ADDENDUM 6 - IFB 2014-003

MATHEWS DRIVE SIDE STREEETS REHABILITATION PROJECT

The Town of Hilton Head Island, South Carolina

March 3, 2014

Item 1. The Geotechnical Report for the project showing the shallow subsurface evaluation and asphalt pavement section recommendations prepared by H.S.A. Engineers & Scientists is included in this Addendum as Attachment 1.

Item 2. Due to possible utility conflicts, the estimated quantities for the following line items have been changed from:

23	7141113	18" RC PIPE CUL-CLASS III	1016	LF
26	7192010	DROP INLET	10	EA

To

23	7141113	18" RC PIPE CUL-CLASS III	1019	LF
26	7192010	DROP INLET	11	EA

Item 3. The following line items have been added to the bid schedule based on potential waterline relocations:

Relocation of 6" Water Lines at 2 Potential Sites

62		6" C900 DR 18 PIPE BLUE	80	LF
63		6" 45-DEGREE BENDS	8	EA
64		6" PVC SLEEVES	4	EA
65		MEGALUGS WITH GASKETS, BOLTS & NUTS	24	EA
66		BELL HARNESS (PIPE RESTRAINTS)	8	EA

Relocation of 16" Water Lines at 1 Potential Sites

62		16" C900 DR 18 PIPE BLUE	40	LF

63		16" 45-DEGREE BENDS	4	EA
64		16" PVC SLEEVES	2	EA
65		Megalugs with gaskets, bolts & nuts	12	EA
66		Bell Harness (Pipe Restraints)	4	EA

Attachment 2 of this Adddendum includes a restrained joint fitting detail.

Attachment 3 of this Addendum includes the revised Bid Schedule List with revised line items from Addendums 1 – 6.

Item 4. The potential Utility Conflicts plan sheets are marked and included as Attachment 4 of this Addendum.

Special Condition 22 – RESPONSIBILITY REGARDING EXISTING UTILITIES AND STRUCTURES has been changed to the following:

SC-22. RESPONSIBILITY REGARDING EXISTING UTILITIES AND STRUCTURES: The Contractor shall abide by the South Carolina Underground Facility Damage Prevention Act. The Contractor shall contact Palmetto Utility Protection Service at 811, at least 72 hours prior to beginning excavation. The existence and location of underground utilities will be thoroughly investigated and verified in the field by the Contractor before starting work. The project has been coordinated with the utility providers residing in the project limits. The location of all known interferences based on the best information available has been shown on the drawings, but this information may not be complete. Excavation in the vicinity of existing structures and utilities shall be carefully done by hand. The Contractor shall be held responsible for any damage to and for maintenance and protection of existing utilities and structures. The Contractor is responsible for coordinating with the utility companies for locations, any relocation, adjustment or replacement of utility facilities. This coordination is not compensable as a separate pay item, but shall be part of the work and included in the unit and lump sum costs of the work. This coordination shall include, but is not limited to, contacting and meeting with utility providers, providing the utility providers any new information on utility locations, surveys, etc., allowing the utility providers access to excavated areas to relocate and/or adjust or protect their facilities. If the Contractor is directed to physically relocate any utility infrastructure, compensation will be made based on the measurement and payment specifications as defined in the contract or change order.

The Contractor shall follow Special Conditions 22 and 23 in regards to responsibility regarding existing utilities and structures.

Special Provision 1 is included in this Addendum as Attachment 5 with General Requirements for Excavation, Backfilling, and Compacting for

Utilities.

Item 5. Special Condition 50 – SURFACE WATER AND GROUNDWATER MANAGEMENT has been changed to the following:

SC-50. SURFACE WATER AND GROUNDWATER MANAGEMENT: Excavations shall be kept free of water. Presence of groundwater shall not increase contract price. Groundwater shall be managed as necessary to complete the work and meet compaction requirements. Surface water / storm runoff on the construction site shall be managed to avoid any adverse impacts to adjoining or upstream properties. The Contractor is responsible for any damages to adjoining properties caused by inadequate water management on the construction site during construction.

Attachment 1 - Geotech Report

HSA
ENGINEERS & SCIENTISTS
A member of the CRA Family of Companies

November 16, 2012

Town of Hilton Head Island
One Town Center Court
Hilton Head Island, South Carolina 29925

Attention: *Ms. Jennifer Lyle, P.E.*

Subject: Shallow Subsurface Evaluation and Asphalt Pavement Section Recommendations
Mathews Drive Side Streets
Hilton Head Island, South Carolina
HSA Project No. 414-4453-11

Dear Ms. Lyle:

HSA Engineers & Scientists (HSA) is pleased to provide existing pavement coring, shallow subgrade exploration, in situ soil infiltration rate testing, and recommendation for remedial actions and/or new asphalt pavement sections for the above referenced project.

Project Information

A brief description of the proposed project was provided within the Job Order No. 11 documentation. The Job Order states that the Town is re-paving and/or paving Oak Park Drive, Mingo Way, Cooperative Way, Thompson Street, Power Alley and portions of Electric Avenue on the west side of Mathews Drive. Also provided to us along with the Job Order was a set of drawings titled "Mathews Drive Side Roads" prepared by Hussey, Gay, Bell & Deyoung, Inc. dated October 2012.

Field Investigation / Subsurface Conditions

As per the Job Order, the scope of our services included four (4) cores through the existing asphalt pavements of Oak Park Drive, Mingo Way, Cooperative Way, and Power Alley to measure the existing pavement section components for thickness. In addition, our scope of work included hand auger borings to determine the shallow subgrade soil conditions beneath the existing pavements at the four locations above plus two additional locations, one each in Thompson Street and Electric Avenue, which are currently unpaved. Lastly, we have performed one soil test boring and percolation test within the proposed stormwater retention pond location at the south end of Electric Avenue.

The field exploration and testing services were performed on October 29 and November 1, 2012. The approximate locations of the six shallow subsurface explorations and the one percolation test

location are indicated on **Figure 1**. At each of the six exploration locations the shallow subgrade soils to a depth of approximately 4 feet below the existing road surface were examined by manually twisting a steel auger into the soil and retrieving representative samples from the cuttings at regular depth intervals. The retrieved samples were placed in containers, labeled to identify the boring number and depth below existing round surface, and delivered to our laboratory for examination by the project engineer and/or for laboratory analysis. Logs detailing the findings of our field explorations are attached as **Appendix A**.

Where the existing streets were paved, the thicknesses of the pavement section components varied significantly from location to location. Typical was an asphalt surface course varying in thickness from 1" to 2" underlain by aggregate base varying in thickness from 4" to 6". The notable exception to the typical section was at Location 6 on Power Alley where the pavement section encountered consisted of approximately 5½" of asphalt with no underlying aggregate base. The subgrade soils at all six of the roadway locations explored consisted generally of dark brown to tan silty fine sands to the boring termination at 4 ft below the existing grade with occasional small hardpan nodules in the upper approximate foot.

Groundwater and/or mottled soil conditions were not encountered in our explorations. Therefore, in our opinion, the seasonal high ground water depth at the test locations is deeper than the 4 ft depth of the borings.

Field Percolation Testing

A field percolation test was performed at location #7 shown on **Figure 1** at the south end of Electric Avenue within the area identified as the proposed stormwater retention pond. The test was performed at an approximate depth of 4 to 6 feet below the surface.

The testing procedure generally conformed to the 'Modified Taft Method' of field percolation testing. The testing procedure first involved using a hand auger to excavate a relatively uniform diameter hole to the desired test depth below the existing ground surface. The testing procedure next involved placing a layer of gravel in the bottom of the hole. The hole was filled with water to a height of 12 inches above the gravel level and maintained at that level throughout an initial 'soaking' period of 10 minutes. After the 10-minute soaking period, the water level in the hole was adjusted to approximately 12 inches above the gravel level, and the water filtration was measured and recorded for 10 minute intervals over a period of 60 minutes. The water percolation rate is that of the last interval recorded in the test hole. The percolation test results are presented in **Appendix B**. The percolation rate for the soil at the approximate depth of 4 to 6 feet was approximately 12 inches per hour at the location tested.

Conclusions and Recommendations

Street pavements are typically designed for a useful service life of 15 to 20 years based upon predicted traffic loadings with the anticipation that routine maintenance such as sealing of cracks, timely repair of potholes, and periodic seal coating of the surface will be necessary throughout the useful life of the pavement. Based on our observations of the existing pavement conditions in the vicinity of our test locations and elsewhere along the currently paved streets of

this study, it is our opinion that the existing pavements are generally beyond their useful design service life except for portions of Power Alley that appear to have been resurfaced more recently. Based on our observations and test results, we concur with the Town of Hilton Head Island stated intention to remove the existing pavement sections and to construct new pavement sections to include proper preparation of the subgrade soils, graded aggregate base, and asphalt wearing surfaces.

The following pavement design guidelines are made without the benefit of specific traffic information and/or reference to any local minimum section standards, and are intended as a general guide for the design engineer's evaluation.

The silty fine sand subgrade soils encountered at our soil test borings are considered suitable for support of the proposed conventional asphalt pavement sections following adequate in-place densification. The preliminary pavement design guidelines provided below assume site preparation to include densification of the upper 18 inches of the underlying subgrade soils to a minimum of 98% of the soil's "Modified" Proctor maximum dry density as determined by ASTM Specification D1557.

The recommended typical pavement section for all streets of this study other than Power Alley consists of 6 inches of graded aggregate base course and 2 inches of asphalt (surface course). Due to the anticipated greater frequency of heavy axle load vehicles traversing Power Alley, the recommended pavement section for Power Alley consists of 8 inches of graded aggregate base course and 3½ inches of asphalt (2" surface + 1½" intermediate).

The asphalt wearing surfaces and base courses should be constructed in accordance with the guidelines of the latest applicable South Carolina Department of Transportation Specifications.

We are pleased to have the opportunity to work with you on this project. If you have any questions or require additional information, please do not hesitate to contact us at (843) 815-5120.

Sincerely,
HSA Engineers & Scientists

W. Chuck Rushing, PE
Senior Engineer

Attachments

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 10300 W. CHUCK RUSHING

11-16-12

Sean M. McCubbins, LEED® AP
Managing Principal

APPENDIX A
Logs of Hand-Auger Borings

HSA
ENGINEERS & SCIENTISTS
A member of the CRA Family of Companies

Project: Mathews Drive Side Streets

Date: 10/29/2012

Technician: J. Maxwell

Project No.: 414-4453-11

Test No.	Depth	Description
HA-1	0-6"	1 ¼" Asphalt and 4 ¾" aggregate base
	6"-1'	Dark brown silty fine SAND with hard pan
	1'-4'	Light brown silty fine SAND
HA-2	0-5"	1" Asphalt and 4" aggregate base
	5"-1'	Dark brown silty fine SAND with hard pan
	1'-4'	Light brown silty fine SAND
HA-3	0-8"	2" Asphalt 6" aggregate base
	8"-2'	Dark brown silty fine SAND
	2'-4'	Tan silty fine SAND
HA-4	0-2.5"	Aggregate
	2.5"-4'	Tan fine to medium silty SAND
HA-5	0-8"	Brown silty fine SAND
	8"-2'	Gray fine to medium silty SAND
	2'-4'	Light brown silty fine SAND
HA-6	0-5.5"	Asphalt
	5.5"-1.5'	Brown silty fine SAND
	1.5'-3'	Light brown silty fine SAND
	3'-4'	Tan silty fine SAND

Comments:

APPENDIX B
Percolation Test Results

HSA
ENGINEERS & SCIENTISTS
A member of the CRA family of Companies

PERCOLATION TEST RESULTS

Project Name: Mathews Drive Side Streets

HSA Project No: 414-4453-11

Test Date 11/1/2012

Test Location: HA-7

Technician B. Pope/J. Maxwell

Depth of Hole: 72"

Soils Encountered:

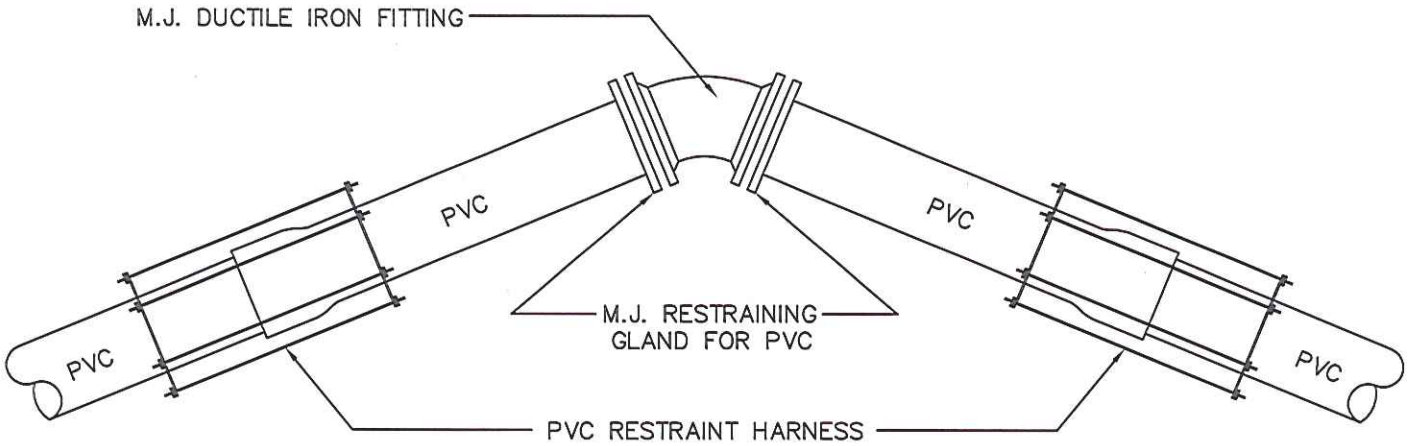
Depth	Soil Description
0 - 2"	Topsoil
2" - 17"	Light Brown Fine SAND (SP)
17" - 46"	Dark Brown Fine SAND (SP)
46" - 72"	Tan Fine to Medium SAND (SP)

Time Interval (minutes)	Drop in water level (inches)	Percolation rate (inches per minute)
10	3.5	0.35
10	3.25	0.33
10	3	0.30
10	2	0.20
10	2.00	0.20
10	2.00	0.20

Percolation rate = 0.20 ipm X 60 = **12.0** **iph**

FIGURE

Town of Hilton Head Island **One Town Center Court** **Hilton Head Island, SC 29928**	HSA ENGINEERS & SCIENTISTS A member of the CRA Family of Companies	**Boring Locations** Mathews Drive Side Streets
Prepared by: CR Date: November 16, 2012		Job No. 414-4453-11 / Figure 1



RESTRAINED JOINT FITTING DETAIL

NOT TO SCALE

HILTON HEAD NO. 1 PUBLIC SERVICE DISTRICT		
RESTRAINED JOINT FITTING		
APPROVED BY: LC	DATE: DEC. 1998	DRAWING NO. VIII–13
SCALE: NTS	REVISED: XXXXXXX	

Attachment 2

Attachment 3

EXHIBIT C - BID SCHEDULE

March 3, 2014

The unit prices given on this document, along with negotiated changes in quantities, shall become the basis for, and included in , the contract agreement. Offerors are responsible for verifying all quantities and notifiying the Owner of any discrepencies greater then 10% of estimate, in writing, prior to the Bid opening.

Item No.	SCDOT Pay Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price
1	1031000	MOBILIZATION	1	LS		
2	1050800	CONST. STAKES, LINES & GRADES	1	EA		
3	1090200	AS-BUILT CONSTRUCTION PLANS				
4	1071000	TRAFFIC CONTROL	1	LS		
5	2011000	CLEARING AND GRUBBING WITHIN RIGHT-OF-WAY	1	LS		
6	2023000	REM. & DISP.OF EXIST. PAVEMENT	5120	SY		
7	2031000	UNCLASSIFIED EXCAVATION	1200	CY		
8	2033000	BORROW EXCAVATION	200	CY		
9	2081001	FINE GRADING	10500	SY		
10	3050106	GRADED AGGREGATE BASE COURSE-6" UNIFORM	8800	SY		
11	4010005	PRIME COAT	1200	GAL		
12	4011004	LIQUID ASPHALT BINDER PG 64-22	50	TON		
13	4020330	HOT MIX ASPHALT INTERMEDIATE COURSE (TYPE C)	130	TON		
14	4030330	HOT MIX ASPHALT SURFACE COURSE (TYPE CM)	820	TON		
15	6271010	4" WHITE SOLID LINE, THERMO, 90 MIL	1800	LF		
16	6271025	24" WH SLDLNES THERMO.-125 MIL	135	LF		
17	6271050	HANDICAP SYMBOL-THERMO-125 MIL	4	EA		
18	6271074	4" YEL.SLD.LINES.-THERMO-90 MIL	65	LF		
19	6510105	FLAT SHEET,TYPE III,FIXED SIZE	75	SF		
20	6531210	U-SEC.POST FOR SGN SUPP. - 3P	190	LF		
21	6750224	4.0" SCHEDULE 40 PVC CONDUIT	34	LF		
22	7141112	15" RC PIPE CUL-CLASS III	255	LF		
23	7141113	18" RC PIPE CUL-CLASS III	1019	LF		
24	7141114	24" RC PIPE CUL-CLASS III	220	LF		
25	7142533	24" R. C. PIPE CUL. FLARED END SECTN - CL 3	1	EA		
26	7192010	DROP INLET	11	EA		
27	7201505	PRECAST CONC.CURB STOP(6'LONG)	86	EA		
~~28~~	~~7202010~~	~~CONCRETE GUTTER~~	~~2260~~	~~LF~~		
29	7203110	CONCRETE CURB AND GUTTER(1'-6") VERTICAL FACE	90	LF		
30	7204100	CONCRETE SIDEWALK(4" UNIFORM)	10	SY		
31	7205000	CONCRET. DRIVE- 6" UNIFORM	50	SY		
32	8041020	RIP-RAP (CLASS A)	60	TN		
33	8048210	GEOTEX/EROS.CONT. (CLASS 2) TYPE C	100	SY		
34	8100100	PERMANENT COVER	0.4	AC		
35	8100200	TEMPORARY COVER	0.4	AC		
36	8104005	FERTILIZER (NITROGEN)	100	LB		
37	8104010	FERTILIZER (PHOSPHORIC ACID)	100	LB		
38	8104015	FERTILIZER (POTASH)	100	LB		
39	8105005	AGRICULTURAL GRANULAR LIME	1000	LB		
40	8110221	PINESTRAW MULCH, 3" DEPTH	2050	SY		
41	8111147	CRAPE MYRTLE- 5'-6' HEIGHT,	9	EA		
42	8111151	SOUTHERN MAGNOLIA- 7'-8' HEIGHT	7	EA		

Attachment 3

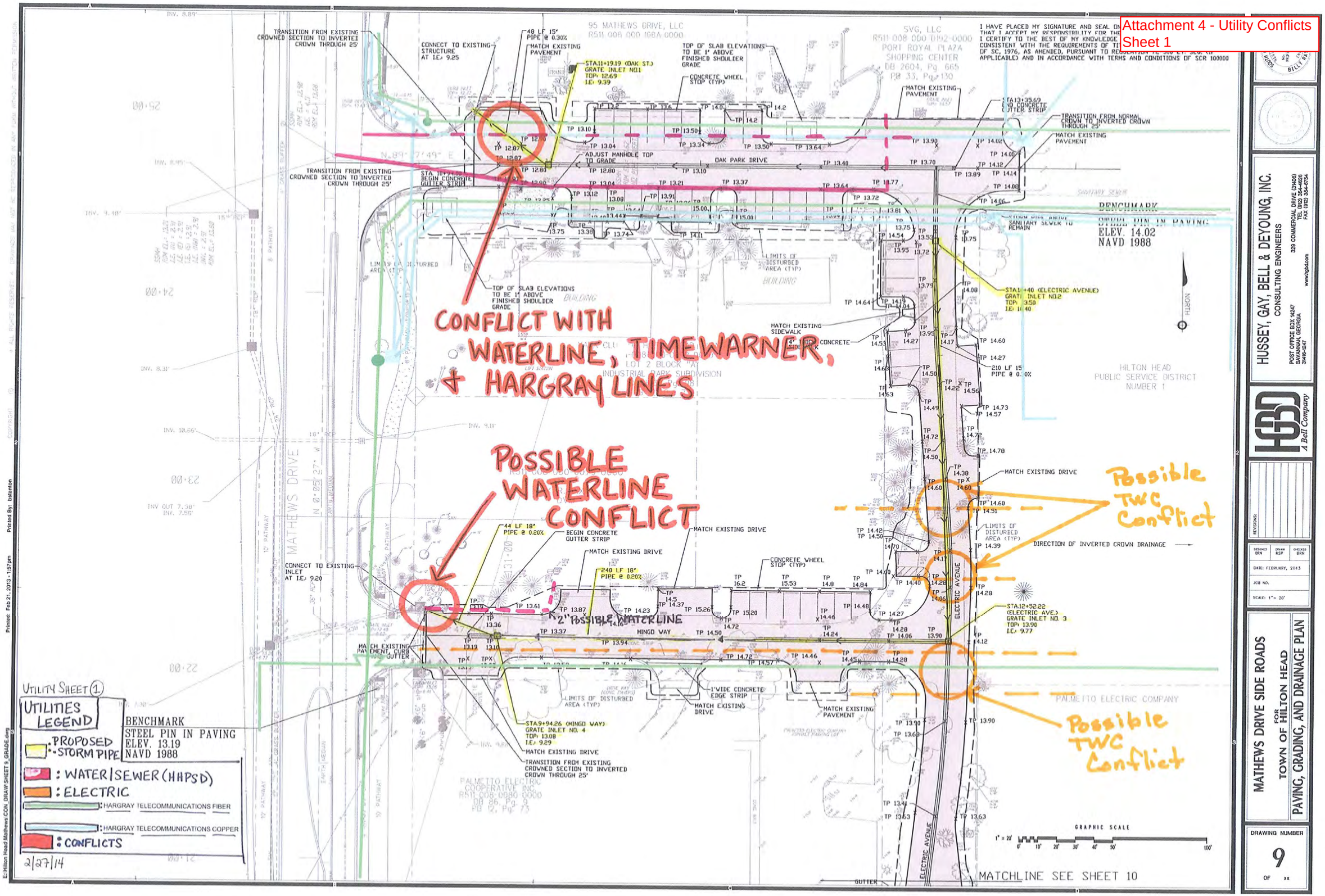
EXHIBIT C - BID SCHEDULE

March 3, 2014

The unit prices given on this document, along with negotiated changes in quantities, shall become the basis for, and included in , the contract agreement. Offerors are responsible for verifying all quantities and notifiying the Owner of any discrepencies greater then 10% of estimate, in writing, prior to the Bid opening.

Item No.	SCDOT Pay Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price
43	8111185	SABAL PAMETTO- 12'-15' HEIGHT	7	EA		
44	8111206	LIVE OAK- 8'-10' HEIGHT, 2.5"-3" CAL	8	EA		
45	8111306	PAMPUS GRASS 18"-24"HT,NO.3	4	EA		
46	8111357	PARSONS JUNIPER 12"-15" SPREAD	150	EA		
47	8111370	BIG BLUE LIRIOPE	94	EA		
48	8111376	WAX MYRTLE- 3'-4' HEIGHT	6	EA		
49	SP - 5	LOROPETALUM, 12-18" HEIGHT, 24" C-C Spread, 3 Gallon	355	EA		
50	8111445	MUHLY GRASS- 12" HEIGHT	700	SY		
51	8114010	TREE PROTECTION	1	LS		
52	8151201	HYDRAULIC EROSION CONTROL PRODUCT (HECP) TYPE 1	0.8	AC		
53	8152004	INLET STRUCTURE FILTER-TYPE F	10	EA		
54	8153000	SILT FENCE	3800	LF		
55	8154050	REMOVAL OF SILT RETAINED BY SILT FENCE	200	CY		
56	8156210	INLET STRUCTURE FILTER-TYPE B	10	EA		
57	8156490	STABILIZED CONSTR. ENTRANCE	500	SY		
58	SP-1	PERMEABLE INTERLOCKING CONCRETE PAVERS	3100	SF		
59	SP-2	SPECIAL CONTRACT BID ITEM-10'X16' CONCRETE PAD WITH 2 BIKE RACKS	2	EA		
60	SP-3	SPECIAL CONTRACT BID ITEM-10'X16' CONCRETE PAD WITH SINGLE BIKE RACK	2	EA		
61	SP-4	HAND WATER ALL LANDSCAPING, 3 DAYS / WEEK FOR 2 MONTHS	1	LS		
Relocation of 6" Water Lines at 2 Potential Sites						
62		6" C900 DR 18 PIPE BLUE	80	LF		
63		6" 45-DEGREE BENDS	8	EA		
64		6" PVC SLEEVES	4	EA		
65		MEGALUGS WITH GASKETS, BOLTS & NUTS	24	EA		
66		BELL HARNESS (PIPE RESTRAINTS)	8	EA		
Relocation of 16" Water Lines at 1 Potential Sites						
62		16" C900 DR 18 PIPE BLUE	40	LF		
63		16" 45-DEGREE BENDS	4	EA		
64		16" PVC SLEEVES	2	EA		
65		Megalugs with gaskets, bolts & nuts	12	EA		
66		Bell Harness (Pipe Restraints)	4	EA		
		Total Price Number 1 - without Concrete Gutter Strip =				
Bid Alternate 1	7202010	CONCRETE GUTTER	2260	LF		
		Total Price Number 2 - without Concrete Gutter Strip =				

Attachment 4 - Utility Conflicts Sheet 1



HUSSEY, GAY, BELL & DEYOUNG, INC.
CONSULTING ENGINEERS
POST OFFICE BOX 14247 SAVANNAH, GEORGIA 31416-0247
329 COMMERCIAL DRIVE (31406) TEL (912) 354-4626 FAX (912) 354-0754
www.hgbd.com

HGBD A Bell Company

REVISIONS:

DESIGNED BRN | DRAWN RSP | CHECKED BRN

DATE: FEBRUARY, 2013

JOB NO.

SCALE: 1" = 20'

MATHEWS DRIVE SIDE ROADS
FOR
TOWN OF HILTON HEAD
PAVING, GRADING, AND DRAINAGE PLAN

DRAWING NUMBER
9
OF xx

Printed: Feb 21, 2013 - 1:57pm Printed By: bstanton

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Attachment 4 - Utility Conflicts Sheet 2

MATCHLINE SEE SHEET 9

I HAVE PLACED MY SIGNATURE AND SEAL ON THIS DOCUMENT TO INDICATE THAT I ACCEPT MY RESPONSIBILITY FOR THE DESIGN. I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THE DESIGN IS CONSISTENT WITH THE REQUIREMENTS OF TITLE 45 CHAPTER 14 OR THE CODE OF SC, 1976, AS AMENDED, PURSUANT TO REGULATION 72-300 ET. SEQ. (IF APPLICABLE) AND IN ACCORDANCE WITH TERMS AND CONDITIONS OF SCR 100000.

BENCHMARK
NAIL FND IN 36"OAK
ELEV.=13.88
(EL. BY OTHERS=15.00)

BENCHMARK
STEEL PIN IN PAVING
ELEV. 13.20
NAVD 1988

PALMETTO ELECTRIC CORP. INC
PO BOX 820
RIDGELAND, SC 29936

MID ISLAND PLAZA LLC
R511-008-0083-0000
DB 1592 Pg. 704
PB 12, Pg. 73

OUR FATHER'S BUSINESS, LLC
R511-008-0608-0000
DB 3009, Pg. 711

INDUSTRIAL PARK SUBDIVISION
PB 12, Pg. 23

COOPERATIVE WAY
THOMPSON STREET
ELECTRIC AVENUE
MATHEWS DRIVE
SHRIMPs LANE

UNDERGROUND ELECTRIC LINES
FIRE HYDRANT
6" WATERLINE
CONCRETE WHEEL STOP (TYP)
LIMITS OF DISTURBED AREA (TYP)
MATCH EXISTING PAVEMENT
MATCH EXISTING GUTTER
BEGIN CONCRETE GUTTER STRIP
TRANSITION FROM NORMAL CROWN TO INVERTED CROWN THROUGH 20'
STA. 12+73.42 (COOPERATIVE WAY) GRATE INLET NO. 5 TOP: 11.45 I.E.: 8.34
STA. 15+66.56 GRATE INLET NO. 6 TOP: 11.50 I.E.: 8.05
STA 12+19.33 THOMPSON STREET GRATE INLET NO. 7 TOP: 11.45 I.E.: 7.36
15 LF 18" RCP
72 LF 18" PIPE @ 0.40%
174 LF 18" PIPE @ 0.40%
142 LF 18" PIPE @ 0.40%

MOVE GRATE INLET No.5 TO STA. 12+63' (COOPERATIVE WAY) TO AVOID ELECTRIC LINE
ADD GRATE INLET No.5.5 TO STA. 15+07 (ELECTRIC AVE)

Possible TWC Conflict

UNDERGROUND ELECTRICAL LINE

POSSIBLE WATERLINE CONFLICT

POSSIBLE ELECTRICAL LINE CONFLICT

POSSIBLE HARGRAY CONFLICT

ADJUST PAVEMENT TO MATCH GRINDER STATION TOP. WHEEL STOP SHALL NOT BE ON GRINDER STATION.

TOP OF SLAB ELEVATIONS TO BE 1' ABOVE FINISHED SHOULDER GRADE
PAVE NEW VOID. MATCH EXISTING PAVEMENT
MATCH NEW GUTTER TO EXISTING PAVEMENT
MATCH EXISTING CURB AND GUTTER
TRANSITION TO INVERTED CROWN SECTION THROUGH 30'
BEGIN CONCRETE GUTTER STRIP

UTILITY SHEET 2

UTILITIES LEGEND
- : PROPOSED STORM PIPE
- : WATER/SEWER
- : ELECTRIC
- : HARGRAY TELE-COMMUNICATIONS
- : CONFLICT

PALMETTO ELECTRIC COMPANY

MATCHLINE SEE SHEET 11

GRAPHIC SCALE 1" = 20'

HUSSEY, GAY, BELL & DEYOUNG, INC.
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www.hgbpd.com
HGBD A Bell Company

REVISIONS:

DESIGNED BRN | DRAWN RSP | CHECKED BRN
DATE: FEBRUARY, 2013
JOB NO.
SCALE: 1" = 20'

MATHEWS DRIVE SIDE ROADS
FOR TOWN OF HILTON HEAD
PAVING, GRADING, AND DRAINAGE PLAN

DRAWING NUMBER 10 OF xx

2/27/14

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Printed: Feb 21, 2013 - 1:58pm Printed By: bstanton

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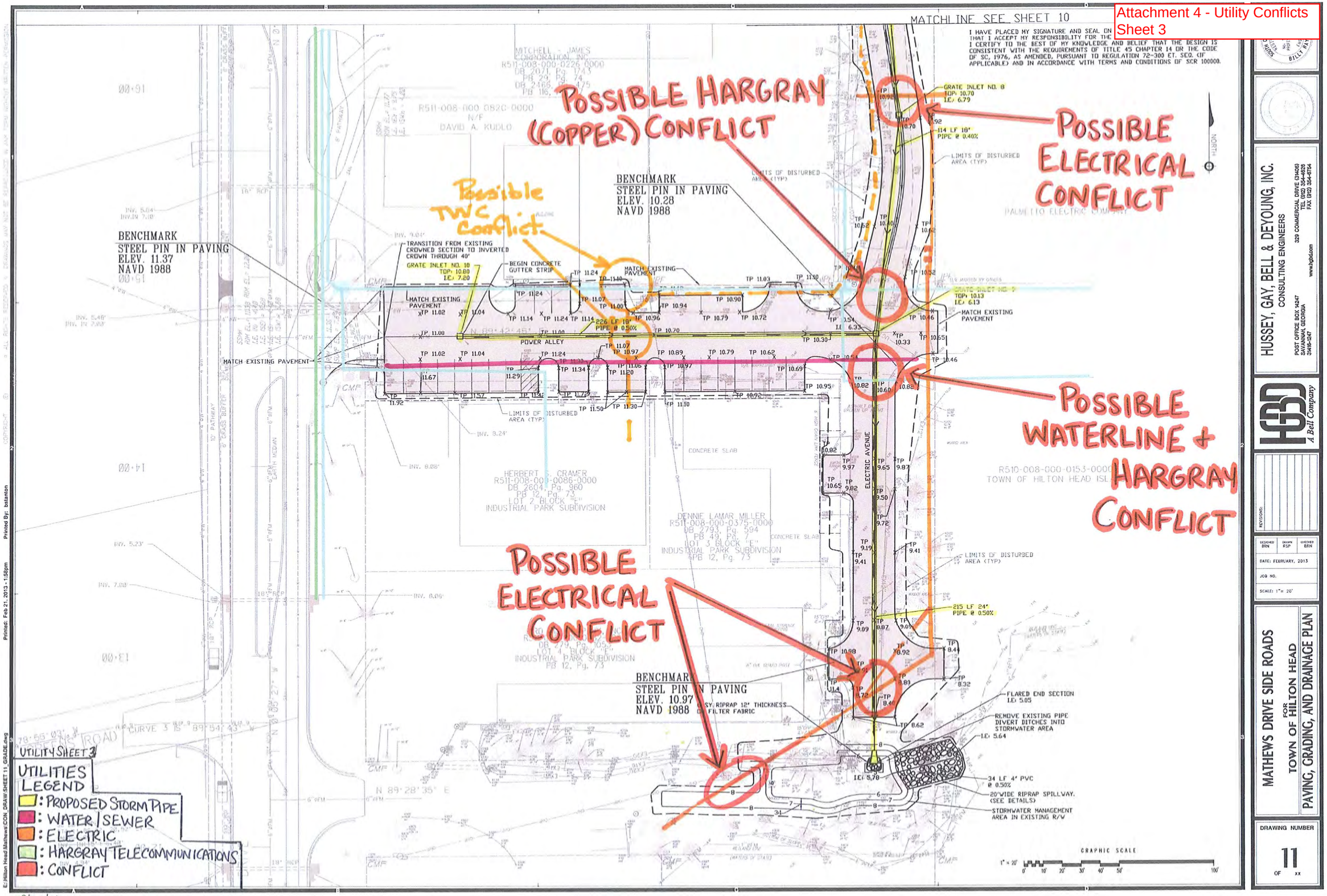
Attachment 4 - Utility Conflicts
Sheet 3



2/27/14

SPECIAL PROVISION 1
EXCAVATION, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Contractor shall furnish all labor, equipment, and material necessary to provide Excavation, Backfilling, and Compacting for Utilities as shown on the drawings and described in the specifications.

1.2 DEFINITIONS

1.2.1 Backfill

Material used in refilling a cut, trench or other excavation.

1.2.2 Cohesive Materials

Soils classified by ASTM D 2487 as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when fines have a plasticity index greater than zero.

1.2.3 Cohesionless Materials

Soils classified by ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.2.4 Compaction

The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 698 or ASTM D 1557 for general soil types.

1.2.5 Granular Pipe Bedding

A dense, well-graded aggregate mixture of sand, gravel, or crushed stone (mixed individually, in combination with each other, or with suitable binder soil) placed on a subgrade to provide a suitable foundation for pipe. Granular bedding material may also consist of poorly graded sands or gravels where fast draining soil characteristics are desired.

1.2.6 Hard Material

Weathered rock, dense consolidated deposits, or conglomerate materials (excluding man made materials such as concrete) which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.7 In-Situ Soil

Existing in place soil.

1.2.8 Lift

A layer (or course) of soil placed on top of subgrade or a previously prepared or placed soil in a fill or backfill.

1.2.9 Porous Fill

A granular soil material having a large void ratio when placed and compacted, allowing a free flow of fluid to or from the surrounding soil, with no more than 5 percent of the material passing the No. 100 Sieve.

1.2.10 Refill

Material placed in excavation to correct overcut in depth.

1.2.11 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.12 Topsoil

In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material.

1.2.13 Unyielding Material

Rock rib, ridge, rock protrusion, or soil with cobbles in the trench bottom requiring a covering of finer grain material or special bedding to avoid bridging in the pipe or conduit.

1.2.14 Unsatisfactory Material

In-Situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in the trench without excessive consolidation or loss of stability. Also backfill material which contains refuse, frozen material, large rocks, debris, soluble particles, and other material which could damage the pipe or cause the backfill not to compact. Materials classified as PT, OH, or OL by ASTM D 2487 are unsatisfactory.

1.2.15 Unstable Material

Material in the trench bottom which lacks firmness to maintain alignment and prevent joints from separating in the pipe, conduit, or appurtenance structure during backfilling. This may be material otherwise identified as satisfactory which has been disturbed or saturated.

1.3 SUBMITTALS

Submit the following in accordance with “SPECIAL CONDITION 37 - SUBMITTALS."

1.3.1 SD-08 Statements

a. Shoring and sheeting plan

b. Dewatering plan

1.3.1.1 Shoring and Sheeting Plan

Describe materials of shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a Professional Engineer registered in South Carolina. Indicate sequence and method of installation and removal.

1.3.1.2 Dewatering Plan

Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area.

1.3.2 SD-11 Factory Test Reports

a. Concrete tests

1.3.3 SD-12 Field Test Reports

a. Test for moisture-density relation

b. Density and moisture tests Submit field test data not listed above sufficiently in advance of construction so as not to delay work.

1.3.3.1 Test for Moisture-Density Relation

Submit 7 days prior to commencing utility excavation.

1.3.3.2 Density and Moisture Tests

Submit within 14 days of test date.

1.4 REGULATORY REQUIREMENTS

Materials and workmanship specified herein with reference to SCDOT Standard Specifications shall be in accordance with the referenced articles, sections, and paragraphs of the standard except that contractual and payment provisions do not apply.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage. Store synthetic fiber filter fabric to prevent exposure to direct sunlight.

1.6 PROTECTION

1.6.1 Dewatering Plan Base on site conditions available soil and hydrological data.

1.6.2 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Report damage to utility lines or subsurface construction immediately to the Town.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

Provide soil materials as specified below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, ice, or other deleterious and objectionable materials.

2.1.1 Backfill

Bring trenches to grade indicated on the drawings using material excavated on the site of this project. This material will be considered unclassified and no testing other than for compaction will be required before use as backfill.

2.1.2 Special Backfill for Structures and Pavements

Backfill trenches under roads, structures, and paved areas shall be as specified in SCDOT Standard Specifications.

2.1.3 Sand

Clean, coarse-grained sand as classified by SCDOT Standard Specifications.

2.1.4 Gravel

Clean, coarsely graded natural gravel, crushed stone or a combination thereof as defined at #57 by the SCDOT Standard Specifications.

2.1.5 Backfill for Underdrainage Systems

Clean sand, crushed rock, or gravel meeting the following requirements:

a. Perforated or Slotted-Wall Pipe: Backfill meeting requirements of Type I material as specified in Table 1.

b. Any Type Drain Used With Filter Fabric: Clean gravel or crushed stone or gravel conforming to ASTM C 33 coarse aggregate grading size 57, or 67.

TABLE 1

Type 1
Gradation E 11
ASTM C 33

ASTM D 422

Sieve Size	Percent Passing
1.5 Inches	--
1 inch	--

3/8 inch	100
No. 4	95-100
No. 8	--
No. 16	45-80
No. 50	10-30
No. 100	0-10

2.1.6 Porous Fill for Sewage Absorption Trenches or Pits

Backfill material consisting of clean crushed rock or gravel having a gradation such that 100 percent passes the 2-inch sieve and zero percent passes the 1/2-inch sieve.

2.1.7 Topsoil Material

Salvaged topsoil from site and/or stockpile. Furnish additional topsoil from approved sources off the site if stockpiled material is insufficient to complete work indicated.

2.1.8 Borrow

Provide materials meeting requirement for porous fill, pipe bedding, special backfill, sand, gravel, and topsoil. Obtain borrow materials in excess of those furnished from excavations specified herein from other sources.

2.1.9 Pipe Bedding

TABLE 02302-1 UTILITY EARTHWORK REFERENCES

PIPE MATERIAL	SOIL MATERIALS REFERENCE	INSTALLATION REF
a. Ductile Iron and Ductile Iron Pressure Pipe	AWWA C600, except refill of overcut shall be gravel, bedding shall be GW GP SW SP.	AWWA C600
b. Electrical Plastic Tubing and Conduit	NEMA TC 2 NFPA 30 NFPA 70	Section 16302
c. Concrete Encased Electrical Plastic Tubing (EPT) and Conduit	NEMA TC 2 3000 psi, Concrete, one inch max aggregate size	Section 16302
d. Concrete Gravity, Sewer,	ACPA 01-103 ASTM C 76	

	Culvert	(Reinforced)	
e.	Corrugated Aluminum and Corrugated Steel Pipe	AASHTO HB14 Division II, Section 23, except bedding shall be GW GP SW SP.	AASHTO HB14
f.	Metallic Water Service Line Pipe (Steel, Copper Tube, Brass)	AWWA C600	Same
g.	Polyethylene (PE) Pressure Pipe	ASTM D 2774, except bedding shall be GW GP SW SP and all material surrounding the pipe shall have maximum particle size of 1/2 inch.	ASTM D 2774
h.	Polyvinyl (PVC) Nonpressure Pipe	ASTM D 2321, except Haunching to springline shall be Class I, gravel	ASTM D 2321 Chloride AWWA M23
i.	Polyvinyl Chloride (PVC) Pressure Pipe	ASTM D 2774, except bedding shall be GW GP SW SP and all material surrounding pipe shall have maximum particle size of 1/2 inch.	ASTM D 2774
j.	PVC and ABS Plastic Utilities Duct	NEMA TC 6 NFPA 30 NFPA 70	Section 16302

Provide material for pipe bedding as indicated.

2.2 CONCRETE PIPE CRADLES OR ARCHES

Concrete pipe cradles where indicated conforming to lines and dimensions indicated. Construct cradles in accordance with SCDOT Standard Specifications.

2.3 FILTER FABRIC

Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments woven, spun

bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D 4759:

	Class A	Class B
a. Grab tensile strength (ASTM D 4632) machine and transversed direction	min. 180	80 lbs.
b. Grab elongation (ASTM D 4632) machine and transverse direction	min. 15	15 percent
c. Puncture resistance (ASTM D 4833)	min. 80	25 lbs.
d. Mullen burst strength (ASTM D 3786)	min. 290	130 psi.
e. Trapezoidal Tear (ASTM D 4533)	min. 50	25 lbs.
f. Permeability (ASTM D 4491)	k fabric greater than k Soil	
g. Ultraviolet Degradation (ASTM D 4355)	70 percent Strength retained at 150 hours	

2.4 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning detectable tape manufactured specifically for warning and identification of buried utility lines. Provide detectable tape on rolls, 12 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Yellow: Electric

Orange: Telephone and Other Communications

Blue: Water Systems

Green: Sewer Systems

Gray: Compressed Air

2.4.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum

strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.4.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.5 MATERIAL FOR PIPE CASING

2.5.1 Casing Pipe

ASTM A 139, Grade B, or ASTM A 252, Grade 2, smooth wall pipe. Casing size shall be of the outside diameter and wall thickness as indicated. Protective coating is not required on casing pipe.

2.5.2 Pipe Supports

Shall be fabricated on non-corrosive products, adjustable to fit pipe and casing.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring bracing cribbing trench boxes and sheeting where indicated or as required for installation. Protection shall be at a minimum:

a. Prevent undermining of pavements, foundations and slabs.

b. Prevent slippage or movement in banks or slopes adjacent to the excavation.

c. Allow for the abandonment of shoring and sheeting materials in place in critical areas as the work is completed. In these areas, backfill the excavation to within 3 feet of the finished grade and remove the remaining exposed portion of the shoring before completing the backfill.

Any shoring required shall be included by the contractor in their bid.

3.1.2 Drainage and Dewatering

Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction.

3.1.2.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and

effectively drained.

3.1.3 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material.

3.1.4 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the construction site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

3.1.5 Structures and Surfaces

Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Protect existing streams, ditches, and storm drain inlets from water-borne soil by means of filter fabric dams as indicated on the contract drawings. Perform work in accordance with requirements specified in SCDOT Standard Specifications.

3.1.5.1 Disposal of Excavated Material

Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.

3.1.6 Channels and Ditches

Construct (rip-rap) rock protection in areas indicated to the lines and thicknesses indicated to dissipate stream energy and prevent channel erosion. Place rip-rap on a layer of filter fabric.

3.2 PIPELINE CASING UNDER PAVEMENT

Provide new smooth wall steel pipeline casing under pavement by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated. Contractor must have a minimum of five (5) years experience with installation of pipeline casing by the auger boring method described below. In lieu of five (5) years experience, the contractor may provide a cash bond, equivalent to the value of the installed work, with the duration equal to the number of years experience that are less than five (5) years.

3.2.1 Large Diameter Auger Bore Method

The proposed boring operation shall be conducted by using a Large Diameter Boring Attachment (LDBA). The LDBA shall be constructed by jacking a steel casing through the earth, using Auger Boring techniques. Auger Boring involves a simple, cyclical procedure of utilizing the thrust power of hydraulic jacks to force the pipe forward. The face is excavated simultaneously with the boring operation. The spoil is removed

through the inside of the pipe to the jacking pit.

The LDBA is a full-face machine with a rotating cutting head for excavating the soil. It has an articulated section with hydraulic rams to make corrections to the line and grade. The cutting head is driven by electric or hydraulic motors. The cutting head rotates and excavates the soil, which travels inside the pipe through the openings in the cutting head. An auger system is used to carry the spoil to the bore pit. The auger boring machine provides the jacking force to thrust the LDBA forward while it excavates. The auger boring machine is also used to power the augers that are used to convey the spoils to the bore pit.

An electric generator shall be used to power up the LDBA and to provide the lighting inside. The generator is normally located at the ground elevation with the cables going through the steel casing all the way to the LDBA. There shall be a communication system between the operator of the LDBA and the operator of the auger boring machine. The communication system is necessary since the operator of the LDBA is at the face of the machine watching the excavation and simultaneously directing the operator of the auger boring machine on the rate of advancement. At the same time, when the auger boring machine operator is retracting the jacks and the machine is not excavating, he directs the LDBA operator to stop the cutting head. Thus, the operators of the LDBA and the auger boring machine must work together to get desirable results.

In addition, there is a bentonite mixing system at the ground surface. This consists of a tank with a mixing device to mix water and bentonite to the required consistency and a pump that will provide the necessary pumping power to pump bentonite in the space between the steel casing and the surrounding soil. On the casing pipe, there are bentonite ports at every 20-feet. The ports are located at 10 o'clock, 12 o'clock, and 2 o'clock. The bentonite is pumped through these ports. The function of bentonite is two-fold. One, it fills the void between the steel casing and the surrounding soil and prevents the soil from caving in on to the pipe and secondly, it reduces the friction between the steel casing pipe and the surrounding soil to minimize the jacking force required to propel the pipe through the ground.

During the boring, the line and grade is monitored by a laser beam. The laser is set up in the back of the jacking pit. The beam travels above the boring machine and below the top of the pipe and through the pipe to a target that is set up near the front of the machine. Care is taken to ensure that the laser is set up such that it is independent of the concrete backstop. This ensures that if the concrete backstop moves due to the jacking forces exerted on it, the laser reference remains unaffected. Also, the laser is checked every time a new casing is added to ensure that the reference is correct and it is aligned to the proper line and grade.

The boring pit size is a function of the pipe diameter, length of pipe segments, dimensions of the LDBA, size of the auger boring machine, and the thrust wall dimensions. A concrete slab will be poured to the same grade as the pipe being installed. The thrust block or the concrete backstop and the concrete slab are poured as an integral unit to take advantage of the entire mass of concrete. The concrete backstop is poured perpendicular to the line above the bore otherwise it may lead to uneven distribution of thrusting loads on the steel casing resulting in difficulties in maintaining proper line and grade. The boring pit shall be size appropriated for the bore and the sides appropriately sloped to the ground elevation. The centerline of the bore is offset about 4-feet to the right while facing the direction of the progress. This allows room for the spoil that is generated during the excavation process.

Once the concrete base slab and the concrete backstop are installed, the tracks for the auger boring machine are placed on the concrete slab in line with the proposed line and grade. The boring machine is then set on the tracks along with the adapter saddles for the LDBA. The LDBA is then set on the saddles and hooked up to the auger boring machine. All electrical and communications are hooked up and tested. The guide laser is then set up independent of the backstop. The line and grade of the LDBA are verified one more time prior to starting the boring operation and necessary adjustments are made to ensure the correct alignment. Bars are welded on both sides to prevent the LDBA from rotating during the boring operation.

"Collaring" is the first operation in beginning a bore with an LDBA. The objective is to start the LDBA into the ground without lifting the casing out of the saddle. This is done by rotating the cutting head at low RPM's and using a slow thrust advance. When about 4 to 6 feet of casing has entered the ground, the saddle is removed. Then the rest of the casing is installed while closely monitoring the line and grade.

After the first section is installed, the LDBA is shut down and all electric and communications cables are disconnected. The auger boring machine is moved to the rear of the tracks and is shut down. The next section of the casing is prepared and is lowered into position. The augers are aligned and then the casings are aligned. Then the casings are pushed together and the large casing is welded. The auger boring machine is attached and all the electric and communication cables are hooked up. The bentonite lines are also hooked up this time to lubricate while the casing is being pushed through the ground. The machines are then started and the casing installed. The process is repeated until the entire bore is completed and the LDBA comes out in the receiving pit.

All lines that are hooked up to the LDBA are then disconnected and pulled out through the casing and the LDBA is detached from the casing being installed and taken out of the receiving pit. The bands attaching the small diameter casing to the bottom of the large diameter casing are cut and pulled out. Cement grout is pumped in the space between the casing and the surrounding soil to displace the bentonite slurry and lock the casing in place.

The Contractor shall provide a boring plan complete with equipment cut sheets, methodology, pit sizes, length and elevation of bore, casing pipe dimensions, etc., to the Town.

3.2.2 Earthwork for Pipeline Casings

Provide excavation, sheet piling, shoring, dewatering, and backfilling for pipeline casings under this section.

3.3 SURFACE PREPARATION

3.3.1 Stockpiling Topsoil

Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling. Locate topsoil so that the material can be used readily for the finished grading. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil. Protect topsoil and keep in segregated piles until needed.

3.3.2 Cutting Pavement, Curbs, and Gutters

Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. When the saw cut is within 8 feet of an existing joint, remove pavement to the existing joint.

3.4 GENERAL EXCAVATION AND TRENCHING

Keep excavations free from water while construction is in progress. Notify the Town immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe. Overexcavate soft, weak, or wet excavations as indicated. Use bedding material placed in 6-inch maximum layers to refill overdepths to the proper grade. At the Contractor's option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified. Grade bottom of trenches accurately to provide uniform

bearing and support for each section of pipe on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as required.

3.4.1 Shoring and Sheeting

Shore and sheet excavations as described in the plan submitted with various member sizes arranged to prevent injury to persons and damage to structures. Arrange shoring and sheeting to preclude injurious caving during removal. Obtain approval from the Engineer prior to removing shoring, sheeting, or bracing in excavations adjacent to on-grade slabs, foundations, or other structural elements.

3.5 BEDDING

Use materials and depths as required for utility lines and utility line structures. Place bedding in 6inch maximum loose lifts. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.

3.5.1 Concrete Cradles

Specified in lieu of other types of bedding for a particular type of pipe material, shall be as indicated.

3.6 BURIED WARNING AND IDENTIFICATION TAPE

Install tape in accordance with manufacturer's recommendations except as modified herein. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.7 BURIED DETECTION WIRE

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. The wire shall extend continuously and unbroken. The wire shall remain insulated over its entire length. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe. Use #10 AWG solid copper polyethylene coated wire, green in color, and appropriate waterproof connectors placed 6 inches above the top of the pipe. Protect wire in rock cut areas. Waterproof connectors must be approved prior to use.

3.8 BACKFILLING

Construct backfill in two operations (initial and final) as indicated and specified in this section. Place initial backfill in 6-inch maximum loose lifts to one foot above pipe unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe structure. Ensure that no damage is done to the utility or its protective coating. Place the remainder of the backfill (final backfill) in 9-inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "General Compaction" before placing the next lift. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized. Provide a minimum cover from final grade of 3' 0" for water piping storm drains and 2' 6" for sewer mains. Increase where this minimum cannot be maintained. The Contractor shall use ductile iron pipe. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of utilities. Testing for the following shall be complete before final backfilling: water distribution storm drainage sanitary sewer systems. Provide buried warning and identification tape installed in accordance with the manufacturer's recommendation.

3.9 COMPACTION

Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

3.9.1 Compaction of Material in Subcuts or Overexcavations

In rock, compact to 95 percent of ASTM D 1557 maximum density. In soft, weak, or wet soils, tamp refill material to consolidate to density of adjacent material in trench wall. In stable soils, compact to 95 percent of ASTM D 1557 maximum density.

3.9.2 Compaction of Pipe and Conduit Bedding

In rock, compact to 95 percent and in soil, compact to 95 percent of ASTM D 1557 maximum density.

3.9.3 Compaction of Backfill

Compact initial backfill material surrounding pipes, cables, conduits, or ducts, to 95 percent of ASTM D 698 maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same material, compact initial backfill to the density of the bedding. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 90 percent of ASTM D 698 maximum density. For utilities under structures and pavements compact succeeding layers of final backfill as specified under SCDOT Standard Specifications.

3.10 SPECIAL EARTHWORK INSTALLATION REQUIREMENTS

3.10.1 Other Appurtenances

Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove rock as specified herein. Remove unstable soil that is incapable of supporting the structure to an overdepth of one foot and refill with gravel to the proper elevation. Refill overdepths with gravel to the required grade and compact as specified.

3.10.2 Steel Cased Pipelines

Install pipeline casing by dry boring and jacking method as follows:

3.10.2.1 Hole for Pipeline Casing

Mechanically bore holes and case through the soil with a cutting head on a continuous auger mounted inside the casing pipe. Weld lengths of pipe together in accordance with AWS D1.1. Do not use water or other fluids in connection with the boring operation.

3.10.2.2 Cleaning

Clean inside of the pipeline casing of dirt, weld splatters, and other foreign matter which would interfere with insertion of the piped utilities by attaching a pipe cleaning plug to the boring rig and passing it through the pipe.

3.10.2.3 Piped Utilities

Provide in casing using mechanical supports (spiders) adjusted to obtained grades and elevations indicated.

3.10.2.4 End Seals

After installation of piped utilities in pipeline casing, provide watertight end seals at each end of pipeline casing between pipeline casing and piping utilities. Provide watertight end seals as indicated.

3.11 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in the areas indicated.

3.11.1 Preparation

Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.2 foot.

3.11.2 Bedding Placement

Spread filter fabric as required.

3.11.3 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.12 FINISH OPERATIONS

3.12.1 Grading

Finish to grades indicated within one-tenth of a foot. Provide sod or topsoil in areas to be seeded or sodded as indicated. Grade areas to drain water away from structures and to provide suitable surfaces for mowing machines. Grade existing grades that are to remain but have been disturbed by the Contractor's operations.

3.12.2 Spreading Topsoil

Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading.

3.12.3 Borrow Area

Grade to drain properly. Maintain and restore borrow pits as specified by SCDOT Standard Specifications.

3.12.4 Disposition of Surplus Material

Surplus or other soil material not required or suitable for filling, backfilling, or grading shall be wasted by disposition in the area indicated. Comply with requirements of SCDOT Standard Specifications. 3.12.5

Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes. Comply with requirements of SCDOT Standard Specifications.

3.12.6 Pavement Repair

Repair pavement, curbs, and gutters as indicated. Do not repair pavement until trench or pit has been backfilled and compacted as specified herein. Provide a temporary road surface of crushed stone over backfilled portion until permanent pavement is repaired. Remove and dispose of temporary road surface material when permanent pavement is placed. As a minimum, maintain one-way traffic on roads and streets crossed by trenches.

3.13 FIELD QUALITY CONTROL

Test gravel bedding for conformance to specified requirements. Test bedding and backfill for moisture-density relations in accordance with ASTM D 698 as specified herein. Perform at least one of each of the required tests for each material provided. Perform sufficiently in advance of construction so as not to delay work. Provide additional tests as specified above for each change of source. Perform density and moisture tests in randomly selected locations and in accordance with ASTM D 1556 as follows:

a. Bedding and backfill in trenches: One test per 200 linear feet in each lift.

b. Appurtenance structures: One test per 300 square feet or fraction thereof in each lift.

END OF SECTION