PERMIT APPLICATION

APPLICATION FOR SOLID WASTE OPERATION/ CONSTRUCTION PERMIT INTERMEDIATE MODIFICATION FOR LANDFILL GAS COLLECTION AND CONTROL SYSTEM REVISIONS

J.E.D. Solid Waste Management Facility
St. Cloud, Osceola County, Florida

Submitted to: Florida Department of Environmental Protection
Waste Management Program
2600 Blair Stone Road, MS456
Tallahassee, FL 32399 USA

Prepared for: Omni Waste of Osceola County, LLC
1501 Omni Way
St. Cloud, FL 34773 USA

Submitted by: Golder Associates Inc.
9428 Baymeadows Road, Suite 400
Jacksonville, FL 32256 USA

Distribution:

1 Copy	FDEP – Waste Management Program
2 Copies	J.E.D. Solid Waste Management Facility
1 Copy	Golder Associates Inc.

October 2014

083-82734.37

Kevin S. Brown
Florida Professional Engineer No. 57819
Certificate of Authorization No. 1670

Signature

Date

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Golder Associates

October 10, 2014 083-82734.37

Mr. Corey Dillmore, PE
Florida Department of Environmental Protection
Permit Processing Central District
2600 Blair Stone Road, MS 4565
Tallahassee, FL 32399

RE: INTERMEDIATE MODIFICATION PERMIT APPLICATION
LANDFILL GAS COLLECTION AND CONTROL SYSTEM REVISIONS
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

Dear Mr. Dillmore:

On behalf of Omni Waste of Osceola County LLC (Omni), Golder Associates Inc. (Golder) has prepared this application to the Florida Department of Environmental Protection (FDEP) for an Intermediate Modification to the Solid Waste Management Facility Permit associated with revisions to the landfill gas collection and control system (GCCS) at the J.E.D. Solid Waste Management Facility located in St. Cloud, Osceola County, Florida. Enclosed are one (1) hard copy of the application, an electronic copy, and a check for $5,000 for the review and processing fee.

This modification to the permit entails design changes to the horizontal collectors, the addition of landfill gas to energy facility, the installation of an exterior pipeline (to convey landfill gas to the landfill gas to energy facility), and relocation of the existing and future flares to a common area. No additional changes to the GCCS including the overall design capacity of the system are proposed. The modification has followed previously approved methodologies and procedures, and references approved design calculations where appropriate.

Golder appreciates the opportunity to provide this information to FDEP. Please contact us should you have any questions or require additional information

Sincerely,

GOLDER ASSOCIATES INC.

Don E. Grigg, PE (Pennsylvania)
Senior Engineer

Kevin S. Brown, PE
Senior Consultant and Principal

Enclosure

cc: J.E.D. Solid Waste Management Facility

Golder Associates Inc.
9428 Baymeadows Road, Suite 400
Jacksonville, FL 32256 USA
Tel: (904) 363-3430 Fax: (904) 363-3445 www.golder.com

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

DEP Form #: 62-701.900(1), F.A.C.

Form Title: Application to Construct, Operate, Modify, or Close a Solid Waste Management Facility

Effective Date: January 6, 2010

Incorporated in Rule: 62-701.330(3), F.A.C.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

APPLICATION TO CONSTRUCT, OPERATE, MODIFY, OR CLOSE A SOLID WASTE MANAGEMENT FACILITY

APPLICATION INSTRUCTIONS AND FORMS

Northwest District
160 Governmental Center
Pensacola, FL 32502-5794
850-595-8360

Northeast District
7825 Baymeadows Way, Ste. B200
Jacksonville, FL 32256-7590
904-807-3300

Central District
3319 Maguire Blvd., Ste. 232
Orlando, FL 32803-3767
407-894-7555

Southwest District
13051 N. Telecom Pkwy
Temple Terrace, FL 33637
813-632-7600

South District
2295 Victoria Ave., Ste. 364
Fort Myers, FL 33901-3881
239-332-6975

Southeast District
400 North Congress Ave.
West Palm Beach, FL 33401
561-681-6600

INSTRUCTIONS TO APPLY FOR A SOLID WASTE MANAGEMENT FACILITY PERMIT

I. General

Solid Waste Management Facilities shall be permitted pursuant to Section 403.707, Florida Statutes,(FS) and in accordance with Florida Administrative Code (FAC) Chapter 62-701. A minimum of four copies of the application shall be submitted to the Department's District Office having jurisdiction over the facility. The appropriate fee in accordance with Rule 62-701.315, FAC, shall be submitted with the application by check made payable to the Department of Environmental Protection (DEP).

Complete appropriate sections for the type of facility for which application is made. Entries shall be typed or printed in ink. All blanks shall be filled in or marked "not applicable" or "no substantial change". Information provided in support of the application shall be marked "submitted" and the location of this information in the application package indicated. The application shall include all information, drawings, and reports necessary to evaluate the facility. Information required to complete the application is listed on the attached pages of this form.

II. Application Parts Required for Construction and Operation Permits

A. Landfills and Ash Monofills - Submit Parts A through S
B. Asbestos Monofills - Submit Parts A,B,C,D,E,F,I,K,M, O through S
C. Industrial Solid Waste Disposal Facilities - Submit Parts A through S

NOTE: Portions of some Parts may not be applicable.

NOTE: For facilities that have been satisfactorily constructed in accordance with their construction permit, the information required for A, B and C type facilities does not have to be resubmitted for an operation permit if the information has not substantially changed during the construction period. The appropriate portion of the form should be marked "no substantial change".

III. Application Parts Required for Closure Permits

A. Landfills and Ash Monofills - Submit Parts A,B,L, N through S
B. Asbestos Monofills - Submit Parts A,B,M, O through S
C. Industrial Solid Waste Disposal Facilities - Submit Parts A,B, L through S

NOTE: Portions of some Parts may not be applicable.

IV. Permit Renewals

The above information shall be submitted at time of permit renewal in support of the new permit. However, facility information that was submitted to the Department to support the expiring permit, and which is still valid, does not need to be re-submitted for permit renewal. Portions of the application not re-submitted shall be marked "no substantial change" on the application form.

V. Application Codes

S	-	Submitted
LOCATION	-	Physical location of information in application
N/A	-	Not Applicable
N/C	-	No Substantial Change

VI. LISTING OF APPLICATION PARTS

PART A: GENERAL INFORMATION

PART B: DISPOSAL FACILITY GENERAL INFORMATION

PART C: PROHIBITIONS

PART D: SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL

PART E: LANDFILL PERMIT REQUIREMENTS

PART F: GENERAL CRITERIA FOR LANDFILLS

PART G: LANDFILL CONSTRUCTION REQUIREMENTS

PART H: HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS

PART I: GEOTECHNICAL INVESTIGATION REQUIREMENTS

PART J: VERTICAL EXPANSION OF LANDFILLS

PART K: LANDFILL OPERATION REQUIREMENTS

PART L: WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS

PART M: SPECIAL WASTE HANDLING REQUIREMENTS

PART N: GAS MANAGEMENT SYSTEM REQUIREMENTS

PART O: LANDFILL CLOSURE REQUIREMENTS

PART P: OTHER CLOSURE PROCEDURES

PART Q: LONG-TERM CARE

PART R: FINANCIAL ASSURANCE

PART S: CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
APPLICATION FOR A PERMIT TO CONSTRUCT, OPERATE, MODIFY OR CLOSE A SOLID WASTE MANAGEMENT FACILITY

Please Type or Print

PART A. GENERAL INFORMATION

1. Type of disposal facility (check all that apply):

☑ Class I Landfill
☐ Class III Landfill
☐ Industrial Solid Waste
☐ Other Describe:
☐ Ash Monofill
☐ Asbestos Monofill

NOTE: Waste Processing Facilities should apply on Form 62-701.900(4), FAC;
Land Clearing Disposal Facilities should notify on Form 62-701.900(3), FAC;
Compost Facilities should apply on Form 62-701.900(10), FAC; and
C&D Disposal Facilities should apply on Form 62-701.900(6), FAC

2. Type of application:

☐ Construction
☐ Operation
☑ Construction/Operation
☐ Closure
☐ Long-term Care Only

3. Classification of application:

☐ New
☐ Renewal
☐ Substantial Modification
☑ Intermediate Modification
☐ Minor Modification

4. Facility name: J.E.D. Solid Waste Management Facility

5. DEP ID number: 89544 County: Osceola

6. Facility location (main entrance):
1501 Omni Way, St. Cloud, Florida 34773

7. Location coordinates:

Section: 11, 13, 14, 17, 18 Township: 285 Range: 32E, 33E

Latitude: 28° 3' 32" Longitude: 81° 5' 46"

Datum: WGS84 Coordinate Method: DGPS

Collected by: Johnston's Surverying Company/Affiliation: Johnston's Surveying

8. Applicant name (operating authority): Omni Waste of Osceola County LLC

Mailing address: 1501 Omni Way, St. Cloud, Florida 34773
Street or P.O. Box City State Zip

Contact person: Mike Kaiser Telephone: (904) 673-0446

Title: Southeast Region Engineer

michael.kaiser@progressivewaste.com
E-Mail address (if available)

9. Authorized agent/Consultant: Golder Associates Inc.

Mailing address: 9428 Baymeadows Road, Suite 400 Jacksonville, Florida 32256
Street or P.O. Box City State Zip

Contact person: Don E. Grigg Telephone: (904) 363-3430

Title: Senior Project Engineer

dgrigg@golder.com
E-Mail address (if available)

10. Landowner (if different than applicant): N/A

Mailing address: _____
Street or P.O. Box City State Zip

Contact person: _____ Telephone: (_____) _____

_____
E-Mail address (if available)

11. Cities, towns and areas to be served:
Osceola County and other counties

12. Population to be served: (Current: 2010 US Census, 5 year projection: 2013 estimate US Census)

Current: 5,800,800 Five-Year Projection: 6,000,000

13. Date site will be ready to be inspected for completion: N/A

14. Expected life of the facility: 23 years

15. Estimated costs:

Total Construction: $ 10,000,000 Closing Costs: $ N/A

16. Anticipated construction starting and completion dates:

From: December 2014 To: September 2015

17. Expected volume or weight of waste to be received:

_____ yds^3/day 6,000 tons/day _____ gallons/day

PART B. DISPOSAL FACILITY GENERAL INFORMATION

1. Provide brief description of disposal facility design and operations planned under this application:
This application is for an intermediate permit modification for the construction and operation of a perimeter header conveyance system, modifications to the design of the horiztonatl collectors, and landfill gas to energy (LFGTE) facility. The perimeter header layout has been revised and will be primarily located on the outer stormwater berm and will include a buried pipeline and above ground piping (to cross the dry retention basin in select areas). Design changes to the horizontal collectors are being made from knowledge gained on the installation and operation of existing horizontal collectors at the facility. Additionally, there will be a LFGTE constructed adjacent to the leachate storage facility. The LFGTE facility will generate electricity using landfill gas as a fuel. Power is planned to be sold to Orlando Utilities Commission.

2. Facility site supervisor: David Collins

Title: Site Supervisor Telephone: (407) 891-3720

david.collins@progressivewaste.com
E-Mail address (if available)

3. Disposal area: Total 360 acres; Used 125 acres; Available 235 acres.

4. Weighing scales used: ☑ Yes ☐ No

5. Security to prevent unauthorized use: ☑ Yes ☐ No

6. Charge for waste received: _____ $/yds^3 35 $/ton ($30-$40/ton)

7. Surrounding land use, zoning:

☐ Residential	☐ Industrial
☑ Agricultural	☐ None
☐ Commercial	☐ Other Describe:

8. Types of waste received:

☑ Household	☑ C & D debris
☑ Commercial	☑ Shredded/cut tires
☑ Incinerator/WTE ash	☐ Yard trash
☑ Treated biomedical	☐ Septic tank
☑ Water treatment sludge	☑ Industrial

☐ Air treatment sludge ☑ Industrial sludge

☐ Agricultural ☑ Domestic sludge

☑ Asbestos ☑ Other Describe:

Waste tires, liquid waste for solidification

9. Salvaging permitted: ☐ Yes ☑ No

10. Attendant: ☑ Yes ☐ No Trained operator: ☑ Yes ☐ No

11. Trained spotters: ☑ Yes ☐ No Number of spotters used: minimum 1 per working face

12. Site located in: ☑ Floodplain ☐ Wetlands ☐ Other:

13. Days of operation: Monday-Sunday

14. Hours of operation: Mon-Fri: 5am-4pm, Sat: 6am-12pm, Sun: 6am to 10am

15. Days Working Face covered: Daily

16. Elevation of water table: 79 ft. Datum Used: NGVD 1929

17. Number of monitoring wells: 63

18. Number of surface monitoring points: 2

19. Gas controls used: ☑ Yes ☐ No Type controls: ☑ Active ☐ Passive

Gas flaring: ☑ Yes ☐ No Gas recovery: ☑ Yes ☐ No

20. Landfill unit liner type:

☐ Natural soils ☐ Double geomembrane

☐ Single clay liner ☑ Geomembrane & composite

☐ Single geomembrane ☑ Double composite

☐ Single composite ☐ None

☐ Slurry wall ☑ Other Describe:

Additional GCL below primary geomembrane in the sump areas.

21. Leachate collection method:

☑ Collection pipes
☑ Geonets
☐ Well points
☐ Perimeter ditch
☐ Other Describe:
☑ Sand layer
☐ Gravel layer
☐ Interceptor trench
☐ None

22. Leachate storage method:

☐ Tanks
☐ Other Describe:
☑ Surface impoundments

23. Leachate treatment method:

☐ Oxidation
☐ Secondary
☐ Advanced
☑ Other
Aeration
☐ Chemical treatment
☐ Settling
☐ None

24. Leachate disposal method:

☑ Recirculated
☑ Transported to WWTP
☐ Injection well
☑ Evaporation
☐ Other
☐ Pumped to WWTP
☐ Discharged to surface water/wetland
☐ Percolation ponds
☐ Spray Irrigation

25. For leachate discharged to surface waters:

Name and Class of receiving water:
N/A

26. Storm Water:

Collected: ☑ Yes ☐ No

Type of treatment:
Dry and wet retention for landfill and dry retention for access road.

Name and Class of receiving water:
Bull Creek, Class III

27. Environmental Resources Permit (ERP) number or status:

Current ERP Numbers are: ERP49-0199752-001-EI(Phase 1 Individual), ERP49-0199752-002-EI (Conceptual), ERP49-0199752-003(Phase 2 Individual), ERP49-0199752-004-EM (Phase 3 Individual).

PART C. PROHIBITIONS (62-701.300, FAC)

S	LOCATION	N/A	N/C	
☐	_____	☐	☑	1. Provide documentation that each of the siting criteria will be satisfied for the facility; (62-701.300(2), FAC)
☐	_____	☐	☑	2. If the facility qualifies for any of the exemptions contained in Rules 62-701.300(12) through (18), FAC, then document this qualification(s).
☐	_____	☐	☑	3. Provide documentation that the facility will be in compliance with the burning restrictions; (62-701.300(3), FAC)
☐	_____	☐	☑	4. Provide documentation that the facility will be in compliance with the hazardous waste restrictions; (62-701.300(4), FAC)
☐	_____	☐	☑	5. Provide documentation that the facility will be in compliance with the PCB disposal restrictions; (62-701.300(5), FAC)
☐	_____	☐	☑	6. Provide documentation that the facility will be in compliance with the biomedical waste restrictions; (62-701.300(6), FAC)
☐	_____	☐	☑	7. Provide documentation that the facility will be in compliance with the Class I surface water restrictions; (62-701.300(7), FAC)
☐	_____	☐	☑	8. Provide documentation that the facility will be in compliance with the special waste for landfills restrictions; (62-701.300(8), FAC)
☐	_____	☐	☑	9. Provide documentation that the facility will be in compliance with the liquid restrictions; (62-701.300(10), FAC)
☐	_____	☐	☑	10. Provide documentation that the facility will be in compliance with the used oil and oily waste restrictions; (62-701.300(11), FAC)

PART D. SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL (62-701.320, FAC)

S	LOCATION	N/A	N/C	
☑	Section D.1 _____	☐	☐	1. Four copies, at minimum, of the completed application form, all supporting data and reports; (62-701.320(5)(a),FAC)

S	LOCATION	N/A	N/C	PART D CONTINUED
☑	Section D.2	☐	☐	2. Engineering and/or professional certification (signature, date and seal) provided on the applications and all engineering plans, reports and supporting information for the application; (62-701.320(6),FAC)
☑	Section D.3	☐	☐	3. A letter of transmittal to the Department; (62-701.320(7)(a),FAC)
☑	Section D.4	☐	☐	4. A completed application form dated and signed by the applicant; (62-701.320(7)(b),FAC)
☑	Section D.5	☐	☐	5. Permit fee specified in Rule 62-701.315, FAC in check or money order, payable to the Department; (62-701.320(7)(c),FAC)
☑	Section D.6	☐	☐	6. An engineering report addressing the requirements of this rule and with the following format: a cover sheet, text printed on 8 1/2 inch by 11 inch consecutively numbered pages, a table of contents or index, the body of the report and all appendices including an operation plan, contingency plan, illustrative charts and graphs, records or logs of tests and investigations, engineering calculations; (62-701.320(7)(d),FAC)
☑	Section D.7	☐	☐	7.Operation Plan and Closure Plan; (62-701.320(7)(e)1,FAC)
☐		☐	☑	8. Contingency Plan; (62-701.320(7)(e)2,FAC)
☑	Section D.9	☐	☐	9. Plans or drawings for the solid waste management facilities in appropriate format (including sheet size restrictions, cover sheet, legends, north arrow, horizontal and vertical scales, elevations referenced to NGVD 1929) showing; (62-701.320(7)(f),FAC)
☐		☐	☑	a. A regional map or plan with the project location in relation to major roadways and population centers;
☐		☐	☑	b. A vicinity map or aerial photograph no more than 1 year old showing the facility site and relevant surface features located within 1000 feet of the facility;
☐		☐	☑	c. A site plan showing all property boundaries certified by a Florida Licensed Professional Surveyor and Mapper; and
☑	Section D.9	☐	☐	d. Other necessary details to support the engineering report, including referencing elevations to a consistent, nationally recognized datum and identifying the method used for collecting latitude and longitude data.

S	LOCATION	N/A	N/C	PART D CONTINUED
☐	_____	☐	☑	10. Documentation that the applicant either owns the property or has legal authority from the property owner to use the site; (62-701.320(7)(g),FAC)
☐	_____	☑	☐	11. For facilities owned or operated by a county, provide a description of how, if any, the facilities covered in this application will contribute to the county's achievement of the waste reduction and recycling goals contained in Section 403.706,FS; (62-701.320(7)(h),FAC)
☑	Section D.12 _____	☐	☐	12. Provide a history and description of any enforcement actions taken by the Department against the applicant for violations of applicable statutes, rules, orders or permit conditions relating to the operation of any solid waste management facility in this state; (62-701.320(7)(i),FAC)
☑	Section D.13 _____	☐	☐	13. Proof of publication in a newspaper of general circulation of notice of application for a permit to construct or substantially modify a solid waste management facility; (62-702.320(8),FAC)
☐	_____	☑	☐	14. Provide a description of how the requirements for airport safety will be achieved including proof of required notices if applicable. If exempt, explain how the exemption applies; (62-701.320(13),FAC)
☐	_____	☑	☐	15. Explain how the operator and spotter training requirements and special criteria will be satisfied for the facility; (62-701.320(15), FAC)

PART E. LANDFILL PERMIT REQUIREMENTS (62-701.330, FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Regional map or aerial photograph no more than 5 years old showing all airports that are located within five miles of the proposed landfill; (62-701.330(3)(a),FAC)
☐	_____	☑	☐	2. Plot plan with a scale not greater than 200 feet to the inch showing; (62-701.330(3)(b),FAC)
☐	_____	☑	☐	a. Dimensions;
☐	_____	☑	☐	b. Locations of proposed and existing water quality monitoring wells;
☐	_____	☑	☐	c. Locations of soil borings;

S	LOCATION	N/A	N/C	PART E CONTINUED
☐	_____	☑	☐	d. Proposed plan of trenching or disposal areas;
☐	_____	☑	☐	e. Cross sections showing original elevations and proposed final contours which shall be included either on the plot plan or on separate sheets;
☐	_____	☑	☐	f. Any previously filled waste disposal areas;
☐	_____	☑	☐	g. Fencing or other measures to restrict access.
☐	_____	☑	☐	3. Topographic maps with a scale not greater than 200 feet to the inch with 5-foot contour intervals showing; (62-701.330(3)(c),FAC):
☐	_____	☑	☐	a. Proposed fill areas;
☐	_____	☑	☐	b. Borrow areas;
☐	_____	☑	☐	c. Access roads;
☐	_____	☑	☐	d. Grades required for proper drainage;
☐	_____	☑	☐	e. Cross sections of lifts;
☐	_____	☑	☐	f. Special drainage devices if necessary;
☐	_____	☑	☐	g. Fencing;
☐	_____	☑	☐	h. Equipment facilities.
☐	_____	☑	☐	4. A report on the landfill describing the following; (62-701.330(3)(d),FAC)
☐	_____	☑	☐	a. The current and projected population and area to be served by the proposed site;
☐	_____	☑	☐	b. The anticipated type, annual quantity, and source of solid waste, expressed in tons;
☐	_____	☑	☐	c. Planned active life of the facility, the final design height of the facility and the maximum height of the facility during its operation;

S	LOCATION	N/A	N/C	PART E CONTINUED
☐	_____	☑	☐	d. The source and type of cover material used for the landfill.
☐	_____	☑	☐	5. Provide evidence that an approved laboratory shall conduct water quality monitoring for the facility in accordance with Chapter 62-160,FAC; (62-701.330(3)(g),FAC)
☐	_____	☑	☐	6. Provide a statement of how the applicant will demonstrate financial responsibility for the closing and long-term care of the landfill; (62-701.330(3)(h),FAC)

PART F. GENERAL CRITERIA FOR LANDFILLS (62-701.340,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Describe (and show on a Federal Insurance Administration flood map, if available) how the landfill or solid waste disposal unit shall not be located in the 100-year floodplain where it will restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain unless compensating storage is provided, or result in a washout of solid waste; (62-701.340(3)(b),FAC)
☐	_____	☑	☐	2. Describe how the minimum horizontal separation between waste deposits in the landfill and the landfill property boundary shall be 100 feet, measured from the toe of the proposed final cover slope; (62-701.340(3)(c),FAC)

PART G. LANDFILL CONSTRUCTION REQUIREMENTS (62-701.400,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Describe how the landfill shall be designed so that solid waste disposal units will be constructed and closed at planned intervals throughout the design period of the landfill and shall be designed to achieve a minimum factor of safety of 1.5 using peak strength values to prevent failures of side slopes and deep-seated failures; (62-701.400(2),FAC)
☐	_____	☑	☐	2. Landfill liner requirements; (62-701.400(3),FAC)
☐	_____	☑	☐	a. General construction requirements; (62-701.400(3)(a),FAC):
☐	_____	☑	☐	(1) Provide test information and documentation to ensure the liner will be constructed of materials that have appropriate physical, chemical, and mechanical properties to prevent failure;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(2) Document foundation is adequate to prevent liner failure;
☐	_____	☑	☐	(3) Constructed so bottom liner will not be adversely impacted by fluctuations of the ground water;
☐	_____	☑	☐	(4) Designed to resist hydrostatic uplift if bottom liner located below seasonal high ground water table;
☐	_____	☑	☐	(5) Installed to cover all surrounding earth which could come into contact with the waste or leachate.
☐	_____	☑	☐	b. Composite liners; (62-701.400(3)(b),FAC)
☐	_____	☑	☐	(1) Upper geomembrane thickness and properties;
☐	_____	☑	☐	(2) Design leachate head for primary LCRS including leachate recirculation if appropriate;
☐	_____	☑	☐	(3) Design thickness in accordance with Table A and number of lifts planned for lower soil component.
☐	_____	☑	☐	c. Double liners; (62-701.400(3)(c),FAC)
☐	_____	☑	☐	(1) Upper and lower geomembrane thicknesses and properties;
☐	_____	☑	☐	(2) Design leachate head for primary LCRS to limit the head to one foot above the liner;
☐	_____	☑	☐	(3) Lower geomembrane sub-base design;
☐	_____	☑	☐	(4) Leak detection and secondary leachate collection system minimum design criteria ($k \geq 10$ cm/sec, head on lower liner ≤ 1 inch, head not to exceed thickness of drainage layer);
☐	_____	☑	☐	d. Standards for geosynthetic components; (62-701.400(3)(d),FAC)

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(1) Factory and field seam test methods to ensure all geomembrane seams achieve the minimum specifications;
☐	_____	☑	☐	(2) Geomembranes to be used shall pass a continuous spark test by the manufacturer;
☐	_____	☑	☐	(3) Design of 24-inch-thick protective layer above upper geomembrane liner;
☐	_____	☑	☐	(4) Describe operational plans to protect the liner and leachate collection system when placing the first layer of waste above 24-inch-thick protective layer.
☐	_____	☑	☐	(5) HDPE geomembranes, if used, meet the specifications in GRI GM13 and LLDPE geomembranes, if used, meet the specifications in GRI GM17;
☐	_____	☑	☐	(6) PVC geomembranes, if used, meet the specifications in PGI 1104;
☐	_____	☑	☐	(7) Interface shear strength testing results of the actual components which will be used in the liner system;
☐	_____	☑	☐	(8) Transmissivity testing results of geonets if they are used in the liner system;
☐	_____	☑	☐	(9) Hydraulic conductivity testing results of geosynthetic clay liners if they are used in the liner system;
☐	_____	☑	☐	e. Geosynthetic specification requirements; (62-701.400(3)(e),FAC)
☐	_____	☑	☐	(1) Definition and qualifications of the designer, manufacturer, installer, QA consultant and laboratory, and QA program;
☐	_____	☑	☐	(2) Material specifications for geomembranes, geocomposites, geotextiles, geogrids, and geonets;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(3) Manufacturing and fabrication specifications including geomembrane raw material and roll QA, fabrication personnel qualifications, seaming equipment and procedures, overlaps, trial seams, destructive and nondestructive seam testing, seam testing location, frequency, procedure, sample size and geomembrane repairs;
☐	_____	☑	☐	(4) Geomembrane installation specifications including earthwork, conformance testing, geomembrane placement, installation personnel qualifications, field seaming and testing, overlapping and repairs, materials in contact with geomembrane and procedures for lining system acceptance;
☐	_____	☑	☐	(5) Geotextile and geogrid specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;
☐	_____	☑	☐	(6) Geonet and geocomposite specifications including handling and placement, conformance testing, stacking and joining, repair, and placement of soil materials and any overlying materials;
☐	_____	☑	☐	(7) Geosynthetic clay liner specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil material and any overlying materials;
☐	_____	☑	☐	f. Standards for soil liner components (62-710.400(3)(f),FAC):
☐	_____	☑	☐	(1) Description of construction procedures including overexcavation and backfilling to preclude structural inconsistencies and procedures for placing and compacting soil component in layers;
☐	_____	☑	☐	(2) Demonstration of compatibility of the soil component with actual or simulated leachate in accordance with EPA Test Method 9100 or an equivalent test method;
☐	_____	☑	☐	(3) Procedures for testing in-situ soils to demonstrate they meet the specifications for soil liners;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(4) Specifications for soil component of liner including at a minimum:
☐	_____	☑	☐	(a) Allowable particle size distribution, Atterberg limits, shrinkage limit;
☐	_____	☑	☐	(b) Placement moisture and dry density criteria;
☐	_____	☑	☐	(c) Maximum laboratory-determined saturated hydraulic conductivity using simulated leachate;
☐	_____	☑	☐	(d) Minimum thickness of soil liner;
☐	_____	☑	☐	(e) Lift thickness;
☐	_____	☑	☐	(f) Surface preparation (scarification);
☐	_____	☑	☐	(g) Type and percentage of clay mineral within the soil component;
☐	_____	☑	☐	(5) Procedures for constructing and using a field test section to document the desired saturated hydraulic conductivity and thickness can be achieved in the field.
☐	_____	☑	☐	g. If a Class III landfill is to be constructed with a bottom liner system, provide a description of how the minimum requirements for the liner will be achieved.
☐	_____	☑	☐	3. Leachate collection and removal system (LCRS); (62-701.400(4),FAC)
☐	_____	☑	☐	a. The primary and secondary LCRS requirements; (62-701.400(4)(a),FAC)
☐	_____	☑	☐	(1) Constructed of materials chemically resistant to the waste and leachate;
☐	_____	☑	☐	(2) Have sufficient mechanical properties to prevent collapse under pressure;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(3) Have granular material or synthetic geotextile to prevent clogging;
☐	_____	☑	☐	(4) Have method for testing and cleaning clogged pipes or contingent designs for rerouting leachate around failed areas;
☐	_____	☑	☐	b. Other LCRS requirements; (62-701.400(4)(b) and (c),FAC)
☐	_____	☑	☐	(1) Bottom 12 inches having hydraulic conductivity ≥ 1×10^{-3} cm/sec;
☐	_____	☑	☐	(2) Total thickness of 24 inches of material chemically resistant to the waste and leachate;
☐	_____	☑	☐	(3) Bottom slope design to accommodate for predicted settlement and still meet minimum slope requirements;
☐	_____	☑	☐	(4) Demonstration that synthetic drainage material, if used, is equivalent or better than granular material in chemical compatibility, flow under load and protection of geomembrane liner.
☐	_____	☑	☐	4. Leachate recirculation; (62-701.400(5),FAC)
☐	_____	☑	☐	a. Describe general procedures for recirculating leachate;
☐	_____	☑	☐	b. Describe procedures for controlling leachate runoff and minimizing mixing of leachate runoff with storm water;
☐	_____	☑	☐	c. Describe procedures for preventing perched water conditions and gas buildup;
☐	_____	☑	☐	d. Describe alternate methods for leachate management when it cannot be recirculated due to weather or runoff conditions, surface seeps, wind-blown spray, or elevated levels of leachate head on the liner;
☐	_____	☑	☐	e. Describe methods of gas management in accordance with Rule 62-701.530, FAC;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	f. If leachate irrigation is proposed, describe treatment methods and standards for leachate treatment prior to irrigation over final cover and provide documentation that irrigation does not contribute significantly to leachate generation.
☐	_____	☑	☐	5.Leachate storage tanks and leachate surface impoundments; (62-701.400(6),FAC)
☐	_____	☑	☐	a. Surface impoundment requirements; (62-701.400(6)(b),FAC)
☐	_____	☑	☐	(1) Documentation that the design of the bottom liner will not be adversely impacted by fluctuations of the ground water;
☐	_____	☑	☐	(2) Designed in segments to allow for inspection and repair as needed without interruption of service;
☐	_____	☑	☐	(3) General design requirements;
☐	_____	☑	☐	(a) Double liner system consisting of an upper and lower 60-mil minimum thickness geomembrane;
☐	_____	☑	☐	(b) Leak detection and collection system with hydraulic conductivity ≥ 1 cm/sec;
☐	_____	☑	☐	(c) Lower geomembrane placed on subbase ≥ 6 inches thick with $k \leq 1 \times 10^{-5}$ cm/sec or on an approved geosynthetic clay liner with $k \leq 1 \times 10^{-7}$ cm/sec;
☐	_____	☑	☐	(d) Design calculation to predict potential leakage through the upper liner;
☐	_____	☑	☐	(e) Daily inspection requirements and notification and corrective action requirements if leakage rates exceed that predicted by design calculations;
☐	_____	☑	☐	(4) Description of procedures to prevent uplift, if applicable;
☐	_____	☑	☐	(5) Design calculations to demonstrate minimum two feet of freeboard will be maintained;
☐	_____	☑	☐	(6) Procedures for controlling vectors and off-site odors.

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	b. Above-ground leachate storage tanks; (62-701.400(6)(c),FAC)
☐	_____	☑	☐	(1) Describe tank materials of construction and ensure foundation is sufficient to support tank;
☐	_____	☑	☐	(2) Describe procedures for cathodic protection if needed for the tank;
☐	_____	☑	☐	(3) Describe exterior painting and interior lining of the tank to protect it from the weather and the leachate stored;
☐	_____	☑	☐	(4) Describe secondary containment design to ensure adequate capacity will be provided and compatibility of materials of construction;
☐	_____	☑	☐	(5) Describe design to remove and dispose of stormwater from the secondary containment system;
☐	_____	☑	☐	(6) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling;
☐	_____	☑	☐	(7) Inspections, corrective action and reporting requirements;
☐	_____	☑	☐	(a) Overfill prevention system weekly;
☐	_____	☑	☐	(b) Exposed tank exteriors weekly;
☐	_____	☑	☐	(c) Tank interiors when tank is drained or at least every three years;
☐	_____	☑	☐	(d) Procedures for immediate corrective action if failures detected;
☐	_____	☑	☐	(e) Inspection reports available for department review.
☐	_____	☑	☐	c. Underground leachate storage tanks; (62-701.400(6)(d),FAC)

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(1) Describe materials of construction;
☐	_____	☑	☐	(2) A double-walled tank design system to be used with the following requirements;
☐	_____	☑	☐	(a) Interstitial space monitoring at least weekly;
☐	_____	☑	☐	(b) Corrosion protection provided for primary tank interior and external surface of outer shell;
☐	_____	☑	☐	(c) Interior tank coatings compatible with stored leachate;
☐	_____	☑	☐	(d) Cathodic protection inspected weekly and repaired as needed;
☐	_____	☑	☐	(3) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling and provide for weekly inspections;
☐	_____	☑	☐	(4) Inspection reports available for department review.
☐	_____	☑	☐	d.Schedule provided for routine maintenance of LCRS; (62-701.400(6)(e),FAC)
☐	_____	☑	☐	6.Liner systems construction quality assurance (CQA); (62-701.400(7),FAC)
☐	_____	☑	☐	a. Provide CQA Plan including:
☐	_____	☑	☐	(1) Specifications and construction requirements for liner system;
☐	_____	☑	☐	(2) Detailed description of quality control testing procedures and frequencies;
☐	_____	☑	☐	(3) Identification of supervising professional engineer;
☐	_____	☑	☐	(4) Identify responsibility and authority of all appropriate organizations and key personnel involved in the construction project;

S	LOCATION	N/A	N/C	PART G CONTINUED
☐	_____	☑	☐	(5) State qualifications of CQA professional engineer and support personnel;
☐	_____	☑	☐	(6) Description of CQA reporting forms and documents;
☐	_____	☑	☐	b. An independent laboratory experienced in the testing of geosynthetics to perform required testing;
☐	_____	☑	☐	7. Soil Liner CQA (62-701.400(8)FAC)
☐	_____	☑	☐	a. Documentation that an adequate borrow source has been located with test results or description of the field exploration and laboratory testing program to define a suitable borrow source;
☐	_____	☑	☐	b. Description of field test section construction and test methods to be implemented prior to liner installation;
☐	_____	☑	☐	c. Description of field test methods including rejection criteria and corrective measures to insure proper liner installation.
☐	_____	☑	☐	8. Surface water management systems; (62-701.400(9),FAC)
☐	_____	☑	☐	a. Provide a copy of a Department permit for stormwater control or documentation that no such permit is required;
☐	_____	☑	☐	b. Design of surface water management system to isolate surface water from waste filled areas and to control stormwater run-off;
☐	_____	☑	☐	c. Details of stormwater control design including retention ponds, detention ponds, and drainage ways;
☐	_____	☑	☐	9. Gas control systems; (62-701.400(10),FAC)
☐	_____	☑	☐	a. Provide documentation that if the landfill is receiving degradable wastes, it will have a gas control system complying with the requirements of Rule 62-701.530, FAC;
☐	_____	☑	☐	10. For landfills designed in ground water, provide documentation that the landfill will provide a degree of protection equivalent to landfills designed with bottom liners not in contact with ground water; (62-701.400(11),FAC)

PART H. HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS (62-701.410(1), FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Submit a hydrogeological investigation and site report including at least the following information:
☐	_____	☑	☐	a. Regional and site specific geology and hydrogeology;
☐	_____	☑	☐	b. Direction and rate of ground water and surface water flow including seasonal variations;
☐	_____	☑	☐	c. Background quality of ground water and surface water;
☐	_____	☑	☐	d. Any on-site hydraulic connections between aquifers;
☐	_____	☑	☐	e. Site stratigraphy and aquifer characteristics for confining layers, semi-confining layers, and all aquifers below the landfill site that may be affected by the landfill;
☐	_____	☑	☐	f. Description of topography, soil types and surface water drainage systems;
☐	_____	☑	☐	g. Inventory of all public and private water wells within a one-mile radius of the landfill including, where available, well top of casing and bottom elevations, name of owner, age and usage of each well, stratigraphic unit screened, well construction technique and static water level;
☐	_____	☑	☐	h. Identify and locate any existing contaminated areas on the site;
☐	_____	☑	☐	i. Include a map showing the locations of all potable wells within 500 feet of the waste storage and disposal areas;
☐	_____	☑	☐	2. Report signed, sealed and dated by PE and/or PG.

PART I. GEOTECHNICAL INVESTIGATION REQUIREMENTS (62-701.410(2),FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Submit a geotechnical site investigation report defining the engineering properties of the site including at least the following:
☐	_____	☑	☐	a. Description of subsurface conditions including soil stratigraphy and ground water table conditions;
☐	_____	☑	☐	b. Investigate for the presence of muck, previously filled areas, soft ground, lineaments and sink holes;
☐	_____	☑	☐	c. Estimates of average and maximum high water table across the site;
☐	_____	☑	☐	d. Foundation analysis including:
☐	_____	☑	☐	(1) Foundation bearing capacity analysis;
☐	_____	☑	☐	(2) Total and differential subgrade settlement analysis;
☐	_____	☑	☐	(3) Slope stability analysis;
☐	_____	☑	☐	e. Description of methods used in the investigation and includes soil boring logs, laboratory results, analytical calculations, cross sections, interpretations and conclusions;
☐	_____	☑	☐	f. An evaluation of fault areas, seismic impact zones, and unstable areas as described in 40 CFR 258.13, 40 CFR 258.14 and 40 CFR 258.15.
☐	_____	☑	☐	2. Report signed, sealed and dated by PE and/or PG.

PART J. VERTICAL EXPANSION OF LANDFILLS (62-701.430,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Describe how the vertical expansion shall not cause or contribute to leachate leakage from the existing landfill, shall not cause objectionable odors, or adversely affect the closure design of the existing landfill;
☐	_____	☑	☐	2. Describe how the vertical expansion over unlined landfills will meet the requirements of Rule 62-701.400, FAC with the exceptions of Rule 62-701.430(1)(c),FAC;
☐	_____	☑	☐	3. Provide foundation and settlement analysis for the vertical expansion;
☐	_____	☑	☐	4. Provide total settlement calculations demonstrating that the final elevations of the lining system, that gravity drainage, and that no other component of the design will be adversely affected;
☐	_____	☑	☐	5. Minimum stability safety factor of 1.5 for the lining system component interface stability and deep stability;
☐	_____	☑	☐	6. Provide documentation to show the surface water management system will not be adversely affected by the vertical expansion;
☐	_____	☑	☐	7. Provide gas control designs to prevent accumulation of gas under the new liner for the vertical expansion.

PART K. LANDFILL OPERATION REQUIREMENTS (62-701.500,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Provide documentation that landfill will have at least one trained operator during operation and at least one trained spotter at each working face; (62-701.500(1),FAC)
☐	_____	☑	☐	2. Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)
☐	_____	☑	☐	a. Designating responsible operating and maintenance personnel;
☐	_____	☑	☐	b. Emergency preparedness and response, as required in subsection 62-701.320(16), FAC;
☐	_____	☑	☐	c. Controlling types of waste received at the landfill;
☐	_____	☑	☐	d. Weighing incoming waste;
☐	_____	☑	☐	e. Vehicle traffic control and unloading;
☐	_____	☑	☐	f. Method and sequence of filling waste;
☐	_____	☑	☐	g. Waste compaction and application of cover;
☐	_____	☑	☐	h. Operations of gas, leachate, and stormwater controls;
☐	_____	☑	☐	i. Water quality monitoring.
☐	_____	☑	☐	j. Maintaining and cleaning the leachate collection system;
☐	_____	☑	☐	3. Provide a description of the landfill operation record to be used at the landfill; details as to location of where various operational records will be kept (i.e. FDEP permit, engineering drawings, water quality records, etc.) (62-701.500(3),FAC)
☐	_____	☑	☐	4. Describe the waste records that will be compiled monthly and provided to the Department annually; (62-701.500(4),FAC)
☐	_____	☑	☐	5. Describe methods of access control; (62-701.500(5),FAC)

S	LOCATION	N/A	N/C	PART K CONTINUED
☐	_____	☑	☐	6. Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized wastes at the landfill; (62-701.500(6),FAC)
☐	_____	☑	☐	7. Describe procedures for spreading and compacting waste at the landfill that include: (62-701.500(7),FAC)
☐	_____	☑	☐	a. Waste layer thickness and compaction frequencies;
☐	_____	☑	☐	b. Special considerations for first layer of waste placed above liner and leachate collection system;
☐	_____	☑	☐	c. Slopes of cell working face and side grades above land surface, planned lift depths during operation;
☐	_____	☑	☐	d. Maximum width of working face;
☐	_____	☑	☐	e. Description of type of initial cover to be used at the facility that controls:
☐	_____	☑	☐	(1) Vector breeding/animal attraction
☐	_____	☑	☐	(2) Fires
☐	_____	☑	☐	(3) Odors
☐	_____	☑	☐	(4) Blowing litter
☐	_____	☑	☐	(5) Moisture infiltration
☐	_____	☑	☐	f. Procedures for applying initial cover including minimum cover frequencies;
☐	_____	☑	☐	g. Procedures for applying intermediate cover;
☐	_____	☑	☐	h. Time frames for applying final cover;
☐	_____	☑	☐	i. Procedures for controlling scavenging and salvaging.

S	LOCATION	N/A	N/C	PART K CONTINUED
☐	_____	☑	☐	j. Description of litter policing methods;
☐	_____	☑	☐	k. Erosion control procedures.
☐	_____	☑	☐	8. Describe operational procedures for leachate management including; (62-701.500(8),FAC)
☐	_____	☑	☐	a. Leachate level monitoring, sampling, analysis and data results submitted to the Department;
☐	_____	☑	☐	b. Operation and maintenance of leachate collection and removal system, and treatment as required;
☐	_____	☑	☐	c. Procedures for managing leachate if it becomes regulated as a hazardous waste;
☐	_____	☑	☐	d. Identification of treatment or disposal facilities that may be used for off-site discharge and treatment of leachate;
☐	_____	☑	☐	e. Contingency plan for managing leachate during emergencies or equipment problems;
☐	_____	☑	☐	f. Procedures for recording quantities of leachate generated in gal/day and including this in the operating record;
☐	_____	☑	☐	g. Procedures for comparing precipitation experienced at the landfill with leachate generation rates and including this information in the operating record;
☐	_____	☑	☐	h. Procedures for water pressure cleaning or video inspecting leachate collection systems.
☑	Section K.9 _____	☐	☐	9. Describe how the landfill receiving degradable wastes shall implement a gas management system meeting the requirements of Rule 62-701.530, FAC; (62-701.500(9),FAC)
☐	_____	☑	☐	10. Describe procedures for operating and maintaining the landfill stormwater management system to comply with the requirements of Rule 62-701.400(9); (62-701.500(10),FAC)

S	LOCATION	N/A	N/C	PART K CONTINUED
☐	_____	☑	☐	11. Equipment and operation feature requirements; (62-701.500(11),FAC)
☐	_____	☑	☐	a. Sufficient equipment for excavating, spreading, compacting and covering waste;
☐	_____	☑	☐	b. Reserve equipment or arrangements to obtain additional equipment within 24 hours of breakdown;
☐	_____	☑	☐	c. Communications equipment;
☐	_____	☑	☐	d. Dust control methods;
☐	_____	☑	☐	e. Fire protection capabilities and procedures for notifying local fire department authorities in emergencies;
☐	_____	☑	☐	f. Litter control devices;
☐	_____	☑	☐	g. Signs indicating operating authority, traffic flow, hours of operation, disposal restrictions.
☐	_____	☑	☐	12. Provide a description of all-weather access road, inside perimeter road and other roads necessary for access which shall be provided at the landfill; (62-701.500(12),FAC)
☐	_____	☑	☐	13. Additional record keeping and reporting requirements; (62-701.500(13),FAC)
☐	_____	☑	☐	a. Records used for developing permit applications and supplemental information maintained for the design period of the landfill;
☐	_____	☑	☐	b. Monitoring information, calibration and maintenance records, copies of reports required by permit maintained for at least 10 years;
☐	_____	☑	☐	c. Maintain annual estimates of the remaining life of constructed landfills and of other permitted areas not yet constructed and submit this estimate annually to the Department;
☐	_____	☑	☐	d. Procedures for archiving and retrieving records which are more than five year old.

PART L. WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS (62-701.510, FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Water quality and leachate monitoring plan shall be submitted describing the proposed ground water, surface water and leachate monitoring systems and shall meet at least the following requirements;
☐	_____	☑	☐	a. Based on the information obtained in the hydrogeological investigation and signed, dated and sealed by the PG or PE who prepared it; (62-701.510(2)(a),FAC)
☐	_____	☑	☐	b. All sampling and analysis preformed in accordance with Chapter 62-160, FAC; (62-701.510(2)(b),FAC)
☐	_____	☑	☐	c. Ground water monitoring requirements; (62-701.510(3),FAC)
☐	_____	☑	☐	(1) Detection wells located downgradient from and within 50 feet of disposal units;
☐	_____	☑	☐	(2) Downgradient compliance wells as required;
☐	_____	☑	☐	(3) Background wells screened in all aquifers below the landfill that may be affected by the landfill;
☐	_____	☑	☐	(4) Location information for each monitoring well;
☐	_____	☑	☐	(5) Well spacing no greater than 500 feet apart for downgradient wells and no greater than 1500 feet apart for upgradient wells unless site specific conditions justify alternate well spacings;
☐	_____	☑	☐	(6) Well screen locations properly selected;
☐	_____	☑	☐	(7) Monitoring wells constructed to provide representative ground water samples;
☐	_____	☑	☐	(8) Procedures for properly abandoning monitoring wells;
☐	_____	☑	☐	(9) Detailed description of detection sensors if proposed.
☐	_____	☑	☐	d. Surface water monitoring requirements; (62-701.510(4),FAC)

S	LOCATION	N/A	N/C	PART L CONTINUED
☐	_____	☑	☐	(1) Location of and justification for all proposed surface water monitoring points;
☐	_____	☑	☐	(2) Each monitoring location to be marked and its position determined by a registered Florida land surveyor;
☐	_____	☑	☐	e. Leachate sampling locations proposed; (62-701.510(5),FAC)
☐	_____	☑	☐	f. Initial and routine sampling frequency and requirements; (62-701.510(6),FAC)
☐	_____	☑	☐	(1) Initial background ground water and surface water sampling and analysis requirements;
☐	_____	☑	☐	(2) Routine leachate sampling and analysis requirements;
☐	_____	☑	☐	(3) Routine monitoring well sampling and analysis requirements;
☐	_____	☑	☐	(4) Routine surface water sampling and analysis requirements.
☐	_____	☑	☐	g. Describe procedures for implementing evaluation monitoring, prevention measures and corrective action as required; (62-701.510(7),FAC)
☐	_____	☑	☐	h. Water quality monitoring report requirements;(62-701.510(9),FAC)
☐	_____	☑	☐	(1) Semi-annual report requirements (see paragraphs 62 701.510(6)(c),(d)and (e) for sampling frequencies);
☐	_____	☑	☐	(2) Documentation that the water quality data shall be provided to the Department in an electronic format consistent with requirements for importing into Department databases, unless an alternate form of submittal is specified in the permit.
☐	_____	☑	☐	(3) Two and one-half year report requirements, or every five years if in long-term care, signed, dated and sealed by PG or PE.

PART M. SPECIAL WASTE HANDLING REQUIREMENTS (62-701.520, FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Describe procedures for managing motor vehicles; (62-701.520(1),FAC)
☐	_____	☑	☐	2. Describe procedures for landfilling shredded waste; (62-701.520(2),FAC)
☐	_____	☑	☐	3. Describe procedures for asbestos waste disposal; (62-701.520(3),FAC)
☐	_____	☑	☐	4. Describe procedures for disposal or management of contaminated soil; (62-701.520(4), FAC)
☐	_____	☑	☐	5. Describe procedures for disposal of biological wastes; (62-701.520(5), FAC)

PART N. GAS MANAGEMENT SYSTEM REQUIREMENTS (62-701.530,FAC)

S	LOCATION	N/A	N/C	
☑	Section N.1 _____	☐	☐	1. Provide the design for a gas management system that will (62-701.530(1), FAC):
☑	Section N.1.1 _____	☐	☐	a. Be designed to prevent concentrations of combustible gases from exceeding 25% the LEL in structures and 100% the LEL at the property boundary;
☑	Section N.1.2 _____	☐	☐	b. Be designed for site-specific conditions;
☐	_____	☐	☑	c. Be designed to reduce gas pressure in the interior of the landfill;
☑	Section N.1.4 _____	☐	☐	d. Be designed to not interfere with the liner, leachate control system or final cover.
☐	_____	☐	☑	2. Provide documentation that will describe locations, construction details and procedures for monitoring gas at ambient monitoring points and with soil monitoring probes; (62-701.530(2), FAC):
☐	_____	☐	☑	3. Provide documentation describing how the gas remediation plan and odor remediation plan will be implemented; (62-701.530(3), FAC):
☑	Section N.4 _____	☐	☐	4. Landfill gas recovery facilities; (62-701.530(5), FAC):

S	LOCATION	N/A	N/C	PART N CONTINUED
☑	Section N.4.a	☐	☐	a. Information required in Rules 62-701.320(7) and 62-701.330(3), FAC supplied;
☑	Section N.4.b	☐	☐	b. Information required in Rule 62-701.600(4), FAC supplied where relevant and practical;
☑	Section N.4.c	☐	☐	c. Estimate of current and expected gas generation rates and description of condensate disposal methods provided;
☑	Section N.4.d	☐	☐	d. Description of procedures for condensate sampling, analyzing and data reporting provided;
☑	Section N.4.5	☐	☑	e. Closure plan provided describing methods to control gas after recovery facility ceases operation and any other requirements contained in Rule 62-701.400(10), FAC;
☐		☐	☑	f. Performance bond provided to cover closure costs if not already included in other landfill closure costs.

PART O. LANDFILL FINAL CLOSURE REQUIREMENTS (62-701.600,FAC)

S	LOCATION	N/A	N/C	
☐		☑	☐	1. Closure permit requirements; (62-701.600(2),FAC)
☐		☑	☐	a. Application submitted to Department at least 90 days prior to final receipt of wastes;
☐		☑	☐	b. Closure plan shall include the following:
☐		☑	☐	(1) Closure design plan;
☐		☑	☐	(2) Closure operation plan;
☐		☑	☐	(3) Plan for long-term care;
☐		☑	☐	(4) A demonstration that proof of financial responsibility for long-term care will be provided.

S	LOCATION	N/A	N/C	PART O CONTINUED
☐	_____	☑	☐	2. Closure design plan including the following requirements: (62-701.600(3),FAC)
☐	_____	☑	☐	a. Plan sheet showing phases of site closing;
☐	_____	☑	☐	b. Drawings showing existing topography and proposed final grades;
☐	_____	☑	☐	c. Provisions to close units when they reach approved design dimensions;
☐	_____	☑	☐	d. Final elevations before settlement;
☐	_____	☑	☐	e. Side slope design including benches, terraces, down slope drainage ways, energy dissipaters and discussion of expected precipitation effects;
☐	_____	☑	☐	f. Final cover installation plans including:
☐	_____	☑	☐	(1) CQA plan for installing and testing final cover;
☐	_____	☑	☐	(2) Schedule for installing final cover after final receipt of waste;
☐	_____	☑	☐	(3) Description of drought-resistant species to be used in the vegetative cover;
☐	_____	☑	☐	(4) Top gradient design to maximize runoff and minimize erosion;
☐	_____	☑	☐	(5) Provisions for cover material to be used for final cover maintenance.
☐	_____	☑	☐	g. Final cover design requirements:
☐	_____	☑	☐	(1) Protective soil layer design;
☐	_____	☑	☐	(2) Barrier soil layer design;

S	LOCATION	N/A	N/C	PART O CONTINUED
☐	_____	☑	☐	(3) Erosion control vegetation;
☐	_____	☑	☐	(4) Geomembrane barrier layer design;
☐	_____	☑	☐	(5) Geosynthetic clay liner design if used;
☐	_____	☑	☐	(6) Stability analysis of the cover system and the disposed waste.
☐	_____	☑	☐	h. Proposed method of stormwater control;
☐	_____	☑	☐	i. Proposed method of access control;
☐	_____	☑	☐	j. Description of the proposed or existing gas management system which complies with Rule 62-701.530, FAC.
☐	_____	☑	☐	3. Closure operation plan shall include:(62-701.600(4),FAC)
☐	_____	☑	☐	a. Detailed description of actions which will be taken to close the landfill;
☐	_____	☑	☐	b. Time schedule for completion of closing and long-term care;
☐	_____	☑	☐	c. Describe proposed method for demonstrating financial assurance for long-term care;
☐	_____	☑	☐	d. Operation of the water quality monitoring plan required in Rule 62-701.510, FAC.
☐	_____	☑	☐	e. Development and implementation of gas management system required in Rule 62-701.530, FAC.
☐	_____	☑	☐	4. Certification of closure construction completion including: (62-701.600(6),FAC)
☐	_____	☑	☐	a. Survey monuments; (62-701.600(6)(a),FAC)
☐	_____	☑	☐	b. Final survey report; (62-701.600(6)(b),FAC)

S	LOCATION	N/A	N/C	PART O CONTINUED
☐	_____	☑	☐	5. Declaration to the public; (62-701.600(7),FAC)
☐	_____	☑	☐	6. Official date of closing; (62-701.600(8),FAC)
☐	_____	☑	☐	7. Justification for and detailed description of procedures to be followed for temporary closure of the landfill, if desired; (62-701.600(9),FAC)

PART P. OTHER CLOSURE PROCEDURES (62-701.610,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Describe how the requirements for use of closed solid waste disposal areas will be achieved;(62-701.610(1),FAC)
☐	_____	☑	☐	2. Describe how the requirements for relocation of wastes will be achieved; (62-701.610(2), FAC)

PART Q. LONG-TERM CARE (62-701.620,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Maintaining the gas collection and monitoring system; (62-701.620(5), FAC)
☐	_____	☑	☐	2. Stabilization report requirements; (62-701.620(6),FAC)
☐	_____	☑	☐	3. Right of access;(62-701.620(7),FAC)
☐	_____	☑	☐	4. Requirements for replacement of monitoring devices; (62-701.620(8),FAC)
☐	_____	☑	☐	5. Completion of long-term care signed and sealed by professional engineer (62-701.620(9), FAC).

PART R. FINANCIAL ASSURANCE (62-701.630,FAC)

S	LOCATION	N/A	N/C	
☐	_____	☑	☐	1. Provide cost estimates for closing, long-term care, and corrective action costs estimated by a PE for a third party performing the work, on a per unit basis, with the source of estimates indicated; (62-701.630(3)&(7), FAC).
☐	_____	☑	☐	2. Describe procedures for providing annual cost adjustments to the Department based on inflation and changes in the closing, long-term care, and corrective action plans; (62-701.630(4)&(8), FAC).
☐	_____	☑	☐	3. Describe funding mechanisms for providing proof of financial assurance and include appropriate financial assurance forms; (62-701.630(5),(6),&(9), FAC).
☐	_____	☑	☐	4. Provide documentation and the appropriate forms for delaying submitting proof of financial assurance for solid waste disposal units that qualify; (62-701.630(2)(c), FAC).

PART S. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

1. Applicant:

The undersigned applicant or authorized representative of Omni Waste of Osceola County LLC

_____ is aware that statements made in this form and attached

information are an application for a Construction/Operation Permit from the Florida Department of Environmental Protection and certifies that the information in this application is true, correct and complete to the best of his/her knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and the Department will be notified prior to the sale or legal transfer of the permitted facility.

Signature of Applicant or Agent

Mike Kaiser, Region Engineer
Name and Title (please type)

michael.kaiser@progressivewaste.com
E-Mail address (if available)

1099 Miller Drive
Mailing Address

Altamonte Springs, FL 32701
City, State, Zip Code

(904) 673-0446
Telephone Number

Date: 9/15/14

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

2. Professional Engineer registered in Florida (or Public Officer if authorized under Sections 403.707 and 403.7075, Florida Statutes):

This is to certify that the engineering features of this solid waste management facility have been designed/examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

KEVIN S. BROWN LICENSE 10/9/14
Signature
No. 57819

Kevin S. Brown, P.E.
Name and Title (please type)

STATE OF FLORIDA PROFESSIONAL ENGINEER

57819
Florida Registration Number
(please affix seal)

3730 Chamblee Tucker Road
Mailing Address

Atlanta, Georgia, 30341
City, State, Zip Code

kbrown@golder.com
E-Mail address (if available)

(770)496-1893
Telephone Number

Date: 10/9/14

WSI
Waste Services, Inc.

2893 Executive Park Drive, Suite 305, Weston, Florida 33331

January 24, 2011

RE: Omni Waste of Osceola County, LLC

To Whom It May Concern:

This is to confirm that Michael Kaiser is an authorized signatory of Omni Waste of Osceola County, LLC (the "Corporation"), with authority to execute and deliver all documents and instruments required in connection with environmental matters for the Corporation, including without limitation, permit applications, modifications and financial assurances for permits issued to the Corporation.

Omni Waste of Osceola County, LLC

William P. Hulligan
Manager

Waste Services, Inc.

William P. Hulligan
Executive Vice President, U.S. Operations

Table of Contents

List of Attachments

A. GENERAL INFORMATION

This intermediate permit modification application (permit modification) was prepared by Golder Associates Inc. (Golder) on behalf of Omni Waste of Osceola County, LLC (Omni) for the construction and operation of a landfill gas collection and control system (GCCS) expansion at the J.E.D. Solid Waste Management Facility (J.E.D. Facility) located in Osceola County, Florida. Omni, a Progressive Waste Solutions Company (Progressive), owns and operates the J.E.D. Facility located at 1501 Omni Way, St Cloud, Florida. This report is divided into sections following the format of the Florida Department of Environmental Protection (FDEP) permit application form 62-701.900(1).

Required information which has previously been submitted and is applicable to this permit modification has not been resubmitted. The portions of the application that have not been resubmitted have been marked “No Substantial Change” or “N/C” on the application form. Information which has been previously submitted and is not applicable to this permit modification has not been resubmitted and has been marked “Not Applicable” or “N/A” on the application form.

The J.E.D. Facility is a Class I Landfill that currently occupies approximately 125 acres of constructed disposal area. The complete build-out of the J.E.D. Facility includes 8 Phases (Cells 1-23) and approximately 360 acres of total landfill acreage. The permitted maximum elevation is 330 feet National Geodetic Vertical Datum.

The Facility has a Title V Air Permit No. 0970079-009-AV and an active GCCS. The GCCS is installed in phases per the approved design to control air emissions, odor and migration of methane.

This permit modification of Operation Permit No. SO49-0199726-022 encompasses the following design and operational changes to the facility:

1. Design changes to the horizontal landfill gas (LFG) collectors (HGC);
2. Development of a landfill gas to energy (LFGTE) facility;
3. Relocation of a section of the GCCS exterior header conveyance system; and
4. Relocation of existing and future LFG gas flares.

Design changes to the HGCs include geotextile wrapping of the HGC system and slope installation changes. These changes reflect findings and experience during installation and operation of existing HGCs at the facility.

A LFGTE facility is being developed to produce renewable energy from LFG generated in the waste disposal area. Omni submitted a Prevention of Significant Deterioration (PSD) Air Permit Application in May 2014 to address future construction of waste fill phases and continued operation of the facility’s air

emissions sources, including a LFGTE facility. The permit application was deemed complete by the FDEP and final issuance of the permit is expected by the end of September, 2014.

Relocation of the exterior header conveyance system will include temporary and permanent aboveground pipelines, and a buried pipeline along the landfill perimeter berm in select areas. Relocation of the header is necessary to service the development of the LFGTE facility located near the facility's leachate holding ponds.

Current design and Solid Waste Permit conditions allow for installation of up to four LFG flare stations around the perimeter of the waste disposal footprint. To date Flare Station #1 has been installed at the north limits of the active disposal footprint area (near the Cell 1 sump). Omni desires to co-locate all LFG handling and management equipment near the proposed LFGTE facility. This will require relocating Flare Station #1 and redesign/permitting of future flares at the LFGTE facility location. This will enable the flares and extraction wells to be operated and maintained more efficiently and in conjunction with the LFGTE facility.

B. DISPOSAL FACILITY GENERAL INFORMATION

Omni is requesting a permit modification to include the four changes as indicated below:

1. Design changes to the horizontal LFG HGC;
2. Development of a LFGTE facility;
3. Relocation of a section of the GCCS exterior header conveyance system; and,
4. Relocation of existing and future LFG flares.

As shown on the drawings in Appendix D-1, the proposed changes include:

1. Design detail changes for the horizontal gas collectors
2. Development of a LFGTE facility
3. Installation of above and below-grade header
4. Installation of condensate collection sumps
5. Installation of pressurized air supply piping
6. Installation of condensate forcemain
7. Relocation of LFG flares to the LFGTE facility location

Additional information on the proposed design changes is included in Sections K and N of this report and the included drawing package.

C. PROHIBITIONS

Section C does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

D. SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL

D.1 Application Form and Supporting Documents

As requested by FDEP, one hard copy and one electronic copy of the completed FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report, including all supporting data are included as part of this permit modification application.

D.2 Engineering Certification

Part S of the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1) has been signed and sealed by a registered Professional Engineer in the State of Florida together with all other applicable engineering plans, reports and supporting information for the application herein as required by Rule 62-701.320(6), FAC.

D.3 Transmittal Letter

A transmittal letter is included at the front of this application as required by Rule 62-701.320(7)(a), FAC.

D.4 Application Form

In accordance with Rule 62-701.320(7)(b), FAC Application Form 62-701.900(1) dated and signed by the applicant is included in this submittal.

D.5 Permit Fee

A check in the amount of $5,000 payable to FDEP is being submitted with this application. This is the amount required for an “Intermediate” Operations/Construction Permit Modification Application.

D.6 Engineering Report

This document with supporting Figures, Tables, and Appendices meets the requirements of an Engineering Report as required by Rule 62-701.320(7)(d), FAC.

D.7 Operations Plan

This application is for a permit modification to allow design changes to the GCCS as described in Section A and B of this Engineering Report. The current approved Operation Plan has been revised to reflect the proposed changes. Refer to Section K of this report for additional information on the Operation Plan.

D.8 Contingency Plan

No changes are proposed for the J.E.D. Facility Contingency Plan and has been marked “N/C” on the Application Form 62-701.900(1).

D.9 Drawings

There have been no changes to the property boundaries since the last permit renewal and therefore a site plan signed and sealed by a Florida Licensed Professional Land Surveyor is not being submitted with this application.

Copies of the design drawings (site plans and details) are located in Appendix D-1 of this submittal.

D.10 Proof of Ownership

There has been no change in ownership of the property since the last operation permit renewal application.

D.11 Recycling Goals

This item is not applicable.

D.12 Enforcement History

No enforcement actions have been taken by the FDEP against the J.E.D. Facility or Omni within the past five years. Attachment D-3 is a list of enforcement actions taken by the FDEP against all Progressive Waste Solutions of Florida operating entities.

D.13 Proof of Publication

To comply with Rule 62-701.320(8), FAC, Omni will publish a Notice of Application as directed by FDEP.

D.14 Airport Safety

This item is not applicable.

D.15 Operator Training

This item is not applicable.

E. LANDFILL PERMIT REQUIREMENTS

Section E does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

F. GENERAL CRITERIA FOR LANDFILLS

Section F does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

G. LANDFILL CONSTRUCTION REQUIREMENTS

Section G does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

H. HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS

Section H does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

I. GEOTECHNICAL INVESTIGATION REQUIREMENTS

Section I does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

J. VERTICAL EXPANSION OF LANDFILLS

Section J does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

K. LANDFILL OPERATION REQUIREMENTS

K.1 Trained Operators

This item is not applicable.

K.2 Landfill Operation Plan

This item is not applicable.

K.3 Operating Record

This item is not applicable.

K.4 Waste Records

This item is not applicable.

K.5 Access Controls

This item is not applicable.

K.6 Load Checking Program

This item is not applicable.

K.7 Spreading and Compacting

This item is not applicable.

K.8 Leachate Management

This item is not applicable.

K.9 Gas Management System

This permit modification application includes the four changes to the GCCS as indicated below:

1. Design changes to the horizontal LFG collectors (HGC);
2. Development of a landfill gas to energy (LFGTE) facility;
3. Relocation of a section of the GCCS exterior header conveyance system; and,
4. Relocation of existing and future LFG flares.

K.9.1 HGC Design Changes

Design changes to the horizontal LFG collectors include geotextile wrapping of the horizontal collector system and slope installation changes. These changes reflect findings and experience during installation and operation of existing horizontal collectors at the facility. No other changes to the lateral piping or vertical LFG extraction well system are being proposed.

Design changes to the HGCs include:

- Variable “zig-zag” slope configuration
- Wrapping of entire HGC (and associated bedding material) in geotextile material

The variable “zig-zag” design allows the installation of the HGCs to be completed safely and effectively in irregular interim waste grades. The HGCs will be installed with drainage pockets at low points to promote drainage of possible landfill liquids from the perforated collector pipe as shown on the drawings in Appendix D-1.

K.9.2 LFGTE Facility

Omni has contracted with a 3rd party developer, Chicago Bridge and Iron (CB&I), to construct and operate an electrical generating facility that will beneficially use the LFG generated from the waste disposal area. Additional information for the LFGTE facility is provided in Section N. Additionally, the operation plan for the proposed LFGTE facility is contained in Appendix K-1 which describes the proposed facility in more detail.

K.9.3 Exterior Header Pipe Relocation

The proposed modifications to the exterior header pipe (gas conveyance pipe external to the waste disposal area) are required due to the above mentioned proposed LFGTE facility. Due to the location of the proposed LFGTE facility (adjacent to the leachate storage ponds) a pipeline must be constructed to convey the landfill gas from the waste disposal area. Permanent sections of this pipeline will be constructed primarily of buried HDPE pipe, with above ground sections crossing over the stormwater retention area being constructed of carbon steel pipe. Temporary pipeline sections will be constructed of HDPE pipe along the limits of Cell 10 and 11. These temporary sections of pipeline will be removed when header pipes can be installed within the waste limits of both cells and connected to the permanent exterior pipeline section.

The pipeline will begin at Cell 10 and be routed in an easterly and southerly direction to the proposed LFGTE facility, where all of the landfill gas management systems will be located. The pipeline will maintain a minimum slope of 0.75% (exterior of the waste disposal area). The pipeline will begin as a temporary 28-inch HDPE pipe connected to the GCCS header installed within the Cell 10 waste limits. This section of pipe will be routed outside of the Cell 10 waste limits and exposed along the landfill perimeter berm to the southern limit of Cell 11 as shown on the drawings in Appendix D-1 (drawings). The section of pipe will be supported as necessary with wood and/or steel bracing or earthfills to maintain a slope for purposes of condensate management and may be painted white or wrapped as needed to minimize thermal expansion and contraction. Once the temporary header is installed to the southern limit of Cell 11, the header will then increase in size to 36-inch HDPE as shown on the drawings. The pipe will then continue along the landfill perimeter berm until it reaches a low point at Cell 15. At this location, the

pipe will transition to below ground installation along the landfill perimeter. In support of this, the landfill perimeter berm will be increase in size to better allow for the installation of the exterior header pipe as shown on the drawings. The pipeline route continues along the landfill perimeter berm until it reaches the stormwater pond adjacent to the proposed LFGTE facility (near future Cell 23), where it will daylight and cross over the stormwater pond. Once the pipeline clears the stormwater pond, it will again transition to below ground installation until reaches the LFG management system location (blowers and conditioning equipment) at the proposed LFGTE facility location.

Along the pipe route there will be sumps at designated low points to collect and convey condensate to an aboveground holding tank near the leachate storage ponds, where it will be commingled with landfill leachate for treatment and disposal. Each sump will contain a pump capable of handling the anticipated amount of condensate, as well as additional features as shown in Appendix D-1. In support of the sumps and pumping system, a pressurized air-supply pipe and liquid forcemain will be installed adjacent to the perimeter header system (collocated in one trench). Pressurized air will be supplied via an air compressor skid system located at the leachate holding ponds and proposed LFGTE facility location.

K.9.4 Relocation of Existing/Future Flares

Omni proposed to centrally locate all flares (existing Flare Station #1 and future) near the LFGTE facility in one location. The common location for all landfill management systems (i.e., blowers, landfill gas conditioning equipment, flares, pressurized air supply) will enable a more efficient operation of the GCCS as a whole and potentially reduce overall operation and maintenance costs. The GCCS (which includes the flares and ancillary equipment) will be constructed and operated in accordance with the facility's PSD and Title V Air Permits and other applicable regulations.

No change to the gas probe monitoring network located along the property boundary is being proposed within this application. Monitoring of gas concentrations in gas monitoring probes will continue to be performed to detect possible subsurface migration of LFG. The regulatory limit for methane at the property boundary is 100 percent of the lower explosive limit (LEL) for combustible gases and 25 percent of the LEL in structures. Continuous gas monitors will be placed within all occupied structures at the LFGTE facility as currently practiced for the existing administration, shop and weigh scale facilities.

K.9.5 Closure Requirements

Waste disposal activities are on-going at the site. At landfill closure, the closure plan will address any integration of the LFGTE facility with the closure and long-term care of the J.E.D. facility.

K.10 Stormwater Management

This item is not applicable.

K.11 Equipment and Operations

This item is not applicable.

K.12 All-Weather Access Road

This item is not applicable.

K.13 Additional Recordkeeping

This item is not applicable.

L. WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS

Section L does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

M. SPECIAL WASTE HANDLING REQUIREMENTS

Section M does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

N. GAS MANAGEMENT SYSTEM REQUIREMENTS

N.1 Landfill Gas Management System

The GCCS at the site currently consists of one blower/candlestick flare skid rated at 3,600 standard cubic feet per minute, approximately 99 LFG extraction wells, LFG conveyance piping, and associated appurtenances. The design modifications proposed under this permit application are voluntary and being performed to support the construction of a LFGTE facility, installing all control devices (flares) in a single location in the landfill gas management area, and revising the design for the HGCs. These revisions are not required by the Federal New Source Performance Standards (NSPS).

N.1.1 Gas Migration Control

Landfill gas migration is currently being controlled by the existing GCCS. The proposed GCCS modification will allow for the conveyance of landfill gas from the disposal area to the landfill gas management area and proposed LFGTE facility. The LFGTE facility will use processed landfill gas as fuel in engine/generator sets to provide electricity. The facility will maintain flare capacity to control 100% of the landfill gas being generated independent of the LFGTE facility.

N.1.2 Site Specific Design Conditions

N.1.2.1 Exterior Header System

The proposed GCCS expansion will be routed along the landfill perimeter berm. Above ground header will be required for portions of the header temporary install locations. Condensate sump(s) will be located along the header route as shown in Appendix D-1.

High density polyethylene (HDPE) is specified for all below grade header pipe and select above grade location near Cells 10 and 11, and carbon steel pipe is specified for the remainder of above grade header pipe. Supporting design calculations were performed (included in Attachment N-1) to assure that the perimeter header will meet the intended use. Specific calculations include:

- pipe capacity;
- pipe minimum bending radius;
- sump sizing (condensate generation);
- sump buoyancy; and
- air supply demand.

In addition, pressurized supply air and forcemain piping will be installed in the same trench as the perimeter header pipe for the management of condensate generated by the LFG. All condensate will be pumped to storage and handling systems located near the existing leachate storage facility. The pressurized air system will be design to support a total of 15 pumps, though only 3 are anticipated to be needed for the exterior header piping.

N.1.2.2 Flare Locations

All flares will be located at one location in the landfill gas management area, located adjacent to the leachate storage pond area. This will allow all flare and landfill gas maintenance actions to be performed in one location streamlining any such processes. The proposed locations can be seen on the drawings contained within Appendix D-1.

N.1.2.3 HGCs

Revisions to the HGCs include changing the slope (from constant) to a "zig-zag: configuration with engineered low points and pockets drains as shown on the included drawings. This revision will allow the installed slope to be maximized while maintaining the ability to safely and effectively install the HGCs. Also, the HGCs and associated bedding material will now be wrapped in a geotextile vice just a geotextile cover. Operational experience has demonstrated some siltation of installed HGCs and this design modification has been introduced to minimize future siltation of HGCs. These above described changes are anticipated to prolong the life of the HGCs and enable safe and efficient installation.

N.1.3 Reducing Gas Pressure

No additional changes to the interior GCCS are proposed within this application.

N.1.4 Liner, Leachate Control System or Final Cover Non-Interference

No proposed modifications to the GCCS expansion will interfere with the bottom liner, leachate control system or final cover system.

N.2 Gas Monitoring Program

No changes to the landfill gas migration monitoring plan are being proposed with this application. Gas monitoring is performed in accordance with Rule 62-701.530, FAC. The results of the quarterly monitoring are submitted to FDEP. New structures associated with the LFGTE facility will be continuously monitored to ensure that atmospheric conditions do no exceed 25% of the LEL for methane.

N.3 Gas and Odor Remediation Plan Implementation

No changes to the landfill gas remediation and odor remediation plans are being proposed with this application. In the event that methane is detected in concentration that exceed the regulatory limit during the quarterly monitoring, Omni shall submit to FDEP a gas remediation plan within seven days of detection and the remedy will be completed within 60 days of the exceedance detection, or as approved by FDEP.

In the event that an objectionable odor caused by LFG is detected, a routine odor-monitoring program will be implemented. If the odor monitoring program confirms the existence of objectionable odors, then an

odor remediation plan shall be submitted to FDEP. Upon approval by FDEP, the odor remediation plan shall be implemented within 30 days.

N.4 Landfill Gas Recovery Facilities

Omni has contracted with CB&I to develop a LFGTE facility for the beneficial use of the LFG produced by the J.E.D. Facility. The LFGTE facility will be located just south of the existing leachate storage ponds. The LFGTE facility will have a gross electrical generating capacity of 19.2 megawatts (MW) and will consist of twelve Caterpillar (CAT Model G3520C (CAT G3520C) lean-burn internal combustion engines and generator sets each having a gross electrical generating capacity of 1.6 MW. The LFGTE facility will be constructed in phases with the initial phase planned for six engines with a gross electrical generating capacity of 9.6 MW. The remaining 6 engines will be installed periodically as landfill gas flow increases. Power will be sold to Orlando Utilities Commission and wheeled along Duke Energy's transmission lines serving the J.E.D. Facility.

The LFGTE facility is expected to operate continuously 24 hours per day with the exception of planned shutdowns (for routine maintenance, repairs, and expansions) and unplanned shutdowns (malfunctions, automatic shutdowns). Omni will maintain a 100% flaring capacity independent of the LFGTE facility via existing and future flares. During normal operation, an automatic valve will direct any excess landfill gas (not being consumed by the LFGTE facility) to the flares for destruction. During the LFGTE facility shutdown periods, Omni's landfill flares will automatically start and destroy the landfill gas until the LFGTE facility is restarted.

The LFGTE Facility is not required to be installed by any regulation or rule. Current plans are to operate the LFGTE facility for a 20-year contract period and longer if economically viable.

N.4.1 Application Information

The information required by Rule 62-701.320(7) and 62-701.330(3), FAC are included in both the permit forms and this engineering report.

N.4.2 Closure Information

Waste disposal activities are on-going at the site. Since the facility will maintain a 100% control capacity of flares (thermal destruction of landfill gas) and the LFGTE plant equipment/revenue generating capacity exceeds the removal value, no additional closure information or equipment removal costs are required for the LFGTE facility. Current plans include an operational life of 20 years based upon the contract between Omni and CB&I. Operation of the LFGTE facility beyond this time has not yet been determined, but would likely continue based on LFG availability and revenue generating capacity.

N.4.3 Gas Generation and Condensate Management

No changes to the gas generating potential are being proposed.

The proposed exterior header system has been designed to handle approximately 10,000 cubic feet per minute of landfill gas starting near Cell 11. Once the facility achieves full build-out, landfill gas will be routed directly from the waste foot print to the LFGTE facility area near Cell 23. The exterior header may still be utilized as an additional method to convey landfill gas from the disposal area to the landfill gas management area and LFGTE facility.

Condensate is generated when extracted gas from the landfill cools in the collection piping. A condensate sump will be located at the engineered low points in the gas header pipeline to collect the condensate and convey it to the leachate storage ponds. The drawings in Attachment D-1 show the condensate sump locations and anticipated details. Attachment N-1 contains the condensate generation estimate calculations and sump design for the perimeter header system.

Condensate from the LFGTE facility will be also generated and is discussed in the LFGTE Facility Operation Plan.

N.4.4 Condensate Sampling, Analyzing, and Data Reporting

All of the condensate being generated from the GCCS will be directed either back into the landfill into the leachate collection system or managed at the leachate storage facility. As necessary, condensate will be sampled to determine hazardous characteristics.

Condensate from the LFGTE facility will be collected and drained to sumps where it will be pumped to the condensate storage and management system located near the leachate storage ponds. Unless otherwise required by Local, State or Federal regulation, condensate will be commingled with leachate and treated and disposed accordingly.

N.4.5 Closure Plan

Waste disposal activities are on-going at the Facility. At landfill closure, the closure plan will address any integration of the GCCS with the intended end use and will contain the following:

- a closure report;
- a closure design plan;
- a closure operation plan;
- closure procedures;
- a plan for long-term care; and
- demonstration of proof of financial responsibility for long term care (note that the facility is planning to maintain a 100% control capacity (via flares) of collected landfill gas, therefore no financial assurance is required for the LFGTE facility.

N.4.6 Closure Costs

The LFGTE facility is a voluntary active LFG collection and control system beneficial use project. Closure cost and long-term care cost estimates are not required as the J.E.D. Facility will maintain 100% capability of flaring the LFG independent of the LFGTE facility. Ceasing or continued operation of the LFGTE facility does not require any “added closure construction cost” due to the salvage value of plant equipment and/or revenue generating capability of the facility that would offset any added maintenance, operating or equipment and structure removal costs. Other changes to the GCCS do not affect the closure costs, as no additional devices are being proposed.

O. LANDFILL CLOSURE REQUIREMENTS

Section O does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

P. OTHER CLOSURE PROCEDURES

Section P does not apply to this permit modification application and is designated as “Not Applicable” on the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1), which is attached at the beginning of this permit application report.

Q. LONG-TERM CARE

Q.1 Gas Collection and Monitoring

The gas collection and monitoring system will be maintained for the duration of the long-term care period as required by Rule 62-701.620(5), FAC and as previously permitted.

Q.2 Stabilization Report

This item is not applicable.

Q.3 Right of Access

This item is not applicable.

Q.4 Replacement of Monitoring Devices

This item is not applicable.

Q.5 Completion of Long-Term Care

This item is not applicable.

R. FINANCIAL ASSURANCE

R.1 Cost Estimates

The closure cost construction and long-term care cost estimates associated with the LFGTE facility are not required as the system is a voluntary system and the owner will maintain 100% control of the collected landfill gas independent of the LFGTE facility. See additional information in Section N.4.6.

R.2 Annual Cost Estimates

This item is not applicable.

R.3 Funding Mechanisms

This item is not applicable.

R.4 Proof for Delaying Submitting Proof of Financial Assurance

This item is not applicable.

S. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

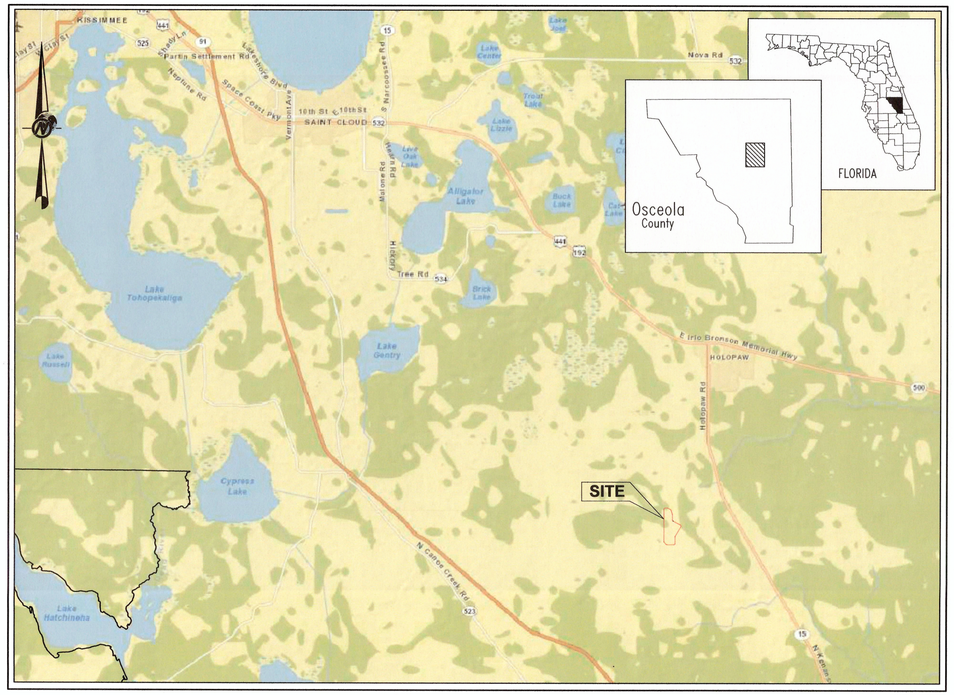
Part S of the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1) has been certified by the Applicant and by a Registered Professional Engineer in the State of Florida.

ATTACHMENT D-1

DRAWINGS

J.E.D. SOLID WASTE MANAGEMENT FACILITY
LANDFILL GAS COLLECTION AND CONTROL SYSTEM (GCCS) REVISIONS
APPLICATION FOR INTERMEDIATE PERMIT MODIFICATION

ST. CLOUD, OSCEOLA COUNTY, FLORIDA



SITE LOCATION MAP

LIST OF DRAWINGS		
SHEET	TITLE	REVISION
1	TITLE SHEET	
2	EXISTING CONDITIONS	
3A	PROPOSED PIPE LAYOUT PLAN & PROFILE (1 OF 2)	
3B	PROPOSED PIPE LAYOUT PLAN & PROFILE (2 OF 2)	
4	GCCS DETAILS (1 OF 3)	
5	GCCS DETAILS (2 OF 3)	
6	GCCS DETAILS (3 OF 3)	

LIST OF DRAWINGS (SIGNED AND SEALED BY OTHERS)		
SHEET	TITLE	REVISION
G000	COVER SHEET	
C100	OVERALL SITE PLAN	
A901	RENDERING - SW VIEW	

Prepared for:

OMNI WASTE OF OSCEOLA COUNTY, LLC

Progressive Waste Solutions

1501 OMNI WAY
ST. CLOUD, FLORIDA 34773
TEL: 407-891-3720 FAX: 407-891-3730

Prepared by:

Golder Associates
Jacksonville, Florida

October 2014

Golder Associates
9428 Baymeadows Way, Suite 400
Jacksonville, Florida 32256
Tel: 904/363-3430 Fax: 904/363-3445
COA No. 1670

KEVIN S. BROWN LICENSE No. 57819 STATE OF FLORIDA REGISTERED PROFESSIONAL ENGINEER

10/9/14

Kevin S. Brown, P.E.
Florida Registration No. 57819

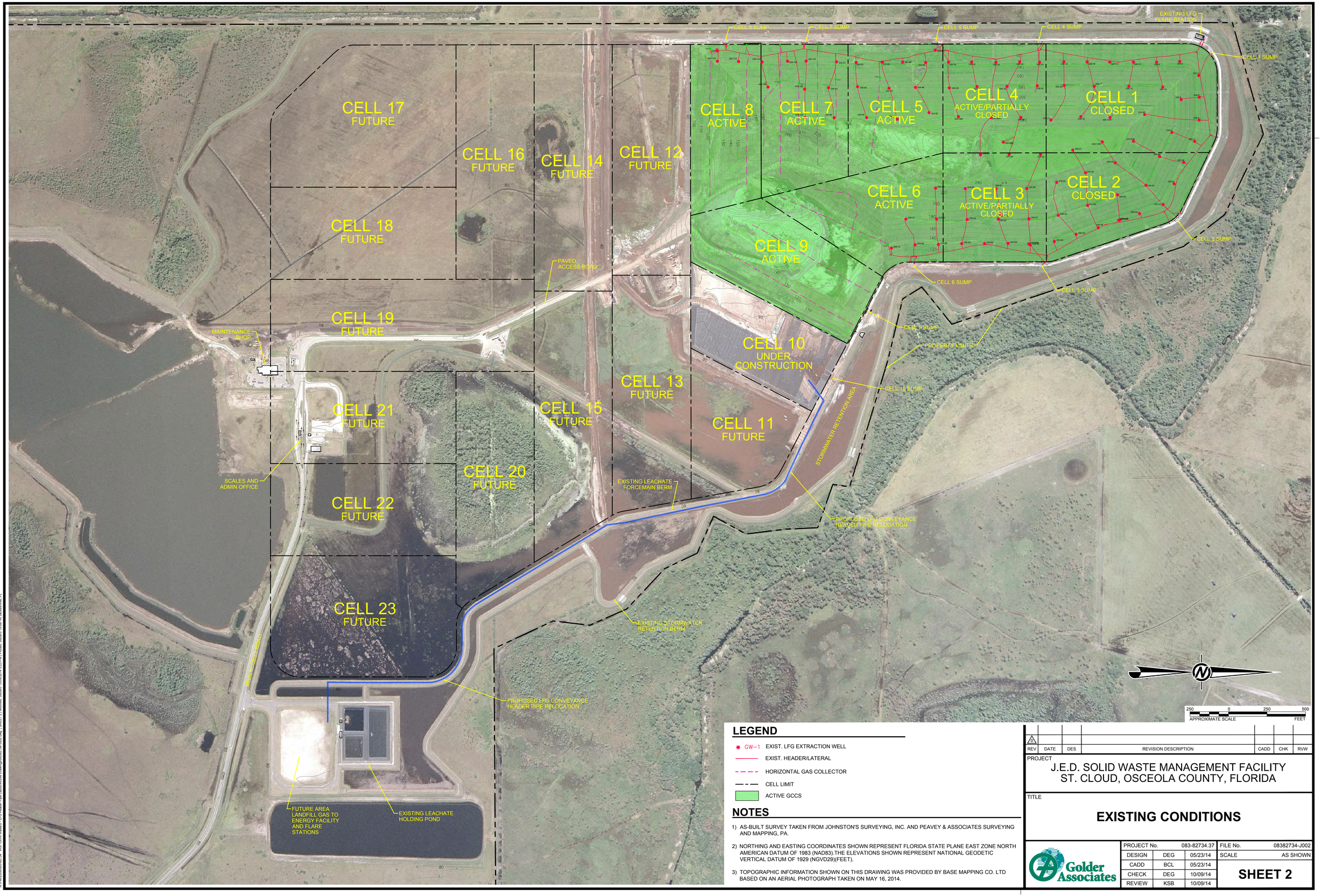
J.E.D. SOLID WASTE MANAGEMENT FACILITY
OSCEOLA COUNTY
FLORIDA

TITLE SHEET/LIST OF DRAWINGS

SHEET 1

PROJECT No.: 083-82734 FILE No.: 08382734-J001 CADD: BCL DATE: 10/08/14

Drawing file: 08382734-J001.dwg Oct 08, 2014 4:40pm



LEGEND

- GW–1 EXIST. LFG EXTRACTION WELL
- EXIST. HEADER/LATERAL
- HORIZONTAL GAS COLLECTOR
- CELL LIMIT
- ACTIVE GCCS

NOTES

1) AS-BUILT SURVEY TAKEN FROM JOHNSTON'S SURVEYING, INC. AND PEAVEY & ASSOCIATES SURVEYING AND MAPPING, PA.
2) NORTHING AND EASTING COORDINATES SHOWN REPRESENT FLORIDA STATE PLANE EAST ZONE NORTH AMERICAN DATUM OF 1983 (NAD83).THE ELEVATIONS SHOWN REPRESENT NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29)(FEET).
3) TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING WAS PROVIDED BY BASE MAPPING CO. LTD BASED ON AN AERIAL PHOTOGRAPH TAKEN ON MAY 16, 2014.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1						

PROJECT

J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE

EXISTING CONDITIONS

Golder Associates

PROJECT No.		083-82734.37	FILE No.		08382734-J002
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CADD	BCL	05/23/14			
CHECK	DEG	10/09/14			SHEET 2
REVIEW	KSB	10/09/14			

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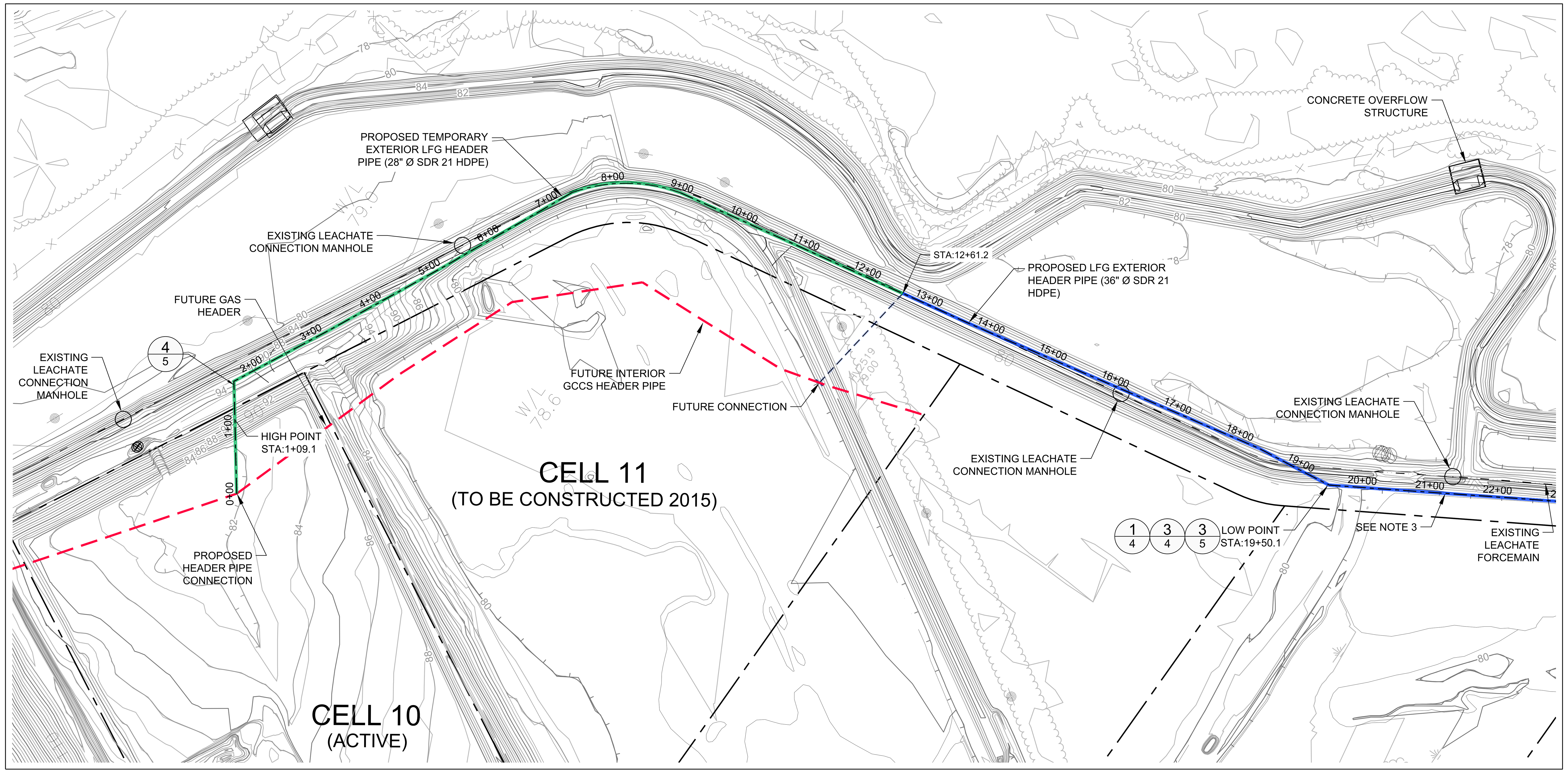
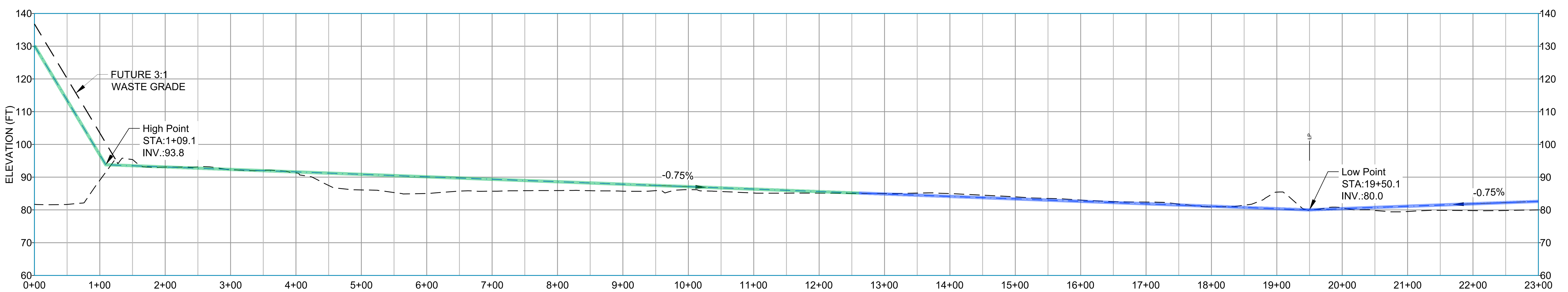




NOTES

1) PROPOSED TEMPORARY LFG CONVEYANCE PIPE FROM CELL 10 TO REMAIN UNTIL WASTE FILL IN CELL 11 ALLOWS FOR INSTALLATION OF HEADER ON WASTE FILL. CONNECT HEADER IN CELL 11 TO PERMANENT HEADER PIPE SYSTEM. REMOVE TEMPORARY HEADER FROM CELL 10. TEMPORARY HEADER PIPE TO BE PAINTED WHITE AND/OR BRACED TO CONTROL THERMAL EXPANSION AND CONTRACTION. EXACT LOCATION OF EXTERIOR HEADER MAY BE ADJUSTED DUE TO FACILITY OPERATIONS.

2) CONDENSATE SUMPS WILL BE LOCATED AT ALL LOW POINTS. SAMPLE PORTS/RISERS WILL BE LOCATED AT ALL HIGH POINTS.

3) EXISTING LANDFILL PERIMETER BERM TO BE MODIFIED IN SUPPORT OF PROPOSED PIPELINE. SEE DETAIL 5/5

HORIZONTAL SCALE 100 0 100 200 FEET
VERTICAL SCALE 20 0 20 40 FEET

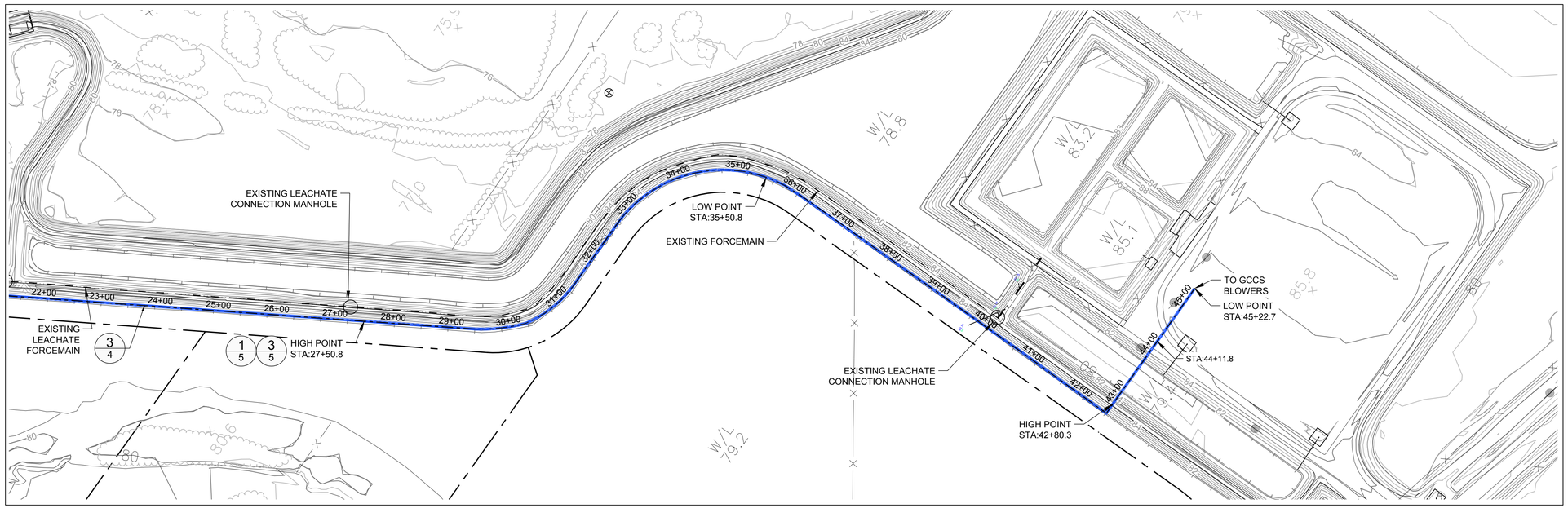
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

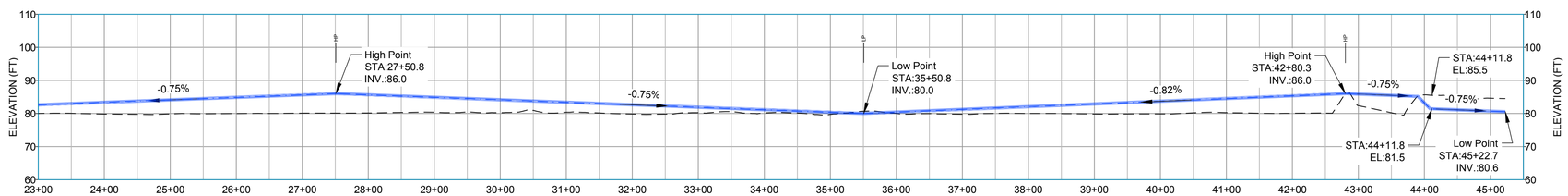
PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
PROPOSED PIPE LAYOUT PLAN & PROFILE (1 OF 2)

PROJECT No.		083-82734.37	FILE No. 08382734-J004
DESIGN	DEG	05/23/14	SCALE AS SHOWN
CADD	BCL	05/23/14	
CHECK	DEG	10/09/14	SHEET 3A
REVIEW	KSB	10/09/14	

Golder Associates





NOTES

1) PROPOSED TEMPORARY LFG CONVEYANCE PIPE FROM CELL 10 TO REMAIN UNTIL WASTE FILL IN CELL 11 ALLOWS FOR INSTALLATION OF HEADER ON WASTE FILL. CONNECT HEADER IN CELL 11 TO PERMANENT HEADER PIPE SYSTEM. REMOVE TEMPORARY HEADER FROM CELL 10. TEMPORARY HEADER PIPE TO BE PAINTED WHITE AND/OR BRACED TO CONTROL THERMAL EXPANSION AND CONTRACTION. EXACT LOCATION OF EXTERIOR HEADER MAY BE ADJUSTED DUE TO FACILITY OPERATIONS.

2) CONDENSATE SUMPS WILL BE LOCATED AT ALL LOW POINTS. SAMPLE PORTS/RISERS WILL BE LOCATED AT ALL HIGH POINTS.

3) EXISTING LANDFILL PERIMETER BERM TO BE MODIFIED IN SUPPORT OF PROPOSED PIPELINE. SEE DETAIL 5/5

HORIZONTAL SCALE 100 0 100 200 FEET
VERTICAL SCALE 20 0 20 40 FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1						

PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
PROPOSED PIPE LAYOUT PLAN & PROFILE (2 OF 2)

Golder Associates

PROJECT No.		083-82734.37	FILE No.	08382734-J004
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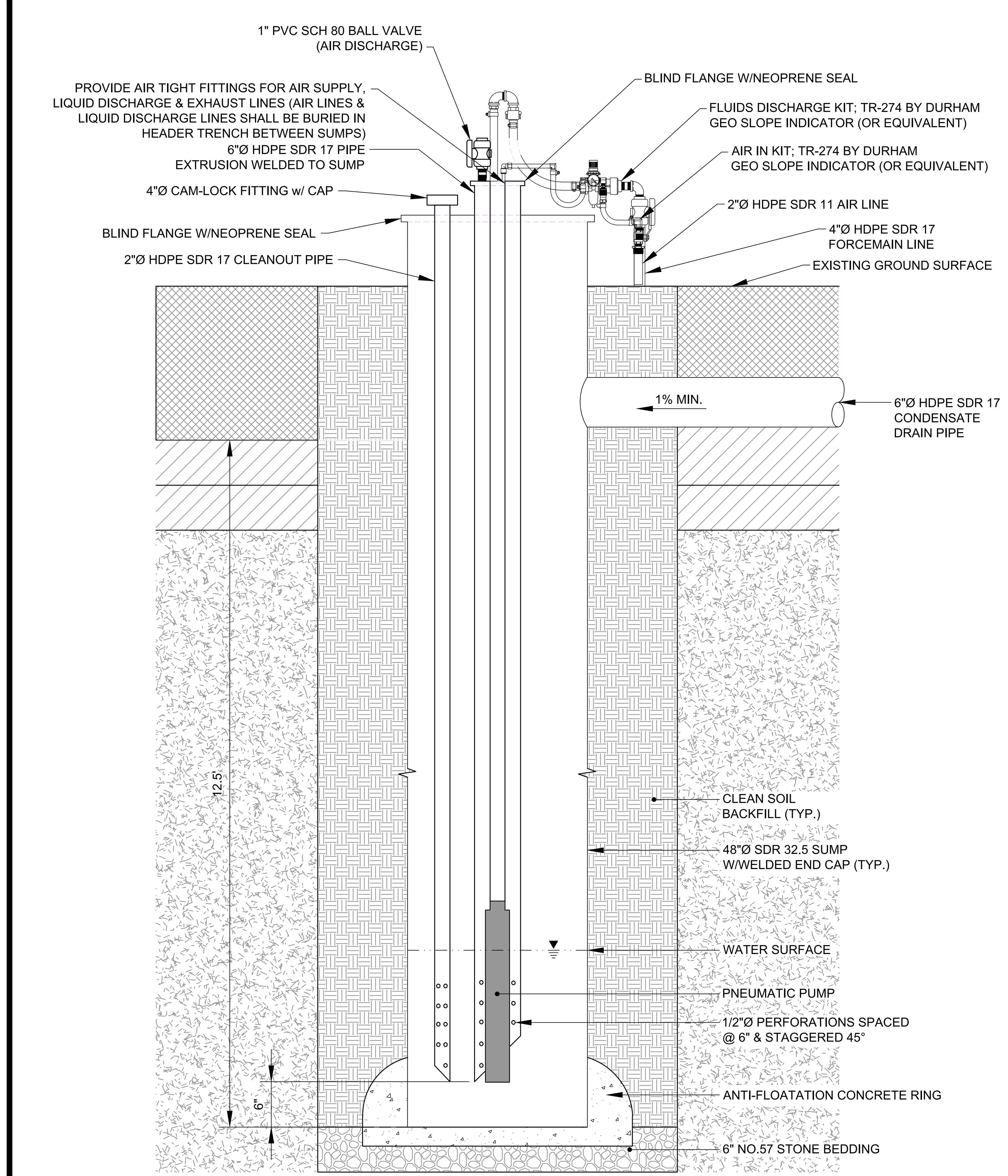
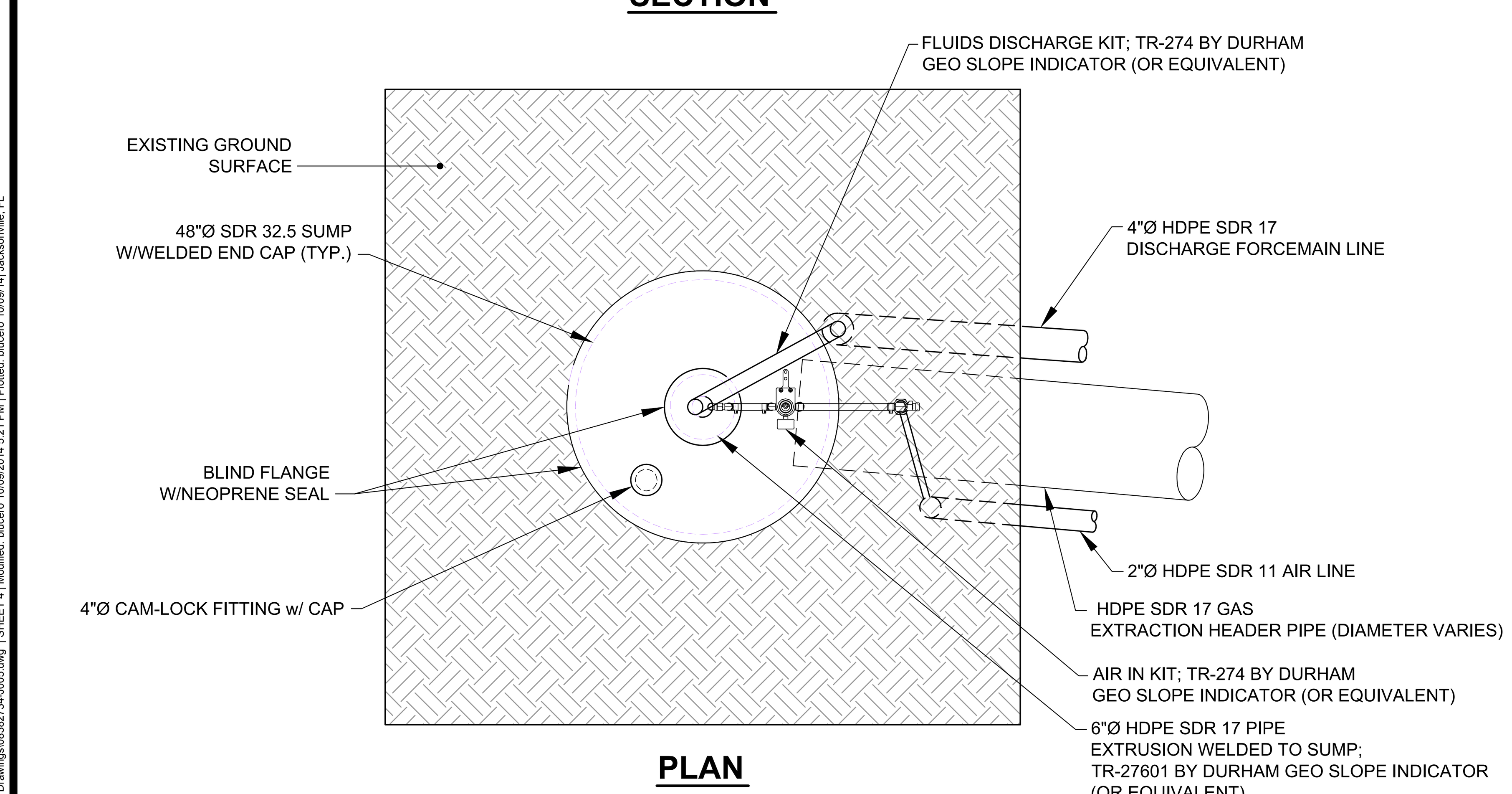
REVIEW	KSB	10/09/14		



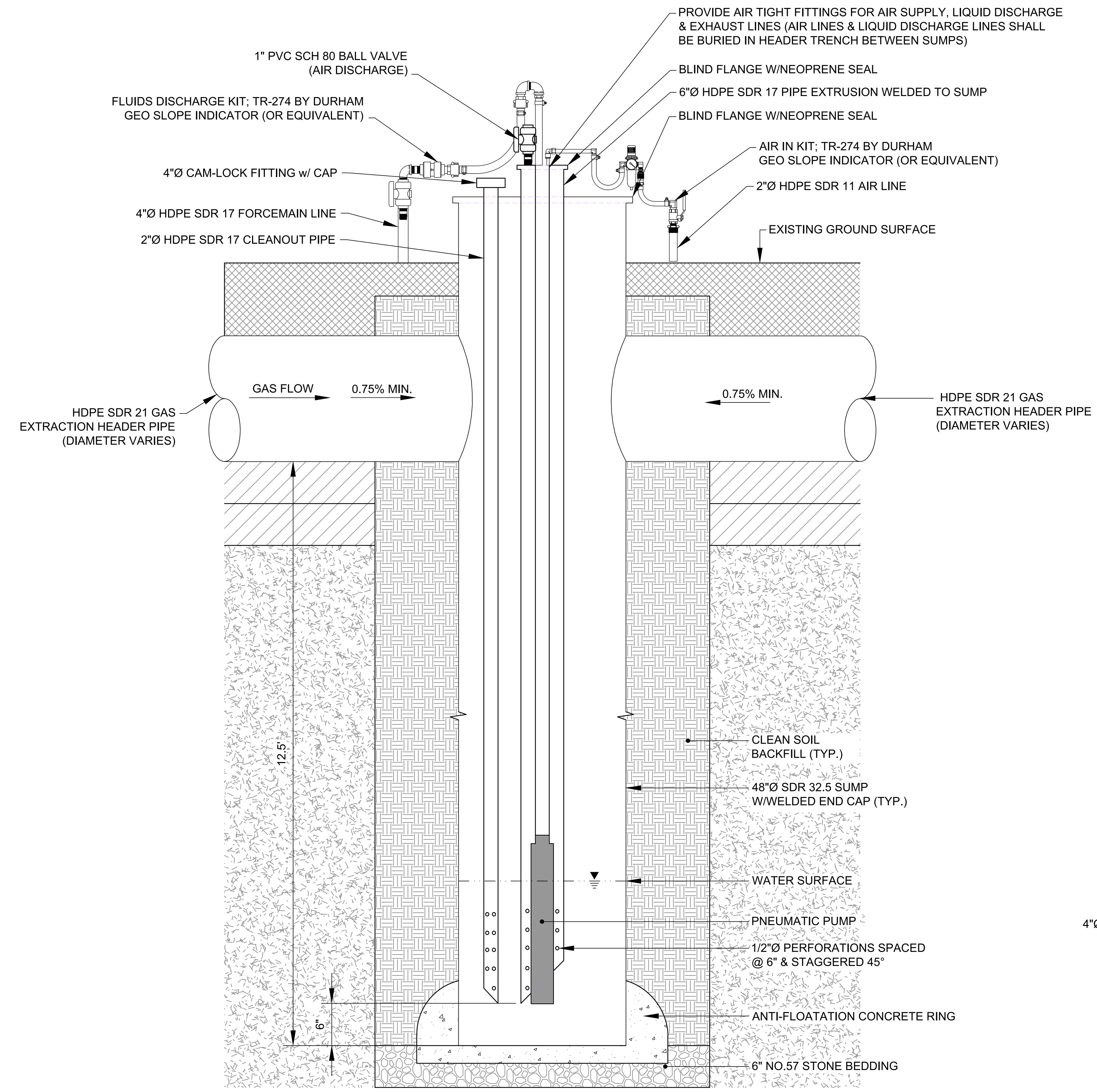
SECTION



PLAN

1/4 REMOTE CONDENSATE SUMP DETAIL (OPTION 1)

NTS



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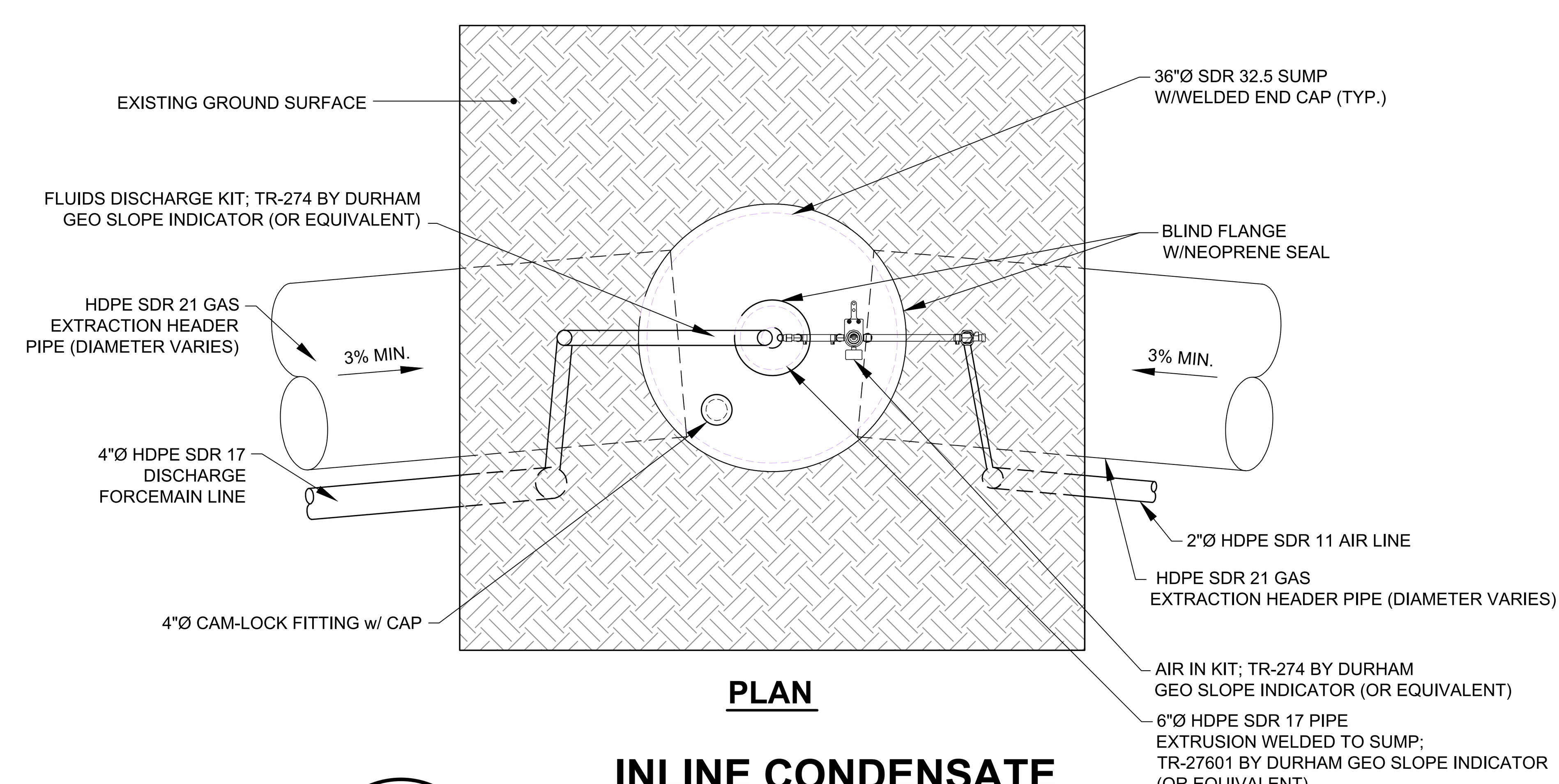
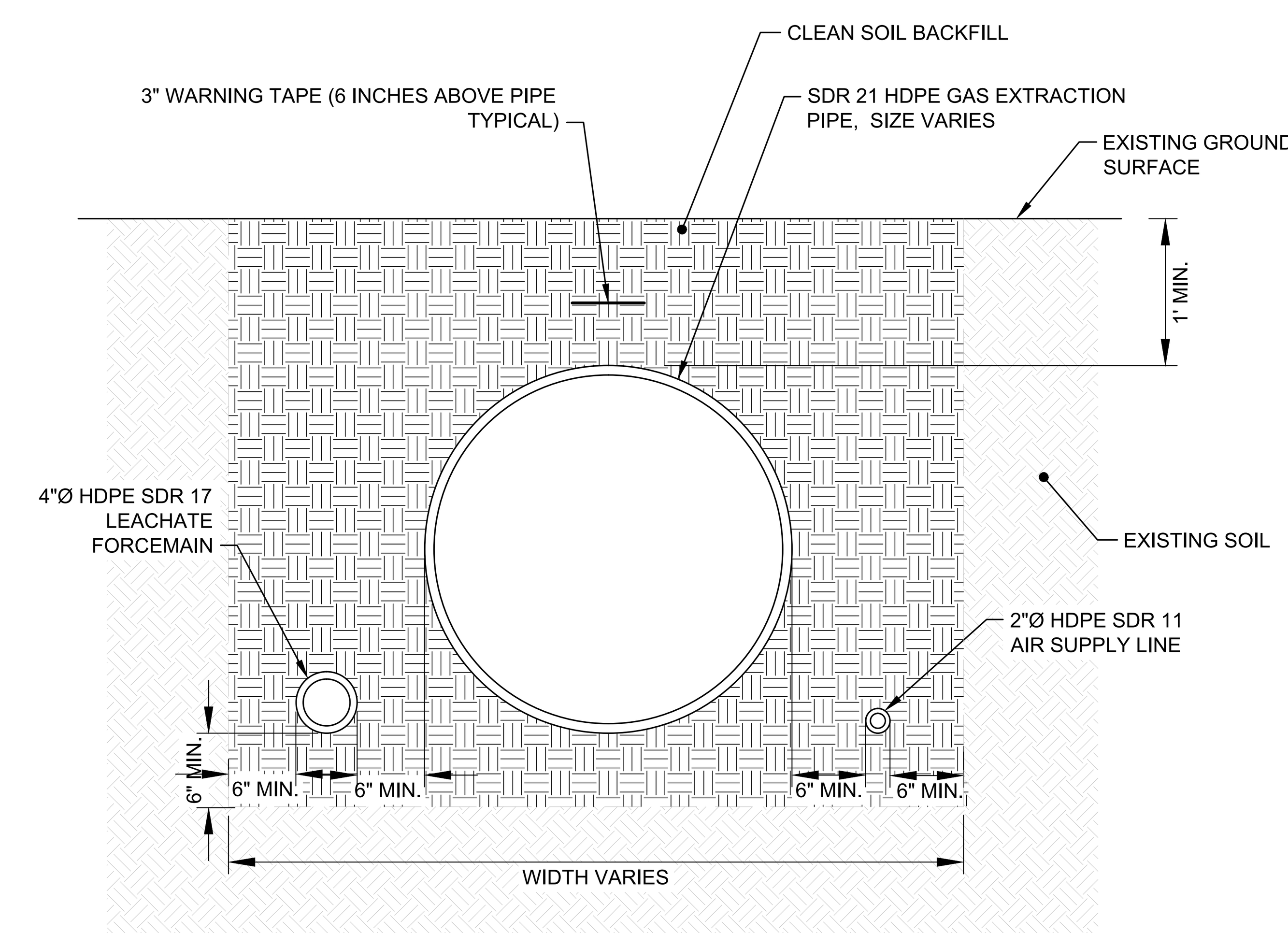


PLAN

2/4 INLINE CONDENSATE SUMP DETAIL (OPTION 2)

NTS



3/4 PIPE TRENCH DETAIL

NTS

NOTES

1. EXACT CONSTRUCTION DETAILS MAY VARY ACCORDING TO FIELD CONDITIONS AND MANUFACTURER SPECIFIC DETAILS WHILE KEEPING THE GENERAL CONCEPTS OF THE DETAILS PRESENTED ON THIS DRAWING.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
GCCS DETAILS (1 OF 3)

Golder Associates				
PROJECT No.		083-82734.37	FILE No.	08382734-J005
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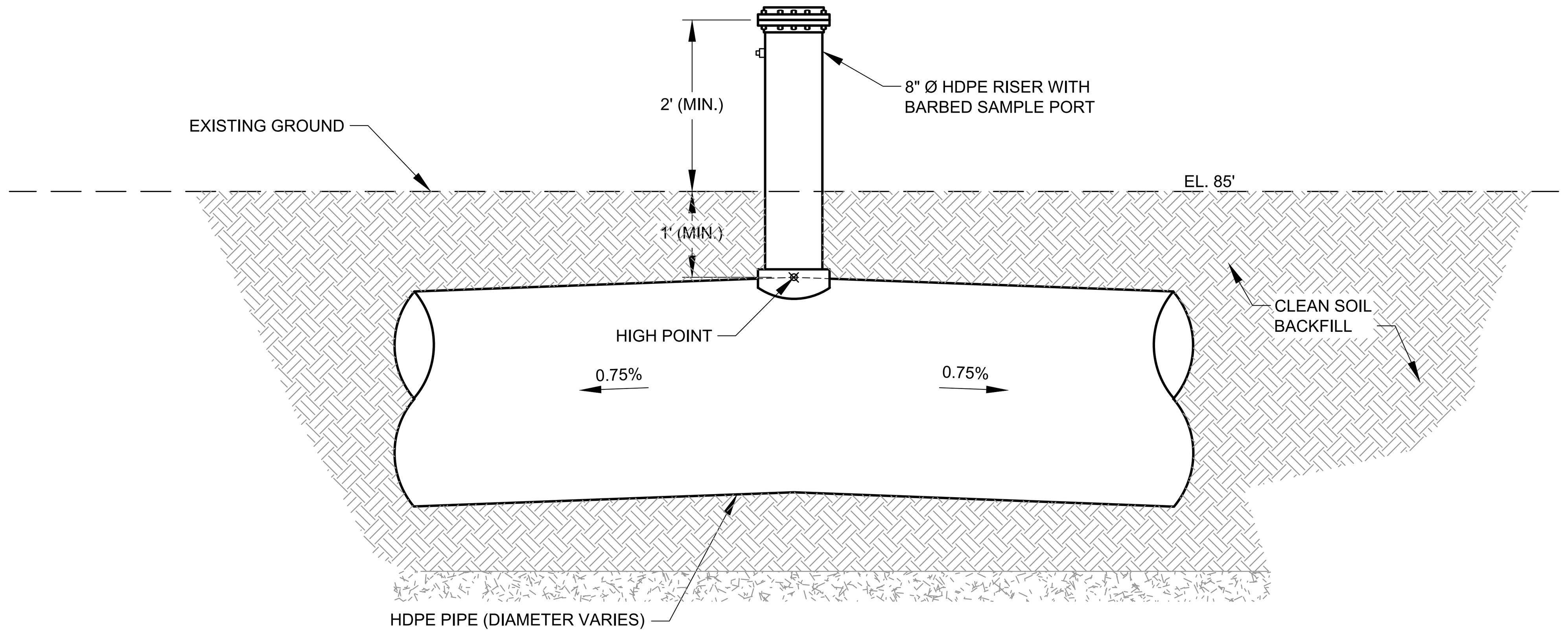
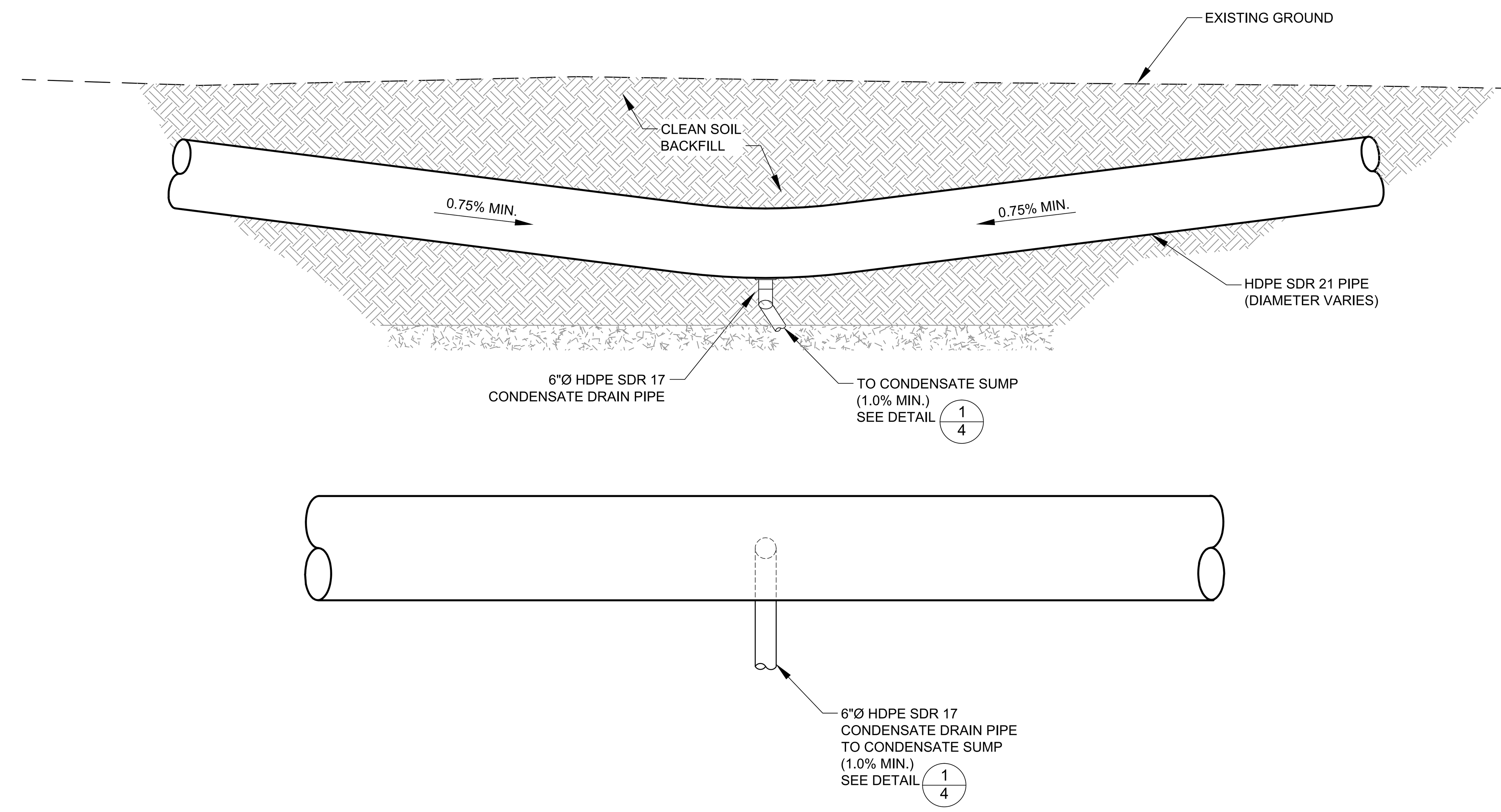
REVIEW	KSB	10/09/14		



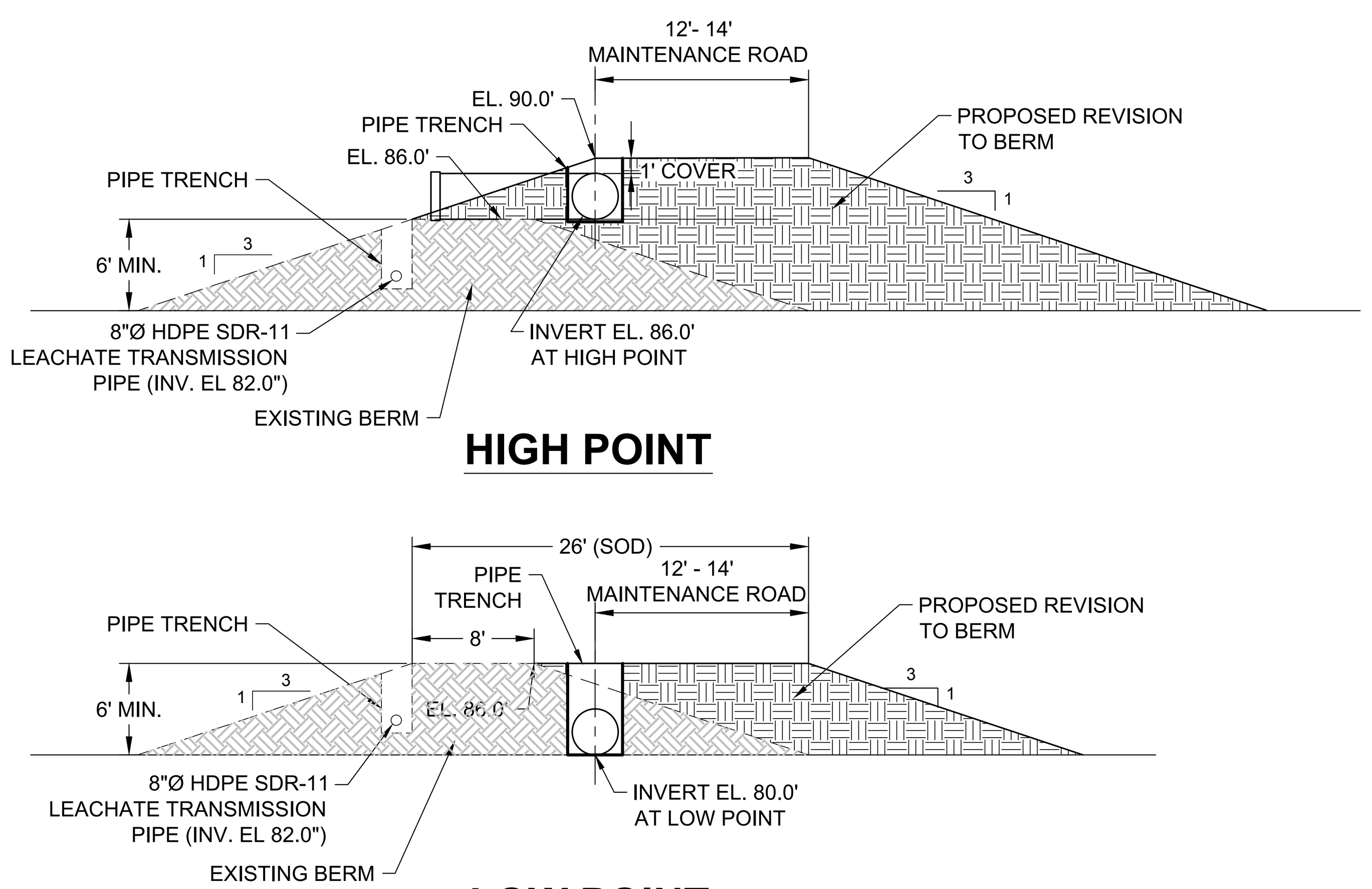
1/5 SAMPLE PORT AT HIGH POINT

NTS



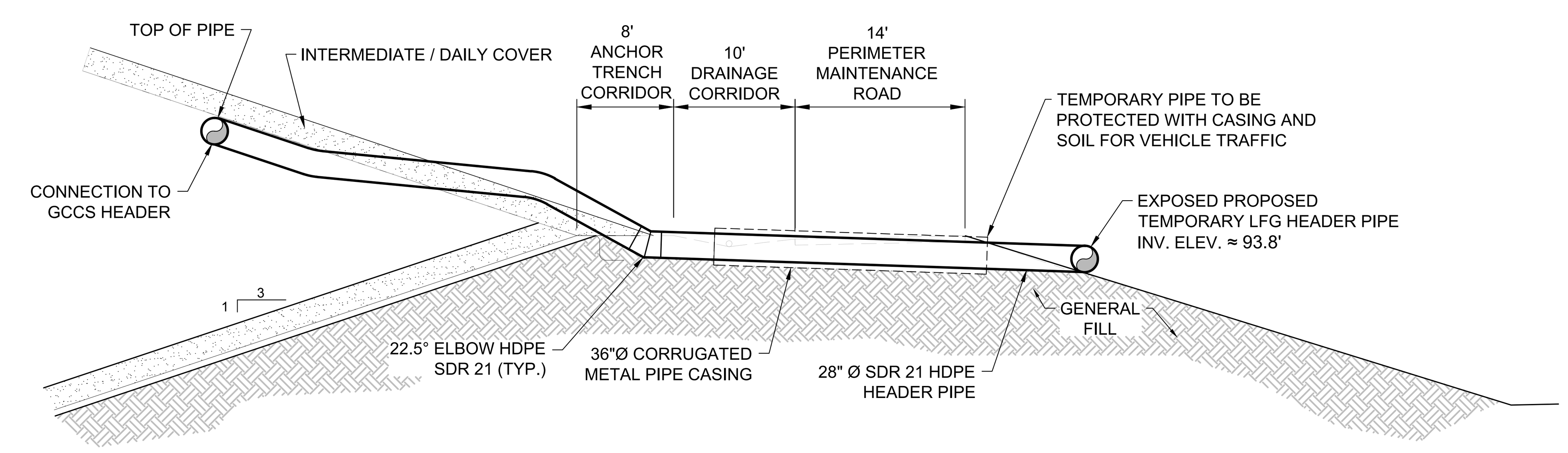
2/5 LOW POINT REMOTE SUMP (OPTION 1)

NTS



3/5 CROSS SECTIONS AT HIGH POINT & LOW POINT

SCALE 10 0 10 20 FEET



4/5 HEADER PIPE AT PROPOSED PIPE CONNECTION

SCALE 10 0 10 20 FEET

NOTES

1. EXACT CONSTRUCTION DETAILS MAY VARY ACCORDING TO FIELD CONDITIONS AND MANUFACTURER SPECIFIC DETAILS WHILE KEEPING THE GENERAL CONCEPTS OF THE DETAILS PRESENTED ON THIS DRAWING.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
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PROJECT

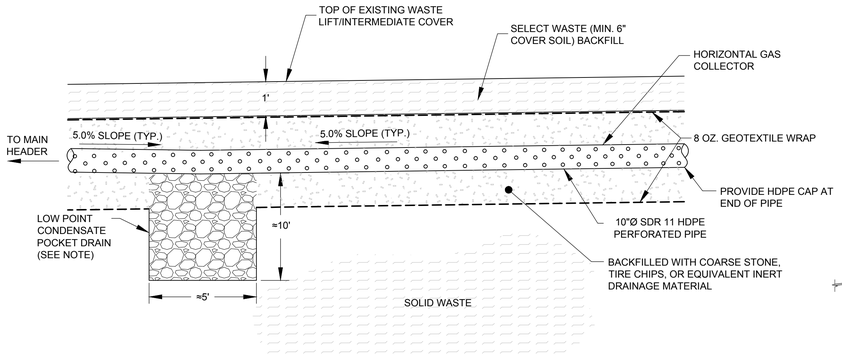
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE

GCCS DETAILS (2 OF 3)

PROJECT No.		083-82734.37	FILE No. 08382734-J005
DESIGN	DEG	05/23/14	SCALE AS SHOWN
CADD	BCL	05/23/14	
CHECK	DEG	10/09/14	SHEET 5
REVIEW	KSB	10/09/14	

Golder Associates

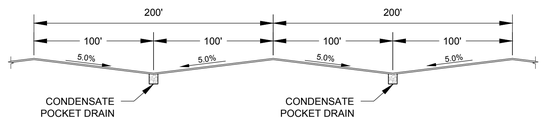


NOTES:
1. CONDENSATE POCKET DRAIN TO BE INSTALLED APPROXIMATELY EVERY 200 LINEAR FEET ALONG HORIZONTAL GAS COLLECTOR (100' BETWEEN LOW/HIGH POINTS). DRAINS TO BE APPROXIMATELY 10'x5'x5' AND BACKFILLED WITH COARSE STONE, TIRE CHIPS, OR EQUIVALENT INERT DRAINAGE MATERIAL.
2. TO ALLOW FOR INCREASED SETTLEMENT AND COMPRESSIBILITY WHEN USING TIRE CHIPS AS BACKFILL MEDIA, INCREASE DEPTHS TO 1.5' ABOVE AND BELOW PIPE. DIMENSIONS OF TRENCH ARE MINIMUM. OWNER MAY INCREASE SIZE OF TRENCH BASED ON MATERIAL USED.

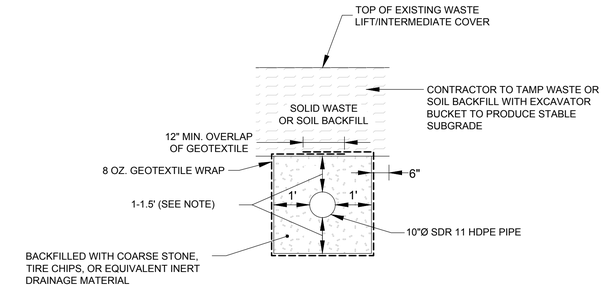
TYPICAL PROFILE OF HORIZONTAL GAS COLLECTOR

1/6

NTS



TYPICAL PIPE PROFILE LAYOUT

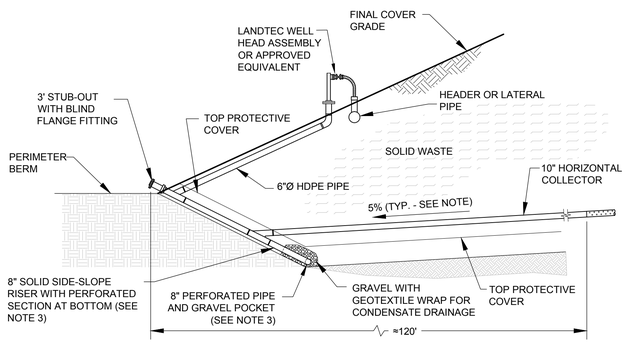


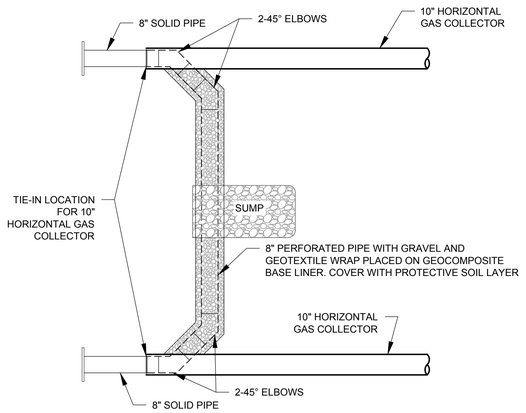
NOTE: TO ALLOW FOR INCREASED SETTLEMENT AND COMPRESSIBILITY WHEN USING TIRE CHIPS AS BACKFILL MEDIA, INCREASE DEPTHS TO 1.5' ABOVE AND BELOW PIPE. DIMENSIONS OF TRENCH ARE MINIMUM. OWNER MAY INCREASE SIZE OF TRENCH BASED ON MATERIAL USED.

TYPICAL SECTION OF 10"Ø HDPE HORIZONTAL GAS COLLECTOR

2/6

NTS



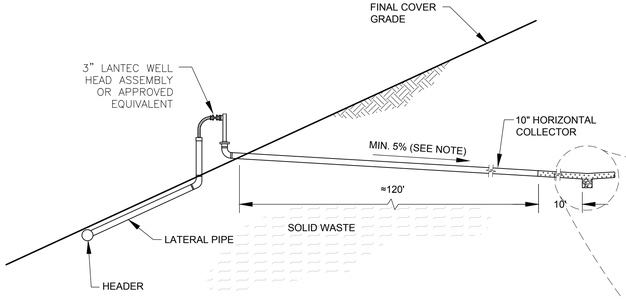


NOTES:
1. SLOPE DIRECTION AND GRADE OF HORIZONTAL GAS COLLECTOR WILL BE BASED ON SLOPE DIRECTION AND GRADE OF FILL OPERATIONS.
2. 8" SOLID SIDESLOPE RISER TO BE INSTALLED DIRECTLY ON UNDERLYING BASE OF GEOCOMPOSITE LINER DURING CELL CONSTRUCTION. PLACE ADDITIONAL STRIP OF GEOCOMPOSITE BENEATH PIPE FOR ADDITIONAL CUSHION.
3. CONNECT SIDESLOPE RISERS ON EACH SIDE OF SUMP (FOR TWO LOWER TIER HORIZONTALS) WITH 8" PERFORATED PIPE AND GRAVEL POCKET. PLACE WRAPPED GRAVEL AND PERFORATED PIPE SECTION DIRECTLY ON GEOCOMPOSITE BASE LINER AND ACROSS SUMP LOCATION. THIS IS TO PROMOTE MORE EFFECTIVE DRAINAGE OF CONDENSATE FROM THE LOWER TIER HORIZONTAL COLLECTORS.

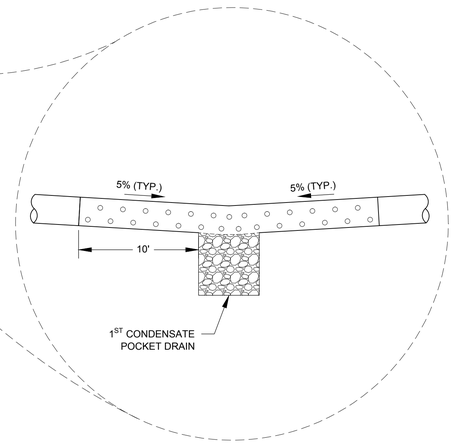
CONNECTION DETAIL HORIZONTAL GAS COLLECTOR (LOWER TIER)

3/6

NTS



NOTE: MUST BE SLOPED INTO WASTE MASS FOR UPPER TIER HORIZONTAL COLLECTORS. MINIMUM 5% SLOPE REQUIRED FOR SOLID PIPE.



CONNECTION DETAIL HORIZONTAL GAS COLLECTOR (UPPER TIER)

4/6

NTS

NOTES

1. EXACT CONSTRUCTION DETAILS MAY VARY ACCORDING TO FIELD CONDITIONS AND MANUFACTURER SPECIFIC DETAILS WHILE KEEPING THE GENERAL CONCEPTS OF THE DETAILS PRESENTED ON THIS DRAWING.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

PROJECT

J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE

GCCS DETAILS (3 OF 3)

Golder Associates

PROJECT No.		083-82734.37	FILE No.		08382734-J005
DESIGN	DEG	05/23/14	SCALE		AS SHOWN
CADD	BCL	05/23/14			
CHECK	DEG	10/09/14			SHEET 6
REVIEW	KSB	10/09/14			

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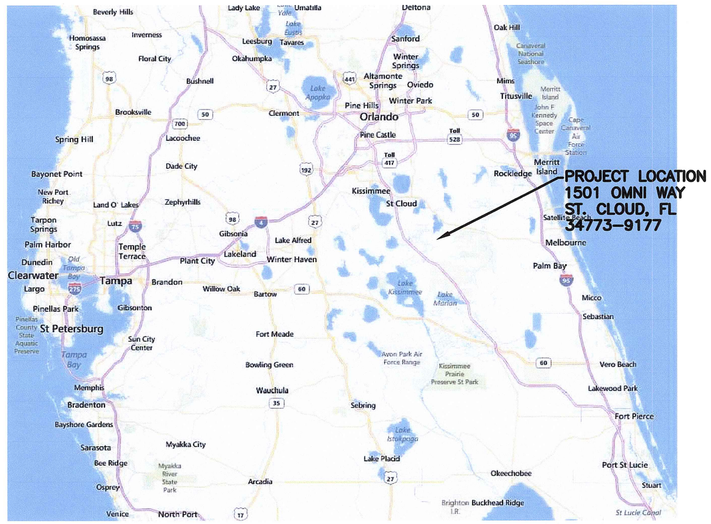
RENEWABLE
LANDFILL GAS TO ENERGY FACILITY
CB&I ENVIRONMENTAL & INFRASTRUCTURE
ST. CLOUD, FLORIDA
2014

STATE MAP



LOCATION MAP

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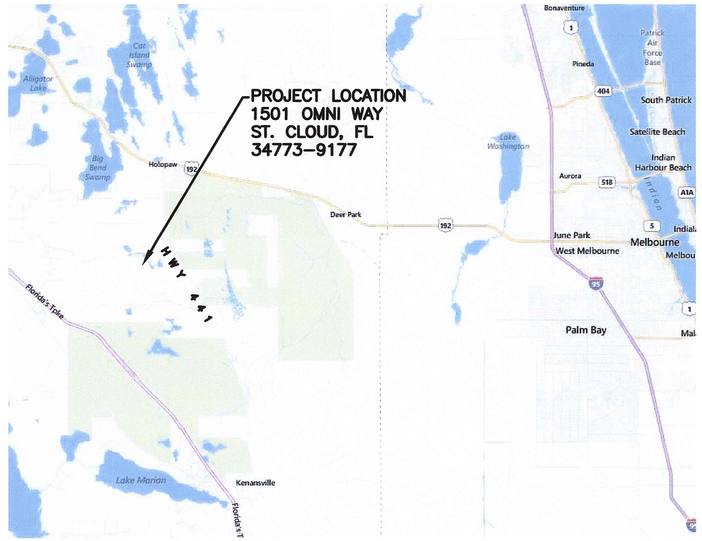

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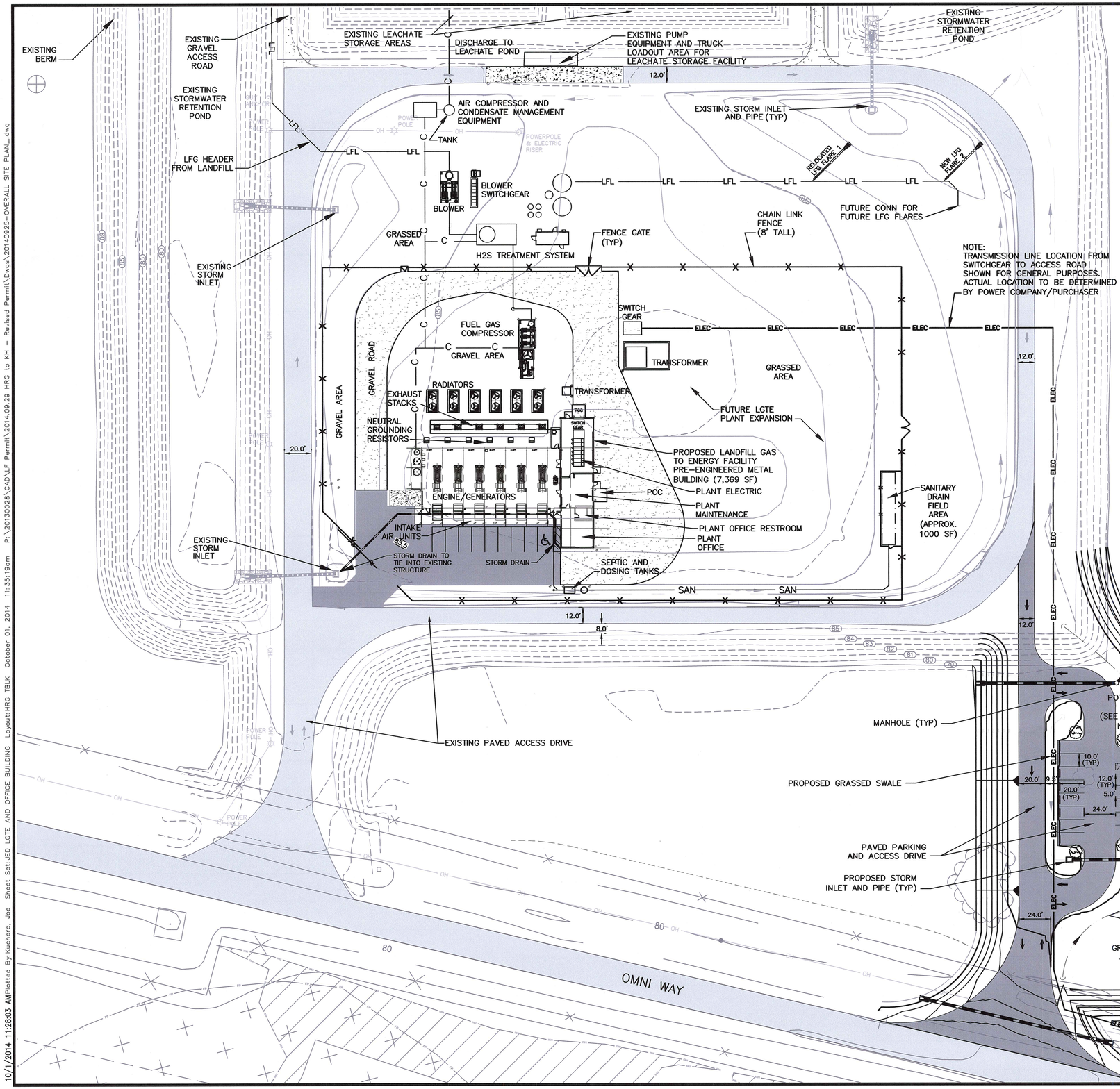

LEGEND

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- NEW PAVEMENT
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- EXISTING WATER SURFACE
- NEW RIP RAP
- EXISTING RIP RAP
- NEW GRAVEL
- EXISTING CONTOUR (5)
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OVERALL SITE PLAN

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ATTACHMENT K-1

OPERATIONS PLAN

(APPENDIX F OF THE CURRENTLY APPROVED OPERATION PLAN FOR THE FACILITY)

OPERATION PLAN

LANDFILL GAS TO ENERGY FACILITY OPERATION PLAN

J.E.D. Solid Waste Management Facility
Osceola County, Florida

Submitted to: Florida Department of Environmental Protection
Waste Management Program, Tallahassee
2600 Blair Stone Road, MS 4565
Tallahassee, FL 32399 USA

Prepared for: Omni Waste of Osceola County, LLC
1501 Omni Way
St. Cloud, FL 34773 USA

Submitted by: Golder Associates Inc.
9428 Baymeadows Road, Suite 400
Jacksonville, FL 32256 USA

Florida Board of Professional Engineers
Certificate of Authorization Number 1670

Distribution:

1 Copy	Florida Department of Environmental Protection Waste & Air Resource Programs, Central District
2 Copies	Omni Waste of Osceola County, LLC
1 Copy	Golder Associates Inc.

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Table of Contents

List of Drawings

1.0 OPERATION PLAN

1.1 Introduction

Golder Associates Inc. (Golder) has prepared this Landfill Gas to Energy Facility Operation Plan (LFGTE Plan) to describe the process and operations associated with the LFGTE Facility at the J.E.D. Solid Waste Management Facility (J.E.D. Facility). Information included in this LFGTE Plan will be incorporated as Appendix F to the approved Operation Plan prepared by Geosyntec Consultants dated November 10, 2011 (note that this replaces the former Appendix F – Auto Shredder Residual (ASR) Recycling Plan since the ASR Recycling operations have ceased and been removed from the facility).

1.2 LFGTE Facility General Information

The proposed LFGTE Facility will be located in an area south of the existing leachate holding ponds at the J.E.D. Facility. Drawings for the LFGTE Facility are included in Appendix 1. The LFGTE Facility will be owned and operated by Chicago Bridge and Iron Company (CB&I) under a long-term agreement with Omni Waste of Osceola County, LLC (Omni). CB&I will purchase landfill gas from Omni to generate electricity which will be sold to the Orlando Utilities Commission (OUC). The power will be wheeled to OUC via Duke Energy's transmission system that currently serves the J.E.D. Facility.

Landfill gas from the disposal area will be conveyed to the LFGTE Facility via a vacuum piping system and will then be treated and used as a fuel to generate electricity. At full build-out the LFGTE Facility will have a gross electrical generation capacity of approximately 19.2 megawatts (MW) of electricity and will consist of 12 Caterpillar (CAT) Model G3520C lean-burn internal combustion engines and generator sets. The LFGTE Facility will be constructed in phases with the initial phase consisting of 6 engine/generator sets with a gross electrical output of approximately 9.6 MW. Commercial operation of the initial phase is planned for September 2015. Expansion of the LFGTE Facility to the full capacity will be completed as increases in landfill gas flows allow. Phased installation of future engine/generator sets may occur in quantities of one or greater. Plant operation will be typically 24 hours per day, 7 days, per week.

The LFGTE Facility will consist of a metal building structure to house the CAT engines, electrical room, office control room, and maintenance shop. Exterior equipment will initially include a hydrogen sulfide treatment system, condensate management equipment, electrical switchgear and transmission facilities, and gas compressor/chiller equipment. In addition to the LFGTE Facility equipment, Omni will operate and maintain landfill gas conveyance piping, blowers and flare equipment in the general location of the LFGTE Facility. Omni's blowers will convey landfill gas to the LFGTE Facility and/or the flares when excess landfill gas is being produced or the LFGTE Facility in not in operation.

1.3 Facility Operations

CB&I will own and operate the LFGTE Facility (under a 20+ year contract with Omni). The LFGTE Facility will be operated generally 24-hours a day, 7 days per week, 52 weeks per year. Routine maintenance and over-haul may require partial or complete shutdown of the plant. Typically, the facility will be staffed 5 days per week. During times when no operator/staff is at the facility, a call-in procedure will be enacted automatically by the plant should an alarm or shutdown occur. Should a call-in occur for an upset or alarmed condition, the on-call operator will report to the plant for troubleshooting, repair, or other actions.

Landfill gas will be consumed as fuel in the Cat G3520C engine/generator sets to produce electricity, which will be sold to OUC. Landfill gas will be conveyed to the LFGTE Facility (and if needed flares) from the waste disposal area via a temporary header system installed along an existing partially constructed landfill perimeter berm. This existing berm contains the leachate force main and was constructed during relocation of the leachate holding facilities in 2012. Additional permanent header piping will be installed in the waste mass as the disposal area is developed. The gas will be pulled under vacuum by blowers and then conditioned to remove a portion of the moisture and hydrogen sulfide contained within the gas prior to being used in the LFGTE Facility or destroyed in flares. An automatic by-pass valve will direct any excess landfill gas to the flares for thermal destruction while the LFGTE Facility is operating. Omni will maintain a 100% capacity of thermal destruction by flares in case of a complete plant shutdown.

The LFGTE Facility will track the amount of total landfill gas used on an hourly basis and the rolling flow rate in standard cubic feet per minute (scfm). Additionally, the LFGTE Facility will maintain records of the total amount of electricity generated on an hourly basis and landfill gas quality as required by permit or otherwise desired.

1.4 Facility Safety

The LFGTE Facility will include a number of safety features including fire alarm and detection, combustible gas detection, lightning protection, utility power protection, and 24/7 monitoring of the facility operations. The following sections summarize these features.

1.4.1 Fire Alarm and Detection

The LFGTE Facility primary occupancy is classified per Florida Building code 2010 section 306.2 as F-1 Factory Industrial Moderate-Hazard occupancy with a secondary occupancy as B – Business. The F-1 occupancy shall be used since it is most restrictive use.

Per Florida Building Code 2010, Section 903.2.4 Group F-1, an *automatic sprinkler system* shall be provided throughout all buildings containing Group F-1 occupancy where one of the following conditions exists:

1. *Fire area* exceeds 12,000 square feet (1115 m^2).
2. A Group F-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group F-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m^2).

The LFGTE facility does not meet any of the 903.2.4 categories; therefore the facility shall not be required to be automatically sprinkled.

Additionally, per FBC 2010, section 907.2.4 Fire Alarm and Detection systems, Group F Fire alarm system is not required for industrial occupancies because the total capacity of the building is under 100 persons and fewer than 25 persons are above or below level of exit discharge.

See the attached HRG plan sheets A001 and A002 for additional details on the building classifications and personnel egress routes.

Although the LFGTE Facility is not required to have a Fire Alarm and Detection system, the LFGTE Facility has been otherwise designed with a system. It should also be noted that the LFGTE Facility building is constructed with minimum of combustible material so as to limit the propagation of fire. The building fire alarm and detection system consists of thermal detectors, smoke detectors, combustible gas detectors, audible and visual alarm devices, and manual fire pull stations. See HRG plan sheet FA101 for locations and details of fire detection system.

Upon any of the below listed alarms, the generator breakers will be tripped, the engine-generator sets will be shutdown and the gas inlet valve to the LFGTE Fuel Gas Skid will be closed in order to control the potential for fire and explosion within the plant:

- high oxygen in the fuel (as detected at the Fuel Gas Skid);
- fuel gas skid blower failure;
- air compressor failure;
- fire detection alarm; and
- high-high methane alarm.

A Plant Emergency Stop (APET) E-stop Pressed. There will be two (2) APET pushbuttons, one located at the internal side of main gate and the other will be at the fuel gas skid.

The facility will be equipped with type 2A portable fire extinguishers. There will be a total of six (6) portable fire extinguishers located in the facility: 3 in the engine room, 1 in the maintenance shop, 1 in the office, and 1 in the electrical room.

1.4.2 Utility Power Protection

When a power failure, short circuit, voltage or frequency disturbance occurs on the utility line, the event is detected by the Interconnection Protection Relay (SEL-351) which will initiate a trip to the utility breaker (52U-A). Opening breaker 52U-A will cause the generator breakers to trip and the gas compressor to shut down. Upon restoration of the utility line voltage, the on-call operator may close the utility breaker (52U-A), restart the gas compressor, and begin the process of restarting/re-synchronizing the generators to the utility.

Each generator is equipped with an automatic voltage regulator and an automatic power factor controller, and is also protected by a multi-function Generator Protection Relay (SEL-300G) against unbalanced current, instantaneous and time delay overcurrent, reverse power, loss of excitation, abnormal voltage, abnormal frequency, and faults that cause a flow of differential currents through the generator windings. Grounding of each generator is achieved through a neutral grounding resistor. The facility medium voltage distribution system is protected by transformer differential, bus differential, and overcurrent devices. The relays utilized at this plant are solid-state devices which are self-testing and therefore require no routine maintenance.

1.4.3 Combustible Gas Detection

The LFGTE Facility will be equipped with a combustible gas (methane) detection system which will continuously monitor ambient air in all facility rooms of the plant for the presence of unsafe atmospheres. The gas detection system control panel located in the control room, measures ambient atmosphere concentrations taken from all facility occupied spaces.

Methane gas is explosive only between certain concentrations. This explosive range is 5% to 15% methane in air. The 5% level is defined as the LOWER EXPLOSIVE LIMIT (LEL) and the 15% level is defined as the UPPER EXPLOSIVE LIMIT (UEL). Below the LEL, an explosion will not occur because the concentration of methane is not high enough to support an explosion. Above the UEL, an explosion will not occur because the concentration of gas to oxygen is too rich to support an explosion. Methane concentration levels are indicated on the methane detection control panel from 0 to 100% of the LEL.

The methane detection unit will send alarms should the concentration of methane initiate the alarms as described in the following:

- High Concentration of Methane Gas (10% LEL, or 0.5% in air by volume) Initiates HIGH FACILITY GAS CONCENTRATION alarm in the control room. This alarm will also activate the facility ventilation system to its “High Evacuation Setting”.

- High-High Concentration of Methane Gas (25% LEL, 1.25% in air by volume) Indicates HIGH-HIGH FACILITY GAS CONCENTRATION alarm in the control room and Illuminates an ALARM CONDITION on the methane detection control panel. The LFGTE Facility will automatically shut down and the affected area should be ventilated using confined space blowers and/or the facility exhaust/supply fans. After sufficient time has been allowed for ventilation, facility personnel will confirm ambient air concentrations from the gas control panel. When safe limits are satisfied, operators may enter the affected building with a portable gas detector and attempt to find and repair the leak.

1.4.4 Lightning Protection and Grounding System

The LFGTE facility will have a lightning protection and grounding system installed in accordance with UL 96 and NFPA 780.

1.4.5 Facility Monitoring

As described above, a number of conditions during facility operation could trigger alarm conditions. Alarm conditions will be monitored by the LFGTE control system and will notify facility operators via text alerts, email alerts, and voice messages through the communication system. Although the facility is not staffed 24/7, operators are on call 24 hours a day, seven days a week to respond to upset conditions at the LFGTE Facility.

In addition to notifying the on-call operator of an upset condition, the central control system can be programmed to shutdown all or a portion of the LFGTE Facility. An upset condition might result in the termination of electrical energy flow to the utility grid, shutdown of one or more engine-generator sets, and/or shutdown of incoming gas compressors/blowers.

1.4.6 Facility Security

The LFGTE Facility is surrounded by security fence and is locked during times when the LFGTE operators are not present. The facility access doors are steel insulated and are locking deadbolts. Steel overhead doors also provide access to the electric room, engine room and storage/shop room areas. The overhead doors are controlled from inside the LFGTE Facility.

1.4.7 Emergency Response

Site emergencies are handled in accordance with the J.E.D. Landfill Facility Emergency Contingency plan contained within the Operation Plan (Geosyntec, November 10, 2011). This plan covers the following:

- fire response;
- medical emergencies response;
- spill/release/emission response;
- natural disasters; and
- hazardous or other unauthorized materials.

A list of emergency telephone numbers will be posted in the LFGTE Facility:

- Ambulance Service 911
- Police Department 911
- Fire Department 911
- J.E.D. Landfill Administration Building (407) 891-3720
- Florida Department of Environmental Protection (407) 897-4100

1.5 Waste / By-product Management

The following sections discuss the LFGTE facility's plan to properly manage various wastes and by-products.

1.5.1 Condensate Management

Condensate will be generated within the LFGTE Facility during the chilling of the landfill gas to approximately 40°F. The condensate will be collected and directed to a below grade double-wall HDPE tank and then pumped to Omni's condensate management system located near the leachate holding facility. The condensate will be tested as necessary to properly characterize the waste stream in accordance with Federal and State hazardous waste rules. Non-hazardous liquids will be pumped into the existing leachate management system for ultimate disposal. If determined to be hazardous, offsite disposal will be arranged at a properly licensed and permitted hazardous waste treatment/disposal facility. Based upon experience at similar facilities, the expected condensate amount for the initial 6 engines will be approximately 2,500 gallons per day. Once the facility reaches the full 12 engine build out, the estimated condensate amount is expected to double or approximately 5,000 gallons per day.

1.5.2 Waste Handling

The LFGTE Facility expects to generate various waste materials in typically small amounts. All non-hazardous waste will be disposed of at the J.E.D. Facility in coordination with Omni and as authorized permits for the J.E.D. Facility. Should any wastes be considered hazardous, they will be treated/disposed at a licensed and permitted hazardous waste facility.

1.5.2.1 Waste Oil

Waste oil will be generated as part of normal operations at the LFGTE Facility. Based upon information from the engine supplier, each engine during a routine oil change will generate approximately 150 gallons of waste oil. The estimated frequency of oil changes is on the order of once for every 750 to 1,000 hours of operation. Thus, with the initial 6 engines looking at a worst case scenario, the anticipated amount of waste oil is estimated to be approximately 900 gallons per month. The LFGTE Facility anticipates having a 1,000 gallon double-wall tank for waste oil which will be serviced by a licensed waste oil contractor at least monthly. The waste oil will then be disposed of or recycled at a licensed waste oil facility.

1.6 Landfill Gas Conveyance

Landfill gas will be conveyed from the waste disposal area to the LFGTE Facility via a vacuum piping system. As previously noted, Omni will construct a temporary header system installed along an existing partially constructed landfill perimeter berm to convey the landfill gas to the LFGTE Facility as shown on Drawing Sheets 3A and 3B. This temporary landfill gas header system will connect the LFGTE Facility to the waste disposal area's GCCS until future development of disposal area allows for the direct tie-in of the GCCS to the LFGTE Facility. Once the waste disposal area has been developed sufficiently to allow for a direct connection in Cell 23 from the GCCS to the LFGTE Facility, a short supply pipe will be installed. After this occurs, the perimeter header may be left in place as an alternative conveyance pathway for landfill gas and troubleshooting.

Piping will consist of both high density polyethylene (HDPE) for below grade installation and carbon steel piping for above grade installation (as necessary for thermal expansion). Other details of the permitted GCCS system design are provided in documents provided at the J.E.D. Facility.

1.6.1 Blower and Flare Operation

Omni plans to maintain a 100% capacity of flares for thermal destruction of landfill gas independent of the LFGTE Facility. All flares will be located in the landfill gas management area (which also houses the LFGTE Facility) as shown on in the Drawing Set for the permit application. The total number and type of flares has not yet been determined, but the total capacity will enable all landfill gas conveyed by the GCCS to the landfill gas management area to be destroyed via flares while the LFGTE Facility is completely shutdown, as required by the facility's Title V Permit.

Omni will conduct routine operation and maintenance on the flares to ensure that proper operation can be achieved when 100% of the available landfill gas is being consumed by the LFGTE Facility (i.e. no landfill gas flow to the flares). Omni will conduct full start-up sequencing of each installed (and operational) flare at least once every 6 months to determine and ensure proper operation. During periods of time when both flare and the LFGTE Facility are operating jointly, Omni will ensure that all installed (and operational) flares are operated such that operational time is shared between each flare. An automatic by-pass valve will be installed to direct excess landfill gas not being consumed by the LFGTE Facility to the flare for thermal destruction.

1.7 LFGTE Facility Closure

The contract between Omni and CB&I is for a 20 plus year period commencing after the beginning of energy generation. Operation of the LFGTE Facility beyond that period is likely but unknown at this time. Since Omni will maintain a 100% flaring capacity of landfill gas independent of the LFGTE Facility and the LFGTE Facility is not required by rule or regulation, no closure and long term care costs are included in this plan. Should the LFGTE Facility cease to operate at the end of the 20 year contract period, landfill

gas will be controlled via thermal destruction in the facility's flare(s). No formal closure construction (e.g. such as Class I landfill closure construction) to stabilize the facility is required once the LFGTE Facility ceases operation.

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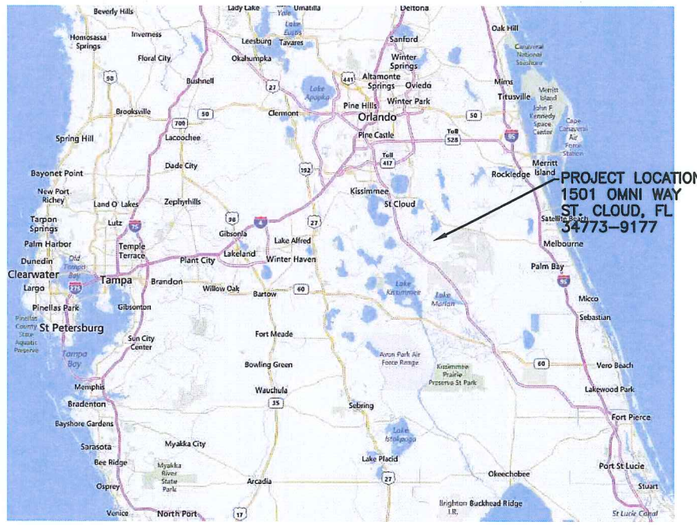

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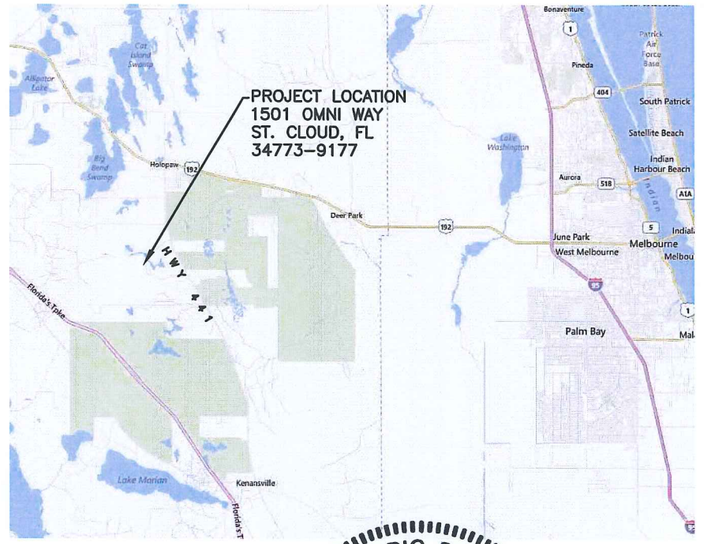

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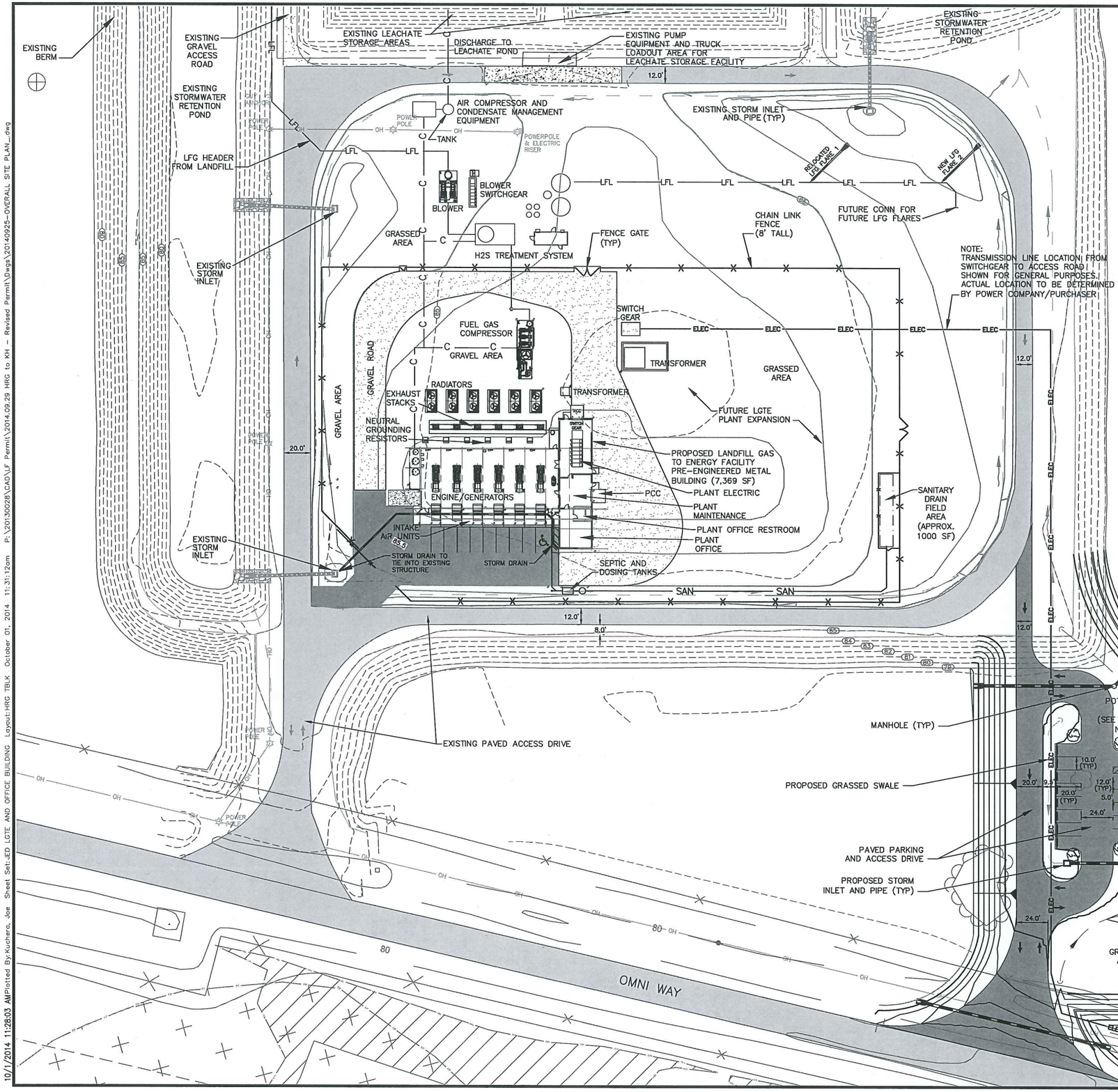

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SCOPE OF WORK:
THE PROJECT CONSISTS OF CONSTRUCTING A NEW 7,360 SF PRE-ENGINEERRED METAL BUILDING TO HOUSE SIX GENERATORS THAT CONVERT LANDFILL GASES TO ELECTRIC POWER. THE FACILITY CONSISTS OF A GENERATOR ROOM, SWITCHGEAR ROOM, MAINTENANCE SHOP, AND AN OFFICE. WORK INCLUDES SITE AND UTILITY IMPROVEMENTS AND NEW BUILDING CONSTRUCTION.

APPLICABLE CODES:
FLORIDA BUILDING CODE (2010)
FLORIDA ACCESSIBILITY CODE (2012)
FLORIDA BUILDING CODE - MECHANICAL (2010)
FLORIDA BUILDING CODE - FUEL GAS (2010)
FLORIDA BUILDING CODE - PLUMBING (2010)
FLORIDA BUILDING CODE - ENERGY CONSERVATION (2010)
NATIONAL ELECTRICAL CODE/ NFPA 70 (2008)
FLORIDA FIRE PREVENTION CODE (2010)

GENERAL INFORMATION:

ZONING CLASSIFICATION:	AGRICULTURAL DEVELOPMENT & CONSERVATION (AC)
DESCRIPTION:	NEW 1 STORY ELECTRICAL POWER GENERATION BUILDING
JURISDICTION:	OSCEOLA COUNTY, FLORIDA
TYPE OF CONSTRUCTION:	TYPE iii-B NON-SPRINKLERED
NEW BUILDING:	7,360 SF, NON-COMBUSTIBLE

FLORIDA BUILDING CODE - BUILDING

CHAPTER 3 OCCUPANCY CLASSIFICATION:

PRIMARY USE: 306.2 F-1 FACTORY INDUSTRIAL MODERATE-HAZARD OCCUPANCY ELECTRIC GENERATION PLANTS

SECONDARY USE: 304 B BUSINESS

F-1 IS MOST RESTRICTIVE USE AND SHALL BE USED AS PRIMARY OCCUPANCY.

CHAPTER 5 BUILDING AREAS AND HEIGHTS:

501.2: PROVIDE ADDRESS IDENTIFICATION OF APPROVED ADDRESS NUMBERS.

TABLE 503: F-1 FACTORY INDUSTRIAL MODERATE-HAZARD OCCUPANCY
TYPE V-B

ALLOWABLE STORIES:	2
ALLOWABLE AREA:	12,000 SF
ALLOWABLE HEIGHT:	55'-0"
ACTUAL AREA:	7,360 SF
ACTUAL STORIES:	1
ACTUAL HEIGHT:	22'-0"

SECTION 508 MIXED USE AND OCCUPANCY
TABLE 508.4 NO SEPARATION REQUIRED BETWEEN F-1 AND B OCCUPANCIES.

CHAPTER 6 TYPES OF CONSTRUCTION:

BUILDING TYPE III-B

TABLE 601		
STRUCTURAL FRAME	0	
BEARING WALLS		
EXTERIOR	2	EXCEPTION F->30' REDUCE TO 0, G APPLIES
INTERIOR	0	
NON-BEARING WALLS AND PARTITIONS		
EXTERIOR (TABLE 602)	0	>30'
INTERIOR	0	
FLOOR CONSTRUCTION	0	D, I ARE NOT APPLICABLE
ROOF CONSTRUCTION	0	

CHAPTER 7 FIRE-RESISTANCE RATED CONSTRUCTION:

NO REQUIRED FIRE RATED ASSEMBLIES PER FBC.
ALL ROOMS SEPARATED BY 1 HOUR RATED ASSEMBLIES.
ENGINE ROOM SEPARATED BY 1 HOUR RATED ASSEMBLY PER NFPA 37
713 SEAL ALL PENETRATIONS THROUGH RATED WALLS
713.1.1 PROVIDE FIRE DAMPERS FOR HVAC/ VENTILATION OR PROTECT ALL PENETRATIONS ACCORDING TO THIS SECTION AND SECTION 716

715 OPENINGS
TABLE 715.4 FIRE PARTITIONS
1 HOUR RATED WALL WITH 3/4 HOUR RATED DOORS AND SHUTTERS.
TABLE 715.5.4 LIMITING SIZES OF WIRED GLASS PANELS
3/4 HOURS - 1296 SQUARE INCHES, MAX. HEUIGHT 54 INCHES, MAX. WIDTH 54"

CHAPTER 8 FINISHES:

GROUP F-1 - NONSPRINKLERED	
EXIT ENCLOSURES & EXIT PASSAGEWAYS:	CLASS B
CORRIDORS:	CLASS C
ROOMS AND ENCLOSED SPACES:	CLASS C
GROUP B - NONSPRINKLERED	
EXIT ENCLOSURES & EXIT PASSAGEWAYS:	CLASS A
CORRIDORS:	CLASS B
ROOMS AND ENCLOSED SPACES:	CLASS C

ASTM E64	FLAME SPREAD	SMOKE DEVELOPMENT
CLASS A	0-25	0-450
CLASS B	26-75	0-450
CLASS C	76-100	0-450

CHAPTER 9 FIRE PROTECTIVE SYSTEMS:

903.2.4 GROUP F-1
1. FIRE AREA >12,000 SF NO
2. FIRE AREA >3 STORIES NO
3. COMBINED FIRE AREA >24,000 SF NO
THEREFORE AUTOMATIC SPRINKLER SYSTEM NOT REQUIRED.

SECTION 906 PORTABLE FIRE EXTINGUISHERS
OCCUPANCY
F-1 MODERATE HAZARD, B
TABLE 906.3 (1)
MODERATE HAZARD

MINIMUM RATED SINGLE EXTINGUISHER	2-A
MAXIMUM FLOOR AREA PER UNIT OF A	1,500 SF
MAXIMUM FLOOR AREA FOR EXTINGUISHER	11,250 SF
MAXIMUM TRAVEL DISTANCE TO EXTINGUISHER	75 FT

EXTINGUISHERS PROVIDED:
3 IN GENERATOR ROOM
1 IN ELECTRICAL ROOM
1 IN SHOP
1 IN OFFICE
TOTAL: 6 EXTINGUISHERS
NOTE: VERIFY LAYOUT WITH LOCAL FIRE MARSHAL.

SECTION 907 FIRE ALARM AND DETECTION SYSTEMS
907.2.4 GROUP F FIRE ALARM SYSTEM NOT REQUIRED FOR INDUSTRIAL OCCUPANCIES BECAUSE TOTAL CAPACITY OF THE BUILDING IS UNDER 100 PERSONS AND FEWER THAN 25 PERSONS ARE ABOVE OR BELOW LEVEL OF EXIT DISCHARGE.

CHAPTER 10 MEANS OF EGRESS:

TABLE 1004.1.1

F-1 (INDUSTRIAL):		100 GROSS
B (BUSINESS):		100 GROSS
OFFICE	573 SF	100 GROSS 6 OCCUPANTS
GENERATOR ROOM	4,675 SF	100 GROSS 47
ELECTRICAL ROOM	1,017 SF	100 GROSS 11
SHOP	564 SF	100 GROSS 6
RESTROOM	110 SF	100 GROSS 2
TOTAL OCCUPANTS		72 OCCUPANTS

ACTUAL OCCUPANT LOAD <15.

1005 EGRESS WIDTH WITHOUT SPRINKLER SYSTEM
OTHER EGRESS - 0.2"/ OCC. 14.4"

1006 MEANS OF EGRESS ILLUMINATION	NOT REQUIRED, EMERGENCY LIGHTING IN FIXTURES PROVIDED.
1008 DOORS	CLEAR OPENING WIDTH OF 32"
1009 STAIRWAYS	44" MIN. WIDTH
1010 RAMPS	1:12 MAX. SLOPE
1011 EXIT SIGNS	ILLUMINATED SIGNS PROVIDED
1014.2 EXIT ACCESS	NO EXIT THROUGH INTERVENING SPACES
1014.3 COMMON PATH OF EGRESS	50' F, S OCCUPANCIES NON-SPRINKLERED
1015.1 MIN. NUMBER OF EXITS	TWO (2)

TABLE 1015.1 OFFICE OCCUPANCY = 6 < 49, ONE EXIT IS ACCEPTABLE
SHOP (F) OCCUPANCY = 6 < 49, ONE EXIT IS ACCEPTABLE
ALL OTHER SPACES HAVE TWO EXITS, DIRECTLY TO EXTERIOR
1015.2.1 TWO EXITS ARE MIN. DISTANCE OF HALF DIAGONAL MET IN ELECTRICAL AND GENERATOR ROOMS

1016.1 EXIT ACCESS TRAVEL DISTANCE	GROUP F = 200' MAX. WITHOUT SPRINKLER GROUP B = 200' MAX. WITHOUT SPRINKLER
1017 MIN. AISLE WIDTH	30"
1018 MIN. CORRIDOR WIDTH	44"
1018.4 DEAD-END CORRIDOR	20'
1020 EXITS - 1020.2.2 EXTERIOR EXIT	DOORS SHALL LEAD DIRECTLY TO PUBLIC WAY
1024 LUMINOUS PATH OF TRAVEL	NOT REQUIRED (F)
1027 EXIT DISCHARGE	DIRECTLY TO EXTERIOR AT GRADE
1032 COMMON PATH OF TRAVEL	50' MAX.

CHAPTER 12 INTERIOR ENVIRONMENT:

1208.2 MINIMUM CEILING HEIGHT	7'-6" MIN., TYP. 7'-0" MIN. AT BATHROOMS

CHAPTER 14 EXTERIOR WALLS:

TABLE 1405.2	
MIN. THICKNESS OF STEEL	.0149 INCHES

CHAPTER 15 ROOF ASSEMBLIEZS AND ROOFTOP STRUCTURES:

TABLE 1505.1 MINIMUM ROOF COVERING	CLASSIFICATION
V-B CONSTRUCTION	CLASS C

TABLE 1507.4.3 (1)
GALVANIZED STEEL ASTM A653 .013" MIN., G90 ZINC COATED
PRE-PAINTED STEEL ASTM A755

1509.6 BUILDING HEIGHT EXCEEDS 16'. ACCESS PROVIDED BY PERMANENT MEANS OF ACCESS. PROVIDE PERMANENT ROOF LADDER WITH SIDERAILS EXTENDING 30" MIN ABOVE ROOF, RUNG SPACING 14" OC MAX., LADDER TOES SPACING 6" MIN. DEPTH, 18" MIN. BETWEEN RAILS (WIDTH), RUNGS .75 DIAMETER MIN. WITH 300 LB LOAD.

1509.7 ROOF MOUNTED MECHANICAL UNITS
CURBS RAISED 8" MIN.
TABLE 1509.7

WIDTH OF MECH UNIT	MIN. CLEARANCE
<24"	14"
24-36"	18"
36-48"	24"
48-60"	30"
>60"	48"

CHAPTER 16 STRUCTURAL DESIGN:

TABLE 1604.5 RISK CATEGORY III (3)
BUILDINGS AND OTHER STRUCTURES THAT REPRESENT A SUBSTANTIAL HAZARD TO HUMAN LIFE IN THE EVENT OF A FAILURE, INCLUDING: POWER GENERATING STATIONS

TABLE 1607.1 LIVE LOADS

	UNIFORM	CONCENTRATED
MANUFACTURING LIGHT	125 PSF	2000 PSF
ROOFS	20 PSF	300 PSF

1607.12 CRANE LOADS TO BE THE RATED CAPACITY OF THE CRANE

1609 WIND LOADS (ASCE 7)
1541 OMNI WAY, ST. CLOUD, FL OSCEOLA COUNTY, FLORIDA
APPLIED TECHNOLOGY COUNCIL ADDRESS QUERY
Vult (CAT III) 149 MPH

1609.2 WIND-BORNE DEBRIS REGION
2. ULTIMATE DESIGN WIND SPEED >140 MPH
THEREFORE BUILDING IN WIND-BORNE DEBRIS REGION
PROTECT ALL OPENINGS, COMPONENTS AND CLADDING.
FLORIDA PRODUCT APPROVALS REQUIRED FOR ALL COMPONENTS AND CLADDING.

1609.3 Vasd = Vult *SQ RT OF .6
TABLE 1609.3.1 Vasd = 116 MPH

1609.4.2 SURFACE ROUGHNESS	CATEGORY C OPEN TERRAIN
1609.4.3 EXPOSURE CATEGORY	CATEGORY C
TABLE 1609.7 M(2) ADJUSTMENT	FACTOR
25' HIGH, EXPOSURE C	1.35

SEE STRUCTURAL DRAWINGS FOR CALCULATIONS AND DESIGN PRESSURES.

FLORIDA BUILDING CODE - PLUMBING

CHAPTER 4 FIXTURES, FAUCETS, AND FIXTURE FITTINGS

TABLE 403.1 MINIMUM PLUMBING FIXTURES

F-1 AND F-2	REQUIRED	PROVIDED
WATER CLOSETS	1/ 100 OCC	1 WC AND 1 URINAL
LAVATORIES	1/ 100 OCC	1
SHOWERS	SECT 411	1
DRINKING FOUNTAINS	1/ 400 OCC	1 HI-LO
OTHER (SERVICE SINK)	1	2

CHAPTER 11 STORM DRAINAGE

FIGURE 1106.1	4.5" 100 YEAR, 1 HOUR RAINFALL
1106.2 6920- 8650 SF	5" DIAMETER LEADERS

USE 6" DOWNSPOUTS AND 8" GUTTERS

FLORIDA BUILDING CODE - ENERGY CONSERVATION

CHAPTER 3 DESIGN CRITERIA

301.2 FLORIDA - WARM HUMID CLIMATE

CHAPTER 5 COMMERCIAL ENERGY EFFICIENCY

TABLE 502.1.1.1 BUILDING THERMAL ENVELOPE
(FOR OFFICE, SHOP & ELECTRICAL ROOM AREAS ONLY)

ROOF R-VALUE	R-40 MIN.
WALL R-VALUE	R-30 MIN.
WINDOW U-FACTOR	<.45
SHGC 0-40% WW RATIO	<.25
SHGC 40-50% WW RATIO	<.19
SHGC >50% WW RATIO	NOT ALLOWED
OPAQUE DOOR SWINGING	<.70
NON-SWINGING	<1.45

2012 FLORIDA ACCESSIBILITY CODE

211 DRINKING FOUNTAIN REQUIREMENTS FOR HI-LO
603.2.2 REQUIRED CLEAR FLOOR SPACES, CLEARANCES AT FIXTURE, AND TURNING SPACE SHALL BE PERMITTED TO OVERLAP/
60.2.3 DOORS SHALL NOT SWING INTO CLEAR FLOOR SPACE OR CLEARANCE FOR ANY FIXTURE (CAN TURN INTO TURNING SPACE)

604.5 GRAB BARS 36X42
605/ 606 URINALS AND SINKS 30X48 APPROACH
608 SHOWERS 30X48 APPROACH

PARKING REQUIREMENTS:

OSCEOLA COUNTY ORD 13-34 CHAPTER 7

90 DEGREE PARKING MIN. PARKING SPACE = 9' WIDE X 19' DEEP
DRIVE AISLE MIN. WIDTH ONE-WAY = 22', TWO-WAY = 24'.

INDUSTRIAL USE
1 PARKING SPACE PER 1000 GSF
7,360 GSF = 8 SPACES REQUIRED.

FLORIDA ACCESSIBILITY CODE 2012
1 DISABLED PARKING SPACE REQUIRED FOR 1-25 TOTAL SPACES
DISABLED PARKING SPACE TO BE 12' WIDE WITH 5' ACCESS AISLE PAINTED WITH 6" BLUE STRIPE LOCATED AT MAIN ENTRY WITH ACCESSIBLE ROUTE, PROVIDE HC PARKING SIGN ON BUILDING PER FS 553.5041

F.S. 553.5041(5)(C)1 STATES: "EACH PARKING SPACE MUST BE NO LESS THAN 12 FEET WIDE. PARKING ACCESS AISLES MUST BE PART OF AN ACCESSIBLE ROUTE TO THE BUILDING OF FACILITY ENTRANCE. IN ACCORDANCE WITH ADAAG S. 4.6.3, ACCESS AISLES MUST BE PLACED ADJACENT TO ACCESSIBLE PARKING SPACES; HOWEVER, TWO ACCESSIBLE PARKING SPACES MAY SHARE A COMMON ACCESS AISLE. THE ACCESS AISLE MUST BE STRIPED DIAGONALLY TO DESIGNATE IT AS A NO-PARKING ZONE."
THE FLORIDA STATUTES CAN BE VIEWED AT WEB SITE:
HTTP://WWW.FLSENATE.GOV/STATUTES/

F.S. 553.5041(6) STATES: "EACH SUCH PARKING SPACE MUST BE PROMINENTLY OUTLINED IN BLUE PAINT AND MUST BE REPAINTED WHEN NECESSARY, TO BE CLEARLY DISTINGUISHABLE AS A PARKING SPACE DESIGNATED FOR PERSONS WHO HAVE DISABILITIES AND MUST BE POSTED WITH A PERMANENT ABOVE-GRADE SIGN OF A COLOR AND DESIGN APPROVED BY THE DEPARTMENT OF TRANSPORTATION WHICH IS PLACED ON OR AT A DISTANCE OF 84 INCHES ABOVE THE GROUND TO THE BOTTOM OF THE SIGN AND WHICH BEARS THE INTERNATIONAL SYMBOL OF ACCESSIBILITY MEETING THE REQUIREMENTS OF ADAAG S. 4.30.7 AND THE CAPTION 'PARKING BY DISABLED PERMIT ONLY'."
AN APPROVED FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) SIGN IS 12 INCHES WIDE BY 18 INCHES HIGH, DESIGNATED FTO-25 IN ACCORDANCE WITH FDOT DESIGN STANDARDS 17355 SHEET 3. DESIGN REQUIREMENTS FOR THIS REFLECTIVE SIGN ARE: 1 INCH SERIES "C" LETTERS ON BLUE BACKGROUND WITH WHITE LEGEND AND BORDER ON TOP, AND A BOTTOM PORTION OF WHITE BACKGROUND WITH BLACK OPAQUE LEGEND AND BORDER.

FDOT STANDARDS REQUIRE THE BLUE OUTLINE TO BE A 6 INCH WIDE BLUE STRIPE TO BE 2 INCHES INSIDE OF THE STANDARD 6 INCH WHITE STRIPE AS SHOWN IN FDOT DESIGN STANDARD 17346 SHEET 10. THIS STANDARD STATES "USE OF PAVEMENT SYMBOL IN ACCESSIBLE PARKING SPACES IS OPTIONAL, WHEN USED THE SYMBOL SHALL BE 3 FEET OR 5 FEET HIGH AND WHITE IN COLOR." BLUE PAVEMENT MARKINGS SHALL BE TINTED TO MATCH SHADE 15180 OF FEDERAL STANDARD 595A.

RICHARD S. STELLMON
FL#92984 10.06.14

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
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8710 EARHART LANE SW
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JED SWMF RENEWABLE LANDFILL GAS TO ENERGY FACILITY
CB&I ENVIRONMENTAL AND INFRASTRUCTURE
ST. CLOUD, FLORIDA
ARCHITECTURAL
GENERAL INFORMATION

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

DRAWN BY: JWK
APPROVED: RSA
JOB DATE: 2014
JOB NO: 20130028

DRAWING
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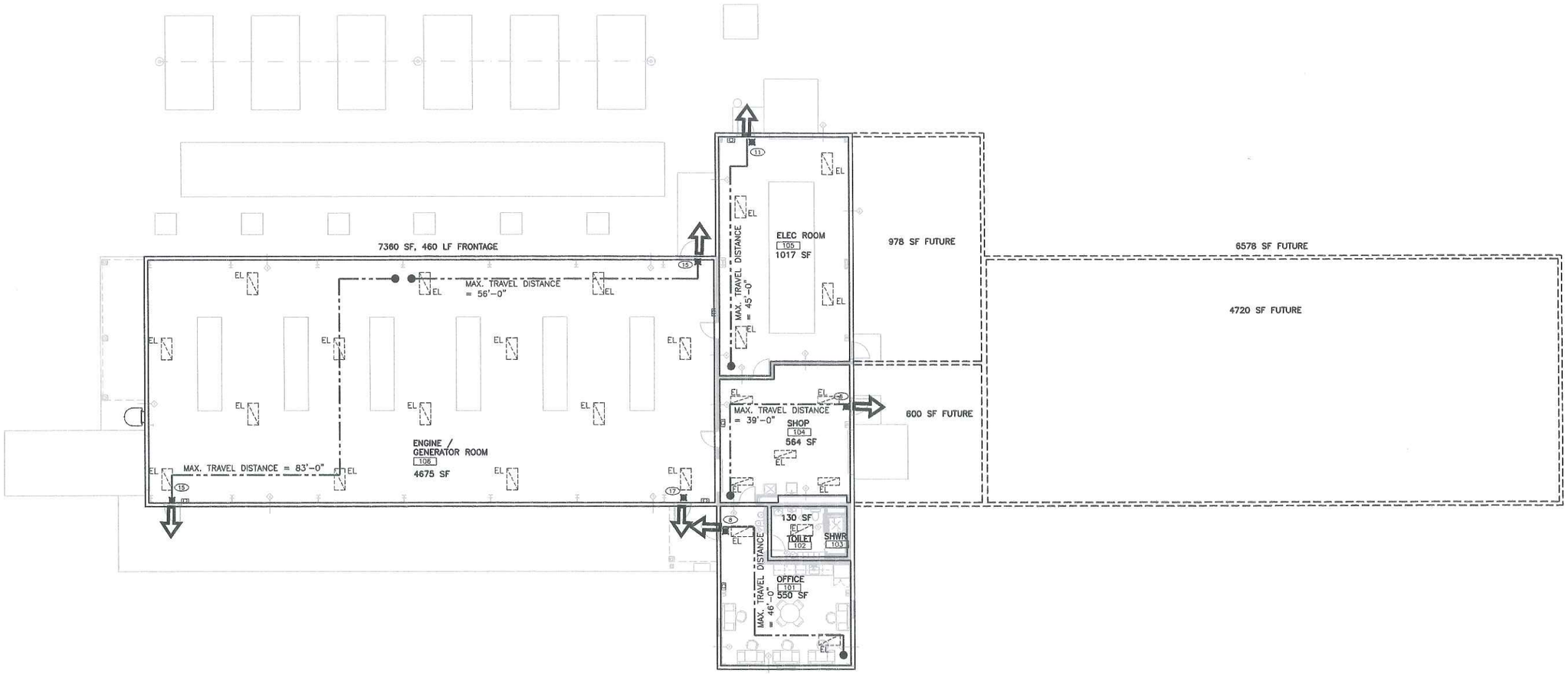

1 LIFE SAFETY PLAN
SCALE: 3/32" = 1'-0"

PLAN NORTH

LIFE SAFETY LEGEND	
FE	FIRE EXTINGUISHER CABINET.
	EMERGENCY EXIT SIGN – SINGLE FACE.
EL	EMERGENCY LIGHTING
30	OCCUPANT LOAD
	PRIMARY MEANS OF EGRESS
	SECONDARY MEANS OF EGRESS
	INDICATES PATH OF TRAVEL TO EXIT
1 HR	INDICATES EXISTING 1–HOUR RATED WALL ASSEMBLY

Richard B. Simons
FL lic 92984 10.06.14

NO.	DATE	BY	REVISION DESCRIPTION

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JED SWMF RENEWABLE LANDFILL GAS TO ENERGY FACILITY
CB&I ENVIRONMENTAL AND INFRASTRUCTURE
ST. CLOUD, FLORIDA
ARCHITECTURAL
LIFE SAFETY PLAN

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

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APPROVED: RSA
JOB DATE: 2014
JOB NO: 20130028

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Xrefs: Xgl-1-d401; xa-1-cert; xa-1-d00; xa-1-p01

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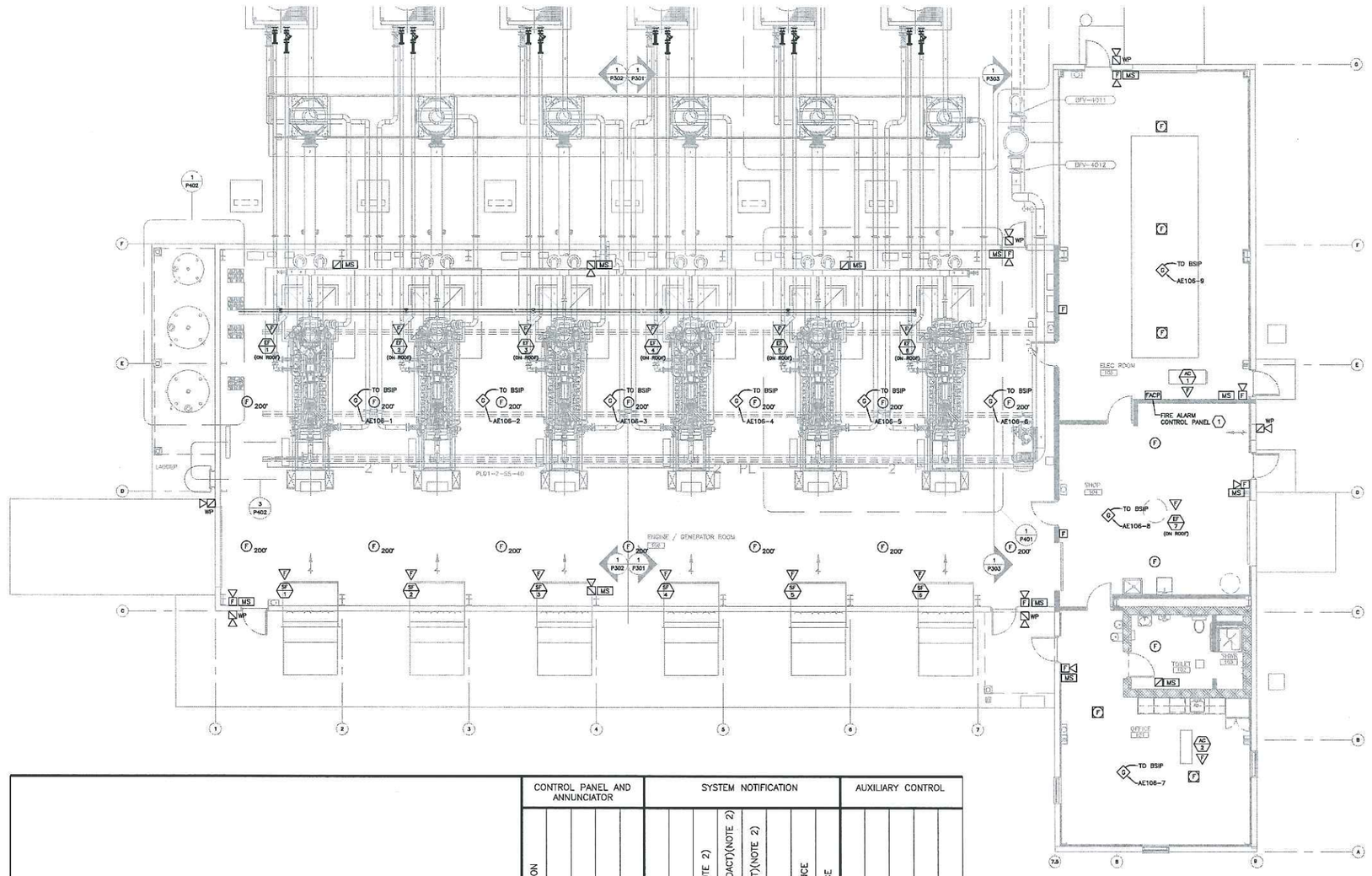


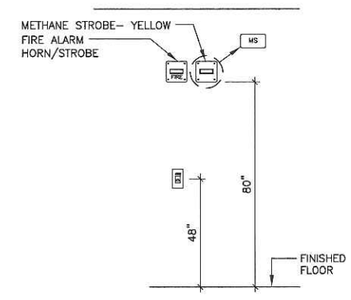
1 FIRE ALARM PLAN

SCALE: 1/8" = 1'-0"

PLAN NORTH

GENERAL FIRE ALARM NOTES:

1. SEE DRAWING E001 FOR SYMBOL LEGEND.
2. CONTRACTOR SHALL PROVIDE AND INSTALL CONDUIT AND WIRING AS NEEDED FOR FIRE ALARM SYSTEM IN ACCORDANCE WITH SECTION 28 31 11.
3. LOCATE SMOKE DETECTORS ON SUSPENDED CEILING IN OFFICE AND TOILET.
4. PROVIDE FLUSH MOUNTED WALL OUTLET BOXES FOR MANUAL PULL STATIONS AND A/V SIGNALS FOR IN OFFICE AND TOILET.
5. CONCEAL FIRE ALARM CONDUITS IN OFFICE AND TOILET.
6. FIRE ALARM WORK SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 72.
7. SEE DRAWING E001 FOR FIRE ALARM SYSTEM LEGEND.
8. (G) GAS METHANE DETECTION SENSOR (SUPPLIED BY CBE) INSTALLED BY ELECTRICAL CONTRACTOR.



2 FIRE ALARM COMPONENT PLACEMENT

SCALE: NONE

FIRE ALARM CONTROL MATRIX

	CONTROL PANEL AND ANNUNCIATOR					SYSTEM NOTIFICATION								AUXILIARY CONTROL				
	AUDIBLE AND VISUAL ALARM INDICATION	SUPERVISORY ALARM INDICATION	TROUBLE INDICATION			FIRE – AUDIBLE ALARM SEQUENCE	FIRE – VISUAL ALARM SEQUENCE	TRANSMIT ALARM SIGNAL (DACT) (NOTE 2)	TRANSMIT TROUBLE ALARM SIGNAL (DACT)(NOTE 2)	TRANSMIT SUPERVISORY ALARM (DACT)(NOTE 2)		METHANE – AUDIBLE ALARM SEQUENCE	METHANE – VISUAL ALARM SEQUENCE	HVAC FAN SHUTDOWN		SWITCHGEAR PLC EMERGENCY TRIP		
MANUAL STATIONS	X					X	X	X						X		X		
SMOKE DETECTORS	X					X	X	X						X		X		
HEAT DETECTORS	X					X	X	X						X		X		
METHANE 1ST ALARM (HIGH)		X								X		X	X					
METHANE 2ND ALARM (HIGH–HIGH)		X								X		X	X					
METHANE TROUBLE ALARM			X						X									
FIRE ALARM AC POWER FAILURE			X						X									
FIRE ALARM LOW BATTERY			X						X									
FIRE ALARM GROUND FAULT, OPEN CIRCUIT, SHORT CIRCUIT			X						X									

ROBERT J. THAYER LICENSE No 75880 STATE OF FLORIDA PROFESSIONAL ENGINEER

Robert J. Thayer 10/2/14

NO.	DATE	BY	REVISION DESCRIPTION

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JED SWMF RENEWABLE LANDFILL GAS TO ENERGY FACILITY
CB&I ENVIRONMENTAL AND INFRASTRUCTURE
ST. CLOUD, FLORIDA
FIRE ALARM
FIRE ALARM SYSTEM PLAN

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

DRAWN BY: JLH
APPROVED: CJH
JOB DATE: 2014
JOB NO: 20130028

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FA101

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ATTACHMENT N-1

CALCULATIONS AND DESIGN SUPPORT

Date:	9/5/2014	**Made by:**	DEG
Project No.:	083-82734.37	**Checked by:**	SFS
Subject:	Pipe Headloss	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Objective

Calculate the estimated losses for the perimeter header pipeline. There are three sumps included in the exterior header pipeline.

Approach

1. Utilize the Spitzglass equation on the attached table to determine the headloss based upon the following inputs:

Assumed flowrate for 28-in. pipe:	5,000	scfm	(1)
Assumed flowrate for 36-in. pipe:	10,000	scfm	(2)
Assumed headloss for each sump (and fittings):	2	in-w.c.	(2)

All HDPE pipe will be PE 4710 and SDR 21.

Conclusion

The estimated headloss along the perimeter header pipeline is 13 in-w.c.

PRESSURE LOSS CALCULATIONS

PERIMETER HEADER

J.E.D. SOLID WASTE MANAGEMENT FACILITY

Notes:

1. This spreadsheet calculates pressure drops between nodes in a pipe network using the Spitzglass formula.
2. All HDPE header pipe is SDR-21 HDPE.

MADE BY: DEG
CHECKED BY: SFS
REVIEWED BY: KSB

HEADER SEGMENT FROM	HEADER SEGMENT TO	BRANCH FLOW (cfm)	HEADER FLOW (cfm)	PIPE NOMINAL DIA (in)	PIPE DIA - ID (in)	VELOCITY (fpm)	VELOCITY (fps)	LENGTH (ft)	C^2	PRESS. DROP (in-wc)	DELTA P PER 100 FT (in-wc)
STA 0+00	STA 12+61.2	0	5000	28	25.173	1,446.68	24.11	1,261.2	6,639,183	1.69	0.13
STA 12+61.2	STA 45+22.7	0	10000	36	32.366	1,750.22	29.17	3,261.5	6,052,470	5.46	0.17
									SUBTOTAL	7.15	
				HEADLOSS FROM SUMPS/FITTINGS (ASSUME 2.0 in-w.c. loss per sump; total of 3 sumps)						6.00	
									TOTAL	13.15	

Spitzglass Formula:

$P = (Q^2)*L/((C^2)*D^5)$

where

P = pressure loss (inches of water)
Q = flow rate (cubic feet/hour)
L = equivalent length of pipe (feet)

$C = 3550/(1+(3.6/D)+(0.03*D))^0.5$

D = pipe diameter (inches)

PE 4710 IPS HDPE Pipe Sizes

20"	22"	24"	26"	28"	30"	32"	34"	36"	42"	48"	54.0"	Nominal Size Actual O.D.	Pressure Rating
20.00"	22.00"	24.00"	26.00"	28.00"	30.00"	32.00"	34.00"	36.00"	42.00"	48.00"	54.00"		
2.857"	3.143"	3.429"	---	---	---	---	---	---	---	---	---	Min. wall	
13.943"	15.337"	16.731"	---	---	---	---	---	---	---	---	---	Average I.D.	DR 7
66.599	80.591	95.916	---	---	---	---	---	---	---	---	---	Weight lb/lf	(336psi)
2.740"	3.014"	3.288"	3.562"	---	---	---	---	---	---	---	---	Min. wall	
14.192"	15.611"	17.030"	18.449"	---	---	---	---	---	---	---	---	Average I.D.	DR 7.3
64.920	78.550	93.480	110.769	---	---	---	---	---	---	---	---	Weight lb/lf	(320psi)
2.222"	2.444"	2.667"	2.889"	3.111"	3.333"	3.556"	---	---	---	---	---	Min. wall	
15.289"	16.818"	18.347"	19.876"	21.404"	22.933"	24.462"	---	---	---	---	---	Average I.D.	DR 9
54.340	65.740	78.260	92.595	107.312	123.183	140.182	---	---	---	---	---	Weight lb/lf	(252psi)
1.818"	2.000"	2.182"	2.364"	2.545"	2.727"	2.909"	3.091"	3.273"	---	---	---	Min. wall	
16.145"	17.760"	19.375"	20.989"	22.604"	24.218"	25.833"	27.447"	29.062"	---	---	---	Average I.D.	DR 11
45.540	55.100	65.580	77.439	89.784	103.076	117.285	132.411	148.454	---	---	---	Weight lb/lf	(202psi)
1.481"	1.630"	1.778"	1.926"	2.074"	2.222"	2.370"	2.519"	2.667"	3.111"	---	---	Min. wall	
16.859"	18.545"	20.231"	21.917"	23.603"	25.289"	26.975"	28.661"	30.347"	35.404"	---	---	Average I.D.	DR 13.5
37.830	45.800	54.500	64.261	74.522	85.543	97.324	109.905	123.208	167.674	---	---	Weight lb/lf	(161psi)
1.290"	1.419"	1.548"	1.677"	1.806"	1.935"	2.065"	2.194"	2.323"	2.710"	3.097"	3.484"	Min. wall	
17.265"	18.991"	20.717"	22.444"	24.170"	25.897"	27.623"	29.350"	31.076"	36.255"	41.435"	46.614"	Average I.D.	DR 15.5
32.819	39.712	47.260	26.531	65.563	75.264	85.672	96.713	108.423	147.568	192.773	243.920	Weight lb/lf	(139psi)
1.176"	1.294"	1.412"	1.529"	1.647"	1.765"	1.882"	2.000"	2.118"	2.471"	2.824"	3.176"	Min. wall	
17.506"	19.256"	21.007"	22.758"	24.508"	26.259"	28.009"	29.760"	31.511"	36.762"	42.014"	47.266	Average I.D.	DR 17
30.570	36.990	44.040	51.856	60.154	69.067	78.557	88.699	99.457	135.372	176.812	223.712	Weight lb/lf	(126psi)
0.952"	1.048"	1.143"	1.238"	1.333"	1.429"	1.524"	1.619"	1.714"	2.000"	2.286"	2.571"	Min. wall	
17.981"	19.779"	21.577"	23.375"	25.173"	26.971"	28.770"	30.568"	32.366"	37.760"	43.154"	48.549"	Average I.D.	DR 21
25.060	30.340	36.100	42.486	49.261	56.585	64.370	72.657	81.446	110.874	144.832	183.253	Weight lb/lf	(101psi)
0.769"	0.846"	0.923"	1.000"	1.077"	1.154"	1.231"	1.308"	1.385"	1.615"	1.846"	2.077"	Min. wall	
18.369"	20.206"	22.043"	23.880"	25.717"	27.554"	29.391"	31.228"	33.065"	38.575"	44.086"	49.597"	Average I.D.	DR 26
20.450	24.740	29.450	34.348	40.186	46.135	52.494	59.264	66.444	90.393	118.081	149.464	Weight lb/lf	(81psi)
0.615"	0.677"	0.738"	0.800"	0.862"	0.923"	0.985"	1.046"	1.108"	1.292"	1.477"	1.662"	Min. wall	
18.695"	20.565"	22.434"	24.304"	26.174"	28.043"	29.913"	31.782"	33.652"	39.260"	44.869"	50.478"	Average I.D.	DR 32.5
15.480	19.970	23.750	27.940	32.421	37.196	42.340	47.773	53.580	72.892	95.233	120.556	Weight lb/lf	(64psi)

Golder Associates

Date:	6/13/2014	**Made by:**	DEG
Project No.:	083-82734.37	**Checked by:**	DHR
Subject:	Minimum Pipe Bending Radius	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Objective

Calculate the minimum radius for the 36-inch HDPE SDR21 header pipe.

Approach

1. Calculate the minimum bend radius for the pipe as stated below:

- R, minimum bend radius for the pipe =	a x OD	inches	(1)
- a, minimum bend ratio =	27	Table 1	(2)
- OD, outside diameter =	36	inches	(3)

2. Use Equation and data above to calculate the minimum bend radius of the 36-inch HDPE SDR 21 pipe.

Solution

R =	972.0	inches	(5)
	81.0	feet	(6)

Conclusion

The minimum bend radius for the 36-inch diameter HDPE SDR 21 pipe is 81 feet. Fittings will be needed to install the pipe into a tighter radius. Note that when fittings are used, the minimum bend radius goes to 100 times the outside diameter of the pipe (3,600 inches or 300 feet) for a distance of 5 times the pipe diameter (180 inches or 15 feet)[1].

1. Taken from Chapter 7 of the Second Edition of the Handbook of PE Pipe; The Plastic Pipe Institute, Inc.

Technical Note PP 819-TN
Field Bending of DriscoPlex® Pipe

Polyethylene pipe's flexibility makes the pipe easy to handle and install. Not only can small diameter (6" and less) pipes be purchased in coils to reduce joining costs but the tight curvature permitted in polyethylene pipelines reduces the need for fittings. All of the major trenchless installation methods rely on the pipe's flexibility for avoiding obstacles and handling curvature in the bore path or misalignment in host pipes. Generally, its great flexibility makes polyethylene pipe the preferred pipe for installation.

Bend Radius

The measure for curvature in a pipeline is the bend radius. See Figure 1.

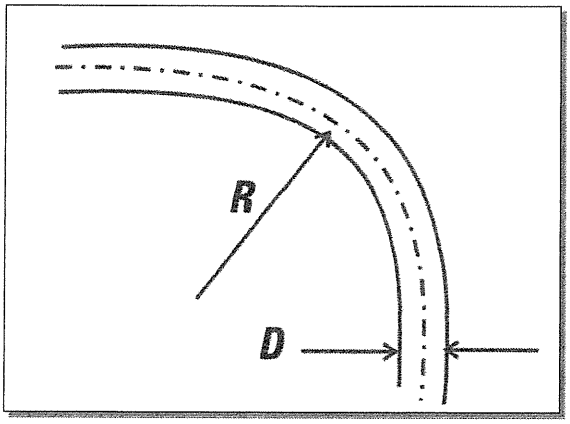

Figure 1. Bend Radius, R

Tightening the curvature of a pipeline results in a smaller (tighter) bend radius. The *minimum bend radius* is defined as the smallest radius to which the pipe may be safely curved.

The *minimum bend radius* for polyethylene pipe is given by Equation 1.

$$R = \alpha(OD) \qquad (1)$$

Where

R = *minimum bend radius* for the pipe (in)

α = *minimum bend ratio*

OD = pipe outside diameter (in)

October 2007 Supersedes all previous publications

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The longitudinal wall strain in a curved pipe is proportional to the bend ratio. Generally, the strain capacity of polyethylene is sufficiently safe for a bend ratio of 20. However, there is another limit to bending. Longitudinal bending induces ovality in the ring direction of the pipe thus reducing the resistance to kinking (local buckling). Thicker wall pipes have higher resistance to kinking and therefore can safely withstand more curvature than thinner wall pipes. Likewise, temporary curvature is less likely to cause kinking than permanent curvature because polyethylene's modulus decreases with time under load. Therefore, the *minimum bend ratio* depends on the DR and the duration of curvature. Table 1 contains *minimum long-term bend ratios* for DriscoPlex® pipe. Because fittings and flanges are rigid compared to pipe, the *minimum bend ratio* must be increased to 100 where fittings or flanges are present in the curve. The *long-term bend ratio* applies to installed pipe but it is also recommended for safely limiting curvature during handling and installation.

Table 1. Minimum Long-Term Bend Ratio for DriscoPlex® Pipe

Dimension Ratio, DR	*Minimum Bend Ratio, α*[1]
7	20
7.3	20
9	20
11	25
13.5	25
17	27
21	27
26	34
32.5	42
41	52
Fitting or flange present in bend	100

Example 1. What is the *minimum bend radius* for a 12" IPS DR17 pipe?

Solution: Find the *minimum bend ratio* in Table 1 for DR17 pipe and solve Equation 1 for the *minimum bend radius.*

$$R = \alpha(OD) = 27\,(12.75\ in) = 344.25\ in = 28.7\ ft$$

[1] See limitations for horizontal directional drilling.

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Installation of Pipe in Curves

Field bending involves excavating the trench to the desired bend radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill. Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material.

Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

Special Considerations for Horizontal Directional Drilling

Directional drillers prefer polyethylene pipe over other materials as it offers them more options in determining laydown locations. They can string the pipe around roadway curves and intersections that would be impossible to do with other types of pipes. The pipe's flexibility allows installers to string pipe perpendicular to the direction of the bore and then sweep the pipe through a tight curve into the bore for pullback and it allows the driller to locate the break-over section closer to the bore. For large diameter pipe installations drillers can usually get by with a single small crane at the break-over as opposed to steel pipes which need multiply cranes. Even though stringing is a temporary condition, Table 1 is recommended for calculating the *minimum bend radius* as the pipe may remain curved for several hours or even days and be exposed to the sun.

The amount of permissible curvature in the bore itself is generally limited by the drill stem's bending capability and not the polyethylene pipe. **However, due to the increased stress in the pipe during a directional drill, the minimum bend ratio in the bore itself should not be less than two times the value shown in Table 1.** For example, a 36" IPS DR 13.5 pipe has a *minimum bend radius* of 75 feet for an open cut installation. In a bore the same pipe would have a *minimum bend radius* of two times 75 feet or 150 feet. The larger radius is rarely a limitation for the driller as the drill stem used with this size pipe (5") generally has at least a 700 foot bend radius.

Special Considerations for Plowing and Planting

Plowing and planting involve cutting a narrow trench, and feeding the pipe into the trench through a shoe or chute fitted just behind the trench cutting equipment. The shoe or chute feeds the pipe into the bottom of the cut. The *minimum bend radius* of the pipe through the shoe may be tighter than the *minimum bend radius* of the pipe used for a permanent long-term installation, but it must not be so tight that the pipe kinks. Table 2 presents the *minimum short-term bend ratio* for applications such as plowing and planting. The pipe's path through the shoe or chute should be as friction free as practicable to reduce additional outerfiber tensile stresses. Generally plowing and planting is limited to 12" and smaller pipes.

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Table 2. Minimum Short-Term Bending Radius

Pipe Dimension Ratio	*Minimum Short-Term Bend Ratio,* α_{ST}
7.3	10
9	10
11	13
13.5	13
17	17
21	17

Summary

Field bending of polyethylene pipes often eliminates the need for fittings. An example is bending the pipe to align it with the curvature in a cul-de-sac. The bending flexibility of polyethylene pipe allows for its installation by trenchless methods, such as sliplining, pipe bursting, and directional drilling and by submerging off shore. To ensure maximum performance of the pipe limit the *minimum long-term bend radius* of pipeline curves to the values given in Table 1.

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Golder Associates

Date:	9/30/2014	**Made by:**	DHR
Project No.:	083-82734.37	**Checked by:**	DEG
Subject:	Condensate Generation	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Objective

Estimate condensate generation for max expected LFG flow rate. Three sumps are planned for the proposed exterior header pipeline.

Approach

1. Calculate condensation production based on the following:

- Max. LFG flows expected =	10,000 ft^3/min	(1)
- Max. LFG Temp. =	90 °F	(2)
- Ambient Air/Min. LFG Temp. =	70 °F	(3)

2. Use ***Attachment 1*** for water content of hydrocarbon gas to choose capacity of LFG to hold moisture at the given temperatures.

Solution

- Max. LFG flows expected =	10,000 ft^3/min		
- Max. LFG flows expected =	14,400,000 ft^3/day	(4)	

Using ***Attachment 1***, the condensate production is:

At 90 °F,	2,200 lb liquid/10^6 ft^3 LFG	(5)	
At 70 °F,	1,100 lb liquid/10^6 ft^3 LFG	(6)	
The amount of liquid lost as LFG cools from (5) to (6) is:	1,100 lb liquid/10^6 ft^3 LFG	(7)	(5) - (6)
Gallons of condensate per day =	1,899.28 gal condensate/day	(8)	(7) * (4) * (gal/8.34lb)

Distribution of Condensate:

Assume that all condensate is formed gradually as it cools, thus each of the three sumps has been assumed to handle equal amounts of condensate.

	1,900 gallons/day	(9)
Condensate collected at each trap/sump =	633 gallons/day	(10)

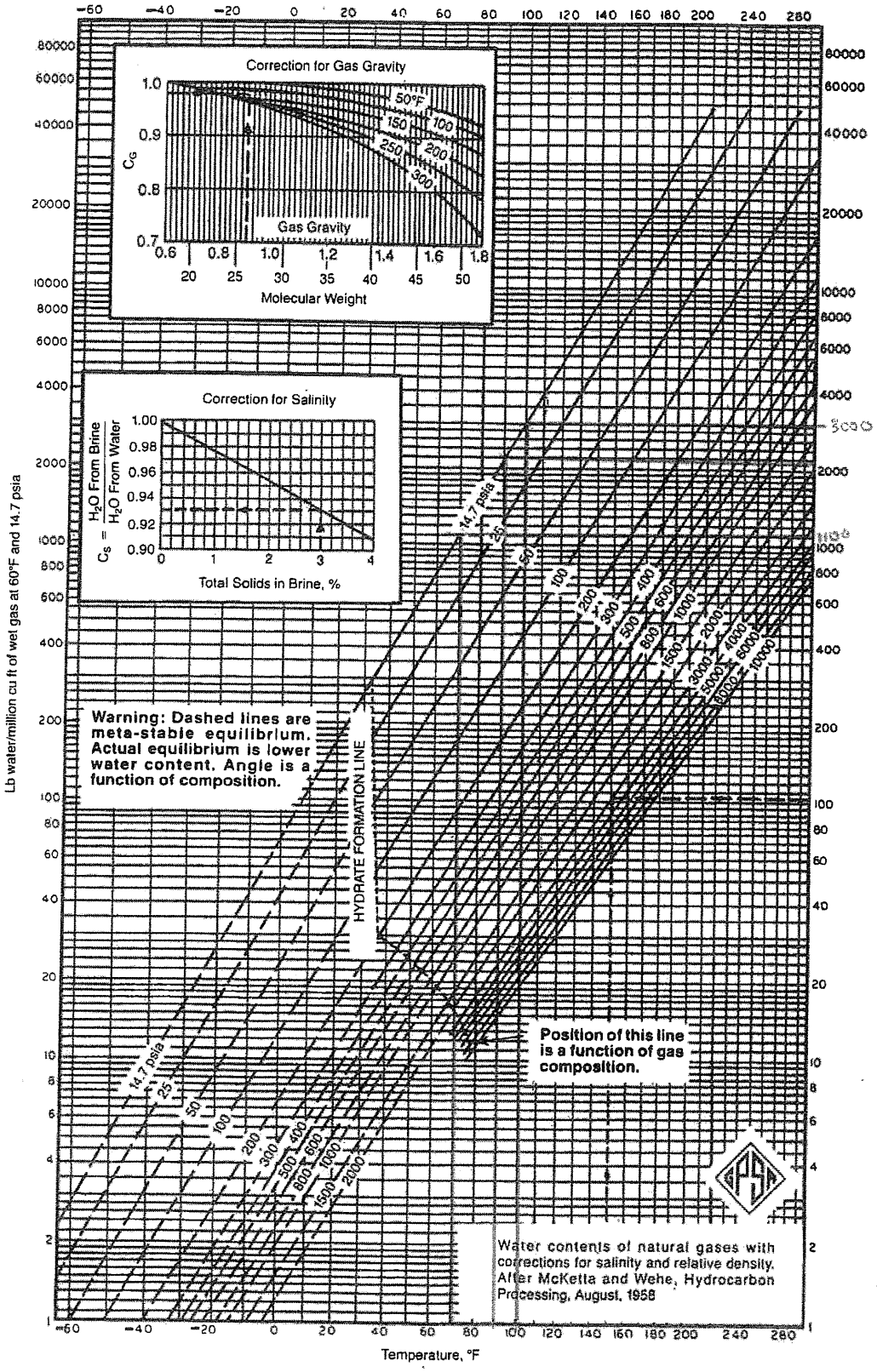
Conclusion

Design each sump to hold at least 633 gpd. Additionally, the installed pump needs to have a pump rate of greater than 0.5 gallon/minutes.

Attachment 1

FIG. 20-3

Water Content of Hydrocarbon Gas



Water contents of natural gases with corrections for salinity and relative density. After McKetta and Wehe, Hydrocarbon Processing, August, 1958

Golder Associates

Date:	9/2/2014	**Made by:**	DEG
Project No.:	083-82734.20	**Checked by:**	SFS
Subject:	Sump Design	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Objective

Determine the proper sump size to allow for 1-1/2 days of storage should a pump fail to operate.

Approach

1. Determine total depth needed for a 48-inch diameter sump based on the following:

- Max. condensate collected per day =	633 gal/day	(1)	Taken from condenate generation calculation
- Min. depth needed (1.5 times max. vacuum of 100" W.C.) =	150 inches	(2)	
-Interior diameter of a 48-inch SDR 32.5 sump:	44.8 inches	(3)	taken from ISCO pipe catalog

2. Determine volume of 12.5-ft (150-inch) deep 48" sump.

Solution

- Area of sump = $\pi \times r^2$	1,576 in^2	(4)	$\pi \times ((3)/2)^2$
- Volume of sump = area x height	236,449 in^3	(5)	(4) x (2)
Convert to gallons	1023.6 gallons	(5)	(4) / 231 in^3/gal
lume needed for 1-1/2 days of storage	950 gallons	(6)	2 x (1)
Estimated days of storage	1.6 days of storage capacity	(7)	(5) / (1)

Conclusion

A 48-inch diameter HDPE SDR 32.5 12.5-feet deep will have sufficient capacity to store greater than 1-1/2 days worth of the estimated condensate generated from the conveyance of landfill gas in the perimeter header pipeline.

PERFORMANCE PIPE
A Division of Chevron Phillips Chemical Company LP

Revised 02-01-2013

DIPS Size and Dimension Data

PE4710 (PE3408)

DriscoPlex® Municipal, Industrial & Energy Series

Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials. HDPE can accomodate up to 1.5 times the pipe pressure rating for a recurring surge and up to 2.0 times the pipe pressure rating for an occasional surge. Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		317 psi DR 7.3			250 psi DR 9.0			200 psi DR 11.0			160 psi DR 13.5			
Nominal Pipe Size	DIPS OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Nominal Pipe Size
4"	4.800	0.658	3.405	3.74	0.533	3.670	3.13	0.436	3.876	2.62	0.356	4.045	2.18	4"
6"	6.900	0.945	4.897	7.73	0.767	5.274	6.47	0.627	5.571	5.42	0.511	5.817	4.50	6"
8"	9.050	1.240	6.421	13.29	1.006	6.917	11.13	0.823	7.305	9.32	0.670	7.630	7.75	8"
10"	11.100	1.521	7.875	20.00	1.233	8.486	16.74	1.009	8.961	14.03	0.822	9.357	11.66	10"
12"	13.200	1.808	9.367	28.28	1.467	10.090	23.67	1.200	10.656	19.84	0.978	11.127	16.48	12"
14"	15.300	2.096	10.856	37.99	1.700	11.696	31.80	1.391	12.351	26.65	1.133	12.898	22.15	14"
16"	17.400	2.384	12.346	49.13	1.933	13.302	41.13	1.582	14.046	34.47	1.289	14.667	28.64	16"
18"	19.500	2.671	13.837	61.71	2.167	14.906	51.66	1.773	15.741	43.29	1.444	16.439	35.97	18"
20"	21.600				2.400	16.512	63.38	1.964	17.436	53.12	1.600	18.208	44.14	20"
24"	25.800				2.867	19.722	90.43	2.345	20.829	75.78	1.911	21.749	62.97	24"
30"	32.000							2.909	25.833	116.58	2.370	26.976	96.87	30"
36"	38.300							3.482	30.918	167.01	2.837	32.286	138.77	36"
42"	44.500										3.296	37.512	187.33	42"

Pressure Rating		125 psi DR 17.0			100 psi DR 21.0			80 psi DR 26.0			63 psi DR 32.5			
Nominal Pipe Size	DIPS OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Nominal Pipe Size
4"	4.800	0.282	4.202	1.76	0.229	4.315	1.45							4"
6"	6.900	0.406	6.039	3.64	0.329	6.203	2.99	0.265	6.338	2.43	0.212	6.451	1.96	6"
8"	9.050	0.532	7.922	6.26	0.431	8.136	5.13	0.348	8.312	4.19	0.278	8.461	3.37	8"
10"	11.100	0.653	9.716	9.42	0.529	9.979	7.73	0.427	10.195	6.30	0.342	10.375	5.09	10"
12"	13.200	0.776	11.555	13.31	0.629	11.867	10.93	0.508	12.123	8.91	0.406	12.339	7.19	12"
14"	15.300	0.900	13.392	17.89	0.729	13.755	14.68	0.588	14.053	11.96	0.471	14.301	9.66	14"
16"	17.400	1.024	15.229	23.15	0.829	15.643	18.98	0.669	15.982	15.48	0.535	16.266	12.48	16"
18"	19.500	1.147	17.068	29.07	0.929	17.531	23.84	0.750	17.910	19.44	0.600	18.228	15.69	18"
20"	21.600	1.271	18.905	35.68	1.029	19.419	29.25	0.831	19.838	23.86	0.665	20.190	19.26	20"
24"	25.800	1.518	22.582	50.89	1.229	23.195	41.73	0.992	23.697	34.03	0.794	24.117	27.46	24"
30"	32.000	1.882	28.010	78.26	1.524	28.769	64.18	1.231	29.390	52.37	0.985	29.912	42.26	30"
36"	38.300	2.253	33.524	112.13	1.824	34.433	91.93	1.473	35.177	75.00	1.178	35.803	60.49	36"
42"	44.500	2.618	38.950	151.39	2.119	40.008	124.09	1.712	40.871	101.28	1.369	41.598	81.68	42"

This size and dimension chart is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using DIPS OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.

Bulletin: PP 153-4710

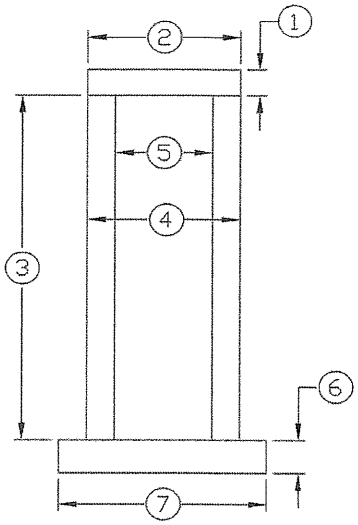
February 2013 Supersedes all previous publications

Golder Associates

Date:	5/28/2014	**Made by:**	DHR
Project No.:	083-82734.37	**Checked by:**	DEG
Subject:	Bouyancy Calculations	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

INPUT PARAMETERS

(1)	Thickness of top slab =	0.25	ft	
(2)	Diameter of top slab =	4.67	ft	
(3)	Height of cylinder =	16.50	ft	
(4)	Outside diameter of cylinder =	4.00	ft	
(5)	Inside diameter of cylinder =	2.98	ft	
(6)	Thickness of bottom slab =	0.25	ft	
(7)	Diameter of bottom slab =	5.33	ft	
(8)	Density of saturated soil γ_{SAT} =	110	lb/ft^3	, Attachment 1
(9)	Density of water γ_W =	62.4	lb/ft^3	
(10)	Density of concrete γ_{CONC} =	150	lb/ft^3	
(11)	DR =	32.5		Attachment 2
(12)	Nominal Pipe Size =	48.0	in	
(13)	Average ID =	44.869	in	
(14)	Minimum Wall Thickness =	1.477	in	
(15)	Weight =	95.233	lb/ft	
(16)	Liquid Level in Wet Well =	36	in	



CALCULATIONS

Area of bottom slab (7) =	22.31	ft^2	
Area of top slab (2 or 4) =	17.13	ft^2	
Area of inside diameter of cylinder (5) =	6.99	ft^2	<-- Area of donut
Volume of displaced soil =	26.36024197	ft^3	
Weight of dry soil =	1,255	lb	(γ_{SAT} - γ_W) x Volume of displaced soil
Density of pipe γ_{pipe} =	59	lb/ft^3	

Calculating empty Weight of Wet Well

Volume of top slab =	4.28	ft^3
Volume of cylinder =	91.99	ft^3
Volume of bottom slab =	5.58	ft^3

Calculating Weight of water in Wet Well

Volume of water in wet well =	32.94	ft^3
Weight of water in wet well =	2,055.54	lb
Weight of Wet Well =	8,064	lb

Golder Associates

Date:	5/28/2014	**Made by:**	DHR
Project No.:	083-82734.37	**Checked by:**	DEG
Subject:	Bouyancy Calculations	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Total Weight (dry soil + wet well) = 9,319 lb <-- Resisting Force (1)

Weight of water = 18,170 lb <-- Bouyant Force (2)

$$F.S. = \frac{9,319}{18,170} \quad \frac{(1)}{(2)}$$

= 0.51 Too low

Weight of concrete needed = 17,935.90 lbs (3) (to achieve a 1.5 factor of safety)

Volume of concrete needed = 119.57 ft^3

4.43 yd^3

$$F.S. = \frac{27,255}{18,170} \quad \frac{(1) + (3)}{(2)}$$

= 1.5 (double check)

Soil Mechanics

T. William Lambe • Robert V. Whitman

Massachusetts Institute of Technology

1969

JOHN WILEY & SONS, New York • Chichester • Brisbane • Toronto • Singapore

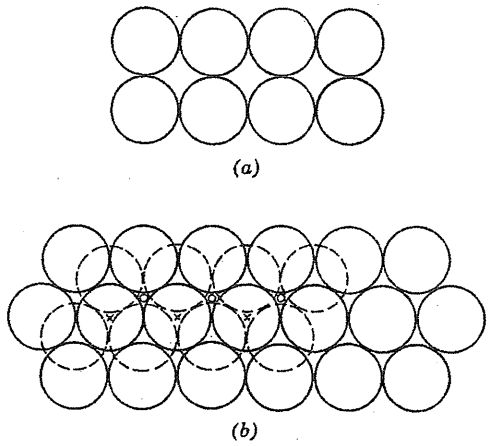


Fig. 3.2 Arrangements of uniform spheres. (*a*) Plan and elevation view: simple cubic packing. (*b*) Plan view: dense packing. Solid circles, first layer; dashed circles, second layer; ∘, location of sphere centers in third layer: face-centered cubic array; ×, location of sphere centers in third layer: close-packed hexagonal array. (From Deresiewicz, 1958.)

these simple packings can be computed from the geometry of the packings, and the results are given in Table 3.2.

This table also gives densities for some typical granular soils in both the "dense" and "loose" states. A variety of tests have been proposed to measure the maximum and minimum void ratios (Kolbuszewski, 1948). The test to determine the maximum density usually involves some form of vibration. The test to determine minimum density usually involves pouring oven-dried soil into a container. Unfortunately, the details of these tests have not been entirely standardized, and values of the maximum density and minimum density for a given granular soil depend on the procedure used to determine them. By using special measures, one can obtain densities greater than the so-called maximum density. Densities considerably less than the so-called minimum density can be obtained, especially with very fine sands and silts, by slowly sedimenting the soil into water or by fluffing the soil with just a little moisture present.

Table 3.2 Maximum and Minimum Densities for Granular Soils

Description	Void Ratio		Porosity (%)		Dry Unit Weight (pcf)	
	e_{max}	e_{min}	n_{max}	n_{min}	$\gamma_{d\,min}$	$\gamma_{d\,max}$
Uniform spheres	0.92	0.35	47.6	26.0	—	—
Standard Ottawa sand	0.80	0.50	44	33	92	110
Clean uniform sand	1.0	0.40	50	29	83	118
Uniform inorganic silt	1.1	0.40	52	29	80	118
Silty sand	0.90	0.30	47	23	87	127
Fine to coarse sand	0.95	0.20	49	17	85	138
Micaceous sand	1.2	0.40	55	29	76	120
Silty sand and gravel	0.85	0.14	46	12	89	146

B. K. Hough, *Basic Soils Engineering*. Copyright © 1957, The Ronald Press Company, New York.

The smaller the range of particle sizes present (i.e., the more nearly uniform the soil), the smaller the particles, and the more angular the particles, the smaller the minimum density (i.e., the greater the opportunity for building a loose arrangement of particles). The greater the range of particle sizes present, the greater the maximum density (i.e., the voids among the larger particles can be filled with smaller particles).

A useful way to characterize the density of a natural granular soil is with *relative density* D_r, defined as

$$D_r = \frac{e_{max} - e}{e_{max} - e_{min}} \times 100\%$$

$$= \frac{\gamma_{d\,max}}{\gamma_d} \times \frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{d\,min}} \times 100\% \qquad (3.1)$$

where

e_{min} = void ratio of soil in densest condition
e_{max} = void ratio of soil in loosest condition
e = in-place void ratio
$\gamma_{d\,max}$ = dry unit weight of soil in densest condition
$\gamma_{d\,min}$ = dry unit weight of soil in loosest condition
γ_d = in-place dry unit weight

Table 3.3 characterizes the density of granular soils on the basis of relative density.

Table 3.3 Density Description

Relative Density (%)	Descriptive Term
0–15	Very loose
15–35	Loose
35–65	Medium
65–85	Dense
85–100	Very dense

Values of water content for natural granular soils vary from less than 0.1% for air-dry sands to more than 40% for saturated, loose sand.

Typical Values of Phase Relationships for Cohesive Soils

The range of values of phase relationships for cohesive soils is much larger than for granular soils. Saturated sodium montmorillonite at low confining pressure can exist at a void ratio of more than 25; saturated clays

Golder Associates

Date:	6/13/2014	**Made by:**	DEG
Project No.:	083-82734.37	**Checked by:**	SFS
Subject:	Presurrized Air Demand	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill Gas to Energy GCCS Expansion		

Objective

Calculate the estimated air demand for 15 pnuematic pumps. 3 pumps will be needed for the pipeline sumps, the capacity for the other 12 is reserved for future capacity.

Approach

1. Utilize the QED online Flow Rate/Air Consumption Calculator based upon the following inputs:

Assumed average depths of pumps (5 pumps@12-ft and 10 pumps@45-ft):	35	feet	(1)
Assumed liquid flow-rate needed (actual needed is 0.1 gpm):	2	gpm	(2)

Conclusion

An reciprocating air compressor without a dryer needs to be able to provide 39 scfm at 100psi of pressure to meet the evaluated demand. Using a 15% safety/friction factor, the recommended size is 45 scfm at 100 psi. Options for other types of compressors and dryers is presented on the QED calculator.

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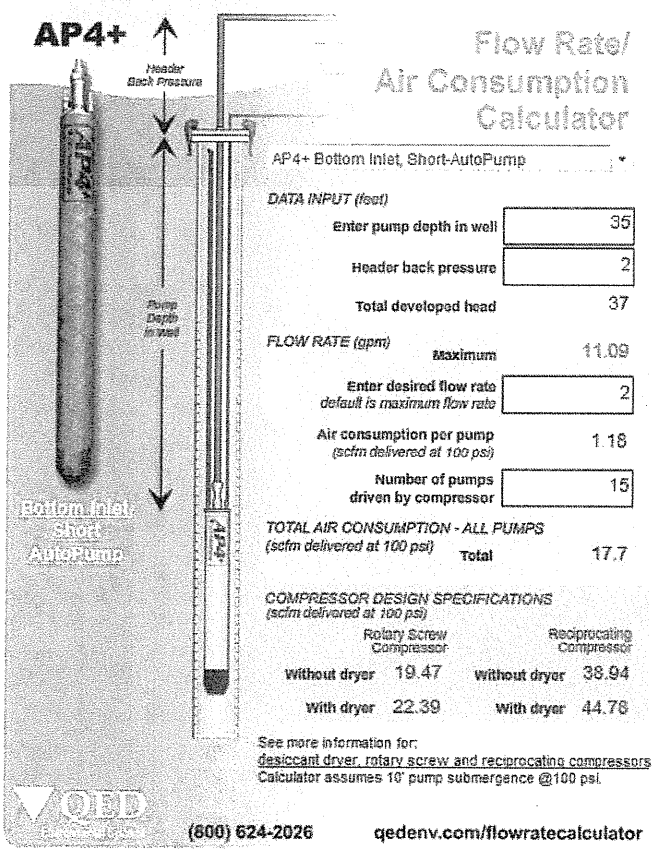

More Information

▼ Click to learn more about the terms discussed in the Flow Rate and Air Usage Calculator

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