

RICHARDSON SMITH GARDNER & ASSOCIATES

Engineering and Geological Services

April 3, 2009

Ms. Donna Wilson
NC DENR - Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, NC 27605

**RE: Johnston County Landfill (Permit No. 51-03)
Permit Modification Request
Miscellaneous Site Improvements**

APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
 DATE 9-28-09 BY A. Wilson
 DATE _____
 PTO 51-03
Attach 1, Part II,
Doc 22
 DOC ID 8483
 DOC ID 8551



Dear Donna:

On behalf of Johnston County, Richardson Smith Gardner & Associates, Inc. (RSG) is submitting this permit modification request for the installation of site improvements at the County's landfill facility. Specifically, the planned site improvements involve surface and subsurface drainage measures around the Phases 4, 4A, and 5 MSW landfill units.

Planned Modifications

As shown in the **attached** drawings, the planned surface drainage measures around Phase 5 (reference **Drawing S3**) are basically maintenance items and don't specifically require separate approval. Subsurface drainage measures are planned on the north end of Phases 4 and 4A (including Sediment Basin 5A) (reference **Drawing S2**) and the east slope of Phase 5 (reference **Drawing S3**) to collect intermittent seeps observed.

For the lined Phases 4A and 5 landfill units, the planned subsurface drainage measures involve placing a network of french drains (referred to as "seep collection trenches") where shown on the drawings to intercept observed seepage. Each drainage network will be connected to the respective leachate collection system for each landfill unit.

For the northern slope of the unlined Phase 4 landfill unit, a similar french drain network to those for Phases 4A and 5 is planned. However, because this unit is unlined, the flow will require collection at a pump station and pumping into an existing leachate force main. For Sediment Basin 5A, located below the Phase 3, 4, and 4A landfill units, a drain system (referred to as "seep collection drains") is proposed around the upper portion of the basin to intercept intermittent seepage that has been observed close to the toe of the slope during wet periods. This drain system will also require collection at a pump station.

The planned pump station to collect flow from both the Phase 4 slope area and Sediment Basin 5A, is located as shown on **Drawing S3**. The 6" gravity line from Sediment Basin 5A will follow the toe of the slope below the access road. Along the alignment of this gravity line is a intermittent wet-weather spring (called a seep on the drawings). The County is currently evaluating whether this spring is impacted from the Phase 4 landfill unit, which is immediately upslope. Provision is made as shown in the plans to collect flow from this spring in the gravity line should it be impacted.

The anticipated flow to the pump station is expected to be typically less than 10 gpm. The pump station will be a duplex (2 pumps) station with pumps capable of pumping approximately 30 to 60 gpm depending on other flow in the force main. This amount of flow will have a negligible impact on the



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Ms. Donna Wilson
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site's leachate management system, which can handle a peak flow of approximately 400 gpm, well in excess of maximum combined flows from all landfill units.

Technical specifications for the project are also **attached**.

Schedule

Due to the remedial element involved with the planned measures, the County is proceeding with the bidding and construction of this project (planned bid date is April 17th). We estimate that construction can begin by mid-May and all elements should be complete within about 90 days thereafter.

Should you have any questions or comments on this submittal or require further information, please contact me as soon as possible.

Sincerely,
Richardson Smith Gardner & Associates, Inc.



Pieter K. Scheer, P.E.
Project Manager



Attachment: Miscellaneous Site Improvements - Technical Specifications
Miscellaneous Site Improvements - Drawings

cc: Tim Broome, P.E., Johnston County
Rick Proctor, Johnston County
Joan Smyth, P.G., RSG

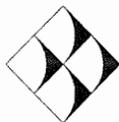
Specifications

Johnston County Landfill Miscellaneous Site Improvements

Prepared for:

Johnston County Department of Public Utilities
Smithfield, North Carolina

March 2009



RICHARDSON SMITH GARDNER & ASSOCIATES

Engineering and Geological Services

14 N. Boylan Avenue

Raleigh, North Carolina 27603

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**JOHNSTON COUNTY LANDFILL
MISCELLANEOUS SITE IMPROVEMENTS**

SPECIFICATIONS

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02608	Precast Concrete Structures
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SECTION 02110

SITE PREPARATION

Site Preparation: Site Preparation includes clearing, grubbing, and stripping operations which precede the proposed construction.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete Site Preparation in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Excavation	02222
Embankment	02223

B. MATERIALS Not Used.

C. SUBMITTALS Not Used.

D. CONSTRUCTION

1. The Contractor shall box and protect all areas to be preserved including all leachate recirculation piping, valves, etc. and all leachate cleanouts.
2. The Contractor shall strip the site within areas designated by the Owner or Engineer, including removal of grass, bush, shrubs, and loose debris.
3. The Contractor shall remove all topsoil and/or wood chips/mulch from designated areas and stockpile nearby where directed by the Owner or Engineer for replacement over the landfill cover when the work in that area is complete.
4. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks, and other perishable materials to a depth of at least 6 inches below ground

surfaces. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

5. Disposal of Cleared and Grubbed Material:

All trees, stumps, roots, and bushes shall be disposed of at the Owner's yard/wood waste processing area. No fee will be charged by the Owner.

END OF SECTION

SECTION 02222

EXCAVATION

Excavation: Excavation includes excavating, sealing, hauling, scraping, undercutting, removal of accumulated surface water or ground water, stockpiling, and all necessary and incidental items as required for bringing the landfill and related structures to the specified lines and grades.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment required to complete Excavation of the project area in accordance with the Contract Drawings and these Specifications, except as noted below:

- a. Stripping of the site and removal of topsoil and/or wood chips/mulch is addressed in Section 02110, Site Preparation, of these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Site Preparation	02110
Embankment	02223
Erosion and Sedimentation Control	02270

3. Definitions:

- a. Excavation: shall consist of the removal and satisfactory disposal and/or stockpiling of materials located within the limits of construction including widening cuts and shaping of slopes necessary for the preparation of roadbeds, landfill slope areas, cutting of any ditches, channels, waterways, entrances, and other work incidental thereto.
- b. Borrow: shall consist of approved on-site material required for the construction of embankments/fills or for other portions of the work.
- c. Select Borrow: shall consist of approved off-site material required for the construction of embankments/fills, roadway subgrade, backfilling, or for

other portions of the work as shown on Contract Drawings or in these Specifications. The Contractor shall make his own arrangements for obtaining select borrow and pay all costs involved.

- d. Unsuitable Material: is any in-place or excavated material which contains undesirable materials, or is in a state which is not appropriate; in the opinion of the Engineer, for the intended use or support of planned structures, embankment, or excavation. This may include but not be limited to organic material, waste/refuse, soft, or wet material not meeting required specifications, etc.
- e. Unsuitable Materials Excavation (Overexcavation): shall consist of the removal and satisfactory disposal of all unsuitable material located within the limits of construction. Where excavation to the finished grade section shown results in a subgrade or slopes of unsuitable material, the Contractor shall overexcavate such material to below the grade shown on the Contract Drawings or as directed by the Engineer.

B. MATERIALS

Excavation shall include the removal of all soil, weathered rock, boulders, conduits, pipe, and all other obstacles encountered and shown on the Contract Drawings or specified herein.

C. SUBMITTALS Not Used.

D. CONSTRUCTION

- 1. The Contractor shall conduct Excavation activities in such a manner that erosion of disturbed areas and off site sedimentation is absolutely minimized as outlined in Section 02270, Erosion and Sedimentation Control, of these Specifications.
- 2. The Contractor shall excavate to the lines and grades shown on the Contract Drawings and stockpile all suitable excavated materials. As the excavation is made, the materials will be examined and identified to the Engineer.

The Contractor will perform all surveys necessary to establish and verify lines and grades for all Excavation, including pipe excavations, soil overexcavation, and anchor trenches.

3. Stockpiling:

The Contractor shall stockpile the materials in appropriate stockpiles as approved by the Engineer.

Stockpiles shall be properly sloped and the surfaces sealed by the Contractor at the end of each working day, or during the day in the event of heavy rain, to the satisfaction of the Engineer.

4. The Contractor shall protect all existing facilities and structures including, but not limited to, existing utilities, monitoring wells, signs, grade stakes, etc. during the grading and stockpiling operations.
5. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such sheeting, timbering, pumping, and drainage as may be required.
6. The Contractor shall be responsible for the control of surface and subsurface water when necessary.
7. Excavation slopes shall be flat enough to avoid sloughs and slides that will cause disturbance of the subgrade or damage of adjacent areas. Slides and overbreaks which occur due to negligence, carelessness, or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as directed by the Engineer at no additional cost to the Owner.
8. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded. All protruding roots and other vegetation shall be removed from slopes.
9. The bottom of all excavations for structures and pipes shall be examined by the Engineer for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer, additional Excavation is required due to the low bearing value of the subgrade material, or if the in-place materials are soft, yielding, pumping and wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted structural fill, or material directed by the Engineer. No payment will be made for subgrade disturbance caused by inadequate Dewatering or improper construction methods.
10. Any areas excavated below design subgrade elevations by the Contractor, unless directed by the Engineer, shall be brought back to design elevations at no cost to the Owner. The Contractor shall place and compact such material in accordance with Section 02223, Embankment, of these Specifications.
11. The Contractor shall dispose of excess or unsuitable excavation materials on-site at location(s) approved by the Owner.
12. The Contractor shall properly level-off bottoms of all excavations. Proof-rolling shall be conducted with appropriate equipment.

13. Upon reaching subgrade elevations shown in excavation areas, the Contractor shall scarify subgrade soils to a minimum depth of 6" and obtain the Engineer's approval of quality. If unsuitable materials are encountered at the subgrade elevation, perform additional excavations as approved by the Engineer to remove unsuitable materials.

14. Overexcavation and Backfill:

Where subgrade materials are determined to be unsuitable, such materials shall be removed by the Contractor to the lengths, widths and depths approved by the Engineer and backfilled with suitable material in accordance with Section 02223, Embankment, of these Specifications unless further excavation or earthwork is required. No additional payment will be made for such excavation and backfill 1 foot or less than the finished subgrade. Unsuitable material excavation greater than 1 foot beneath the finished subgrade shall be made on a unit price basis for excavation and backfill, only as approved by the Engineer prior to the work. Unit price for overexcavation and backfill greater than 1 foot in depth shall include disposal of unsuitable materials.

15. All cuts shall be brought to the grade and cross section shown on the Contract Drawings, or established by the Engineer, prior to final inspection.

16. The Contractor shall protect finished lines and grades of completed excavation against excessive erosion, damage from trafficking, or other causes and shall repair any damage at no additional cost to the Owner.

17. Trench Excavation:

a. All pipe Excavation and trenching shall be done in strict accordance with these Specifications, all applicable parts of the OSHA Regulations, 29 CFR 1926, Subpart P, and other applicable regulations. In the event of any conflicts in this information, safe working conditions as established by the appropriate OSHA guidelines shall govern.

b. The minimum trench widths shall be as indicated on the Contract Drawings. Enlargements of the trench shall be made as needed to give ample space for operations at pipe joints. The width of the trench shall be limited to the maximum dimensions shown on the Contract Drawings, except where a wider trench is needed for the installation of and work within sheeting and bracing.

c. Except where otherwise specified, excavation slopes shall be flat enough to avoid slides which will cause disturbance of the subgrade, damage to adjacent areas, or endanger the lives or safety of persons in the vicinity.

- d. Hand excavation shall be employed wherever, in the opinion of the Engineer, it is necessary for the protection of existing utilities, poles, trees, pavements, obstructions, or structures.
 - e. No greater length of trench in any location shall be left open, in advance of pipe laying, than shall be authorized or directed by the Engineer and, in general, such length shall be limited to approximately one hundred (100) feet.
 - f. Pipe Bedding: All pipe bedding shall be as shown on the Contract Drawings, unless otherwise specified herein.
18. Sheeting and Bracing:
- a. The Contractor shall furnish, place, and maintain such sheeting and bracing which may be required to support sides of Excavation or to protect pipes and structures from possible damage and to provide safe working conditions in accordance with current OSHA requirements. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the sole expense of the Contractor. The Contractor shall be responsible for the adequacy of all sheeting and bracing used and for all damage resulting from sheeting and bracing failure or from placing, maintaining, and removing it.
 - b. The Contractor shall exercise caution in the installation and removal of sheeting to insure that excessive or unusual loadings are not transmitted to any new or existing structure. The Contractor shall promptly repair at his expense any and all damage that can be reasonably attributed to sheeting installation or removal.
 - c. All sheeting and bracing shall be removed upon completion of the work.
19. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed at the Contractor's sole expense.
20. Exposed Waste:
- In accordance with State landfill regulations, any waste exposed as the result of the Contractor's activities must be covered at the end of the day with tarps or a minimum 6 inches of soil to prevent exposure to vectors.

END OF SECTION

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SECTION 02223

EMBANKMENT

Embankment: Embankment is the on-site compacted fill that provides the subgrade for some access roadways and structures and backfill around structures and piping.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete Embankment including borrowing, hauling, screening, discing, drying, compaction, control of surface and subsurface water, final grading, sealing, and all necessary and incidental items as detailed or required to complete the Embankment, all in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Excavation	02222
Erosion and Sedimentation Control	02270

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these Specifications.

ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³).
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
ASTM D 2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
ASTM D 2937	Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
ASTM D 6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. Definitions:

- a. Embankment: Shall include construction of all site earthwork including roadways, subgrade, perimeter berm embankments, including preparation of the areas upon which materials are to be placed. Embankment may also be referred to as structural and/or controlled fill. All Embankment materials may be either (off-site) Select Borrow or (on-site) Borrow unless otherwise noted on Contract Drawings or specified by the Engineer.
- b. Prepared Subgrade: The ground surface after clearing, grubbing, stripping, excavation, scarification, and/or compaction, and/or proof rolling to the satisfaction of the Engineer.
- c. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes. Well-graded does not define any numerical value that must be placed on the coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters. Well-graded is used to define a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.
- d. Unclassified Fill: The nature of materials to be used is not identified or described herein but must be approved by the Engineer prior to use.

B. MATERIALS

1. Embankment materials shall consist of clean well-graded natural soil classified as SW, SM, SM-SC, SC, ML, CL-ML, or CL (ASTM D 2488) containing no topsoil or other deleterious material. Other material classifications may be approved by the Engineer.
2. Stones or rock fragments shall not exceed one half the maximum lift thickness as compacted in any dimension. Isolated rocks shall be a maximum of 24-inches in any dimension.

C. SUBMITTALS Not Used.

D. CONSTRUCTION

1. The Contractor shall conduct Embankment activities in such a manner that erosion of disturbed areas and off-site sedimentation is absolutely minimized as outlined in Section 02270, Erosion and Sedimentation Control, of these Specifications.
2. All placement and compaction of Embankment shall be performed only when the Engineer is informed by the Contractor of intent to perform such work.
3. Embankment shall be placed and compacted to the lines and grades shown on the Contract Drawings. Placement of Embankment outside the construction limits shall occur only as directed and approved by the Engineer.

The Contractor will perform all surveys necessary to establish and verify lines and grades for all Embankment.

4. The Contractor shall protect all existing facilities including, but not limited to, utilities and monitoring wells.
5. Subgrade Preparation:
 - a. The Engineer shall inspect the exposed subgrade prior to placement of Embankment to assure that all rocks, topsoil, vegetation, roots, debris, or other deleterious materials have been removed.
 - b. Prior to placement of Embankment, the exposed subgrade shall be proofrolled using a static smooth-drum roller, loaded tandem axle dump truck, or other suitable equipment in the presence of the Engineer. Any soft or unsuitable materials revealed before or during the in-place compaction shall be removed as directed by the Engineer and replaced with suitable Embankment.

6. Surfaces on which Embankment is to be placed, shall be scarified or stepped in a manner which will permit bonding of the Embankment with the existing surface.
7. The Contractor shall be responsible for preparing the materials for the Embankment, including but not limited to, in-place drying or wetting of the soil necessary to achieve the compaction criteria of these Specifications.
8. The Contractor shall be responsible for the control of surface and subsurface water when necessary.
9. Embankment materials shall be placed in a manner permitting drainage and in continuous, approximately horizontal layers.
10. Compaction Requirements:
 - a. The Contractor shall compact Embankment in accordance with the requirements shown in Table 1 of this section. If Embankment does not meet the specified requirements, the Contractor shall rework the material, as may be necessary and continue compaction to achieve these requirements, or remove and replace the material to achieve the specified requirements, at Contractor's expense.
 - b. Each lift shall be compacted prior to placement of succeeding lifts. In confined areas, mechanical equipment, suitable for small areas and capable of achieving the density requirements, shall be required.
 - c. Lift compaction shall be performed with an appropriately heavy, properly ballasted, penetrating-foot or smooth-drum vibratory compactor depending on soil type. Compaction equipment shall be subject to approval by the Engineer.
11. Embankment that becomes excessively eroded, soft, or otherwise unsuitable shall be removed or repaired by the Contractor as directed by the Engineer, at no cost to the Owner.
12. The exposed surface of Embankment shall be rolled with a smooth-drum roller at the end of each work day to protect from adverse weather conditions.
13. Where Embankment is to be placed and compacted on slopes that are steeper than 3:1, the subgrade shall be benched to a minimum depth of 6 inches and the Embankment shall be placed in horizontal lifts.

14. Backfilling for Structures and Piping:

- a. All structures, including manholes and pipes shall be backfilled with Embankment as shown in the Contract Drawings and as described in these Specifications.
- b. Where sheeting is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when sheeting is removed. If significant volumes of soil cannot be prevented from clinging to the extracted sheets, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that sheeting will be driven in similar soil conditions or employ other appropriate means to prevent loss of support.
- c. When backfilling around structures, do not backfill until concrete has sufficiently cured (as determined by the Engineer) and is properly supported. Place backfill in a manner to avoid displacement or damage of structures.

TABLE 1: REQUIRED EMBANKMENT PROPERTIES

ITEM	Required % Standard Proctor (ASTM D698) ²	Required Moisture Content ³	Maximum Lift Thickness (Compacted) (inches)
Embankment	95	As Required for Compaction	8
Embankment Beneath Structures and Roads ¹	98		8
Backfill Around Structures	95		8
Backfill in Pipe Trenches	95		6
Unclassified Fill	N/A	N/A	N/A

Notes:

1. Embankment beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45° slope. Embankment beneath roads shall be considered to include all embankment placed within 2 vertical feet of the final wearing surface and shall also include shoulders.
2. Determine field density using ASTM D 6938, ASTM D 1556, ASTM D 2167, or ASTM D 2937.
3. Determine field moisture content using ASTM D 6938, ASTM D 2216, ASTM D 4643, or ASTM D 4959.
4. The Engineer may allow exceptions to the above criteria for areas outside of the containment area which are not subject to significant long-term loads.

END OF SECTION

SECTION 02240

GEOTEXTILES

Geotextiles: For the proposed construction, a Type GT-S (Separator/Filter) Geotextile is specified. The Type GT-S Geotextile will be placed in some erosion control and drainage applications.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of Geotextiles including all necessary and incidental items as detailed or required for the Contractor to complete the installation in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Erosion and Sedimentation Control	02270
Drainage Aggregate	02711

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO) are hereby made a part of these specifications.

ASTM D 3786	Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
ASTM D 4355	Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

ASTM D 4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
ASTM D 4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
ASTM D 5261	Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
AASHTO M 288	Standard Specification for Geotextiles.

B. MATERIALS

1. General:

The materials supplied under these Specifications shall consist of new, first-quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.

Labels on each roll of Geotextile shall identify the length, width, lot and roll numbers, and name of Manufacturer.

2. The Type GT-S Geotextile shall be a nonwoven spunbonded or nonwoven needlepunched synthetic fabric consisting of polyester or polypropylene manufactured in a manner approved by the Engineer. Woven fabrics may be used in certain applications if approved in advance by the Engineer.

3. All Geotextiles shall conform to the properties listed in Table 1 of this section.

C. SUBMITTALS

Prior to the installation of Geotextiles, the Contractor shall submit the following to the Engineer:

1. Mill Certificate and Sample: Prior to shipping to the site, the Contractor shall submit a mill certificate or affidavit signed by a legally authorized official of the Manufacturer for each type of Geotextile attesting that the Geotextiles meet the physical and manufacturing requirements stated in these Specifications. The

Contractor shall also submit a sample of each Geotextile to be used. The samples shall be labeled with the product name and be accompanied by the Manufacturer's specifications.

2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into the construction.

D. CONSTRUCTION

1. Shipping, Handling, and Storage:

All Geotextiles shall be shipped, handled, and stored in strict accordance with the Manufacturer's recommendations.

2. Installation:

- a. The surface receiving the Geotextiles shall be prepared to a relatively smooth condition, free of obstructions, standing water, excessive depressions, debris, and very soft, excessively wet, and/or loose pockets of soil. This surface shall be approved by the Engineer prior to Geotextile placement.

- b. Geotextiles shall be placed to the lines and grades shown on the Contract Drawings. At the time of installation, Geotextiles shall be rejected by the Engineer if they have defects, rips, holes, flaws, evidence of deterioration, or other damage.

- c. The Geotextiles shall be placed smooth and free of excessive wrinkles.

- d. On slopes, Geotextiles shall be anchored at the top and unrolled down the slope. In the presence of wind, all Geotextiles shall be weighted with sandbags or other material as approved by the Engineer. Geotextiles uplifted by wind may be reused upon approval by the Engineer.

4. Seams:

All Geotextile seams shall be overlapped a minimum of 12 inches or continuously sewn or heat bonded with methods approved by the Engineer.

5. Repair Procedures:

Any Geotextile that is torn, punctured, or otherwise damaged shall be repaired or replaced, as directed by the Engineer, by the Contractor at no additional cost to the Owner. The repair shall consist of a patch of the same type of Geotextile placed over the failed areas and shall overlap the existing Geotextile a minimum of 18

inches from any point of the rupture. Patches shall be spot sewn or heat bonded so as not to shift during cover placement.

6. Cover Placement:

Placement of cover over Geotextiles shall be performed in a manner as to ensure that the Geotextiles or underlying materials are not damaged. Cover material shall be placed such that excess tensile stress is not mobilized in the Geotextile.

TABLE 1: REQUIRED GEOTEXTILE PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE ¹
			TYPE GT-S
Geotextile Construction (NW = Nonwoven) (W = Woven)	-----	-----	NW ² or W ³
Mass per Unit Area (Unit Weight)	ASTM D 5261	oz/yd ²	N/A
Ultraviolet Resistance (500 hrs)	ASTM D 4355	%	70
Strength Class ⁴	AASHTO M 288	Class	2
Tensile Properties:	ASTM D 4632		
Grab Strength		lbs	160 (NW) 250 (W)
Grab Elongation		%	≥ 50 (NW) < 50 (W)
Puncture Resistance	ASTM D 4833	lbs	55 (NW) 90 (W)
Trapezoidal Tear Strength	ASTM D 4533	lbs	55 (NW) 90 (W)
Burst Strength	ASTM D 3786	psi	200 (NW) 400 (W)
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	70+
Permittivity	ASTM D 4491	sec ⁻¹	1.0

Notes:

1. Minimum Average Roll Value (MARV).
2. Nonwoven geotextiles that have been heat calendered are not acceptable, unless approved by the Engineer in advance.
3. Woven geotextiles shall be approved in advance by the Engineer. Woven geotextiles formed exclusively with slit film fibers are not acceptable.
4. AASHTO M 288 criteria includes the above listed requirements for: Tensile Properties, Puncture Resistance, Trapezoidal Tear Strength, and Burst Strength.

END OF SECTION

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SECTION 02258

VEGETATIVE SOIL LAYER

Vegetative Soil Layer (VSL): The Vegetative Soil Layer (VSL) is placed in the cover system in order to support the growth of vegetative cover.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of the VSL (including topsoil) for the landfill cover, including borrowing, hauling, spreading, and final grading and all necessary and incidental items as detailed or required to complete the VSL, all in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Revegetation	02930

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these Specifications.

ASTM D 2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. MATERIALS

Soil that meets all of the following requirements shall be classified as select soil fill for use in construction of the VSL.

1. Soil shall be classified according to the Unified Soil Classification System (USCS) as SM, SM-SC, SC, ML, ML-CL, CL, or MH (ASTM D 2487). Alternatives to these requirements must be approved in advance by the Engineer.

2. Select soil fill materials shall be reasonably free of gypsum, ferrous, and/or

calcareous concretions and nodules, refuse, roots, or other deleterious substances.

3. Continuous and repeated visual inspection of the materials being used will be performed by the Contractor to ensure proper soils are being used. In addition, the Engineer shall make frequent inspections of the placement operations and materials.
4. The VSL shall be uniform, smooth, and free of debris, rock, plant materials, and other foreign material larger than 3 inches in diameter. The material should contain no sharp edges. This material must be capable of supporting growth of vegetative cover.
5. Topsoil: The upper 6 inches of VSL shall be natural or blended soil material capable of supporting the growth of vegetative cover.

C. SUBMITTALS Not Used.

D. CONSTRUCTION

1. VSL shall be placed and compacted to the minimum thicknesses shown on the Contract Drawings. The Contractor shall be responsible for monitoring the thickness by hand auger or other means during placement in an area.
2. VSL shall be compacted by tracking the final lift with tracked equipment.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENTATION CONTROL

Erosion and Sedimentation Control: Erosion and Sedimentation Control is a system of construction and engineered measures (devices, structures, practices, etc.) which act to minimize surface water induced erosion of disturbed areas and the resulting off-site sedimentation.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of and maintain Erosion and Sedimentation Control measures and related work in accordance with the Contract Drawings and these Specifications.

All Erosion and Sedimentation Control work shall be in accordance with the latest edition of the North Carolina Erosion and Sediment Control Planning and Design Manual as well as applicable regulations.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Geotextiles	02240
Rip Rap	02271
Rolled Erosion Control Products	02275
Revegetation	02930

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these specifications.

ASTM D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.

ASTM D 4355	Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
ASTM D 4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
ASTM D 4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

B. MATERIALS

1. Permanent Drainage Channels, Diversions, Swales, and Ditches:

Permanent drainage channels, diversions, swales, and ditches shall be constructed as shown on the Contract Drawings.

2. Silt Fence:

Silt fences shall be constructed as needed, based on the Contractor's discretion and Engineer's approval. The silt fence is a permeable barrier erected within and downgradient of small disturbed areas to capture sediment from sheet flow. It is made of filter fabric buried at the bottom, stretched, and supported by posts and wire mesh backing. Silt fence shall conform to the following properties:

- a. Posts: Posts shall be 1.33 lb/linear foot steel (preferred) or wood with a minimum length of 5 feet. Steel posts shall be "U" or "T"-type. Wood posts shall have a minimum diameter of 4-inches.
- b. Filter Fabric: Filter fabric shall be a woven geotextile made specifically for sediment control. Filter fabric shall conform to the properties listed in Table 1 of this section.

3. Geotextiles:

Geotextiles shall conform to the requirements of Section 02240, Geotextiles, of these Specifications.

4. Down Pipes:

Down pipes shall be constructed as shown on the Contract Drawings.

5. Rip Rap:

Rip Rap shall conform to the requirements of Section 02271, Rip Rap, of these Specifications.

6. Rolled Erosion Control Products (RECPs):

Rolled Erosion Control Products (RECPs) shall conform to the requirements of Section 02275, Rolled Erosion Control Products, of these Specifications.

7. Other Work:

In addition to the Erosion and Sedimentation Control measures shown on the Contract Drawings, the Contractor shall provide adequate means to prevent any sediment from entering any storm drains, drop inlets, ditches, streams, or bodies of water downstream of any area disturbed by construction. Excavation materials shall be placed upstream of any trench or other excavation to prevent sedimentation of off-site areas. In areas where a natural buffer area exists between the work area and the closest stream or water course, this area shall not be disturbed. All paved areas shall be scraped and swept as necessary to prevent the accumulation of dirt and debris. Work associated with this provision shall be considered incidental to the project and no separate payment will be made.

8. Temporary and Permanent Ground Cover:

The Contractor shall provide temporary or permanent ground cover (or other acceptable measure(s)) adequate to restrain erosion on erodible slopes or other areas within 21 calendar days following completion of any phase of grading. The Contractor shall provide permanent ground cover for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following the completion of construction.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification and summary of all required test results, prior to installation, that all Erosion and Sedimentation Control materials manufactured for the project have been produced in accordance with these Specifications.
2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.

D. CONSTRUCTION

1. Establishment of Erosion and Sedimentation Control Measures:
 - a. All Erosion and Sedimentation Control measures will be constructed according to the Contract Drawings and these Specifications.
 - b. Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the Erosion and Sedimentation Control measures may need to be adjusted on several occasions to reflect the current phase of construction.
 - c. Erosion and Sedimentation Control measures shall be established prior to the work in a given area. Where such practice is not feasible, the Erosion and Sedimentation Control measure(s) shall be established immediately following completion of the clearing operation.
 - d. The construction schedule adopted by the Contractor will impact the placement and need for specific measures required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and prevent or correct the discharge of sediment outside the limits of construction (unless controlled by other on-site measure(s)).
 - e. The location and extent of Erosion and Sedimentation Control measures shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from construction areas. All deviations from the control provisions shown on the Contract Drawings shall have the prior approval of the Engineer.
2. Inspection and Maintenance of Erosion and Sedimentation Control Measures:
 - a. The Contractor shall furnish the labor, material, and equipment required for the inspection and maintenance of all Erosion and Sedimentation Control measures. Maintenance shall be scheduled as required for a particular measure to maintain the removal efficiency and intent of the measure.

- b. All Erosion and Sedimentation Control measures shall be inspected at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period and appropriate maintenance conducted. A rain gauge shall be maintained on the site and a record of the rainfall amounts and dates shall be kept properly.
- c. Maintenance shall include, but not be limited to:
 - (1) The removal and satisfactory disposal of trapped or deposited sediments from basins, traps, barriers, filters, and/or drainage features/devices;
 - (2) Replacement of filter fabrics used for silt fences upon loss of efficiency; and
 - (3) Replacement of any other components which are damaged or cannot serve the intended use.
- d. The Contractor shall accept and maintain any existing sediments that are included in existing sediment traps or basins that accept or will accept stormwater flow and or sediment accumulation from all areas within the Contractor's limits of construction.
- e. Sediments removed from Erosion and Sedimentation Control measures shall be disposed of in locations that will not result in off-site sedimentation as approved by the Engineer.
- f. All Erosion and Sedimentation Control measures shall be maintained to the satisfaction of the Engineer until the site has been stabilized.

3. Graded Slopes and Fills:

The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetated cover or other adequate measures.

4. Finish Grading:

All disturbed areas shall be uniformly graded to the lines, grades, and elevations shown on the Contract Drawings. Finished surfaces shall be reasonably smooth, compacted, and free from irregular surface changes. Unless otherwise specified, the degree of finish shall be that ordinarily obtainable from either blade or scraper operations. Areas shall be finished to a smoothness suitable for application of topsoil.

5. Revegetation:

Revegetation shall conform to the requirements of Section 02930, Revegetation, of these Specifications.

6. Cleanup:

- a. The Contractor shall remove from the site all subsoil excavated from his work and all other debris including, but not limited to, branches, paper, and rubbish in all landscape areas, and remove temporary barricades as the work proceeds.
- b. All areas shall be kept in a neat, orderly condition at all times. Prior to final acceptance, the Contractor shall clean up the entire landscaped area to the satisfaction of the Engineer.

TABLE 1: REQUIRED SILT FENCE FILTER FABRIC PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE ¹
Grab Tensile Strength ²	ASTM D 4632	lbs	100 x 100
Grab Elongation	ASTM D 4632	%	20 (Max.)
Trapezoidal Tear Strength ²	ASTM D 4533	lbs	65 x 65
Burst Strength	ASTM D 3786	psi	300
Puncture Resistance	ASTM D 4833	lbs	65
Ultraviolet Resistance (500 hrs)	ASTM D 4355	%	80
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	30+
Permittivity	ASTM D 4491	sec ⁻¹	0.05

Notes:

- 1. Minimum Average Roll Value (MARV).
- 2. Values for machine and cross machine direction (MD x XD), respectively.

END OF SECTION

SECTION 02271

RIP RAP

Rip Rap: This section includes all rip rap aprons and channel protection.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of Rip Rap for protection of earthen slopes against erosion as indicated, including all necessary and incidental items, in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Geotextiles	02240
Erosion and Sedimentation Control	02270

3. Reference Standards:

The latest revision of the following standards of the North Carolina Department of Transportation (NCDOT) are hereby made a part of these Specifications.

NCDOT Standard Specifications for Roads and Structures.

B. MATERIALS

1. Rip Rap: Rip Rap shall be of the size indicated on the Contract Drawings and shall conform to NCDOT Section 1042, Rip Rap Materials.

2. Geotextiles: Geotextiles shall conform to the requirements outlined in Section 02240, Geotextiles, of these Specifications.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification and summary of all required test results prior to installation, that all Rip Rap has been produced in accordance with these Specifications.
2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.

D. CONSTRUCTION

1. Surface Preparation:

- a. Trim and dress all areas to conform to the Contract Drawings as indicated with tolerance of 2 inches from theoretical slope lines and grades.
- b. Bring areas that are below allowable minimum tolerance limit to grade by filling with compacted Embankment material similar to adjacent material.
- c. Geotextiles shall be placed as shown on the Contract Drawings and in accordance with Section 02240, Geotextiles, of these Specifications.
- d. Do not place any stone material on the prepared surface prior to inspection and approval to proceed from the Engineer.

2. Placing Rip Rap:

Rip Rap shall be placed in accordance with NCDOT Section 868, Rip Rap.

END OF SECTION

SECTION 02275

ROLLED EROSION CONTROL PRODUCTS

Rolled Erosion Control Products: Rolled Erosion Control Products (RECPs) include erosion control blankets (ECB) and turf reinforcement mats (TRM) placed in channels and on slopes.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of all RECPs in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Erosion and Sedimentation Control	02270
Revegetation	02930

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these specifications.

ASTM D 4355	Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
ASTM D 6475	Standard Test Method for Measuring Mass per Unit Area of Erosion Control Blankets.
ASTM D 6524	Standard Test Method for Measuring the Resiliency of Turf Reinforcement Mats.
ASTM D 6525	Standard Test Method for Measuring Nominal Thickness of Permanent Erosion Control Products.

ASTM D 6566	Standard Test Method for Measuring Mass per Unit Area of Turf Reinforcement Mats.
ASTM D 6818	Standard Test Method for Ultimate Tensile Properties of Turf Reinforcement Mats.

B. MATERIALS

1. General:

The materials supplied under these Specifications shall consist of new, first-quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.

Labels on each RECP shall identify the length, width, product name, and name of Manufacturer.

2. Erosion Control Blanket (ECB):

ECB shall consist of a machine-produced mat of straw or wood excelsior fiber covered on the top side with a photodegradable extruded plastic or woven biodegradable netting and sewn together with degradable thread. ECB shall also conform to the properties listed in Table 1 of this section. ECB shall be S75, as manufactured by North American Green, CURLEX I, as manufactured by American Excelsior Company, LANDLOK S1, as manufactured by Propex Fabrics, or approved equal.

3. Turf Reinforcement Mat (TRM):

TRM shall consist of a dense web of crimped and interlocking polypropylene fibers positioned between two biaxially oriented nets and mechanically bound together by parallel stitching with polypropylene thread. TRM shall be designed to accelerate seedling emergence, exhibit high resiliency, and possess strength and elongation properties to limit stretching in a saturated condition. TRM shall be stabilized against chemical and UV degradation which are normally found in a natural soil environment and shall have no biodegradable components. TRM shall also conform to the properties listed in Table 1 of this section. TRM shall be LANDLOK TRM 435, as manufactured by Propex Fabrics, or approved equal.

4. Anchors: Anchors for RECPs shall consist of machine made staples of No. 8 gauge new steel wire formed into a “U” shape. The size when formed shall be not less than 8 inches in length with a throat of not less than 1 inch in width. Longer anchors may be required for loose soils. Other anchors, such as metal pins or plastic pegs, may also be used if approved in advance by the Engineer.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Mill Certificate and Sample: Prior to shipping to the site, the Contractor shall submit a mill certificate or affidavit signed by a legally authorized official of the Manufacturer for each RECP attesting that each RECP meets the physical and manufacturing requirements stated in these Specifications. The Contractor shall also submit a sample of each RECP to be used. The sample shall be labeled with the product name and be accompanied by the Manufacturer's specifications.
2. Furnish copies of delivery tickets or other approved receipts as evidence for materials received that will be incorporated into the construction.

D. CONSTRUCTION

1. Shipping, Handling, and Storage:

All RECPs shall be shipped, handled, and stored in strict accordance with the Manufacturer's recommendations.

2. Installation - General:

- a. Placing of RECPs shall be done immediately following seeding. Seeding shall be performed in accordance with Section 02930, Revegetation, of these Specifications.
- b. RECPs shall be placed to the lines and grades shown on the Contract Drawings. The earth surface shall be smooth and free from stones, clods, or debris which will prevent the contact of the RECP with the soil. Care shall be taken to preserve the required line, grade, and cross section of the area.
- c. RECPs shall be unrolled in the direction of the flow of water and shall be applied without stretching so that it will lie smoothly but loosely on the soil surface.
- d. At the time of installation, RECPs shall be rejected, if they have defects, rips, holes, flaws, evidence of deterioration, or other damage.
- e. The Engineer may require adjustments in the installation requirements to fit individual conditions.

3. Installation - Channels:

RECPs installed in channels shall be unrolled parallel to the direction of water flow. The first roll shall be centered longitudinally in the channel and anchored with staples. Subsequent rolls shall be installed outward to the edges of the channel and be lapped to allow installation of a common row of anchors. RECP ends shall be overlapped with the upstream ends on top (“shingled”). Refer to the Contract Drawings and/or the Manufacturer’s installation guidelines/instructions for installation details.

4. Installation - Slopes:

RECPs installed on slopes shall be oriented in vertical strips and anchored. Subsequent rolls shall be installed outward to the edge(s) of the original roll and be lapped to allow installation of a common row of anchors. RECP ends shall be shingled. Refer to the Contract Drawings and/or the Manufacturer’s installation guidelines/instructions for installation details.

5. Maintenance:

Maintenance of RECPs shall be in accordance with Section 02270, Erosion and Sedimentation Control, of these Specifications.

TABLE 1: REQUIRED ROLLED EROSION CONTROL PRODUCT PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE ¹
Erosion Control Blanket (ECB)			
Mass per Unit Area	ASTM D 6475	lbs/yd ²	0.5 ± 10% (Straw) 0.7 ± 10% (Excelsior)
Tensile Strength ²	ASTM D 6818	lbs/ft	50 x 65
Tensile Elongation	ASTM D 6818	%	20
Maximum Permissible Shear Stress (Un-Vegetated)	-----	lb/ft ²	1.55
Functional Longevity	-----	months	12
Turf Reinforcement Mat (TRM)			
Mass per Unit Area	ASTM D 6566	oz/yd ²	8
Thickness	ASTM D 6525	inches	0.35
Tensile Strength ²	ASTM D 6818	lbs/ft	225 x 175
Tensile Elongation	ASTM D 6818	%	50 (max.)
Resiliency	ASTM D 6524	%	80
UV Resistance (1,000 Hours)	ASTM D 4355	%	80
Maximum Permissible Shear Stress (Long-Term Vegetated)	Large Scale	lb/ft ²	5

Notes:

1. Typical for ECB; Minimum Average Roll Value (MARV) for TRM.
2. Values for machine and cross machine direction (MD x XD), respectively.

END OF SECTION

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SECTION 02608

PRECAST CONCRETE STRUCTURES

Precast Concrete Structures: Precast Concrete Structures are used as wet wells and valve boxes.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of Precast Concrete Structures in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Excavation	02222
Embankment	02223
Erosion and Sedimentation Control	02270
CPE Pipe	02612
HDPE Pipe	02614
Valves	02640
Pumps Stations	11316

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these Specifications.

ASTM A 615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
ASTM C 443	Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
ASTM C 478	Standard Specification for Precast Reinforced Concrete Manhole Sections.

ASTM C 497	Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
ASTM C 990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
ASTM C 1433	Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.

4. Quality Control:

The Contractor shall perform leak testing of Precast Concrete Structures as described in this section.

B. MATERIALS

1. Precast Concrete Manholes: All precast concrete manholes shall be constructed from non-shrink, 4,000 psi compressive strength concrete in conformance with ASTM C 478 and as detailed on the Contract Drawings.
2. Precast Concrete Boxes: All precast concrete boxes shall be constructed from non-shrink, 4,000 psi compressive strength concrete in conformance with ASTM C 1433 and as detailed on the Contract Drawings.
3. Joints: All joints shall be sealed with preformed plastic gaskets in conformance with ASTM C 990 or rubber gaskets in conformance with ASTM C 443.
4. Steps: All steps shall be constructed of 0.5 inch reinforcing rod completely encased in corrosion-resistant rubber or plastic. The upper surfaces of each step shall have a traction tread of self cleaning rubber cleats and guide lugs on both sides to prevent slippage.
5. Covers: Covers shall be as shown on the Contract Drawings.
6. Markings: All Precast Concrete Structures shall include markings clearly identifying the date of manufacture, the name of the manufacturer, and any other pertinent information.
7. Epoxy Coating: The interior of all wet wells shall be factory epoxy coated with a minimum 50 mil surface dry. Epoxy sealer prime coating and finish coating shall be NSP 100 and NSP 120, respectively, or approved equal.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. The Contractor shall submit shop drawings for Precast Concrete Structures for approval at least 2 weeks prior to construction. Shop drawings shall show complete design, installation, and construction information in such detail as to enable the Engineer to determine the adequacy of the proposed units for the intended purpose.

D. CONSTRUCTION

1. The Precast Concrete Structures shall be installed at the locations and to the elevations indicated on the Contract Drawings. The Contractor shall give the Engineer sufficient notice so he may observe the field location and installation activities.
2. Precast Concrete Structures will be bedded as indicated on the Contract Drawings and backfilled with structural fill. Reference Section 02223, Embankment, of these Specifications.
3. Precast Concrete Structures which are damaged or become damaged will be rejected or shall be repaired in a manner approved by the Engineer at the Contractor's sole expense.

END OF SECTION

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SECTION 02612

CORRUGATED POLYETHYLENE (CPE) PIPE

<u>Corrugated Polyethylene (CPE) Pipe:</u> CPE Pipe is used in seep collection trenches.
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A. DESCRIPTION

1. General:

The Contractor shall furnish labor, material, and equipment to complete installation of CPE Pipe in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Drainage Aggregate	02711

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO) are hereby made a part of these specifications.

ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
ASTM D 2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
AASHTO M 252	Specification for Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.

AASHTO M 294 Specification for Corrugated Polyethylene Pipe, 12 to 36
Inch Diameter.

B. MATERIALS

1. All CPE Pipe shall meet the requirements of AASHTO M 252 (3 to 10 inch diameter) or AASHTO M 294 (12 to 36 inch diameter).
2. All CPE Pipe shall be of the size and wall type indicated on the Contract Drawings.
3. Visible defects, such as cracks, creases, crazing, non-uniformly pigmented areas, or undispersed raw materials shall not be acceptable and will result in rejection of the pipe by the Engineer.
4. Pipe Perforations: Perforated wall pipe shall be used where indicated on the Contract Drawings. Perforations shall be Class 2 as specified by AASHTO.
5. CPE Pipe fittings and couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings and couplings supplied or recommended by the pipe manufacturer shall be used.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification and summary of all required test results, prior to installation, that all CPE Pipe manufactured for the project has been produced in accordance with these Specifications.
2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.
3. Survey Results:

After placement of CPE Pipe, survey results shall be submitted for review prior to acceptance.

D. CONSTRUCTION

1. Shipping, Handling, and Storage:

All CPE Pipe shall be shipped, handled, and stored in strict accordance with the Manufacturer's recommendations.

2. CPE Pipe Installation:

- a. The Contractor shall install CPE Pipe to the lines and grades shown on the Contract Drawings. Line and grade of piping shall be maintained with laser or approved equivalent. The Contractor shall give the Engineer sufficient notice so that he may observe field location and installation activities.
- b. Perforated CPE Pipe shall be placed during construction as shown on the Contract Drawings.

3. Cleaning:

All CPE Pipe shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

4. Surveying:

The Contractor shall provide an as-built survey showing the location of all CPE Pipe on 100 foot centers and at bends/connections.

END OF SECTION

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SECTION 02614

HIGH DENSITY POLYETHYLENE (HDPE) PIPE

High Density Polyethylene (HDPE) Pipe: HDPE Pipe is used in seep collection drains.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of HDPE Pipe in accordance with the Contract Drawings and these Specifications. The Contractor shall also clean and test pipelines where required.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Excavation	02222
Embankment	02223
Precast Concrete Structures	02608
Pumps Stations	11316

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these specifications.

ASTM D 638	Standard Test Method for Tensile Properties of Plastics.
ASTM D 790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
ASTM D 1238	Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
ASTM D 1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique.
ASTM D 1603	Standard Test Method for Carbon Black in Olefin Plastics.

ASTM D 2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
ASTM D 3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
ASTM D 3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fitting Materials.
ASTM F 412	Standard Terminology Relating to Plastic Piping Systems.
ASTM F 714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
ASTM F 1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
ASTM F 1473	Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins.
ASTM F 2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.

B. MATERIALS

1. All HDPE Pipe shall be manufactured from new materials meeting the physical requirements shown in Table 1 of this section.
2. All HDPE Pipe shall have smooth interior walls and the DR (dimension ratio) and diameter of the pipe shall be as shown on the Contract Drawings.
3. All HDPE Pipe having an outside diameter 3.5 inches and larger shall meet the requirements of ASTM F 714. All HDPE Pipe having an outside diameter less than 3.5 inches shall meet the requirements of ASTM D 3035.
4. Visible defects, such as cracks, creases, crazing, non-uniformly pigmented areas, or undispersed raw materials shall not be acceptable and will result in rejection of the pipe by the Engineer.

5. Pipe Perforations: The perforations of the perforated HDPE Pipe shall be as shown on the Contract Drawings.
6. All HDPE Pipe fittings shall be in accordance with ASTM D 3261 and shall be pressure rated to match the system piping. The fittings shall be manufactured from the same materials as the pipe itself. The butt fusion outlets of fittings shall be machined to the same DR as the system piping to which they are to be fused.
7. Electronic Marker (Locator) Balls:

Electronic marker (locator) balls shall be provided and installed along all buried force mains installed under this section. Marker balls shall have a passive device capable of reflecting a specifically designated repulse frequency, unique to the utility being installed. Marker balls shall have a self-leveling capability and be 4 inch diameter green ScotchMark ball markers, as manufactured by 3M, or approved equal. Marker balls shall be installed approximately 6 inches over the point to be located and a minimum of 6 inches from any metal objects. Marker balls shall be installed while the pipe is being laid and shall be placed directly over the pipe. However, burial shall not be less than 18 inches or more than 3 feet. Marker balls shall be hand backfilled to 6 inches above the ball to prevent movement or damage. Marker balls shall be installed at the following locations:

- a. At a minimum of every 100 linear feet along each main line.
- b. At bends 22.5 degrees and larger.
- c. At capped or plugged ends.
- d. At tees along each main line.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification and summary of all required test results, prior to installation, that all HDPE Pipe manufactured for the project has been produced in accordance with these Specifications.
2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.
3. Survey Results:

After placement of HDPE Pipe, survey results shall be submitted for review prior to acceptance.

D. CONSTRUCTION

1. Shipping, Handling, and Storage:

All HDPE Pipe shall be shipped, handled, and stored in strict accordance with the Manufacturer's recommendations.

2. HDPE Pipe Installation:

- a. The Contractor shall install HDPE Pipe to the lines and grades shown on the Contract Drawings. Line and grade of piping shall be maintained with laser or approved equivalent. The Contractor shall give the Engineer sufficient notice so that he may observe field location and installation activities.
- b. Excavation for leachate transmission lines shall be backfilled as directed by the Engineer as shown on the Contract Drawings. Sand backfill or approved soil backfill compacted to at least 95 percent of the Standard Proctor dry density (ASTM D 698) shall be used.

Sharp stones or other potentially damaging material shall be removed from the base of the trench prior to placement of the piping. A leveling course, as required, shall consist of sand or other approved material.

c. Pipe Connections: Joining of HDPE Pipe shall be as follows:

- (1) General pipe sections shall be butt-fusion welded according to the Manufacturer's recommendations and shall be performed by a Manufacturer's authorized, trained fusion technician.
- (2) Pipe ends to be butt-fusion welded shall be clean and dry at the time of welding. No welding shall occur during precipitation or excessive moisture.
- (3) The Contractor shall grind burrs or other potentially damaging areas in the welds prior to placement of the pipe.
- (4) Specified bolted pipe connections shall be made as specified on the Contract Drawings using stainless steel hardware and neoprene gaskets.
- (5) Polyethylene stub ends and flanges must be at the ambient temperature of the surrounding soil at the time they are bolted tight to prevent relaxation of the flange bolts and loosening of the joint due to thermal contraction of the polyethylene.

(6) Properly executed electrofusion fittings may be used.

d. Perforated HDPE Pipe shall be placed during construction as shown on the Contract Drawings.

3. Cleaning:

All HDPE Pipe shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

4. Surveying:

The Contractor shall provide an as-built survey showing the location of all HDPE Pipe on 100 foot centers and at bends/connections.

TABLE 1: REQUIRED HDPE PIPE PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE¹
Material Designation	ASTM D 412	-----	PE 3408
Cell Classification	ASTM D 3350	-----	345464 C
Density	ASTM D 1505	g/cm ³	0.955
Melt Flow Index	ASTM D 1238	g/10 min	0.1
Flexural Modulus	ASTM D 790	psi	130,000
Tensile Strength @ Yield	ASTM D 638	psi	3,200
SCG (PENT)	ASTM F 1473	hrs.	> 100
Hydrostatic Design Basis at 73° F	ASTM D 2837	psi	1,600
UV Stabilizer	ASTM D 1603	% Carbon Black	2 - 3%

Notes:

1. Nominal Values.

END OF SECTION

SECTION 02640

VALVES

Valves: swing check and ball valves are to be installed in the pump station valve boxes.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of all valves including all fittings, appurtenances, and transition pieces required for a complete and operable installation in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Precast Concrete Structures	02608
HDPE Pipe	02614
Pumps Stations	11316

3. Reference Standards:

The latest revision of the following standards of the American National Standard Institute (ANSI) are hereby made a part of these specifications.

ANSI B 16.1 Pipe Flanges and Flanged Fittings.

B. MATERIALS

1. Valve Materials and Construction:

a. All valves shall be constructed of new, first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated.

b. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

- c. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Contract Drawings or specified herein. Flanged ends shall be flat-faced, 125 lb. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping.

2. Swing Check Valves:

Swing Check Valves shall be constructed of solid Class 12454-B PVC or Class 23447-B CPVC with EPDM or Teflon seats and seals. Valves intended for chemical service shall be constructed of materials suitable for the intended service. Valves shall have an external lever and weight. Check valves shall have flanged (ANSI) ends. Valves shall be capable of top entry to facilitate cleaning and repair without removal from the line. Valves shall incorporate a single disc design. Check valves shall be as manufactured by ASAHI/AMERICA, Inc., or equal.

3. Ball Valves:

Ball valves shall be constructed of PVC. Ball valves shall have two-way blocking capability and shall have flanged (ANSI) ends. Ball valves shall have Teflon seats with Viton backing cushions and Viton o-ring seals, and shall be designed for a maximum water working pressure of 150 psi at 120°F. Ball valves shall be furnished with ABS lever operating handles. Ball valves shall be as manufactured by Asahi/America, Inc., or equal.

4. Valve Operators:

The valve operator shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valve will be subjected. All gearing shall be totally enclosed, sealed, and permanently lubricated.

5. Valve Boxes:

Valve boxes shall be constructed of reinforced concrete or cast iron, have cast iron lids, and shall generally be as shown on the Contract Drawings. Valve boxes shall be of the appropriate size depending on the particular valve installed. Valve boxes shall be approved by the Engineer prior to installation. Precast concrete valve boxes shall be in accordance with Section 02608, Precast Concrete Structures, of these Specifications.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification and summary of all required test results, prior to installation, that all valves manufactured for the project have been produced in accordance with these Specifications.
2. Submit Shop Drawings for all valves and accessories prior to installation. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics, and complete descriptive information to demonstrate full compliance with the Contract Documents.
3. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.
4. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories. The Manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

D. CONSTRUCTION

1. Before installation, all valves shall be lubricated, manually opened and closed to check their operation, and the interior of the valves shall be thoroughly cleaned.
2. Install all valves where shown on the Contract Drawings in accordance with the Manufacturer's instructions.
3. Install all valves so that operating handwheels or wrenches may be conveniently turned but without interfering with access, and as approved by the Engineer.
4. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment, or other causes. Concrete valve footings shall be provided for each unsupported valve where recommended by the Manufacturer or as directed by the Engineer.
5. Valve boxes shall be set plumb, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

END OF SECTION

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SECTION 02711

DRAINAGE AGGREGATE

Drainage Aggregate: Drainage Aggregate includes coarse aggregate, which is placed for the purpose of subsurface water collection and removal.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete the installation of Drainage Aggregate in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Geotextiles	02240
Vegetative Soil Layer	02258
CPE Pipe	02612

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) and the North Carolina Department of Transportation (NCDOT) are hereby made a part of these specifications.

ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 2434	Standard Test Method for Permeability of Granular Soils (Constant Head).
ASTM D 3042	Standard Test Method for Insoluble Residue in Carbonate Aggregates.
NCDOT	Standard Specifications for Roads and Structures.

B. MATERIALS

1. Coarse Aggregate:

- a. Coarse aggregate (NCDOT No. 57 Stone) shall be placed around the collection pipes where shown on the Contract Drawings.
- b. Coarse aggregate shall be sound, durable, and free from seams, cracks, or other structural defects. The material shall be free of shale, clay, friable materials, and debris. Coarse aggregate consisting of long, thin, and/or highly angular particles may be rejected at the sole discretion of the Engineer.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Submit a certification that all materials manufactured for the project have been produced in accordance with these Specifications.

D. CONSTRUCTION

1. The Drainage Aggregate is placed directly over piping; thus, caution shall be exercised by the Contractor to prevent damage to these materials.
2. All placement of Drainage Aggregate shall be performed only when the Engineer is informed by the Contractor of intent to perform such work.

END OF SECTION

SECTION 02930

REVEGETATION

Revegetation: Revegetation includes permanent Revegetation of all site areas disturbed by the Contractor whether inside the Contract Limits or not.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete Revegetation in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Embankment	02223
Vegetative Soil Layer	02258
Erosion and Sedimentation Control	02270
Rolled Erosion Control Products	02275

3. Warranty:

The Contractor shall be responsible for the satisfactory establishment and growth of a permanent stand of vegetation for a period of one year following the final seeding as judged by the Engineer. During this period, the Contractor shall be responsible for the maintenance items described in Paragraph D.4 (Maintenance) of this Specification.

B. MATERIALS

1. Limestone: Unless otherwise defined by specific soil tests, supply agricultural grade ground limestone conforming to the current "Rules, Regulations, and Standards of the Fertilizer Board of Control."

2. Fertilizer: Unless otherwise defined by specific soil tests, supply commercial fertilizer of 10-20-10 analysis, meeting applicable requirements of State and Federal law. Do not use cyanamic compounds of hydrated lime. Deliver fertilizer in original containers labeled with content analysis.

3. Grass Seed: Supply fresh, clean, new-crop seed as specified in Table 1 of this section. Do not use seed which is wet, moldy, or otherwise damaged. Deliver seed in standard sealed containers labeled with producer's name and seed analysis, and in accord with US Department of Agriculture Rules and Regulations under Federal Seed Act.
4. Mulch: Supply clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, or other locally available mulch material.
 - a. Do not use mulch containing a quantity of matured, noxious weed seeds or other species that will be detrimental to seeding, or provide a menace to surrounding land.
 - b. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.
5. Binder: Supply emulsified asphalt or synthetic binder.
6. Water: Supply potable, free of substances harmful to growth.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. Results of soil tests performed and proposed modifications, if any, to the specified requirements.
2. Certificates for each grass seed mixture, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Certify that each container of seed delivered is fully labeled in accordance with Federal Seed Act and equals or exceeds specification requirements.
3. Copies of invoices for fertilizer, showing grade furnished and total quantity applied.

D. CONSTRUCTION

1. The Contractor shall establish a smooth, healthy, uniform, close stand of grass from the specified seed. Prior to Revegetation, the Contractor shall adequately test the soils to be revegetated to ensure the adequacy of the specified requirements. Any modifications to these requirements deemed necessary after the review of soil test results, shall be at the Contractor's sole expense. The Engineer will perform the observations to determine when successful Revegetation is achieved.

2. Soil Preparation:

- a. Limit preparation to areas which will be planted soon after preparation.
- b. Loosen surface to minimum depth of four (4) inches.
- c. Remove stones, sticks, roots, rubbish and other extraneous matter over three (3) inches in any dimension.
- d. Spread lime uniformly over designated areas at the rate specified in Table 1 of this section.
- e. After application of lime, prior to applying fertilizer, loosen areas to be seeded with double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
- f. Distribute fertilizer uniformly over areas to be seeded at the rate specified in Table 1 of this section.
 - (1) Use suitable distributor.
 - (2) Incorporate fertilizer into soil to depth of a least two (2) inches.
 - (3) Remove stones or other substances which will interfere with turf development or subsequent mowing.
- g. Grade seeded areas to smooth, even surface with loose, uniformly fine texture.
 - (1) Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
 - (2) Fine grade just prior to planting.

3. Seeding:

- a. Use approved mechanical power driven drills or seeders, mechanical hand seeders, or other approved equipment.
- b. Distribute seed evenly over entire area at the rate specified in Table 1 of this section.

- c. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors.
- d. Resume work only when favorable condition develops, or as directed by the Engineer.
- e. Lightly rake seed into soil followed by light rolling or cultipacking.
- f. Immediately protect seeded areas against erosion by mulching or placing Rolled Erosion Control Products in accordance with Section 02275 of these Specifications, where applicable.
 - (1) Spread mulch in a continuous blanket at the rate specified in Table 1 of this section.
 - (2) Immediately following spreading mulch, secure with evenly distributed binder at the rate specified in Table 1 of this section.

4. Maintenance:

The Contractor shall be responsible for maintaining all seeded areas through the end of his warranty period. The Contractor shall provide, at his expense, protection of all seeded areas against damage at all times until acceptance of the work. Maintenance shall include, but not be limited to, the following items:

- a. Regrade and revegetate all eroded areas until adequately stabilized by grass.
- b. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
- c. Replant bare areas using same materials specified.

TABLE 1: SEEDING SCHEDULE

MATERIAL	SEED TYPE	APPLICATION RATE ¹
Lime	-----	4,000 lbs/acre
Fertilizer	-----	1,000 lbs/acre
Seed		
Permanent:	Kentucky 31 Tall Fescue	80 lbs/acre
	Pensacola Bahiagrass	50 lbs/acre
	Sericea Lespedeza ³	30 lbs/acre
	Kobe Lespedeza	10 lbs/acre
	Seasonal Nurse Crop ²	See Note 2
Temporary:	Seasonal Nurse Crop ²	See Note 2
Mulch	-----	4,000 - 5,000 lbs/acre
Binder	-----	150 gallons/acre

Notes:

1. Application rates and/or chemical analysis shall be confirmed or established by a soil test(s).
2. Use seasonal nurse crop in accordance with seeding dates as stated below:

April 15 - August 15	10 lbs/acre German Millet or
	15 lbs/acre Sudangrass
August 16 - April 14	25 lbs/acre Rye (grain).
3. From September 1 - March 1, use unscarified Sericea seed.

END OF SECTION

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SECTION 11316

PUMP STATIONS

Pump Stations: Pumps will be used to pump subsurface flow collected at Pump Station S1 into an existing leachate force main.

A. DESCRIPTION

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of all Pump Stations, including all necessary and incidental items, in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

<u>Work</u>	<u>Section</u>
Geotextiles	02240
Precast Concrete Structures	02608
HDPE Pipe	02614
Valves	02640
Electrical: Basic Requirements	16050

3. Manufacturers Qualifications:

The manufacturer shall be a UL listed shop for industrial control systems and shall provide evidence of such on request from the Engineer or Owner.

4. Warranty:

All equipment shall be warranted by the manufacturer against defects in material, installation, and workmanship for a period of one year. Warranties shall become effective (initiate) upon successful system start-up by the manufacturer's representative as required in this section.

B. MATERIALS

1. General:

The materials supplied under these Specifications shall consist of new, first-quality products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.

2. Pumps:

a. General:

The pumps shall be capable of the pumping conditions listed in Table 1 of this section. The pumps shall be suitable for vertical installations as shown on the Contract Drawings. Each pump shall be capable of pumping leachate.

b. Pumps shall be submersible, centrifugal non-clog capable of passing solids as specified with hydraulic sealing diaphragms, pump mounting plates and base elbows with bottom rail supports, stainless steel upper rail supports, stainless steel lifting cable, schedule 40-A stainless steel guide rails, and stainless steel cable supports. Pump housing shall be of heavy cast iron construction. All fasteners shall be 303 stainless steel or approved equal. Each pump shall be capable of being hoisted vertically out of the wet well, and returned to operation without requiring the operator to enter the wet well. It is the intent of these specifications that the pumps, base plates, guide rails, hoisting cable and connections to the control system (including panel, starters and circuit breakers), be provided by the pump manufacturer as an integral system. The impeller shall be of bronze, ductile iron, or other durable, corrosion-resistant approved material. The pump impeller shall be of semi-open non-clog design and shall have back vane(s) to prevent build up of solids behind the impeller. The impeller shall be rigidly fixed to the motor shaft with a key(s) or other approved fastener (so designed to prevent separation under rotational loading). The motor shaft shall be stainless steel, supported by upper and lower bearings. The upper bearing shall be a self-lubricating ball bearing. The lower bearing shall be a sleeve bearing or double row ball bearing lubricated from an oil chamber. Shaft and bearing shall have sufficient section to withstand all rotational and axial loading to be reasonably expected under normal wastewater pumping situations.

c. The shaft shall be sealed from the volute with an oil-lubricated mechanical seal system. The oil chamber shall be equipped with a seal sensor system to detect any leakage around the seal system. Pumps shall be tungsten

carbide, double type. One replacement seal for each pump must be submitted to the Owner.

- d. The motor chamber shall be suitably sealed from the other chambers of the pump and from the exterior so as to be entirely suitable for submerged operation. The motor chamber may either be of oil-filled or air-filled design.
- e. Pumps shall be as manufactured by ITT Flygt, EMU, Fairbanks Morse, or approved equal.
- f. Motors:

Pump motors shall be of the sealed submersible type meeting UL Class I, Group D, Division I - Explosion proof requirements. The maximum rpm of the motor shall be 1200, unless approved by the Owner. Motors shall meet NEMA thermal rating MGI - 12.42. All leads are to be epoxy sealed.

Moisture sensing probes and thermal protectors shall be furnished. Motor frame and end shield shall be corrosion resistant cast iron. Insulation shall be compatible Class B rated system with Class F material rated for continuous duty in 40-degree C liquids. Motor shaft shall be Type 416 stainless steel. All hardware shall be stainless steel. Motors shall be Reliance or equal. Motors shall not be overloaded at any point within the operating range.

Motors shall be furnished with a sufficient length of submersible, waterproof, and multi-conductor power and control cable for direct feed to control panel without splicing. Cable size shall be sufficient to meet motor requirements.

- g. External Chamber Seals and Connections:

The pumping chamber shall be sealed tightly together utilizing "O"-rings or resilient gasketing material. The power cable connection shall provide for a positive clamping action to seal the electrical connection and relieve strain on the cable strands.

3. Pump Controls:

- a. The Pump Manufacturer shall provide the pump control panel and accessory equipment. The Contractor shall install the controls as shown on the drawings and manufacturer's instructions. The control system shall include all motor starters, alternator, relay, level control switches, control panel, circuit breakers, alarm apparatus, and internal wiring.

- b. Discrete cable supported displacement switches shall be employed for level control.

4. Control Sequence:

- a. On rising liquid level in the wet well, a mercury-type float switch shall start the lead pump. As the liquid level continues to rise, the second mercury float switch shall start the lag pump. The pumps will continue to operate until the liquid level recedes to the level of the third mercury float switch that shall stop the pumps. The fourth mercury float switch shall energize the alarm circuit, should the liquid level rise above the lag pump cut-on-level.
- b. The pumps shall automatically alternate between the “lead” and “lag” positions by means of an electric alternator in the panel.
- c. Provided with the pump and control equipment shall be electrical contacts, an alarm light and alarm horn which shall be mounted on the exterior of the station. The alarm equipment shall be interlocked with wet well controls to be actuated upon high wet well levels or loss of power. The alarm circuits shall be low voltage.

5. Control Panel:

- a. Control panel for the pump station shall be shipped to the site, completely prewired, pre-assembled and ready for service. The control panel shall be NEMA-4X stainless steel with hinged door and lockable handle. Panel shall have a back mounting panel and a front inside hinged panel to make the control panel “dead-front” when outside door is open. The control panel shall have a stainless steel rainhood sized to shelter **all** cabinets including control panel, manual transfer switch for an external emergency generator, etc., and be mounted on a concrete pad of minimum 4" thickness as shown on the Contract Drawings. The control panel shall contain the following accessories housed in a NEMA 4X stainless steel enclosure:
 - (1) Hand/Off/Auto switch with speed indicator and speed adjusting potentiometer for each pump and labeled.
 - (2) Highwater alarm relay wired to alarm circuit.
 - (3) Motor moisture and thermal sensing relays wired to alarm circuit.
 - (4) Multi-colored (or equivalent markings) circuitry to facilitate trouble shooting.

- (5) Waterproof button lights labeled "Pump Run" mounted on door for each pump.
- (6) Elapsed time meter to indicate running time for each pump.
- (7) All necessary internal wiring, relays, etc., to provide operation as previously described.
- (8) Phase monitoring capability which shall override and stop the normal operation of the pumps.
- (9) Waterproof button type alarm lights labeled "Motor temperature" and "Motor Moisture" for each pump, "High Water", "Power Failure", and "Loss of Phase".
- (10) Provide 120 volt alarm light with red globe and guard to be mounted on top of rain hood and horn with the silencer buttons mounted on the control panel for the alarm conditions. Provide the alarm lights and horns loose for external mounting.
- (11) Provide a voltage free dry contact as a composite for all alarm conditions and provide a voltage free dry contact for each alarm status.
- (12) Branch circuit breakers as required.
- (13) Automatic electric alternator.
- (14) Time delay for the low level circuit to delay restarting of the pumps.
- (15) Install a 208 volt relay to enable only one pump to run on emergency power.
- (16) All necessary internal relays etc. to provide intrinsically safe operation as previously described.
- (17) Provide in a separate NEMA 4 stainless steel panel, a remote terminal unit (RTU), consisting of an Instrallogic Corp. Model ILCE 3000 JC/LS. Interconnect all alarm functions in the pump control panel plus a "transferred" alarm from the manual transfer switch.
- (18) Contacts and wiring as required for a remote on/off station for each pump to override and stop the operation of each pump.

- (19) Magnetic starter for each motor with under-voltage release and quick-trip ambient-compensated overload protection for each leg. Starting shall be “across the line” except where motor horsepower is greater than 25, in which case, reduced voltage soft starters shall be required.
- (20) 120 volt auxiliary duplex weatherproofing GFI power receptacle mounted on the bottom on the enclosure.
- (21) Mercury Displacement Switches for Level Controls: Float switches shall be of the mercury-tube type, encapsulated in polyurethane or vinyl floats. The units shall be waterproof, shockproof, explosion proof, and equipped with sufficient submersible cable to extend to the control panel from the wet well without splicing. Any required weights shall be provided. Switches shall be suspended in the wet well on a suitable stainless steel rack.

6. Wet Well and Appurtenances:

- a. Pump station wet well shall be precast concrete with monolithic base. Minimum dimensions shall be as indicated on the Contract Drawings. The precast wet well shall meet ASTM C913 and ASTM C478 specifications. A thicker base shall be provided if required to prevent flotation. A minimum 12" thick foundation shall be provided for the wet well base. Concrete shall be reinforced to withstand the internal and external loads indicated plus a 100-psf live load on the top slab. The Contractor shall backfill around the wet well and surrounding structures to meet 95% Standard Proctor (ASTM D 698) compaction. It shall be the Contractor's responsibility to haul in select material, if needed.
- b. Joints shall be sealed with butyl rubber mastic (Ramneck), or “O-ring” gasket installed in accordance with the manufacturer's instructions. All joints shall be parged on the interior and exterior with type “C” mortar.
- c. The interior of the wet well shall be factory epoxy coated with a minimum 50 mil surface dry. Epoxy sealer prime coating and finish coating shall be NSP 100 and NSP 120, respectively, or approved equal.
- d. The wet well shall have, mounted at 18” above wet well top, a stainless steel junction box to enable quick disconnect of power leads to pump motors when pulling pumps out for maintenance.
- e. The wet well shall be equipped with vent pipe with insect screen. Vent pipe should be PVC.

- f. The wet well shall be equipped with an aluminum access hatch as shown on the Contract Drawings that shall be of adequate dimensions to pull out pumps with no obstruction. Aluminum access hatches shall be exterior sidewalk, single or double leaf type as shown or indicated on the Contract Drawings.
- g. All bolts, brackets, hardware, etc. for fastening items or bolting piping located in the wet well shall be stainless steel.
- h. A sloped invert of non-shrink grout shall be constructed at the base of the wet well. The invert shall have sufficient slope to prevent build-up of solids in the wet well bottom.

7. Valve Boxes:

- a. Valve boxes shall be precast concrete with monolithic top and bottom as indicated on the Contract Drawings.
- b. Valve boxes shall have an aluminum access hatch as shown on the Contract Drawings.

8. Pump Station Site:

- a. The pump station site shall be as shown on the Contract Drawings. The access road shall be a minimum of 10 feet wide and shall consist of 8 inches of compacted aggregate base course (ABC) and an underlying Type GT-S Geotextile.
- b. The wet well shall be accessible on at least one side by service truck with crane mounted on rear passenger side.
- c. Positive drainage away from all structures shall be provided.
- d. The control panel shall be within site distance and panel shall be oriented as directed by the Owner.

9. Flow Meters:

Flow meters shall be installed where shown on the Contract Drawings. Each flow meter shall be the electromagnetic type capable of true volumetric measurement. Each flow meter shall register total product flow and record totalized flow rate and shall be integrated into the pump control system. Flow meters shall have flanged connections and be constructed of materials compatible with leachate. Flow meters shall have the following characteristics:

- (1) Accuracy to $\pm 0.25\%$ of Rate
- (2) Intelligent Micro-processor Based Transmitter
- (3) Pressure Limits from Full Vacuum to 200 psi
- (4) Temperature Limits to 250° F
- (5) NEMA 4X Environmental Rating
- (6) Accidental and Total Submergence Protection.

Flow meters shall be as manufactured by SeaMetrics, Foxboro, Badger, ABB, or approved equal.

Valve boxes for flow meters shall be as shown on the Contract Drawings. Valve boxes shall be approved by the Engineer prior to installation.

10. Gauges:

Gauges shall be furnished and installed under this section. All gauges shall be the Bourdon tube type with a black phenolic case conforming to NEMA 4 requirements and a 2½ inch diameter dial face. Gauge windows shall be constructed of a shatterproof glass. The gauge dial shall have black scale markings on a white background evenly spaced over a 270 degree arc. Gauges shall be provided on the discharge of the submersible pumps in a location as directed by the Engineer.

Each gauge installation shall include a diaphragm seal with flushing connection and a ½ inch 300 series stainless steel shutoff cock. The diaphragm seal shall be designed for continuous duty and the diaphragm shall be constructed of 300 series stainless steel with a silicone fill liquid. The diaphragm seal body shall be constructed of carbon steel with a ½ inch, minimum, threaded connection on the process side and a ¼ inch, minimum, threaded connection on the gauge side.

Discharge gauges shall be graduated in psi from zero to approximately 25% above the respective pump shutoff head.

The Contractor shall coordinate with the various pump manufacturers so that all gauges are supplied by one gauge manufacturer. Gauges shall be as manufactured by Ashcroft Gauge, Division of Dresser Industries, U.S. Gauge Division of Ametek, or equal.

C. SUBMITTALS

The Contractor shall submit the following to the Engineer:

1. The Contractor shall submit shop drawings for Pump Stations for approval at least 4 weeks prior to construction.

2. Operation and maintenance manuals shall be provided for all the equipment specified in this section.
3. The pump supplier shall submit documentation that the pumps will work with this application and provide certified performance curves.
4. The Contractor shall submit the manufacturer's warranty for each pump supplied.

D. CONSTRUCTION

1. Pump Stations shall be constructed as shown on the Contract Drawings and with the manufacturer's standard dimensions and tolerances for the pumps specified.
2. The Contractor shall install all pumps, motors, variable speed drives, and controls specified herein in accordance with the Contract Drawings and as recommended by the manufacturer. The Pump Manufacturer shall provide pumps, motors, variable speed drives, controls and all other necessary items to make a complete installation. The Contractor shall take possession of all pumps and equipment when delivered.
3. The Engineer will inspect the subgrade before the setting of the wet well. The Contractor shall notify the Engineer of intent to perform this work.
4. Soil shall be backfilled around wet well and other structures in 1' lifts or shallower and shall be compacted to 95% Standard Proctor maximum dry density (ASTM D 698).

5. Painting & Touch-Up:

All metal components with the exception of the stainless steel guide rails shall be painted in accordance with Section 2.7.3.

After all equipment and appurtenances have been installed, the Contractor shall touch-up any abrasions, scratches, or patches in the surface protection of any furnished item of work. Any mud, grease, or other extraneous material shall be removed from the completed work using suitable solvents or detergent solutions.

6. Repairs to Wet Well:

All openings made in the wet well for anchorages, conduit runs, pipe runs, etc., shall be sealed using a cement grout. The grout shall be neatly applied to the vacancy and shall be trowelled in, and excess grout shall be immediately removed from the wet well. Grout shall be high strength, non-shrink type.

7. System Start-Up:

The Contractor shall provide the services of the pump, control, and alarm system manufacturer's representatives to check the installation, make adjustments, and place the equipment in operation. Provide a minimum of two (2) eight hour days on-site for start-up, checks of the system, and supervision of any adjustments.

The system start-up shall be conducted in the presence of the Contractor, manufacturer's representative, the Engineer, and the Owner and shall not be considered complete until written acceptance is provided by the Engineer.

During system start-up, all panels shall be tested to the necessary power requirements to assure proper operation of all the components. Each control function shall be activated to check for proper indication.

TABLE 1: PUMP REQUIREMENTS

PROPERTY	PUMP STATION S1 PUMPS
Quantity	2
Model	ITT Flygt MP 3085 HT, or equal
Capacity (gpm)	40
Total Head (feet)	100
Shutoff Head (feet)	122
Horsepower	4
Voltage	208V/3 Phase/60 Hz

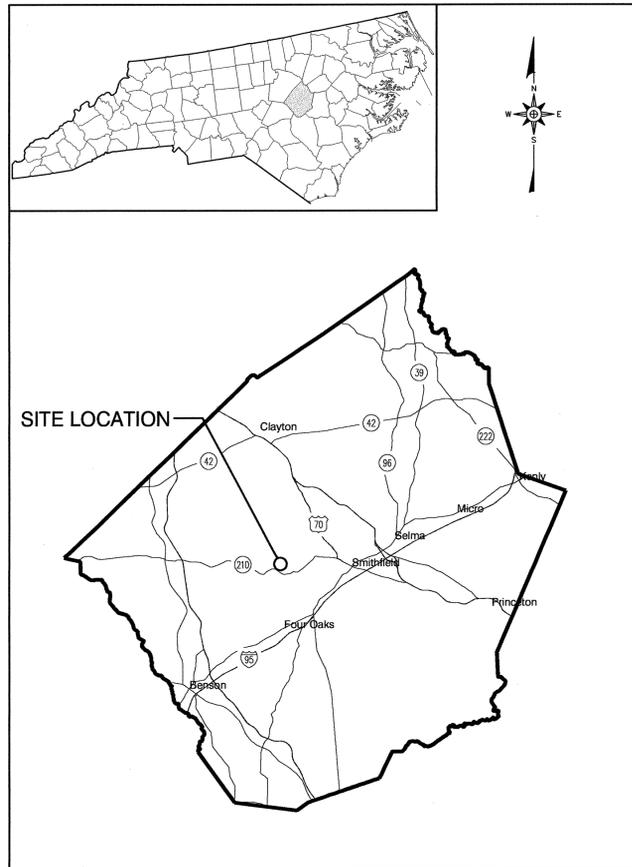
END OF SECTION

JOHNSTON COUNTY, NORTH CAROLINA
DEPARTMENT OF PUBLIC UTILITIES

**JOHNSTON COUNTY MSW LANDFILL
MISCELLANEOUS SITE IMPROVEMENTS
CONSTRUCTION DRAWINGS**

MARCH 2009

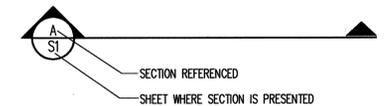
**FOR BIDDING
NOT FOR CONSTRUCTION**



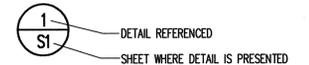
SITE LOCATION MAP
NOT TO SCALE

SHEET NO.	DRAWING NO.	DRAWING TITLE
1	-	TITLE - COVER SHEET
2	S1	EXISTING SITE CONDITIONS
3	S2	PHASES 4 & 4A WORK
4	S3	PHASE 5 WORK
5	D1	DETAILS (SHEET 1 OF 4)
6	D2	DETAILS (SHEET 2 OF 4)
7	D3	DETAILS (SHEET 3 OF 4)
8	D4	DETAILS (SHEET 4 OF 4)
9	EL1	ELECTRICAL PLAN AND DETAILS

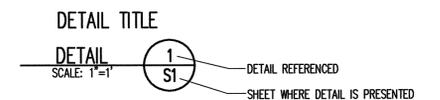
STANDARD SECTION LOCATION CALLOUT (SHEET AND DETAIL)



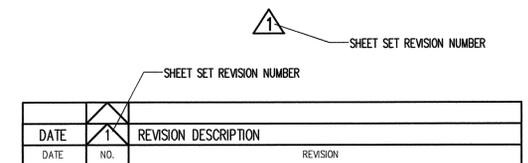
STANDARD DETAIL CALLOUT



STANDARD DETAIL LABEL AND CALLOUT



STANDARD REVISION CALLOUT (SHEET AND DETAIL)



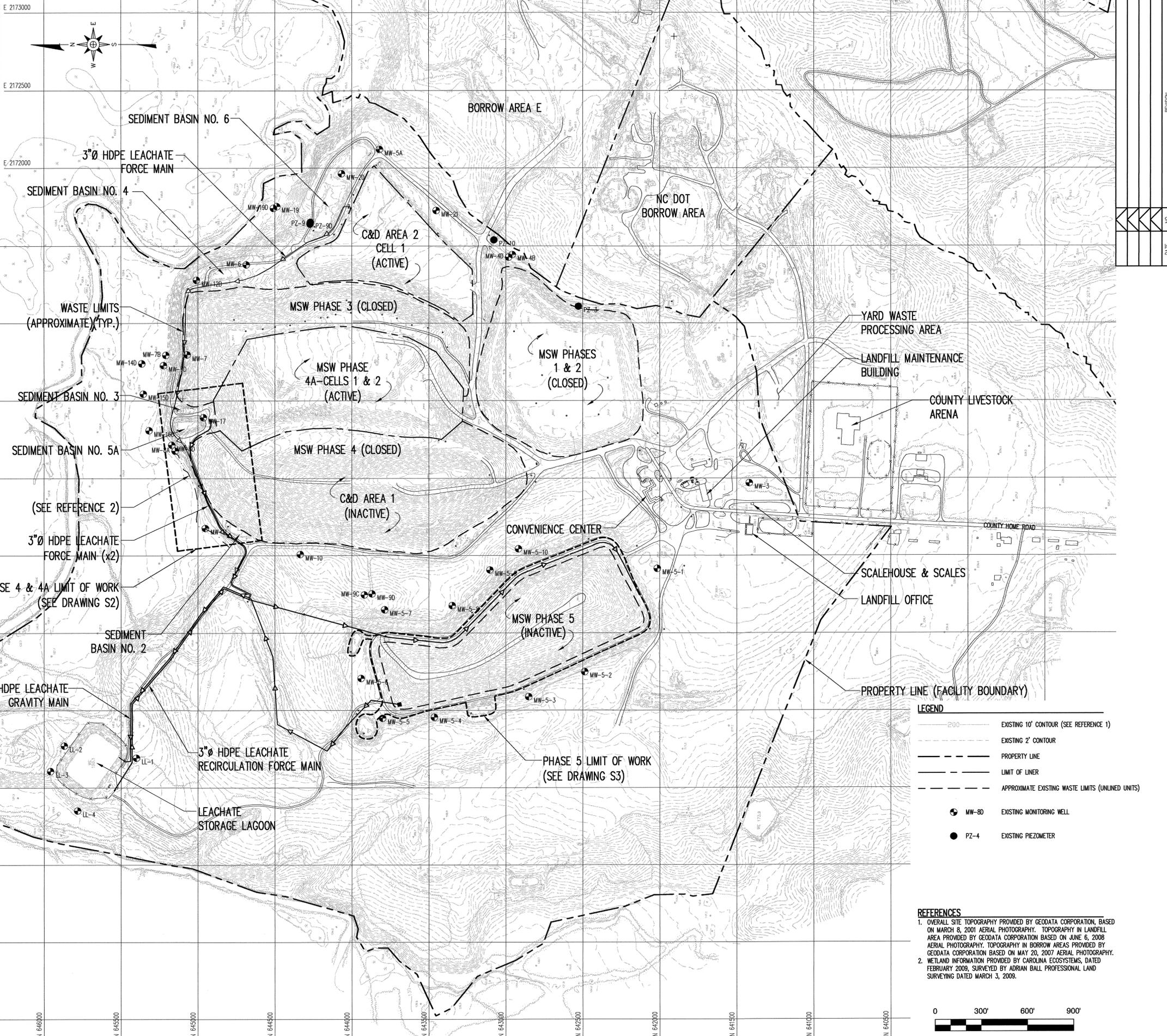

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SAFETY NOTE:
THE CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS CONTRACT AND FOR COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS, AND ORDINANCES INCLUDING BUT NOT LIMITED TO THOSE CURRENTLY MANDATED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

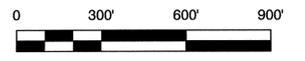
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- LEGEND**
- 200 — EXISTING 10' CONTOUR (SEE REFERENCE 1)
 - — — EXISTING 2' CONTOUR
 - — — — — PROPERTY LINE
 - — — — — LIMIT OF LINER
 - - - - - APPROXIMATE EXISTING WASTE LIMITS (UNLINED UNITS)
 - MW-80 EXISTING MONITORING WELL
 - PZ-4 EXISTING PIEZOMETER

- REFERENCES**
1. OVERALL SITE TOPOGRAPHY PROVIDED BY GEODATA CORPORATION, BASED ON MARCH 8, 2001 AERIAL PHOTOGRAPHY. TOPOGRAPHY IN LANDFILL AREA PROVIDED BY GEODATA CORPORATION BASED ON JUNE 6, 2008 AERIAL PHOTOGRAPHY. TOPOGRAPHY IN BORROW AREAS PROVIDED BY GEODATA CORPORATION BASED ON MAY 20, 2007 AERIAL PHOTOGRAPHY.
 2. WETLAND INFORMATION PROVIDED BY CAROLINA ECOSYSTEMS, DATED FEBRUARY 2009. SURVEYED BY JORIAN BALL PROFESSIONAL LAND SURVEYING DATED MARCH 3, 2009.



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 14 N. Boylan Ave., Raleigh, N.C. 27603
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 www.rsgengineers.com

PROJECT TITLE: JOHNSTON COUNTY LANDFILL MISCELLANEOUS SITE IMPROVEMENTS CONSTRUCTION DRAWINGS

DATE: _____

NO. _____

REVISION _____

SEAL: [Professional Engineer Seal for J. A. L.]

PROJECT TITLE: JOHNSTON COUNTY LANDFILL MISCELLANEOUS SITE IMPROVEMENTS CONSTRUCTION DRAWINGS

EXISTING SITE CONDITIONS

DRAWING TITLE: _____

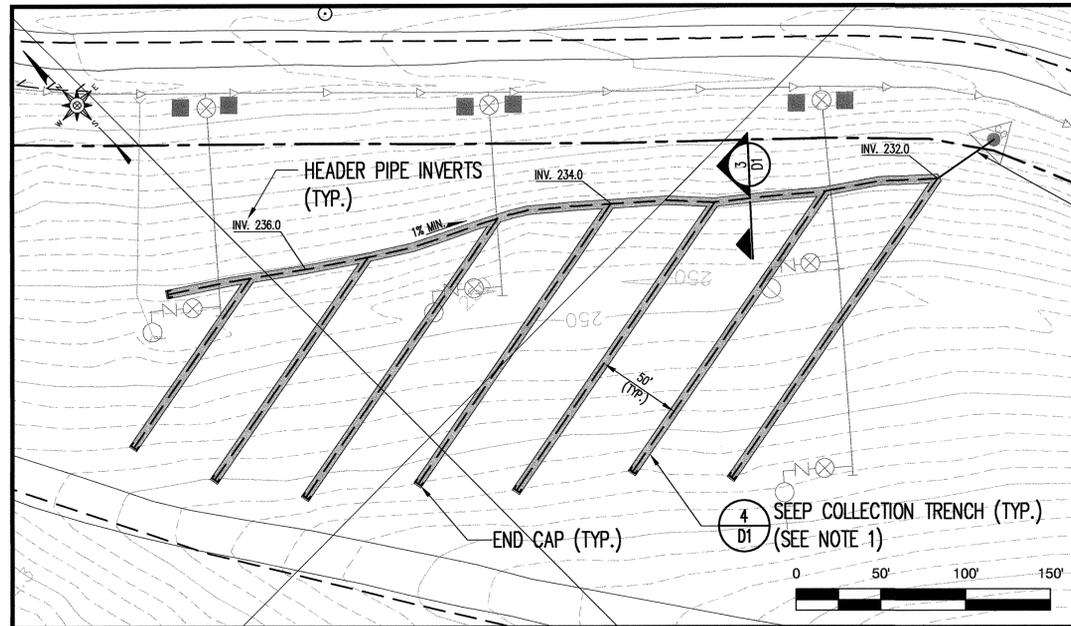
DESIGNED BY: P.K.S. DRAWN BY: J.A.L.

CHECKED BY: J.B.M. PROJECT NO.: JOHN-08-3

SCALE: AS SHOWN DATE: MAR. 2009

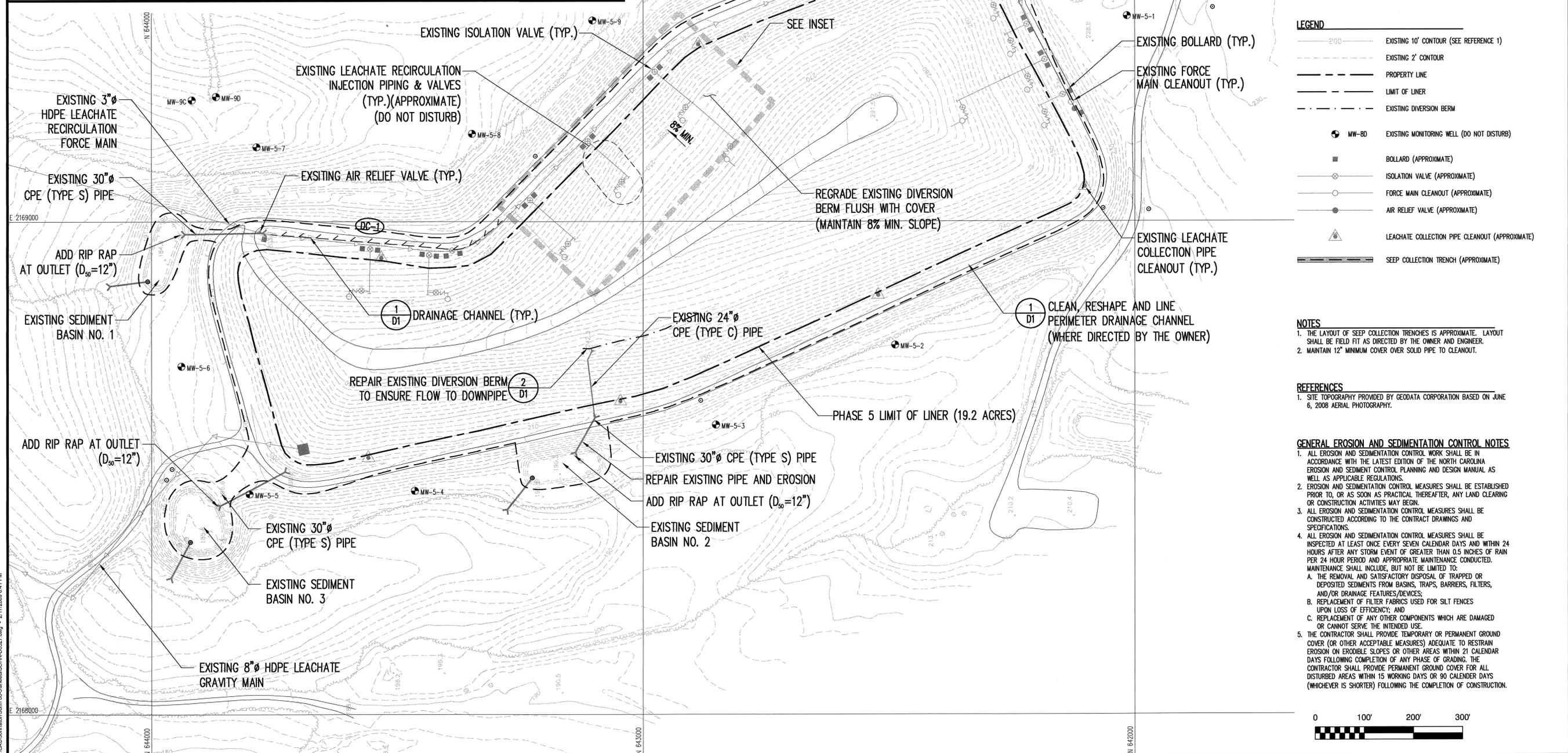
FILE NAME: JOHN-08-255

SHEET NO. 2 DRAWING NO. S1



SAFETY NOTE:
 THE CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS CONTRACT AND FOR COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS, AND ORDINANCES INCLUDING BUT NOT LIMITED TO THOSE CURRENTLY MANDATED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

FOR BIDDING
NOT FOR CONSTRUCTION



- LEGEND**
- EXISTING 10' CONTOUR (SEE REFERENCE 1)
 - EXISTING 2' CONTOUR
 - PROPERTY LINE
 - LIMIT OF LINER
 - EXISTING DIVERSION BERM
 - MW-BD EXISTING MONITORING WELL (DO NOT DISTURB)
 - BOLLARD (APPROXIMATE)
 - ISOLATION VALVE (APPROXIMATE)
 - FORCE MAIN CLEANOUT (APPROXIMATE)
 - AIR RELIEF VALVE (APPROXIMATE)
 - LEACHATE COLLECTION PIPE CLEANOUT (APPROXIMATE)
 - SEEP COLLECTION TRENCH (APPROXIMATE)

- NOTES**
1. THE LAYOUT OF SEEP COLLECTION TRENCHES IS APPROXIMATE. LAYOUT SHALL BE FIELD FIT AS DIRECTED BY THE OWNER AND ENGINEER.
 2. MAINTAIN 12" MINIMUM COVER OVER SOLID PIPE TO CLEANOUT.

- REFERENCES**
1. SITE TOPOGRAPHY PROVIDED BY GEODATA CORPORATION BASED ON JUNE 6, 2008 AERIAL PHOTOGRAPHY.

- GENERAL EROSION AND SEDIMENTATION CONTROL NOTES**
1. ALL EROSION AND SEDIMENTATION CONTROL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE NORTH CAROLINA EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL AS WELL AS APPLICABLE REGULATIONS.
 2. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE ESTABLISHED PRIOR TO, OR AS SOON AS PRACTICAL THEREAFTER, ANY LAND CLEARING OR CONSTRUCTION ACTIVITIES MAY BEGIN.
 3. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE CONSTRUCTED ACCORDING TO THE CONTRACT DRAWINGS AND SPECIFICATIONS.
 4. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD AND APPROPRIATE MAINTENANCE CONDUCTED. MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO:
 - A. THE REMOVAL AND SATISFACTORY DISPOSAL OF TRAPPED OR DEPOSITED SEDIMENTS FROM BASINS, TRAPS, BARRIERS, FILTERS, AND/OR DRAINAGE FEATURES/DEVICES;
 - B. REPLACEMENT OF FILTER FABRICS USED FOR SILT FENCES UPON LOSS OF EFFICIENCY; AND
 - C. REPLACEMENT OF ANY OTHER COMPONENTS WHICH ARE DAMAGED OR CANNOT SERVE THE INTENDED USE.
 5. THE CONTRACTOR SHALL PROVIDE TEMPORARY OR PERMANENT GROUND COVER (OR OTHER ACCEPTABLE MEASURES) ADEQUATE TO RESTRAIN EROSION ON ERODIBLE SLOPES OR OTHER AREAS WITHIN 21 CALENDAR DAYS FOLLOWING COMPLETION OF ANY PHASE OF GRADING. THE CONTRACTOR SHALL PROVIDE PERMANENT GROUND COVER FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING THE COMPLETION OF CONSTRUCTION.



REVISION

NO.	DATE

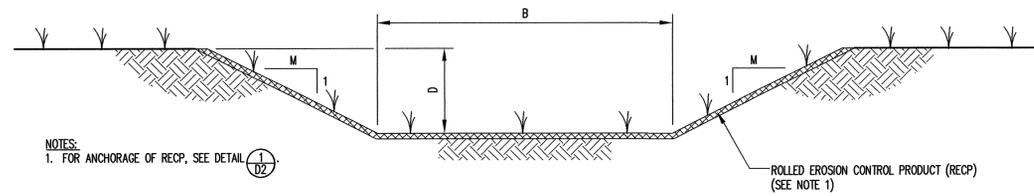
RICHARDSON SMITH GARDNER & ASSOCIATES
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 www.rsgengineers.com
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 fax: 919-828-3899

SEAL

PROJECT TITLE:
**JOHNSTON COUNTY LANDFILL
 MISCELLANEOUS
 SITE IMPROVEMENTS
 CONSTRUCTION DRAWINGS**

DRAWING TITLE:
PHASE 5 WORK

DESIGNED BY: P.K.S.	DRAWN BY: J.A.L.
CHECKED BY: JSM	PROJECT NO.: JOHN 08-3
SCALE: AS SHOWN	DATE: MAR. 2009
FILE NAME: JOHN-D0827	DRAWING NO.:
SHEET NO. 4	DRAWING NO. S3



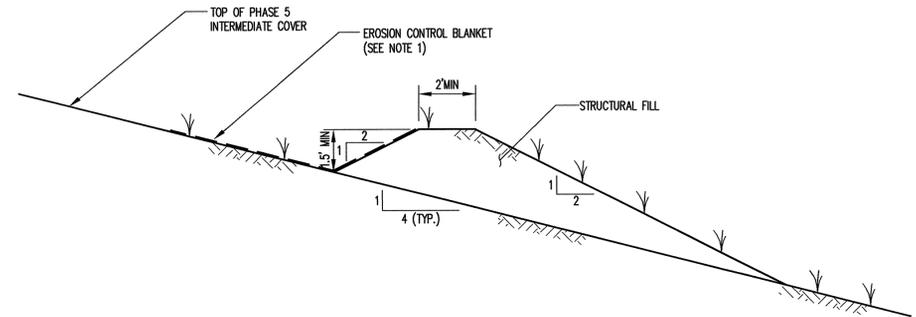
SAFETY NOTE:
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NOT FOR CONSTRUCTION

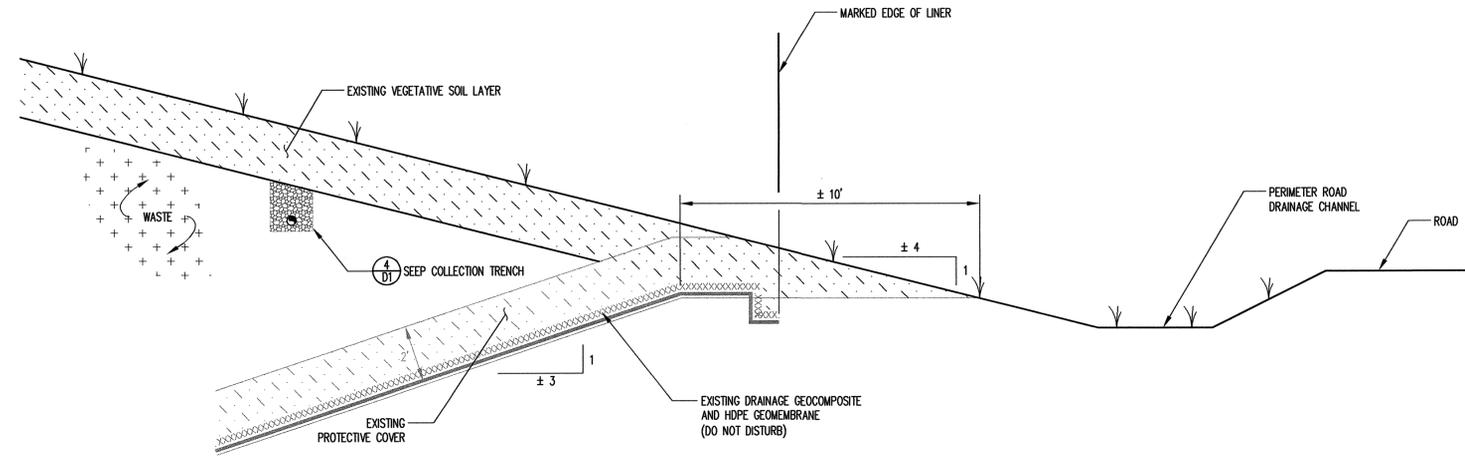
DRAINAGE CHANNEL SCHEDULE						
DRAINAGE CHANNEL	LINING	B (FEET)	D (FEET)	M	D ₅₀ (INCHES)	X (FEET)
DC-1	TRM*	3.0	2.5	3	-	-
CLEANED OUT AND RESHAPED PERIMETER CHANNEL (NOMINAL DIMENSIONS)	ECB*	3.0	2.0	3	-	-

*ECB = EROSION CONTROL BLANKET/TRM = TURF REINFORCEMENT MATTING

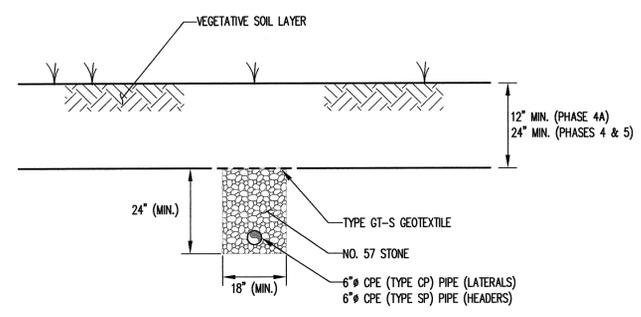
RECP LINED CHANNELS
 DRAINAGE CHANNEL
 DETAIL 1
 NOT TO SCALE



DIVERSION BERM CROSS-SECTION
 DETAIL 2
 NOT TO SCALE

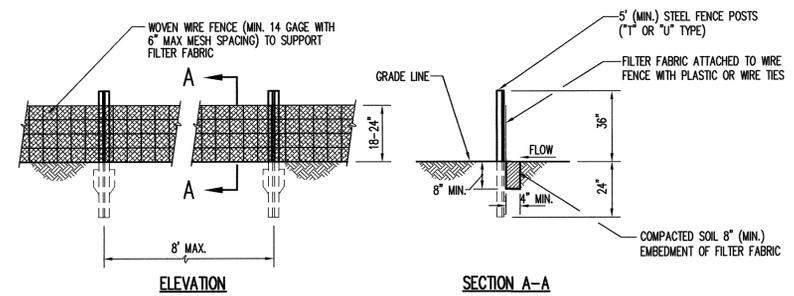


SECTION THROUGH PHASE 5 TOE OF SLOPE
 DETAIL 3
 NOT TO SCALE



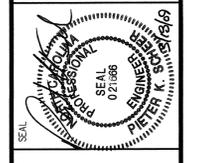
NOTE:
 1. PLAN DRAWINGS SHOW PIPE INVERTS FOR HEADER PIPING. HEIGHT OF STONE WILL NEED TO BE GREATER THAN 24" IN SOME LOCATIONS TO ACHIEVE THESE ELEVATIONS.

SEEP COLLECTION TRENCH
 DETAIL 4
 NOT TO SCALE



SILT FENCE
 DETAIL 5
 NOT TO SCALE

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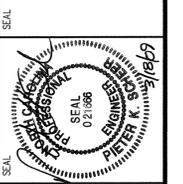


JOHNSTON COUNTY LANDFILL
 MISCELLANEOUS
 SITE IMPROVEMENTS
 CONSTRUCTION DRAWINGS

DETAILS
 (SHEET 1 OF 4)

DESIGNED BY: P.K.S.	DRAWN BY: J.A.L.
CHECKED BY: JBA	PROJECT NO.: JOHN 08-3
SCALE: AS SHOWN	DATE: MAR. 2009
FILE NAME: JOHN-D0528	
SHEET NO. 5	DRAWING NO. D1

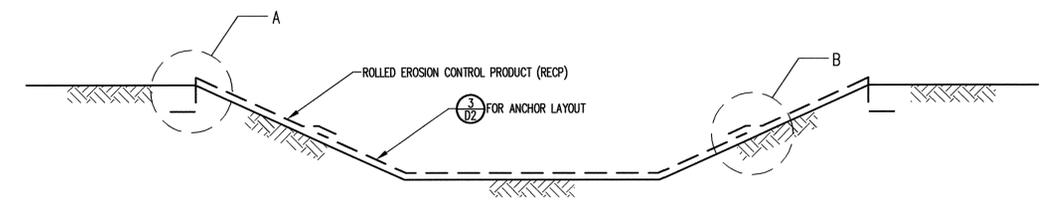
NO.	DATE	REVISION



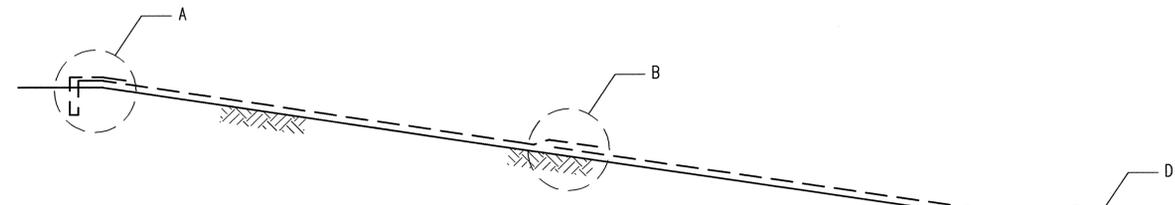
PROJECT TITLE:
**JOHNSTON COUNTY LANDFILL
 MISCELLANEOUS
 SITE IMPROVEMENTS
 CONSTRUCTION DRAWINGS**

DRAWING TITLE:
**DETAILS
 (SHEET 2 OF 4)**

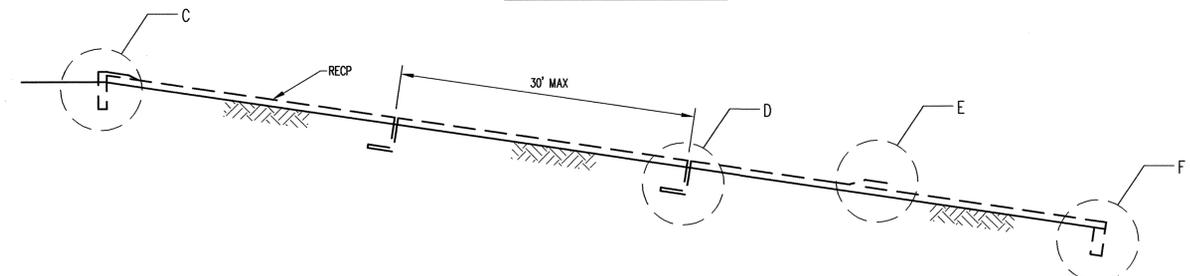
DESIGNED BY: P.K.S.	DRAWN BY: J.A.L.
CHECKED BY: Y.M.	PROJECT NO.: JOHN 08-3
SCALE: AS SHOWN	DATE: MAR. 2009
FILE NAME: JOHN-00529	SHEET NO.: 6
DRAWING NO.:	D2



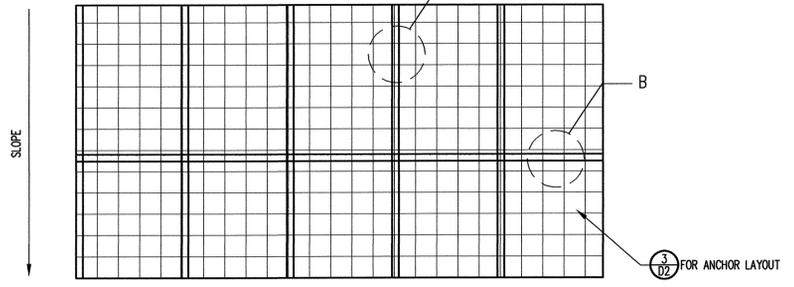
TYPICAL CHANNEL CROSS SECTION



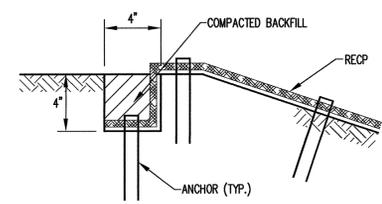
TYPICAL SLOPE PROFILE



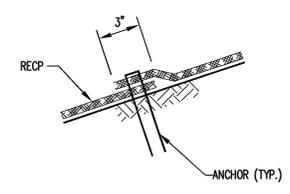
TYPICAL CHANNEL PROFILE



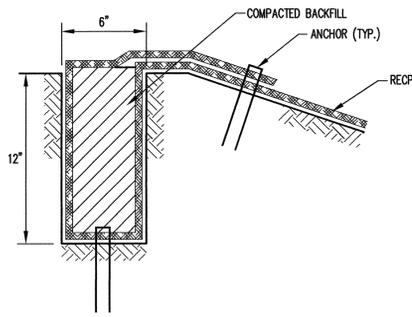
TYPICAL SLOPE PLAN VIEW



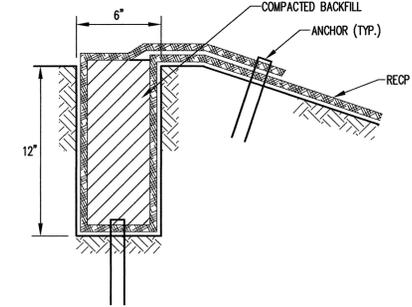
A. LONGITUDINAL ANCHOR TRENCH



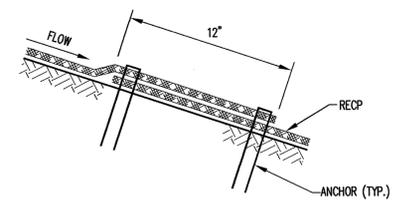
B. OVERLAP AT ADJACENT EDGES



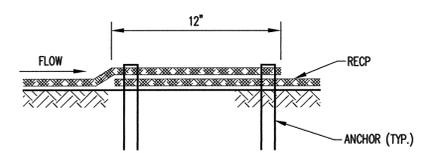
C. UPSTREAM TERMINAL ANCHOR TRENCH



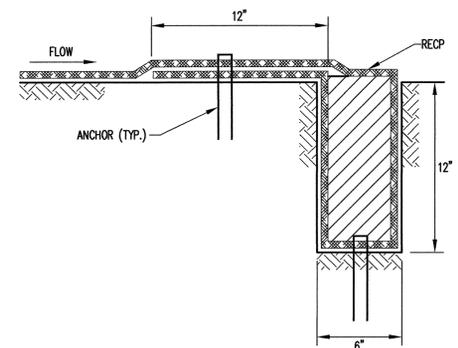
A. UPSLOPE TERMINAL ANCHOR TRENCH



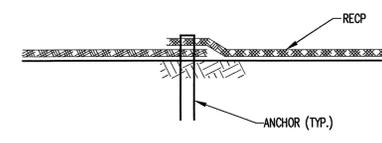
B. OVERLAP AT ROLL ENDS



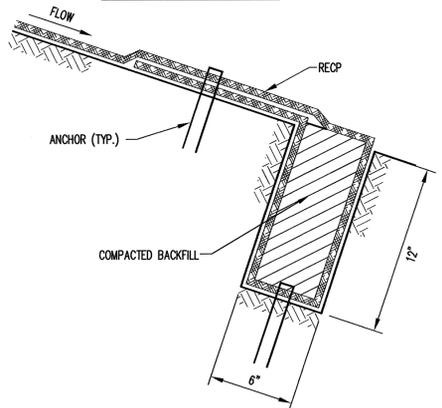
E. OVERLAP AT ROLL ENDS



F. DOWNSTREAM TERMINAL ANCHOR TRENCH



C. OVERLAP AT ADJACENT EDGES



D. DOWNSLOPE TERMINAL ANCHOR TRENCH

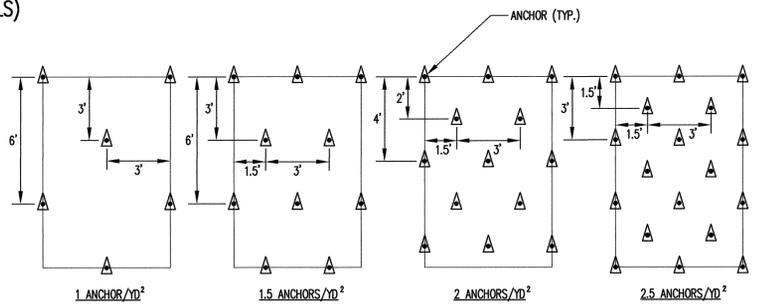
NOTES:
 1. PLACE ANCHORS AT ANCHOR TRENCHES, OVERLAPS, AND CHECK SLOTS ON 1 FOOT CENTERS.
 IF APPLICABLE, STAGGER ANCHOR SPACING BETWEEN MULTIPLE ROWS OF ANCHORS.

NOTE:
 1. PLACE ANCHORS AT ANCHOR TRENCHES, OVERLAPS, AND CHECK SLOTS ON 1 FOOT CENTERS.
 IF APPLICABLE, STAGGER ANCHOR SPACING BETWEEN MULTIPLE ROWS OF ANCHORS.

INSTALLATION OF ROLLED EROSION CONTROL PRODUCTS (CHANNELS)

DETAIL 1
 NOT TO SCALE
 D2

LOCATION	REQUIRED ANCHOR SPACING (ANCHORS/YD ²)
ALL CHANNELS	2.5
1.5H:1V SLOPES	2.0
2H:1V SLOPES	2.0
2.5H:1V SLOPES	1.5
3H:1V SLOPES	1.5
3.5H:1V SLOPES	1.0
4H:1V SLOPES	1.0



ANCHOR LAYOUT

DETAIL 3
 NOT TO SCALE
 D2

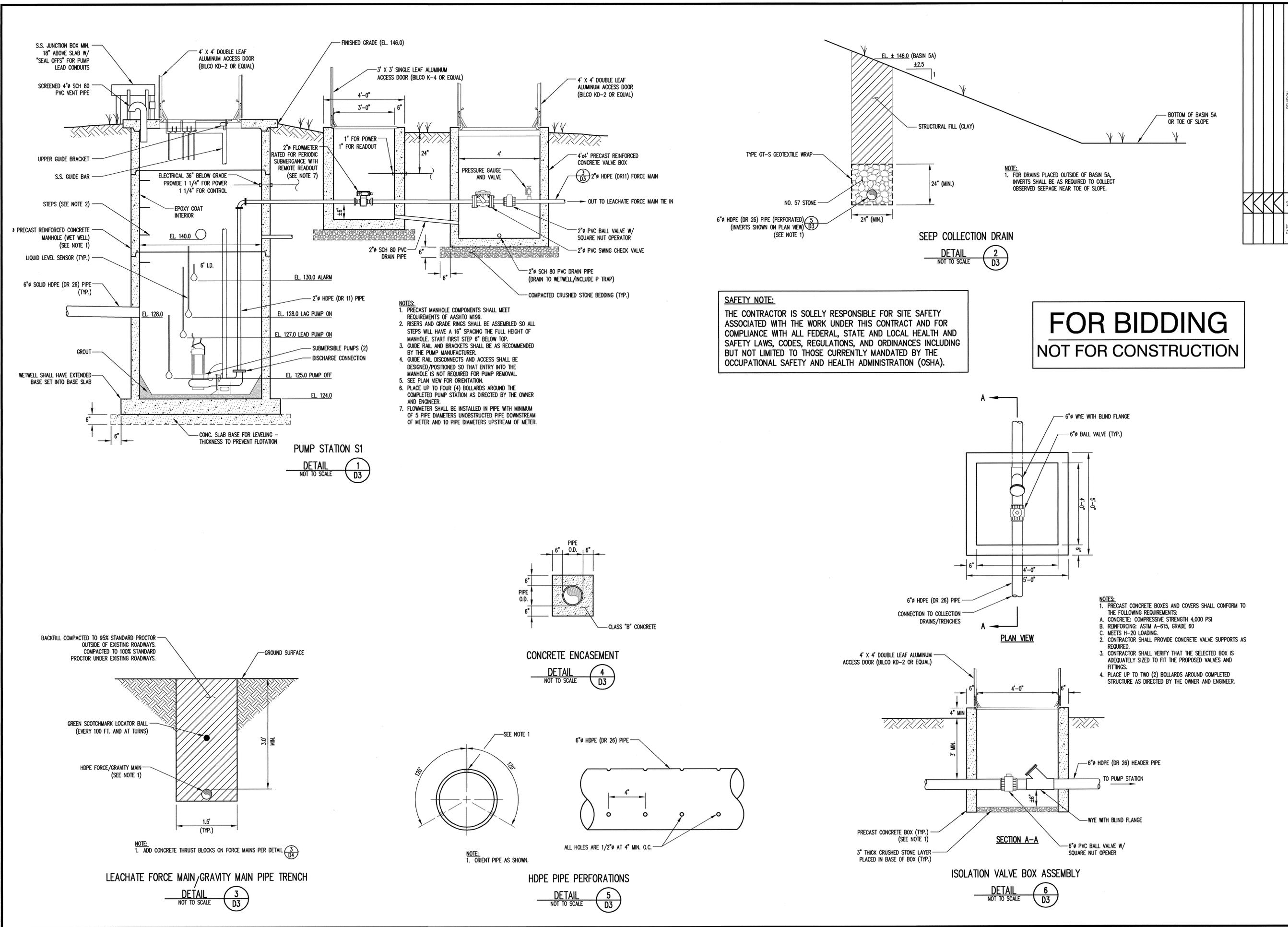
INSTALLATION OF ROLLED EROSION CONTROL PRODUCTS (SLOPES)

DETAIL 2
 NOT TO SCALE
 D2

SAFETY NOTE:
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**FOR BIDDING
 NOT FOR CONSTRUCTION**

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- NOTES:**
1. PRECAST MANHOLE COMPONENTS SHALL MEET REQUIREMENTS OF AASHTO M199.
 2. RISERS AND GRADE RINGS SHALL BE ASSEMBLED SO ALL STEPS WILL HAVE A 16" SPACING THE FULL HEIGHT OF MANHOLE. START FIRST STEP 6" BELOW TOP.
 3. GUIDE RAIL AND BRACKETS SHALL BE AS RECOMMENDED BY THE PUMP MANUFACTURER.
 4. GUIDE RAIL DISCONNECTS AND ACCESS SHALL BE DESIGNED/POSITIONED SO THAT ENTRY INTO THE MANHOLE IS NOT REQUIRED FOR PUMP REMOVAL.
 5. SEE PLAN VIEW FOR ORIENTATION.
 6. PLACE UP TO FOUR (4) BOLLARDS AROUND THE COMPLETED PUMP STATION AS DIRECTED BY THE OWNER AND ENGINEER.
 7. FLOWMETER SHALL BE INSTALLED IN PIPE WITH MINIMUM OF 5 PIPE DIAMETERS UNOBSTRUCTED PIPE DOWNSTREAM OF METER AND 10 PIPE DIAMETERS UPSTREAM OF METER.

SAFETY NOTE:
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FOR BIDDING
NOT FOR CONSTRUCTION

RICHARDSON SMITH GARDNER & ASSOCIATES
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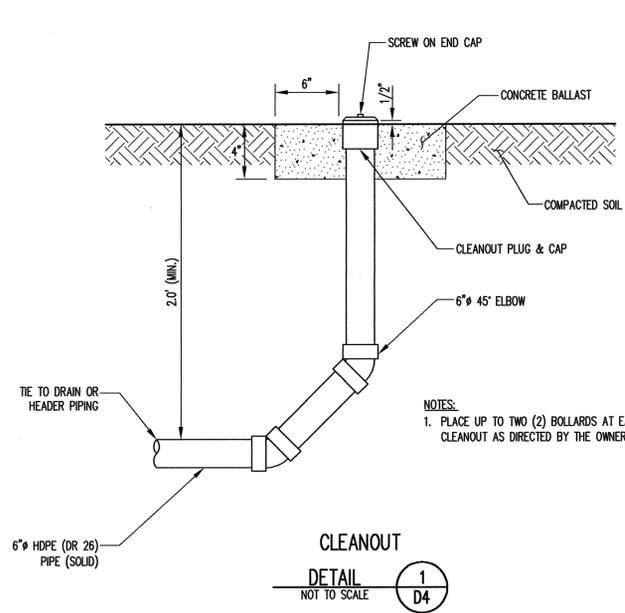
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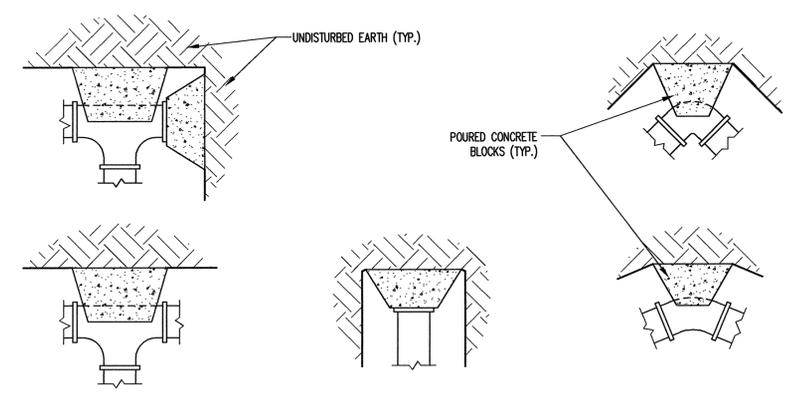
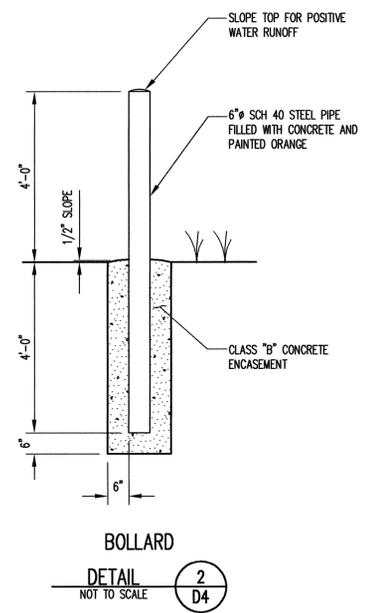
JOHNSTON COUNTY LANDFILL
 MISCELLANEOUS
 SITE IMPROVEMENTS
 CONSTRUCTION DRAWINGS

PROJECT TITLE:	
DRAWING TITLE:	
DESIGNED BY: P.K.S.	DRAWN BY: J.A.L.
CHECKED BY: PKS	PROJECT NO.: JOHN 08-3
SCALE: AS SHOWN	DATE: MAR. 2009
FILE NAME: JOHN-D0530	
SHEET NO. 7	DRAWING NO. D3

DETAILS
 (SHEET 3 OF 4)

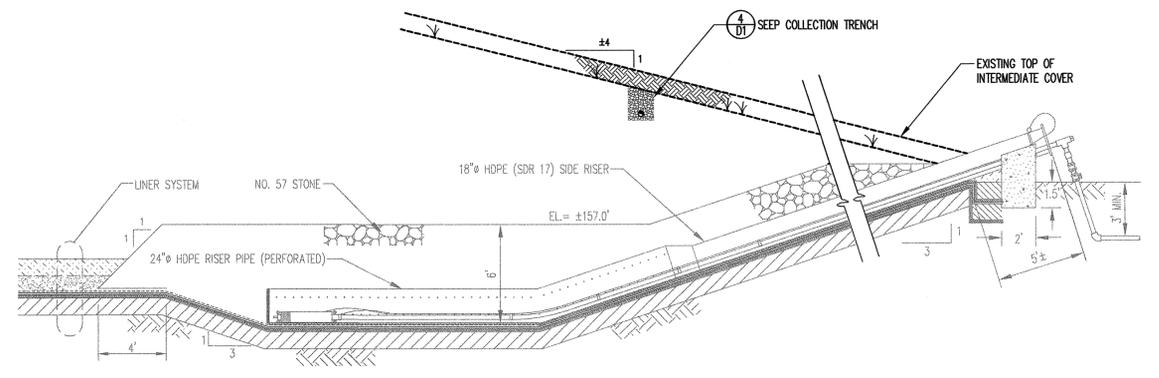
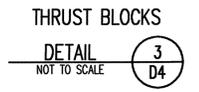


NOTES:
1. PLACE UP TO TWO (2) BOLLARDS AT EACH CLEANOUT AS DIRECTED BY THE OWNER.



NOTES:
1. THESE DETAILS ARE FOR BOTH VERTICALLY AND HORIZONTALLY LAID PIPE.
2. POURED IN PLACE CONCRETE SHALL BE CLASS B.
3. LEAVE JOINTS CLEAR OF CONCRETE FOR EASY ACCESS.
4. POLYETHYLENE SHALL BE WRAPPED AROUND FITTINGS WHERE CONCRETE BLOCKING WILL EVENTUALLY BE REMOVED.
5. THE CRITICAL CONDITION OF UNDISTURBED EARTH IS ANTICIPATED TO BE SILTY SAND.
6. FITTING FACTORS:
90° - 1.41
PLUG - 1.00
45° - 0.77
22 1/2° - 0.39
11 1/4° - 0.20

REQUIRED AREA OF BLOCK FACE EARTH BEARING (B) SHALL BE FIGURED AS FOLLOWS WHERE:
B = AREA OF BLOCK FACE (SQ. FT.)
A = AREA OF PIPE DIA. IN SQ. IN.
P = DESIGN WORKING PRESS, PSI.
C = FITTING FACTOR
B = P.A.C
2000

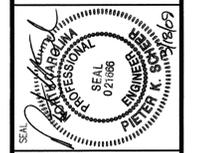


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REVISION	NO.	DATE

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DRAWING TITLE:
**DETAILS
(SHEET 4 OF 4)**

DESIGNED BY: P.K.S.	DRAWN BY: J.A.L.
CHECKED BY: TBM	PROJECT NO.: JOHN 08-3
SCALE: AS SHOWN	DATE: MAR. 2009
FILE NAME: JOHN-00531	SHEET NO. DRAWING NO.
8	D4

