DESIGNED FOR A MAXIMUM WHEEL LOAD OF 16000–LBS PLUS 33% IMPACT FACTOR. (EQUIVALENT TO H–20)
3– IT IS ESSENTIAL THAT ALL BOLTS ARE IN PLACE WHENEVER COVER IS EXPOSED TO TRAFFIC
"LOCTITE 242 BLUE", MUST BE APPLIED TO ALL BOLTS AFTER EACH USE.
4–SUITABLE FOR USE IN TRAFFIC PER ASTM C1802–14 LOAD LEVEL 7
5– APPROXIMATE WEIGHT:1043.86 lbs.



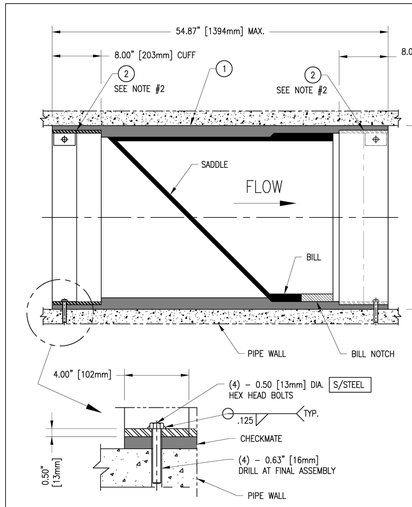
SECTION B-B

INTERPRET DIMENSIONS AS FOLLOWS
DECIMALS IN INCHES
STRAIGHT AND ANGULAR TOLERANCES AS FOLLOWS:
DECIMALS .XX ±.01
TOLERANCES UNLESS OTHERWISE SPECIFIED:
<10' = ± 1/8
>10' = ± 1/4

U.S.F. FABRICATION INC.
HIALEAH, FLORIDA

HATCH DT93AHS 36X48 A1G2K12n7
GENERAL ARRANGEMENT

DRAWN BY:	SCALE: 1:20	SHEET 1 OF 2	DATE: 07/27/22
APPD BY: SROB	DWG. NO. 1000210054	SHEET SIZE: B	REV. 0



PIN PER NOTE #4
RECOMMENDED PINNING CONFIGURATION
(SUPPLIED BY CUSTOMER) (SEE I.O.M.)
NOT TO SCALE

ITEM	QTY.	DESCRIPTION	MAT'L
1	1	ULTRAFLEX CHECKMATE CHECK VALVE	MUST BE SUPPLIED
2	2	CLAMP	MUST BE SUPPLIED

NOTES:
1. PIPE INSIDE DIAMETER – MUST BE SUPPLIED (MINIMUM ALLOWABLE PIPE DIAMETER – 29.37 INCHES)
2. CLAMP INSTALLED IN UPSTREAM OR DOWNSTREAM CUFF DEPENDING ON INSTALLATION ORIENTATION
3. MAXIMUM ALLOWABLE BACK PRESSURE – 38.0 FEET
4. IT IS RECOMMENDED TO BOLT OR PIN CHECKMATE TO PIPE AS SHOWN, 4 PLACES 90° APART

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

* PATENT PENDING *

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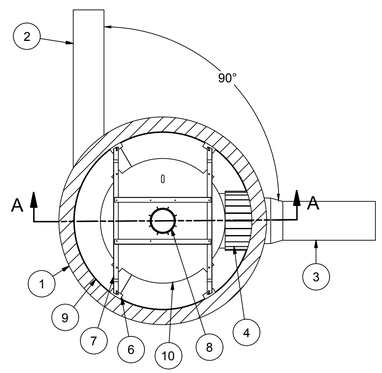
CUSTOMER: XXX
ORDER No: XXX

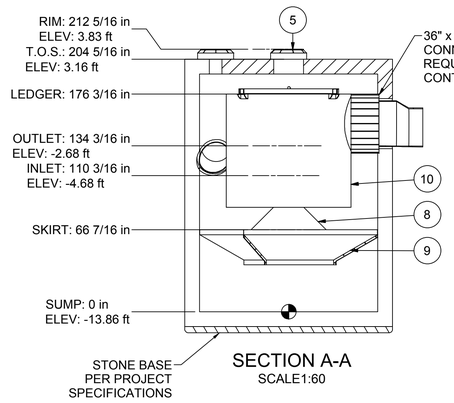
OPPORTUNITY No: XXXXX | SALES ORDER No: TXX–XXXX

Tideflex® Technologies
A Division of Red Valve Company, Inc.
750 HOLIDAY DR. STE.400
PITTSBURGH, PA. 15220
info@redvalve.com
412.279.0044
fax 412.279.5410

TT PRODUCT: 30" ULTRAFLEX CHECKMATE CHECK VALVE
TT PART No: CMCBUF–300–APPROVAL
DR. BY: TLM | DATE: 2–6–17 | CHKD. BY: | DATE:
CAD SCALE: FULL
PLOT SCALE: 1 = 1
REV
DWG No: TTS–XXXX

PIPE DETAILS					
PIPE	MATERIAL	LENGTH	INV UP	INV DOWN	SLOPE
INLET	PVC	30.0 ft	-2.68 ft	-4.68 ft	6.67
OUTLET	PVC	10.0 ft	-2.68 ft	-2.70 ft	0.20





SECTION A-A
SCALE1:60

PARTS LIST		
ITEM	DESCRIPTION	SIZE (in)
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	144
2	INLET PIPE (BY OTHERS)	24
3	OUTLET PIPE (BY OTHERS)	30
4	PIPE COUPLING (BY OTHERS)	
5	FRAME AND COVER	24
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	CENTER SHAFT AND CONE	
9	BENCHING SKIRT	
10	DIP PLATE	

DD SIZE	4'	6'	8'	10'	12'
OUTLET STUB ID	12"	18"	24"	30"	36"
OUTLET STUB OD	12.5"	18.7"	24.8"	36"	42"

EQUIPMENT PERFORMANCE
The stormwater treatment unit shall adhere to the hydraulic parameters given in the chart below and provide the removal efficiencies and storage capacities as follows:

1. Performance objectives: The unit shall be capable of treating the peak flow rate listed below.
2. Peak Hydraulic Capacity: 38.0 cfs (1076 l/s)
3. Sediment Storage Capacity: 14.70 cu. yd. (11.13 cu. m)
4. Continuous Oil Storage Capacity: 1770 gal. (6700 liters)
5. Sediment shall be stored in a zone that is isolated from the main flow path and protected from reintrainment by a benching skirt.

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.
4. CONTRACTOR IS RESPONSIBLE FOR MATERIALS AND LABOR TO BRING CASTINGS TO FINISHED GRADE

REVISION HISTORY			
REV.	BY	DESCRIPTION	DATE
–	KSM	FIRST RELEASE	3/30/2022

PROJECTION

IF IN DOUBT ASK

DATE: 3/30/2022	SCALE: 1:60	
DRAWN BY: KSM	CHECKED BY:	APPROVED BY:

Title
12-ft DIAMETER
DOWNSTREAM DEFENDER

WQU - 91ST STREET
PUMP STATION - 91ST STREET
SURFSIDE, FL

Patent: www.hydro-int.com/patents

Hydro International®
hydro-int.com

WEIGHT:	MATERIAL:
STOCK NUMBER: 1	
DRAWING NO.: 22_12_1161-12ftDD-1	
SHEET SIZE: B	SHEET: 1 OF 3	Rev: –

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SHEET TITLE
PUMP STATION DETAILS -91ST STREET

SHEET NUMBER	CP-406
PROJECT NUMBER	11494.01

STATUS: CONSTRUCTION DOCUMENTS

Drawing name: S:\11494.01 - Abbott Avenue Stormwater Drainage Design Phase II – Town of Surfside\Engineering\Cadd\11494.01 CP-4XX - Pump Station Details.dwg

Plotted by: cmorales On 4/10/2023 6:22 PM

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Geotechnical Exploration Report

Abbott Avenue Stormwater Improvements

Miami, Florida

September 15, 2022
UES Project No.: 2130.2200041.0000

Prepared for: Keith and Associates

ENVIRONMENTAL • GEOTECHNICAL • MATERIALS TESTING • INSPECTIONS
GFA INTERNATIONAL

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Delray Beach, FL	Ocala, FL	Tampa, FL
Douglasville, GA	Orlando, FL	Tifton, GA
Fort Myers, FL	Palm Coast, FL	West Palm Beach, FL
Fort Pierce, FL	Panama City, FL	
Gainesville, FL	Pelham, AL	

September 15, 2022

Mr. Carlos Morales
Keith and Associates, Inc.
301 East Atlantic Boulevard
Pompano Beach, FL 33060
Phone: (305) 310-1531
Email: cmorales@keithteam.com

RE: Geotechnical Exploration for
Abbott Avenue Stormwater Improvements
Abbott Avenue with 91st and 92nd Street
Miami, FL 33154
UES Project No. 2130.2200041.0000

Dear Mr. Morales,

In accordance with your authorization, Universal Engineering Sciences (UES) has completed the subsurface exploration and geotechnical engineering evaluation for the above referenced project in accordance with the signed geotechnical and engineering service agreement for this project. The scope of UES's services was planned in conjunction with and authorized by you.

The purpose of UES's subsurface exploration was to classify the nature of the subsurface soils and general geomorphic conditions and to evaluate their impact upon the proposed installation of underground pump stations. This report contains the results and UES's engineering interpretation of subsurface conditions of the site with respect to the project characteristics as described to UES and site preparation procedures.

1.0 PROJECT DESCRIPTION

The site is located at Abbott Avenue with 91st and 92nd Street and Bay Drive with 91st St and 92nd St, Miami, FL, as shown in **Figure 1**. The proposed development consists of the installation of two underground storm water pump stations connected to three drainage wells. No drainage or pavement information was provided at the time of UES's exploration or report preparation.

FIGURE 1 – SITE LOCATION PLAN

ABBOTT AVENUE STORMWATER IMPROVEMENTS
MIAMI, FL
UES PROJECT NO. : 2130.2200041.0000

2.0 Observations

2.1 Site Observation and Historical Data

The subject property is located at Abbott Avenue with 91st and 92nd Street, Bay Drive with 91st St and 92nd St in Miami, Florida. The site is currently an existing roadway used by residents. No soil staining or visual evidence of chemical or petroleum spillage was apparent. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES would be pleased to perform these services if required.

UES reviewed historic aerials from 1940 through 2022. The 1940 aerial depicts the site is an existing paved roadway and the site has remained relatively unchanged.

2.2 Laboratory Testing and Procedures

Soil samples recovered from UES's field exploration were returned to the laboratory. A geotechnical engineer visually examined and reviewed the field descriptions of the recovered soils in general accordance with ASTM D-2488. Samples were visually examined to accurately evaluate the subsurface soil properties and site geomorphic conditions. The following tests were performed to aid in classifying the soils and to help evaluate the general engineering characteristics of the site soils: natural moisture content (ASTM D-2216), percent passing the No. 200 sieve (ASTM D-1140), and organic content (ASTM D-2974). Table 1 below presents the summary of laboratory test results of the soils samples tested.

Table 1 Summary of Laboratory Test Results

Boring	Sample Depth (feet)	Moisture Content (%)	Percent Passing No. 200 Sieve (%)	Organic Content (%)
B01	4 – 6	149.5	2.8	7
B03	2 – 4	55.3	17.3	4

Representative samples of the soils encountered during the field exploration will be held in the laboratory for your inspection for 30 days unless UES is notified otherwise.

2.3 Field Exploration

UES performed four (4) standard penetration test (SPT) borings to depths of 30 feet below ground surface (BGS). **Figure 2** shows the approximate location of the borings performed at the site.

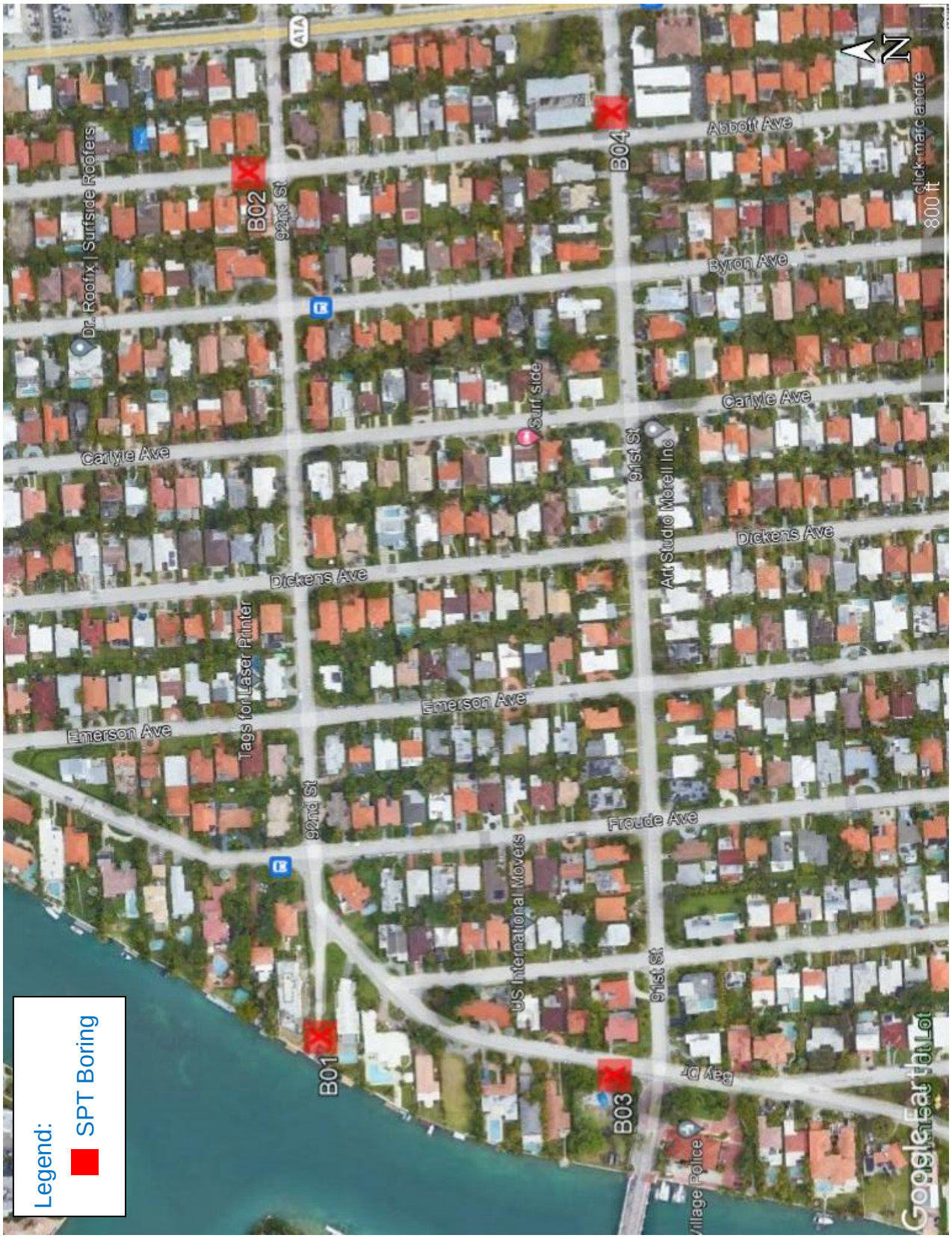


FIGURE 2 – BORING LOCATION PLAN

NOTE: BORING LOCATIONS WERE LOCATED USING A MEASURING TAPE AND EXISTING LANDMARKS AS REFERENCE POINTS. IN ADDITION, THE LATITUDE, LONGITUDE, AND ELEVATION NOTED ON THE BORING LOGS WERE TAKEN FROM GOOGLE EARTH. THEREFORE, LOCATIONS SHOWN ON THE PLAN ARE APPROXIMATE.

The SPT boring method was used as the investigative tool within the borings. Penetration tests were performed in substantial accordance with ASTM Procedure D-1586, “Penetration Test and Split-Barrel Sampling of Soils”. This test procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound automatic hammer falling 30 inches. The number of blows per foot, for the second and third 6-inch increments, is an indication of soil strength. The SPT borings were performed using a B-57 truck-mounted drill rig equipped with an automatic hammer. The soil samples recovered from the soil borings were classified and stratified by a geotechnical engineer. Following completion of the field services, all boreholes were backfilled with excavated soil/rock, and the site generally cleaned, as required.

The results of the classification and stratification are encountered during UES’s exploration are presented in **Appendix A** "Record of Test Boring”. It should be noted that soil conditions might vary between what is depicted on the attached log and other areas of the site. The soil boring data reflect information from a specific test location only. Site specific survey staking for the test location was not provided for UES’s field exploration. The boring location was determined in the field by a project engineer by measuring distances and estimating right angles from existing site features. The latitude, longitude, and elevation noted in UES’s boring logs were taken from Google Earth. Google Earth uses WGS-84 or Local Mean Sea Level (MSL) as datum. It should be noted that elevations may not always be correct if fill is added or site grades change to a site after Google captures the image. The boring location and elevations noted should, therefore, be considered approximate. The boring depths were confined to the zone of soil likely to be stressed by the proposed construction.

The boring logs depicts the observed soils in graphic detail. The Standard Penetration Test boring indicates the penetration resistance, or N-values logged during the drilling and sampling activities. Please refer to **Appendix B** “Notes Related to the Test Borings” for further clarification of UES’s field exploration. The classifications and descriptions shown on the log are generally based upon visual characterizations of the recovered soil samples. All soil samples reviewed have been depicted and classified in accordance with the Unified Soil Classification System symbols (i.e. SP, SP-SM, SC, etc.). See in **Appendix C** "Discussion of Soil Groups", for a detailed description of various soil groups.

3.0 SUBSURFACE CONDITIONS

The soils at the explored locations generally consisted of up to 4” to 6” of asphalt atop very loose to medium dense, fine to medium grained sand with varying amounts of limestone and shell fragments from ground surface to depths of 4 feet below ground surface (BGS), underlain by very loose, fine to medium grained sand with variable amounts of shell fragments to an approximate depths of 6 to 8 feet BGS. The following layer consisted of loose. The next layer consisted of medium dense, fine to medium grained sand with varying amounts of shell fragments to the approximate depths of 13 to 23 feet BGS. The final layer consisted limestone fragments with varying amounts of sand to the termination depth of the borings at 30 feet BGS.

It should be noted that boring B01 encountered unsuitable, loose organic soils and debris at a depth of nearly 2 to 6 feet BGS, and boring B03 encountered unsuitable, loose organics and silty soils at a depth of nearly 2 to 6 feet BGS. The SPT N-values ranged between 0 (weight of hammer) to more than 50 blows per foot (refusal).

For a more precise description of the conditions encountered within the soil test borings, refer to the "Record of Test Boring" logs included in **Appendix A**.

3.1 Groundwater Considerations

Groundwater at the time of testing (August 2022) was encountered at an approximate depth of 2'2" to 4'2" BGS. The groundwater table will fluctuate seasonally depending upon local rainfall. The groundwater table will fluctuate seasonally depending upon local rainfall heavy rainfall can lead to its formation which can dissipate with time under the influence of downward percolation and evaporation from the surface.

No additional investigation was conducted in relation to any existing well field in the vicinity. Well fields can influence water table levels and cause significant fluctuations. If a more comprehensive water table analysis is necessary, UES recommends contacting a registered professional specialized in hydrogeology.

4.0 FOUNDATION RECOMMENDATIONS

It is UES's understanding that the proposed bottom elevation of the new pump station will be approximately 10 to 11 feet below existing ground surface. UES has assumed that the foundation loading will be in the order of **50 kips**. Based on the borings, UES recommends the pump station be supported on a shallow foundation system. UES recommends using a maximum net allowable soil pressure of **2,500 psf**. The allowable soil pressure recommended will yield settlement values less than 1-inch total and ½-inch differential. Footing dimensions shall be determined in accordance with the aforementioned allowable soil pressure, the Florida Building Code (latest edition), and any local municipal ordinance. In addition, to minimize the possibility of connections to uncouple or detach, UES recommends the use of flexible connections to tolerate any disturbance or additional stress that might be caused by settlement or heave of the underlying in-situ soils. The site contractor should review the soils information to determine the appropriate method of installation. Control of the groundwater (dewatering) will be necessary.

As for lateral loads, the wet well has to withstand the lateral pressures produced by the backfill pressing against the wet well's walls. To calculate these pressures, the designer may use the following parameters:

Cohesion, c' = 0 psf
Angle of shearing resistance, Φ' = 32^{o}
Soil's unit weight, Y' = 115 pcf
At-rest earth pressure coefficient, k_o = 0.47

These parameters may be used if granular soils (either fill material or the in-situ granular soils) are used as backfill. The at-rest coefficient is used since the wet well is braced against the opposite wall as it is backfilled, not allowing rotation of the wall.

If fill is to be brought in to be used as backfill (if needed), it should be inorganic (classified as SP/SW) containing not more than 5 percent (by weight) fibrous organic materials. Fill materials with silt-size soil fines in excess of 10% should not be used, this includes cyclone sand material. Place fill and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density (ASTM D-1557) with a tamper. Dewatering techniques will be necessary.

5.0 SITE PREPARATION RECOMMENDATIONS

Pipe bedding and backfill requirements to one (1) foot above the crown of pipe should be specified by the civil engineer. UES suggests the use of a “self” compacting material such as coarse aggregate (i.e. FDOT No. 57 stone) for backfill material placed below the groundwater table. A filter fabric (geotextile) should be used to avoid migration of the existing soils into the newly placed backfill. “Self” compacting material placed below the groundwater should consist of inorganic, non-plastic material, free of any man-made debris, limerock with a three (3) inch maximum particle size with ASTM classification (USCS) of GP, GW or FDOT 57 Stone with less than 5% material finer than the No. 200 Sieve and a maximum particle size of 3 inches. The No. 57 stone should not be placed more than one foot above the groundwater.

Fill placed in one (1) foot above the crown of the pipe shall consist of select material having no more than 12 percent passing the No. 200 sieve, with a maximum particle size of 3 inches. **Some of the material removed during trench excavation is unsuitable for use as backfill.** The trench backfill shall be placed in maximum loose lifts of 12 inches and compacted to at least 95% of the Modified Proctor (ASTM D1557) maximum dry density or as specified by the civil engineer.

Organic soils and fines should be removed from the utility runs and replaced with clean, compacted fill to provide adequate support for the proposed pipe system. A more detailed description of this work is as follows:

1. Utility runs installed below the groundwater table should be dewatered to allow excavation, inspection and backfill in the dry.

2. Organic soils and fines found 1 foot beneath the proposed utility invert depth should be removed and replaced with clean compacted fill., assuming the existing grade elevation is to remain unchanged.

3. After excavation to design invert elevations, in-situ bedding soils should be compacted to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) to a depth of 12 inches below the bedding level. Compaction in confined areas should be accomplished using equipment such as jumping jacks and ‘walk-behind’ vibratory plates and rollers.

4. Utility backfill may consist of excavated, non-organic materials that include rock fragments no larger than 3 inches in diameter. Offsite fill material (if required) should consist of clean granular soils with less than 10 percent soil fines. Place fill in uniform 6-inch thick (loose) lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D1557).

5. In paved areas, the pavement subgrade should be reestablished using approved materials and specific compactive effort.

6.0 EXCAVATION CONDITIONS

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the OSHA guidelines. It is UES's understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

UES is providing this information solely as a service to UES's client. UES is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred. **The SPT methodology (ASTM D-1586) used in performing UES's borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty to advance other tools, equipment or materials.**

7.0 BACKFILL

Some of the soils encountered during UES's exploration appear to be unsuitable for re-use as backfill soils. Material required for backfilling should consist of clean sands with no more than 10% passing the U.S. No. 200 sieve **(Note: Excavated soils may be re-used provided that the maximum particle size is less than 3 inches in diameter)**. The backfill should be placed in uncompacted lifts of not more than 12 inches in thickness and should be uniformly compacted to the requirements stated in the contract specifications. Heavy compaction equipment should be operated no closer than 3 feet of any installed structure. Compaction adjacent to structures should be performed with small compaction equipment (e.g., jumping-jack or heavy plate tamper). The contractor should use caution during the backfilling operations to prevent any damage to adjacent structures.

Testing of backfill should be performed in accordance with the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

8.0 REPORT LIMITATIONS

This consulting report has been prepared for the exclusive use of the current project owners and other members of the design team for this project. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied. The evaluation submitted in this report, is based in part upon the data collected during a field exploration, however, the nature and extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report. In the event changes are made in the nature, design, or locations of the proposed structure, the evaluation and opinions contained in this report shall not be considered valid, unless the changes are reviewed and conclusions modified or verified in writing by Universal Engineering Sciences. Lastly, in accepting this report, the client understands that the data obtained from the soil borings is intended for foundation analysis only and is not to be used for excavating or backfilling pricing estimates.

The analysis and recommendations submitted in this report are based on the data obtained from the tests performed at the location indicated on the attached figure. This report does not reflect any variations, which may occur between borings. While the borings are representative of the subsurface conditions at their respective locations and for their vertical reaches, local variations characteristic of the subsurface soils of the region are anticipated and may be encountered. The delineation between soil types shown on the soil logs is approximate and the description represents UES's interpretation of the subsurface conditions at the designated boring locations on the particular date drilled.

Any third-party reliance of UES's geotechnical report or parts thereof is strictly prohibited without the expressed written consent of Universal Engineering Sciences. The SPT methodology (ASTM D-1586) used in performing UES's borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty to advance other tools, equipment or materials.

Respectfully Submitted,
Universal Engineering Sciences
Registry #4930

G. Vineetha

Vineetha Garikapati, M.S, E.I.T.
Project Manager

Estela G. León Aguilar, P.E.
Geotechnical Department Manager
Professional Engineer #83307
State of Florida

Appendices

Appendix A	Record of Test Borings
Appendix B	Notes Related to the Test Borings
Appendix C	Discussion of Soil Groups

APPENDIX A
Record of Test Borings

UNIVERSAL ENGINEERING SCIENCES
1215 Wallace Drive
Delray Beach, 33444
(561)347-0070
(561)395-5805

LOG OF BORING B01

CLIENT Keith & Associates
PROJECT NAME Abbot Avenue Stormwater Improvements
PROJECT NUMBER 2130.2200041.0000
PROJECT LOCATION Bay Dr & Abbott Ave. with 91st St & 92nd St, Miami, FL
DRILLING CONTRACTOR Florida Geotechnical Drilling
HOLE DEPTH 30 ft
HOLE DIAMETER
DRILLER Lazaro Tarajano
DATE STARTED 8/19/22
COMPLETED 8/19/22
DRILL RIG B57
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 2.17 ft / Elev 0.83 ft
METHOD Standard Penetration Test
LATITUDE 25.879556
LONGITUDE -80.129139
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0	0	6" of asphalt atop, medium dense, gray, fine to medium grained SAND (SP) with some limestone fragments.	1	90	14 9 4 5	13		
		2.0 ▽ Very loose, brown, fine to medium grained SAND (SP) with some debris (plastic), trace of limestone fragments	2	90	3 2 1 2	3		
5	-5	4.0 Very loose, dark brown, fine to medium grained SAND (SP) with ROOTS, trace of organics. 6.0	3	90	0 0 0 2	WOH	149.5	6.6
		Loose, gray, fine to medium grained SAND (SP) with SHELL fragments, trace of organics. 8.0	4	90	2 2 2 3	4		
10	-10	Medium dense, gray, fine to medium grained SAND (SP) with some shell fragments. 13.0	5	90	7 9 9 9	18		
15	-15	Hard, LIMESTONE. 18.0	6	90	20 50/2"	>>		
20	-20	LIMESTONE fragments with trace of sand.	7	90	17 12 20 48	32		
25	-25		8	90	11 12 7 3	19		
30			9	90	3 2 1 1	3		

Bottom of borehole at 30.0 feet.

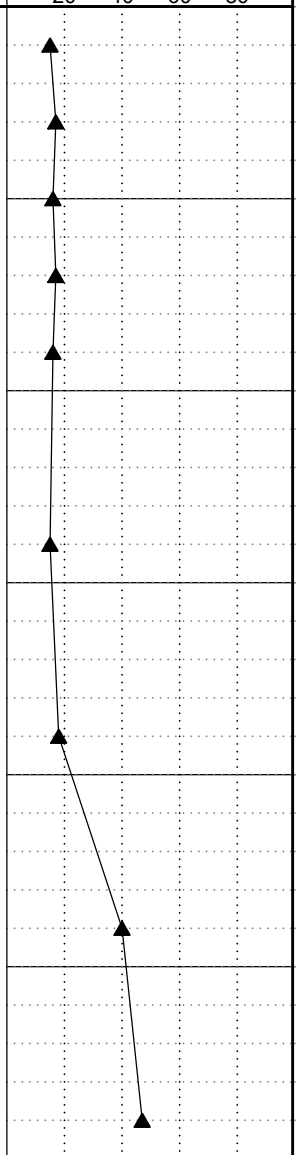
UNIVERSAL ENGINEERING SCIENCES
1215 Wallace Drive
Delray Beach, 33444
(561)347-0070
(561)395-5805

LOG OF BORING B02

CLIENT Keith & Associates
PROJECT NAME Abbot Avenue Stormwater Improvements
PROJECT NUMBER 2130.2200041.0000
PROJECT LOCATION Bay Dr & Abbott Ave. with 91st St & 92nd St, Miami, FL
DRILLING CONTRACTOR Florida Geotechnical Drilling
HOLE DEPTH 30 ft
HOLE DIAMETER
DRILLER Lazaro Tarajano
DATE STARTED 8/19/22
COMPLETED 8/19/22
DRILL RIG B57
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 2.83 ft / Elev 2.17 ft
METHOD Standard Penetration Test
LATITUDE 25.879941
LONGITUDE -80.123864
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
	5		4.5" of asphalt atop, medium dense, gray, fine to medium grained SAND (SP).	1	90	8 9 6 6	15		
			2.0						
			▽ Medium dense, tan, fine to medium grained SAND (SP) with some shell fragments, trace of roots.	2	90	4 8 9 10	17		
			4.0						
5	0		Medium dense, gray, fine to medium grained SAND (SP) with some shell fragments.	3	90	8 8 8 9	16		
			6.0						
			Medium dense, gray, fine to medium grained SAND (SP) with SHELL fragments.	4	90	6 8 9 11	17		
				5	90	3 6 10 12	16		
10	-5								
			13.0						
			Medium dense, light gray, fine to medium grained SAND (SP) with some shell fragments.	6	90	8 8 7 6	15		
15	-10								
			18.0						
			LIMESTONE fragments with sand.	7	90	7 7 11 9	18		
20	-15								
			23.0						
			LIMESTONE fragments with trace of sand.	8	90	9 12 28 21	40		
25	-20								
				9	90	27 30 17 15	47		
30	-25		30.0						

Bottom of borehole at 30.0 feet.



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Delray Beach, 33444
(561)347-0070
(561)395-5805

LOG OF BORING B03

CLIENT Keith & Associates
PROJECT NAME Abbot Avenue Stormwater Improvements
PROJECT NUMBER 2130.2200041.0000
PROJECT LOCATION Bay Dr & Abbott Ave. with 91st St & 92nd St, Miami, FL
DRILLING CONTRACTOR Florida Geotechnical Drilling
HOLE DEPTH 30 ft
HOLE DIAMETER
DRILLER Lazaro Tarajano
DATE STARTED 8/19/22
COMPLETED 8/19/22
DRILL RIG B57
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 4.17 ft / Elev 0.83 ft
METHOD Standard Penetration Test
LATITUDE 25.877979
LONGITUDE -80.129375
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
	5		Medium dense, gray, fine to medium grained SAND (SP) with some silt.	1	90	6 5 4 4	9		
			2.0 Loose, dark gray, fine to medium grained SILTY SAND (SM).	2	90	4 3 1 1	4	55.3	3.5
			4.0 ▽ Very loose, dark brown, fine to medium grained SAND (SP) with ROOTS, trace of organics.	3	90	0 0 0 2	WOH		
5	0		6.0 Medium dense, dark gray, fine to medium grained SAND (SP) with some shell fragments.	4	90	3 5 7 7	12		
				5	90	6 5 6 6	11		
10	-5		13.0 Medium dense, gray, fine to medium grained SAND (SP) with SHELL fragments.	6	90	5 6 7 5	13		
15	-10		18.0 LIMESTONE fragment with trace of sand.	7	90	17 23 25 19	48		
				8	90	17 10 11 14	21		
20	-15								
25	-20			9	90	13 13 10 16	23		
30	-25		30.0 Bottom of borehole at 30.0 feet.						

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

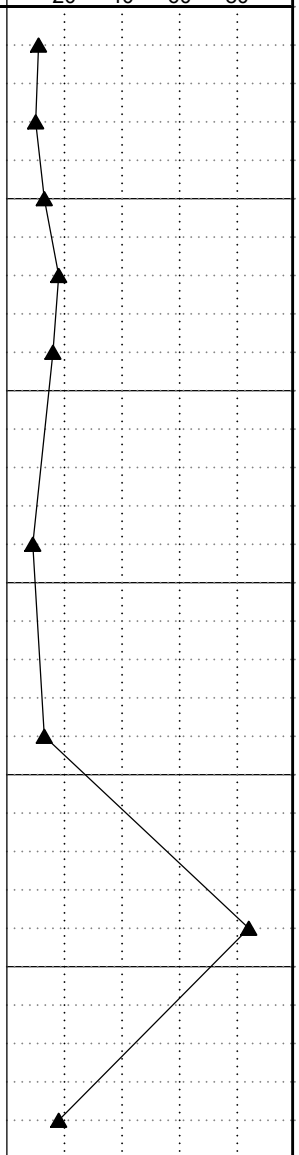
UNIVERSAL ENGINEERING SCIENCES
1215 Wallace Drive
Delray Beach, 33444
(561)347-0070
(561)395-5805

LOG OF BORING B04

CLIENT Keith & Associates
PROJECT NAME Abbot Avenue Stormwater Improvements
PROJECT NUMBER 2130.2200041.0000
PROJECT LOCATION Bay Dr & Abbott Ave. with 91st St & 92nd St, Miami, FL
DRILLING CONTRACTOR Florida Geotechnical Drilling
HOLE DEPTH 30 ft
HOLE DIAMETER
DRILLER Lazaro Tarajano
DATE STARTED 8/19/22
COMPLETED 8/19/22
DRILL RIG B57
GROUND WATER LEVEL: ▽ **AT TIME OF DRILLING** 2.83 ft / Elev 5.17 ft
METHOD Standard Penetration Test
LATITUDE 25.877995
LONGITUDE -80.123496
NOTE:
HAMMER TYPE 140# with 30 in Drop - Automatic Hammer

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS	N VALUE	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)
0	5		4" of asphalt atop, medium dense, dark gray, fine to medium grained SAND (SP) with trace of shell fragments.	1	90	6 7 4 13	11		
			2.0						
			▽ Medium dense, gray, fine to medium grained SAND (SP) with SHELL fragments.	2	90	4 4 6 8	10		
5	0			3	90	3 6 7 10	13		
				4	90	7 8 10 9	18		
	-5			5	90	9 6 10 10	16		
10									
				6	90	3 4 5 5	9		
15	-10		18.0						
			Medium dense, gray, fine to medium grained SAND (SP) with trace of shell fragments.	7	90	8 9 4 3	13		
20									
	-15		23.0						
			LIMESTONE fragments with some sand.	8	90	17 44 40 26	84		
25									
	-20			9	90	6 8 10 12	18		
30			30.0						

Bottom of borehole at 30.0 feet.



APPENDIX B

Notes Related to Test Borings

NOTES RELATED TO
RECORDS OF TEST BORING AND
GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified and located in the field based on measured and estimated distances from existing site features.

3. The borehole was backfilled to site grade following boring completion, patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions, and recommendations presented in the report text.

6. The Standard Penetration Test (SPT) was performed in accordance ASTM Procedure D-1586. SPT testing procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound hammer falling 30 inches.

7. On the Record of Test Boring listed as “Blow Counts”, the N-value is the sum of the SPT hammer blows required to drive the split-tube sampler through the second and third 6-inch increment of the sampling layer, and is an indication of soil strength.

8. Shown on the Record of Test Boring an SPT N-value expressed as 50/2” is descriptive of the fact that 50 hammer blows were required to drive the split-spoon sampler a distance of approximately 2 inches.

9. The soil/rock strata interfaces shown on the Records of Test Boring are approximate and may vary from those in the field. The soil/rock conditions shown on the Records of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

10. Relative density and consistency for sands/gravels, silts/clays, and limestone are described as follows:

Cohesionless Soils	
SPT (N-Value)	Relative Density
0 – 3	Very Loose
4 – 8	Loose
9 – 24	Medium Dense
25 – 40	Dense
Over 40	Very Dense

Silts and Clays	
SPT (N-Value)	Consistency
0 – 1	Very Soft
2 – 4	Soft
4 – 6	Firm
7 – 12	Stiff
13 – 24	Very Stiff
Over 24	Hard

Limestone	
SPT (N-Value)	Relative Density
0 – 19	Very Soft
20 – 49	Soft
50 – 100	Medium Hard
50 for 3 to 5”	Moderately Hard
50 for 0 to 2”	Hard

11. Definition of descriptive terms of modifiers for silts/clays/shells/gravels are described as follows:

Percentage of Modifier Material	First Qualifier	Second Qualifier
0 – 5	With a Trace of + Silt, Clay, Shell	With a Trace
5 – 12	Slightly + Silty, Clayey, Shelly	With Some
12 – 30	Silty, Clayey, Shelly	With
30 – 50	Very + Silty, Clayey, Shelly	And

12. Descriptive characteristics for organic content percentages are described as follows:

Percentage of Organic Material	Descriptor
0 – 5	With a Trace
5 – 20	With Organics
20 – 75	Highly Organic
75 – 100	Peat

APPENDIX C

Discussion of Soil Groups

DISCUSSION OF SOIL GROUPS

COARSE GRAINED SOILS

GW and SW GROUPS. These groups comprise well-graded gravelly and sandy soils having little or no plastic fines (less than 5 percent passing the No. 200 sieve). The presence of the fines must not noticeably change the strength characteristics of the coarse-grained fraction and must not interface with it's free-draining characteristics.

GP and SP GROUPS. Poorly graded gravels and sands containing little of no plastic fines (less than 5 percent passing the No. 200 sieve) are classed in GP and SP groups. The materials may be called uniform gravels, uniform sands or non-uniform mixtures of very coarse material and very fine sands, with intermediate sizes lacking (sometimes called skip-graded, gap-graded or step-graded). This last group often results from borrow pit excavation in which gravel and sand layers are mixed.

GM and SM GROUPS. In general, the GM and SM groups comprise gravels or sands with fines (more than 12 percent passing the No. 200 sieve) having low or no plasticity. The plasticity index and liquid limit of soils in the group should plot below the "A" line on the plasticity chart. The gradation of the material is not considered significant and both well and poorly graded materials are included.

GC and SC GROUPS. In general, the GC and SC groups comprise gravelly or sandy soils with fines (more than 12 percent passing the No. 200 sieve), which have a fairly high plasticity. The liquid limit and plasticity index should plot above the "A" line on the plasticity chart.

FINE GRAINED SOILS

ML and MH GROUPS. In these groups, the symbol M has been used to designate predominantly silty material. The symbols L and H represent low and high liquid limits, respectively, and an arbitrary dividing line between the two is set at a liquid limit of 50. The soils in the ML and MH groups are sandy silts, clayey silts or inorganic silts with relatively low plasticity. Also included are loess type soils and rock flours.

CL and CH GROUPS. In these groups the symbol C stands for clay, with L and H denoting low or high liquid limits, with the dividing line again set at a liquid limit of 50. The soils are primarily inorganic clays. Low plasticity clays are classified as CL and are usually lean clays, sandy clays or silty clays. The medium and high plasticity clays are classified as CH. These include the fat clays, gumbo clays and some volcanic clays.