PERMIT APPLICATION

APPLICATION FOR SOLID WASTE PERMIT MINOR MODIFICATION
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
Solid Waste Section
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 – Solid Waste Section
2 Copies	J.E.D. Solid Waste Management Facility
1 Copy	Golder Associates Inc.

May 2016

083-82734.47

BRANDON K. POIENCOT
LICENSE
No. 77044
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Brandon K. Poiencot
Florida Professional Engineer No. 77044
Certificate of Authorization No. 1678

5/19/16
Date

A world of capabilities delivered locally

Golder Associates

May 16, 2016 083-82734.47

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

RE: MINOR MODIFICATION PERMIT APPLICATION
LANDFILL GAS COLLECTION AND CONTROL DEWATERING SYSTEM
SOLID WASTE FACILITY OPERATION PERMIT No. SO49-0199726-022
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 a Minor Modification to Solid Waste Management Facility Operation Permit Number SO49-0199726-022 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 $250 for the review and processing fee.

This modification to the permit entails design and installation of a dewatering maintenance system for the existing and proposed GCCS including installation of an exterior transmission line (to convey dewatering discharge from the active disposal area to the existing leachate storage ponds). No additional changes to the GCCS 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 Mr. Mike Kaiser with Progressive Waste Solutions at (904) 673-0446 or the undersigned us should you have any questions or require additional information

Sincerely,

GOLDER ASSOCIATES INC.

Brandon K. Poiencot, PE
Project Engineer

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: February 15, 2015

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 Street
Suite 308
Pensacola, FL 32502-5794
850-595-8300

Northeast District
7777 Baymeadows Way West
Suite 100
Jacksonville, FL 32256-7590
904-256-1700

Central District
3319 Maguire Boulevard
Suite 232
Orlando, FL 32803-3767
407-897-4100

Southwest District
13051 North Telecom Pkwy
Temple Terrace, FL 33637
813-470-5700

South District
2295 Victoria Ave, Suite 364
P.O. Box 2549
Fort Myers, FL 33901-3881
239-344-5600

Southeast District
3301 Gun Club Road
MSC 7210-1
West Palm Beach, FL 33406
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 permit application shall be submitted in accordance with the requirements of Rule 62-701.320(5)(a), F.A.C., to the appropriate Department 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;
Yard Trash Disposal Facilities should notify on Form 62-701.900(3), FAC;
Compost Facilities should apply on Form 62-709.901(1), 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 Omini 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 Surveying Company/Affiliation: Johnston's Surveying

8. Applicant name (operating authority): Omini 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 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: 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: 22 years

15. Estimated costs:
Total Construction: $ 300,000 Closing Costs: $ N/A

16. Anticipated construction starting and completion dates:
From: June 2016 To: December 2018

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 the operations permit minor modification for the construction of a landill gas extraction well dewatering system. The dewatering system will be utilized to optimize landfill gas flow rates in support of the landfill gas to energy facility.

2. Facility site supervisor: John Hartings

Title: Landfill Manager Telephone: (407) 891-3720

john.hartings@progressivewaste.com
E-Mail address (if available)

3. Disposal area: Total acres: 360 Used acres: 135.9 Available acres: 224.1

4. Weighing scales used: ☑ Yes ☐ No

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

6. Charge for waste received: _____ $/yds^3 35 $/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 unless volume of recyclable goods is sufficient

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 (describe):

13. Days of operation: Monday - Sunday

14. Hours of operation: Mon - Fri: 5am - 4pm, Sat: 6am - 12pm, Sun: 6am - 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
- ☐ Single clay liner
- ☐ Single geomembrane
- ☐ Single composite
- ☐ Slurry wall
- ☐ Double geomembrane
- ☑ Geomembrane & composite
- ☑ Double composite
- ☐ None
- ☑ Other (describe):

Additional GCL below primary geomembrane in the sump areas in Cells 5 through 23.

21. Leachate collection method:

- ☑ Collection pipes
- ☑ Geonets
- ☐ Well points
- ☐ Perimeter ditch
- ☐ Other (describe):
- ☑ Double geomembrane
- ☐ Gravel layer
- ☐ Interceptor trench
- ☐ None

22. Leachate storage method:

☐ Tanks ☑ Surface impoundments

☐ Other (describe):

23. Leachate treatment method:

☐ Oxidation ☐ Chemical treatment

☐ Secondary ☐ Settling

☐ Advanced ☐ None

☑ Other (describe):

Aeration

24. Leachate disposal method:

☑ Recirculated ☐ Pumped to WWTP

☑ Transported to WWTP ☐ Discharged to surface water/wetland

☐ Injection well ☐ Percolation ponds

☑ Evaporation ☐ Spray irrigation

☐ Other (describe):

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), ERP49-0199752-010-EI (Phase 4 Individual)

PART C. PROHIBITIONS (62-701.300, FAC)

LOCATION

S ☐ _____ N/A ☑ N/C ☐	1. Provide documentation that each of the siting criteria will be satisfied for the facility; (62-701.300(2), FAC)
S ☐ _____ N/A ☑ N/C ☐	2. If the facility qualifies for any of the exemptions contained in Rules 62-701.300(12), (13) and (16) through (18), FAC, then document this qualification(s);
S ☐ _____ N/A ☑ N/C ☐	3. Provide documentation that the facility will be in compliance with the burning restrictions; (62-701.300(3), FAC)
S ☐ _____ N/A ☑ N/C ☐	4. Provide documentation that the facility will be in compliance with the hazardous waste restrictions; (62-701.300(4), FAC)
S ☐ _____ N/A ☑ N/C ☐	5. Provide documentation that the facility will be in compliance with the PCB disposal restrictions; (62-701.300(5), FAC)
S ☐ _____ N/A ☑ N/C ☐	6. Provide documentation that the facility will be in compliance with the biomedical waste restrictions; (62-701.300(6), FAC)
S ☐ _____ N/A ☑ N/C ☐	7. Provide documentation that the facility will be in compliance with the Class I surface water restrictions; (62-701.300(7), FAC)
S ☐ _____ N/A ☑ N/C ☐	8. Provide documentation that the facility will be in compliance with the special waste for landfills restrictions; (62-701.300(8), FAC)
S ☐ _____ N/A ☑ N/C ☐	9. Provide documentation that the facility will be in compliance with the liquid restrictions; (62-701.300(10), FAC)
S ☐ _____ N/A ☑ N/C ☐	10. Provide documentation that the facility will be in compliance with the used oil and oily waste restrictions; (62-701.300(11), FAC)
S ☐ _____ N/A ☑ N/C ☐	11. Provide documentation that the facility will be in compliance with the CCA treated wood restrictions; (62-701.300(14), FAC)
S ☐ _____ N/A ☑ N/C ☐	12. Provide documentation that the facility will be in compliance with the dust control restrictions; (62-701.300(15), FAC)

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

LOCATION

S ☑ See Section 4.1 N/A ☐ N/C ☐ 1. A minimum of one completed electronic application form, all supporting data and reports; (62-701.320(5)(a), FAC)

S ☑ See Section 4.2 N/A ☐ N/C ☐ 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)

S ☑ See Section 4.3 N/A ☐ N/C ☐ 3. A letter of transmittal to the Department; (62-701.320(7)(a), FAC)

S ☑ See Section 4.4 N/A ☐ N/C ☐ 4. A completed application form dated and signed by the applicant; (62-701.320(7)(b), FAC)

S ☑ See Section 4.5 N/A ☐ N/C ☐ 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)

S ☑ See Section 4.6 N/A ☐ N/C ☐ 6. An engineering report addressing the requirements of this rule and with the following format: a cover sheet, text printed on 8 ½ 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)

S ☑ See Section 4.7 N/A ☐ N/C ☐ 7. Operation Plan and Closure Plan; (62-701.320(7)(e)1, FAC)

S ☐ _____ N/A ☐ N/C ☑ 8. Contingency Plan; (62-701.320(7)(e)2, FAC)

S ☑ See Section 4.9 N/A ☐ N/C ☐ 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)

S ☑ See Section 4.9 N/A ☐ N/C ☐ a. A regional map or plan with the project location in relation to major roadways and population centers;

S ☑ See Section 4.9 N/A ☐ N/C ☐ b. A vicinity map or aerial photograph no more than one year old showing the facility site and relevant surface features located within 1000 feet of the facility;

S ☑ See Section 4.9 N/A ☐ N/C ☐ c. A site plan showing all property boundaries certified by a Florida Licensed Professional Surveyor and Mapper;

S ☑ See Section 4.9 N/A ☐ N/C ☐ 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;

LOCATION **PART D CONTINUED**

S ☐ _____ N/A ☐ N/C ☑ 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)

S ☐ _____ N/A ☑ N/C ☐ 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)

S ☑ See Section 4.12 N/A ☐ N/C ☐ 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 the state; (62-701.320(7)(i), FAC)

S ☑ See Section 4.13 N/A ☐ N/C ☐ 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; (62-701.320(8), FAC)

S ☐ _____ N/A ☑ N/C ☐ 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)

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Regional map or aerial photograph no more than five years old showing all airports that are located within five miles of the proposed landfill; (62-701.330(3)(a), FAC)

S ☐ _____ N/A ☑ N/C ☐ 2. Plot plan with a scale not greater than 200 feet to the inch showing: (62-701.330(3)(b), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. Dimensions;

S ☐ _____ N/A ☑ N/C ☐ b. Locations of proposed and existing water quality monitoring wells;

S ☐ _____ N/A ☑ N/C ☐ c. Locations of soil borings;

S ☐ _____ N/A ☑ N/C ☐ d. Proposed plan of trenching or disposal areas;

S ☐ _____ N/A ☑ N/C ☐ e. Cross sections showing original elevations and proposed final contours which shall be included either on the plot plan or on separate sheets;

LOCATION		PART E CONTINUED
S ☐ _____	N/A ☑ N/C ☐	f. Any previously filled waste disposal areas;
S ☐ _____	N/A ☑ N/C ☐	g. Fencing or other measures to restrict access;
S ☐ _____	N/A ☑ N/C ☐	3. Topographic maps with a scale not greater than 200 feet to the inch with five foot contour intervals showing: (62-701.330(3)(c), FAC)
S ☐ _____	N/A ☑ N/C ☐	a. Proposed fill areas;
S ☐ _____	N/A ☑ N/C ☐	b. Borrow areas;
S ☐ _____	N/A ☑ N/C ☐	c. Access roads;
S ☐ _____	N/A ☑ N/C ☐	d. Grades required for proper drainage;
S ☐ _____	N/A ☑ N/C ☐	e. Cross sections of lifts;
S ☐ _____	N/A ☑ N/C ☐	f. Special drainage devices if necessary;
S ☐ _____	N/A ☑ N/C ☐	g. Fencing;
S ☐ _____	N/A ☑ N/C ☐	h. Equipment facilities;
S ☐ _____	N/A ☑ N/C ☐	4. A report on the landfill describing the following: (62-701.330(3)(d), FAC)
S ☐ _____	N/A ☑ N/C ☐	a. The current and projected population and area to be served by the proposed site;
S ☐ _____	N/A ☑ N/C ☐	b. The anticipated type, annual quantity, and source of solid waste expressed in tons;
S ☐ _____	N/A ☑ N/C ☐	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 ☐ _____	N/A ☑ N/C ☐	d. The source and type of cover material used for the landfill;
S ☐ _____	N/A ☑ N/C ☐	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
S ☐ _____	N/A ☑ N/C ☐	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)

LOCATION

S ☐ _____ 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)

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Describe how the landfill shall be designed so the 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)

S ☐ _____ N/A ☑ N/C ☐ 2. Landfill liner requirements; (62-701.400(3), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. General construction requirements; (62-701.400(3)(a), FAC)

S ☐ _____ N/A ☑ N/C ☐ (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 ☐ _____ N/A ☑ N/C ☐ (2) Document foundation is adequate to prevent liner failure;

S ☐ _____ N/A ☑ N/C ☐ (3) Constructed so bottom liner will not be adversely impacted by fluctuations of the ground water;

S ☐ _____ N/A ☑ N/C ☐ (4) Designed to resist hydrostatic uplift if bottom liner located below seasonal high ground water table;

S ☐ _____ N/A ☑ N/C ☐ (5) Installed to cover all surrounding earth which could come into contact with the waste or leachate;

LOCATION		PART G CONTINUED
S ☐ _____ N/A ☑ N/C ☐		b. Composite liners; (62-701.400(3)(b), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Upper geomembrane thickness and properties;
S ☐ _____ N/A ☑ N/C ☐	(2)	Design leachate head for primary leachate collection and removal system (LCRS) including leachate recirculation if appropriate;
S ☐ _____ N/A ☑ N/C ☐	(3)	Design thickness in accordance with Table A and number of lifts planned for lower soil component;
S ☐ _____ N/A ☑ N/C ☐		c. Double liners; (62-701.400(3)(c), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Upper and lower geomembrane thickness and properties;
S ☐ _____ N/A ☑ N/C ☐	(2)	Design leachate head for primary LCRS to limit the head to one foot above the liner;
S ☐ _____ N/A ☑ N/C ☐	(3)	Lower geomembrane sub-base design;
S ☐ _____ N/A ☑ N/C ☐	(4)	Leak detection and secondary leachate collection system minimum design criteria (k ≥ 10 cm/sec, head on lower liner ≤ 1 inch, head not to exceed thickness of drainage layer);
S ☐ _____ N/A ☑ N/C ☐		d. Standards for geosynthetic components; (62-701.400(3)(d), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Factory and field seam test methods to ensure all geomembrane seams achieve the minimum specifications;
S ☐ _____ N/A ☑ N/C ☐	(2)	Geomembranes to be used shall pass a continuous spark test by the manufacturer;
S ☐ _____ N/A ☑ N/C ☐	(3)	Design of 24-inch-thick protective layer above upper geomembrane liner;
S ☐ _____ N/A ☑ N/C ☐	(4)	Describe operational plans to protect the liner and leachate collection system when placing the first layer of waste above a 24-inch-thick protective layer;
S ☐ _____ N/A ☑ N/C ☐	(5)	HDPE geomembranes, if used, meet the specifications in GRI GM13, and LLDPE geomembranes, if used, meet the specifications in GRI GM17;
S ☐ _____ N/A ☑ N/C ☐	(6)	PVC geomembranes, if used, meet the specifications in PGI 1104;

S ☐ _____ N/A ☑ N/C ☐ (7) Interface shear strength testing results of the actual components which will be used in the liner system;

S ☐ _____ N/A ☑ N/C ☐ (8) Transmissivity testing results of geonets if they are used in the liner system;

S ☐ _____ N/A ☑ N/C ☐ (9) Hydraulic conductivity testing results of geosynthetic clay liners if they are used in the liner system;

S ☐ _____ N/A ☑ N/C ☐ e. Geosynthetic specification requirements; (62-701.400(3)(e), FAC)

S ☐ _____ N/A ☑ N/C ☐ (1) Definition and qualifications of the designer, manufacturer, installer, QA consultant and laboratory, and QA program;

S ☐ _____ N/A ☑ N/C ☐ (2) Material specifications for geomembranes, geocomposites, geotextiles, geogrids, and geonets;

S ☐ _____ N/A ☑ N/C ☐ (3) Manufacturing and fabrication specifications including geomembrane raw material and roll QA, fabrication personnel qualifications, seaming equipment and procedures, overlaps, trial seams, destructive and non-destructive seam testing, seam testing location, frequency, procedure, sample size, and geomembrane repairs;

S ☐ _____ N/A ☑ N/C ☐ (4) Geomembrane installation specifications including earthwork, conformance testing, geomembrane placement, installation personnel qualifications, field seaming and testing, overlapping and repairs, materials in contact with geomembranes, and procedures for lining system acceptance;

S ☐ _____ N/A ☑ N/C ☐ (5) Geotextile and geogrids specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;

S ☐ _____ N/A ☑ N/C ☐ (6) Geonet and geocomposites specifications including handling and placement, conformance testing, stacking and joining, repair, and placement of soil materials and any overlying materials;

S ☐ _____ N/A ☑ N/C ☐ (7) Geosynthetic clay liner specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;

LOCATION		PART G CONTINUED
S ☐ _____ N/A ☑ N/C ☐		f. Standards for soil liner components; (62-701.400(3)(f), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Description of construction procedures including over-excavation and backfilling to preclude structural inconsistencies and procedures for placing and compacting soil components in layers;
S ☐ _____ N/A ☑ N/C ☐	(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;
S ☐ _____ N/A ☑ N/C ☐	(3)	Procedures for testing in situ soils to demonstrate they meet the specifications for soil liners;
S ☐ _____ N/A ☑ N/C ☐	(4)	Specifications for soil component of liner including at a minimum:
S ☐ _____ N/A ☑ N/C ☐	(a)	Allowable particle size distribution, and Atterberg limits including shrinkage limit;
S ☐ _____ N/A ☑ N/C ☐	(b)	Placement moisture and dry density criteria;
S ☐ _____ N/A ☑ N/C ☐	(c)	Maximum laboratory-determined saturated hydraulic conductivity using simulated leachate;
S ☐ _____ N/A ☑ N/C ☐	(d)	Minimum thickness of soil liner;
S ☐ _____ N/A ☑ N/C ☐	(e)	Lift thickness;
S ☐ _____ N/A ☑ N/C ☐	(f)	Surface preparation (scarification);
S ☐ _____ N/A ☑ N/C ☐	(g)	Type and percentage of clay mineral within the soil component;
S ☐ _____ N/A ☑ N/C ☐	(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;
S ☐ _____ N/A ☑ N/C ☐		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;

S ☑	See Section 7.1.1 N/A ☐ N/C ☐	3. Leachate collection and removal system (LCRS); (62-701.400(4), FAC)
S ☐	_____ N/A ☑ N/C ☐	a. The primary and secondary LCRS requirements; (62-701.400(4)(a), FAC)
S ☐	_____ N/A ☑ N/C ☐	(1) Constructed of materials chemically resistant to the waste and leachate;
S ☐	_____ N/A ☑ N/C ☐	(2) Have sufficient mechanical properties to prevent collapse under pressure;
S ☐	_____ N/A ☑ N/C ☐	(3) Have granular material or synthetic geotextile to prevent clogging;
S ☐	_____ N/A ☑ N/C ☐	(4) Have a method for testing and cleaning clogged pipes or contingent designs for reducing leachate around failed areas;
S ☐	_____ N/A ☑ N/C ☐	b. Other LCRS requirements; (62-701.400(4)(b), (c) and (d), FAC
S ☐	_____ N/A ☑ N/C ☐	(1) Bottom 12 inches having hydraulic conductivity ≥ 1 x 10^{-3} cm/sec;
S ☐	_____ N/A ☑ N/C ☐	(2) Total thickness of 24 inches of material chemically resistant to the waste and leachate;
S ☐	_____ N/A ☑ N/C ☐	(3) Bottom slope design to accommodate for predicted settlement and still meet minimum slope requirements;
S ☐	_____ N/A ☑ N/C ☐	(4) Demonstration that synthetic drainage material, if used, is equivalent or better than granular material in chemical compatibility, flow under load, and protection of geomembranes liner;
S ☐	_____ N/A ☑ N/C ☐	(5) Schedule provided for routine maintenance of LCRS.
S ☐	_____ N/A ☑ N/C ☐	4. Leachate recirculation; (62-701.400(5), FAC)
S ☐	_____ N/A ☑ N/C ☐	a. Describe general procedures for recirculating leachate;
S ☐	_____ N/A ☑ N/C ☐	b. Describe procedures for controlling leachate runoff and minimizing mixing of leachate runoff with storm water;
S ☐	_____ N/A ☑ N/C ☐	c. Describe procedures for preventing perched water conditions and gas buildup;

S ☐ _____ N/A ☑ N/C ☐ 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;

S ☐ _____ N/A ☑ N/C ☐ e. Describe methods of gas management in accordance with Rule 62-701.530, FAC;

S ☐ _____ N/A ☑ N/C ☐ 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;

S ☐ _____ N/A ☑ N/C ☐ 5. Leachate storage tanks and leachate surface impoundments; (62-701.400(6), FAC)

S ☐ _____ N/A ☐ N/C ☑ a. Surface impoundment requirements; (62-701.400(6)(b), FAC)

S ☐ _____ N/A ☐ N/C ☑ (1) Documentation that the design of the bottom liner will not be adversely impacted by fluctuations of the ground water;

S ☐ _____ N/A ☐ N/C ☑ (2) Designed in segments to allow for inspection and repair, as needed, without interruption of service;

S ☐ _____ N/A ☐ N/C ☑ (3) General design requirements;

S ☐ _____ N/A ☐ N/C ☑ (a) Double liner system consisting of an upper and lower 60-mil minimum thickness geomembrane;

S ☐ _____ N/A ☐ N/C ☑ (b) Leak detection and collection system with hydraulic conductivity ≥ 1 cm/sec;

S ☐ _____ N/A ☐ N/C ☑ (c) Lower geomembrane place 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;

S ☐ _____ N/A ☐ N/C ☑ (d) Design calculation to predict potential leakage through the upper liner;

S ☐ _____ N/A ☐ N/C ☑ (e) Daily inspection requirements, and notification and corrective action requirements if leakage rates exceed that predicted by design calculations;

S ☐ _____ N/A ☐ N/C ☑ (4) Description of procedures to prevent uplift, if applicable;

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

S ☐ _____ N/A ☑ N/C ☐ (1) Describe materials of construction;

S ☐ _____ N/A ☑ N/C ☐ (2) A double-walled tank design system to be used with the following requirements:

S ☐ _____ N/A ☑ N/C ☐ (a) Interstitial space monitoring at least weekly;

S ☐ _____ N/A ☑ N/C ☐ (b) Corrosion protection provided for primary tank interior and external surface of outer shell;

S ☐ _____ N/A ☑ N/C ☐ (c) Interior tank coatings compatible with stored leachate;

S ☐ _____ N/A ☑ N/C ☐ (d) Cathodic protection inspected weekly and repaired as needed;

S ☐ _____ N/A ☑ N/C ☐ (3) Describe an overfill prevention system, such as level sensors, gauges, alarms, and shutoff controls to prevent overfilling, and provide for weekly inspections;

S ☐ _____ N/A ☑ N/C ☐ (4) Inspection reports available for Department review;

S ☐ _____ N/A ☑ N/C ☐ 6. Liner systems construction quality assurance (CQA); (62-701.400(7), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. Provide CQA Plan including:

S ☐ _____ N/A ☑ N/C ☐ (1) Specifications and construction requirements for liner system;

S ☐ _____ N/A ☑ N/C ☐ (2) Detailed description of quality control testing procedures and frequencies;

S ☐ _____ N/A ☑ N/C ☐ (3) Identification of supervising professional engineer;

S ☐ _____ N/A ☑ N/C ☐ (4) Identify responsibility and authority of all appropriate organizations and key personnel involved in the construction project;

S ☐ _____ N/A ☑ N/C ☐ (5) State qualifications of CQA professional engineer and support personnel;

LOCATION **PART G CONTINUED**

S ☐ _____ N/A ☑ N/C ☐ (6) Description of CQA reporting forms and documents;

S ☐ _____ N/A ☑ N/C ☐ b. An independent laboratory experienced in the testing of geosynthetics to perform required testing;

S ☐ _____ N/A ☑ N/C ☐ 7. Soil liner CQA; (62-701.400(8), FAC)

S ☐ _____ N/A ☑ N/C ☐ 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;

S ☐ _____ N/A ☑ N/C ☐ b. Description of field test section construction and test methods to be implemented prior to liner installation;

S ☐ _____ N/A ☑ N/C ☐ c. Description of field test methods, including rejection criteria and corrective measures to insure proper liner installation;

S ☐ _____ N/A ☑ N/C ☐ 8. For surface water management systems at aboveground disposal units, provide documentation showing the design of any features intended to convey stormwater to a permitted or exempted treatment system; (62-701.400(9), FAC)

S ☐ _____ N/A ☐ N/C ☑ 9. Gas control systems; (62-701.400(10), FAC)

S ☐ _____ N/A ☐ N/C ☑ 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;

S ☐ _____ N/A ☑ N/C ☐ 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(2), FAC)

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Submit a hydrogeological investigation and site report including at least the following information:

S ☐ _____ N/A ☑ N/C ☐ a. Regional and site specific geology and hydrology;

S ☐ _____ N/A ☑ N/C ☐ b. Direction and rate of ground water and surface water flow including seasonal variations;

LOCATION **PART H CONTINUED**

S ☐ _____ N/A ☑ N/C ☐ c. Background quality of ground water and surface water;

S ☐ _____ N/A ☑ N/C ☐ d. Any on-site hydraulic connections between aquifers;

S ☐ _____ N/A ☑ N/C ☐ e. Site stratigraphy and aquifer characteristics for confining layers, semi-confining layers, and all aquifers below the site that may be affected by the disposal facility;

S ☐ _____ N/A ☑ N/C ☐ f. Description of topography, soil types, and surface water drainage systems;

S ☐ _____ N/A ☑ N/C ☐ g. Inventory of all public and private water wells within a one mile radius of the site 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;

S ☐ _____ N/A ☑ N/C ☐ h. Identify and locate any existing contaminated areas on the site;

S ☐ _____ N/A ☑ N/C ☐ i. Include a map showing the locations of all potable wells within 500 feet of the waste storage and disposal areas;

S ☐ _____ N/A ☑ N/C ☐ 2. Report signed, sealed, and dated by P.E. and/or P.G.

PART I. GEOTECHNICAL INVESTIGATION REQUIREMENTS (62-701.410(3) and (4), FAC)

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Submit a geotechnical site investigation report defining the engineering properties of the site including at least the following:

S ☐ _____ N/A ☑ N/C ☐ a. Description of subsurface conditions including soil stratigraphy and ground water table conditions;

S ☐ _____ N/A ☑ N/C ☐ b. Investigate for the presence of muck, previously filled areas, soft ground, and lineaments;

S ☐ _____ N/A ☑ N/C ☐ c. Estimates of average and maximum high water table across the site;

S ☐ _____ N/A ☑ N/C ☐ d. Evaluation of potential for fault areas and seismic impact zones;

S ☐ _____ N/A ☑ N/C ☐ e. Foundation analysis including:

S ☐ _____ N/A ☑ N/C ☐ (1) Foundation bearing capacity analysis;

S ☐ _____ N/A ☑ N/C ☐ (2) Total and differential subgrade settlement analysis;

S ☐ _____ N/A ☑ N/C ☐ (3) Slope stability analysis;

S ☐ _____ N/A ☑ N/C ☐ f. Evaluation of potential for sinkholes and sinkhole activity at the site that is based upon the investigations required in Rule 62-701.410(3)(f), F.A.C.;

S ☐ _____ N/A ☑ N/C ☐ g. A geotechnical report providing a description of methods used in the investigation, and includes soil boring logs, laboratory results, analytical calculations, cross sections, interpretations, conclusions, and a description of any engineering measures proposed for the site;

S ☐ _____ N/A ☑ N/C ☐ 2. Report signed, sealed, and dated by P.E. and/or P.G.

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

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Describe how the vertical expansion shall not cause or contribute to any violations of water quality standards or criteria, shall not cause objectionable odors, or adversely affect the closure design of the existing landfill;

S ☐ _____ N/A ☑ N/C ☐ 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;

S ☐ _____ N/A ☑ N/C ☐ 3. Provide foundation and settlement analysis for the vertical expansion;

S ☐ _____ N/A ☑ N/C ☐ 4. Provide total settlement calculations demonstrating that the final elevations of the lining system, gravity drainage, and no other component of the design will be adversely affected;

S ☐ _____ N/A ☑ N/C ☐ 5. Minimum stability factor of safety of 1.5 for the lining system component interface stability and for deep stability;

S ☐ _____ N/A ☑ N/C ☐ 6. Provide documentation to show the surface water management system will not be adversely affected by the vertical expansion;

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Provide documentation that the 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)

S ☐ _____ N/A ☑ N/C ☐ 2. Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. Designating responsible operating and maintenance personnel;

S ☐ _____ N/A ☑ N/C ☐ b. Emergency preparedness and response, as required in subsection 62-701.320(16), FAC;

S ☐ _____ N/A ☑ N/C ☐ c. Controlling types of waste received at the landfill;

S ☐ _____ N/A ☑ N/C ☐ d. Weighing incoming waste;

S ☐ _____ N/A ☑ N/C ☐ e. Vehicle traffic control and unloading;

S ☐ _____ N/A ☑ N/C ☐ f. Method and sequence of filling waste;

S ☐ _____ N/A ☑ N/C ☐ g. Waste compaction and application of cover;

S ☐ _____ N/A ☐ N/C ☑ h. Operations of gas, leachate, and stormwater controls;

S ☐ _____ N/A ☑ N/C ☐ i. Water quality monitoring;

S ☐ _____ N/A ☑ N/C ☐ j. Maintaining and cleaning the leachate collection system;

S ☐ _____ N/A ☑ N/C ☐ 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. DEP permit, engineering drawings, water quality records, etc.); (62-701.500(3), FAC)

S ☐ _____ N/A ☑ N/C ☐ 4. Describe the waste records that will be compiled monthly and provided to the Department annually; (62-701.500(4), FAC)

S ☐ _____ N/A ☑ N/C ☐ 5. Describe methods of access control; (62-701.500(5), FAC)

S ☐ _____ N/A ☑ N/C ☐ 6. Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized waste at the landfill; (62-701.500(6), FAC)

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

LOCATION		PART K CONTINUED
S ☐ _____	N/A ☐ N/C ☑	8. Describe operational procedures for leachate management including: (62-701.500(8), FAC)
S ☐ _____	N/A ☐ N/C ☑	a. Leachate level monitoring;
S ☐ _____	N/A ☐ N/C ☑	b. Operation and maintenance of leachate collection and removal system, and treatment as required;
S ☐ _____	N/A ☐ N/C ☑	c. Procedures for managing leachate if it becomes regulated as a hazardous waste;
S ☐ _____	N/A ☐ N/C ☑	d. Identification of treatment or disposal facilities that may be used for off-site discharge and treatment of leachate;
S ☐ _____	N/A ☐ N/C ☑	e. Contingency plan for managing leachate during emergencies or equipment problems;
S ☐ _____	N/A ☐ N/C ☑	f. Procedures for recording quantities of leachate generated in gal/day and including this in the operating record;
S ☐ _____	N/A ☐ N/C ☑	g. Procedures for comparing precipitation experienced at the landfill with leachate generation rates and including this information in the operating record;
S ☐ _____	N/A ☐ N/C ☑	h. Procedures for water pressure cleaning or video inspecting leachate collection systems;
S ☑ See Section 10.9	N/A ☐ N/C ☐	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)
S ☐ _____	N/A ☑ N/C ☐	10. Describe procedures for operating and maintaining the landfill stormwater management system to comply with the requirements of Rule 62-701.400(9), FAC; (62-701.500(10), FAC)
S ☐ _____	N/A ☑ N/C ☐	11. Equipment and operation feature requirements; (62-701.500(11), FAC)
S ☐ _____	N/A ☑ N/C ☐	a. Sufficient equipment for excavating, spreading, compacting, and covering waste;
S ☐ _____	N/A ☑ N/C ☐	b. Reserve equipment or arrangements to obtain additional equipment within 24 hours of breakdown;
S ☐ _____	N/A ☑ N/C ☐	c. Communications equipment;

S ☐ _____ N/A ☑ N/C ☐ d. Dust control methods;

S ☐ _____ N/A ☑ N/C ☐ e. Fire protection capabilities and procedures for notifying local fire department authorities in emergencies;

S ☐ _____ N/A ☑ N/C ☐ f. Litter control devices;

S ☐ _____ N/A ☑ N/C ☐ g. Signs indicating operating authority, traffic flow, hours of operation, and disposal restrictions;

S ☐ _____ N/A ☑ N/C ☐ 12. Provide a description of all-weather access road, inside perimeter road, and other on-site roads necessary for access at the landfill; (62-701.500(12), FAC)

S ☐ _____ N/A ☑ N/C ☐ 13. Additional record keeping and reporting requirements; (62-701.500(13), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. Records used for developing permit applications and supplemental information maintained for the design period of the landfill;

S ☐ _____ N/A ☑ N/C ☐ b. Monitoring information, calibration and maintenance records, and copies of reports required by permit maintained for at least 10 years;

S ☐ _____ N/A ☑ N/C ☐ 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;

S ☐ _____ N/A ☑ N/C ☐ d. Procedures for archiving and retrieving records which are more than five years old;

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

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. A water quality monitoring plan shall be submitted describing the proposed ground water and surface water monitoring systems, and shall meet at least the following requirements:

S ☐ _____ N/A ☑ N/C ☐ a. Based on the information obtained in the hydrogeological investigation and signed, dated, and sealed by the P.G. or P.E. who prepared it; (62-701.510(2)(a), FAC)

LOCATION		PART L CONTINUED
S ☐ _____ N/A ☑ N/C ☐		b. All sampling and analysis performed in accordance with Chapter 62-160, FAC; (62-701.510(2)(b), FAC)
S ☐ _____ N/A ☑ N/C ☐		c. Ground water monitoring requirements; (62-701.510(3), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Detection wells located downgradient from and within 50 feet of disposal units;
S ☐ _____ N/A ☑ N/C ☐	(2)	Downgradient compliance wells as required;
S ☐ _____ N/A ☑ N/C ☐	(3)	Background wells screened in all aquifers below the landfill that may be affected by the landfill;
S ☐ _____ N/A ☑ N/C ☐	(4)	Location information for each monitoring well;
S ☐ _____ N/A ☑ N/C ☐	(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;
S ☐ _____ N/A ☑ N/C ☐	(6)	Properly selected well screen locations;
S ☐ _____ N/A ☑ N/C ☐	(7)	Monitoring wells constructed to provide representative ground water samples;
S ☐ _____ N/A ☑ N/C ☐	(8)	Procedures for properly abandoning monitoring wells;
S ☐ _____ N/A ☑ N/C ☐	(9)	Detailed description of detection sensors, if proposed;
S ☐ _____ N/A ☑ N/C ☐		d. Surface water monitoring requirements; (62-701.510(4), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Location of and justification for all proposed surface water monitoring points;
S ☐ _____ N/A ☑ N/C ☐	(2)	Each monitoring location to be marked and its position determined by a registered Florida land surveyor;
S ☐ _____ N/A ☑ N/C ☐		e. Initial and routine sampling frequency and requirements; (62-701.510(5), FAC)
S ☐ _____ N/A ☑ N/C ☐	(1)	Initial background ground water and surface water sampling and analysis requirements;

LOCATION **PART L CONTINUED**

S ☐ _____ N/A ☑ N/C ☐ (2) Routine monitoring well sampling and analysis requirements;

S ☐ _____ N/A ☑ N/C ☐ (3) Routine surface water sampling and analysis requirements;

S ☐ _____ N/A ☑ N/C ☐ f. Describe procedures for implementing evaluation monitoring, prevention measures, and corrective action as required; (62-701.510(6), FAC)

S ☐ _____ N/A ☑ N/C ☐ g. Water quality monitoring report requirements; (62-701.510(8), FAC)

S ☐ _____ N/A ☑ N/C ☐ (1) Semi-annual report requirements; (see paragraphs 62-701.510(5)(c) and (d), FAC for sampling frequencies)

S ☐ _____ N/A ☑ N/C ☐ (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;

S ☐ _____ N/A ☑ N/C ☐ (3) Two and one-half year, or annual, report requirements, or every five years if in long-term care, signed dated, and sealed by P.G. or P.E.;

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

LOCATION

S ☐ _____ N/A ☑ N/C ☐ 1. Describe procedures for managing motor vehicles; (62-701.520(1), FAC)

S ☐ _____ N/A ☑ N/C ☐ 2. Describe procedures for landfilling shredded waste; (62-701.520(2), FAC)

S ☐ _____ N/A ☑ N/C ☐ 3. Describe procedures for asbestos waste disposal; (62-701.520(3), FAC)

S ☐ _____ N/A ☑ N/C ☐ 4. Describe procedures for disposal or management of contaminated soil; (62-701.520(4), FAC)

S ☐ _____ N/A ☑ N/C ☐ 5. Describe procedures for disposal of biological wastes; (62-701.520(5), FAC)

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

LOCATION

S ☐ _____ N/A ☐ N/C ☑	1. Provide documentation for a gas management system that will: (62-701.530(1), FAC)	
S ☐ _____ N/A ☐ N/C ☑	a. Be designed to prevent concentrations of combustible gases from exceeding 25% the LEL in structures and 100% the LEL at the property boundary;	
S ☑ See Section 13.1 N/A ☐ N/C ☐	b. Be designed for site specific conditions;	
S ☑ See Section 13.1 N/A ☐ N/C ☐	c. Be designed to reduce gas pressure in the interior of the landfill;	
S ☐ _____ N/A ☐ N/C ☑	d. Be designed to not interfere with the liner, leachate control system, or final cover;	
S ☐ _____ N/A ☐ N/C ☑	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)	
S ☐ _____ N/A ☐ N/C ☑	3. Provide documentation describing how the gas remediation plan and odor remediation plan will be implemented; (62-701.530(3), FAC)	
S ☐ _____ N/A ☐ N/C ☑	4. Landfill gas recovery facilities; (62-701.530(5), FAC)	
S ☐ _____ N/A ☐ N/C ☑	a. Provide information required in Rules 62-701.320(7) and 62-701.330(3), FAC;	
S ☐ _____ N/A ☐ N/C ☑	b. Provide information required in Rule 62-701.600(4), FAC, where relevant and practical;	
S ☐ _____ N/A ☐ N/C ☑	c. Provide estimates of current and expected gas generation rates and description of condensate disposal methods;	
S ☐ _____ N/A ☐ N/C ☑	d. Provide description of procedures for condensate sampling, analyzing, and data reporting;	
S ☐ _____ N/A ☐ N/C ☑	e. Provide closure plan describing methods to control gas after recovery facility ceases operation, and any other requirements contained in Rule 62-701.400(10), FAC;	

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

LOCATION

S ☐ _____ N/A ☑ N/C ☐	1. Closure permit requirements; (62-701.600(2), FAC)
S ☐ _____ N/A ☑ N/C ☐	a. Application submitted to the Department at least 90 days prior to final receipt of wastes;
S ☐ _____ N/A ☑ N/C ☐	b. Closure plan shall include the following:
S ☐ _____ N/A ☑ N/C ☐	(1) Closure design plan;
S ☐ _____ N/A ☑ N/C ☐	(2) Closure operation plan;
S ☐ _____ N/A ☑ N/C ☐	(3) Plan for long-term care;
S ☐ _____ N/A ☑ N/C ☐	(4) A demonstration that proof of financial assurance for long-term care will be provided;
S ☐ _____ N/A ☑ N/C ☐	2. Closure design plan including the following requirements: (62-701.600(3), FAC)
S ☐ _____ N/A ☑ N/C ☐	a. Plan sheet showing phases of site closing;
S ☐ _____ N/A ☑ N/C ☐	b. Drawings showing existing topography and proposed final grades;
S ☐ _____ N/A ☑ N/C ☐	c. Provisions to close units when they reach approved design dimensions;
S ☐ _____ N/A ☑ N/C ☐	d. Final elevations before settlement;
S ☐ _____ N/A ☑ N/C ☐	e. Side slope design including benches, terraces, down slope drainage ways, energy dissipaters, and description of expected precipitation effects;
S ☐ _____ N/A ☑ N/C ☐	f. Final cover installation plans including:
S ☐ _____ N/A ☑ N/C ☐	(1) CQA plan for installing and testing final cover;
S ☐ _____ N/A ☑ N/C ☐	(2) Schedule for installing final cover after final receipt of waste;
S ☐ _____ N/A ☑ N/C ☐	(3) Description of drought resistant species to be used in the vegetative cover;

S ☐ _____ N/A ☑ N/C ☐	(4) Top gradient design to maximize runoff and minimize erosion;
S ☐ _____ N/A ☑ N/C ☐	(5) Provisions for cover material to be used for final cover maintenance;
S ☐ _____ N/A ☑ N/C ☐	g. Final cover design requirements;
S ☐ _____ N/A ☑ N/C ☐	(1) Protective soil layer design;
S ☐ _____ N/A ☑ N/C ☐	(2) Barrier soil layer design;
S ☐ _____ N/A ☑ N/C ☐	(3) Erosion control vegetation;
S ☐ _____ N/A ☑ N/C ☐	(4) Geomembrane barrier layer design;
S ☐ _____ N/A ☑ N/C ☐	(5) Geosynthetic clay liner design, if used;
S ☐ _____ N/A ☑ N/C ☐	(6) Stability analysis of the cover system and the disposed waste;
S ☐ _____ N/A ☑ N/C ☐	h. Proposed method of stormwater control;
S ☐ _____ N/A ☑ N/C ☐	i. Proposed method of access control;
S ☐ _____ N/A ☑ N/C ☐	j. Description of the proposed or existing gas management system which complies with Rule 62-701.530, FAC;
S ☐ _____ N/A ☑ N/C ☐	3. Closure operation plan shall include: (62-701.600(4), FAC)
S ☐ _____ N/A ☑ N/C ☐	a. Detailed description of actions which will be taken to close the landfill;
S ☐ _____ N/A ☑ N/C ☐	b. Time schedule for completion of closing and long-term care;
S ☐ _____ N/A ☑ N/C ☐	c. Describe proposed method for demonstrating financial assurance for long-term care;
S ☐ _____ N/A ☑ N/C ☐	d. Operation of the water quality monitoring plan required in Rule 62-701.510, FAC;
S ☐ _____ N/A ☑ N/C ☐	e. Development and implementation of gas management system required in Rule 62-701.530, FAC;

S ☐ _____ N/A ☑ N/C ☐ 4. Certification of closure construction completion and final reports including: (62-701.600(6), FAC)

S ☐ _____ N/A ☑ N/C ☐ a. Survey monuments; (62-701.600(6)(a), FAC)

S ☐ _____ N/A ☑ N/C ☐ b. Final survey report; (62-701.600(6)(b), FAC)

S ☐ _____ N/A ☑ N/C ☐ c. Closure construction quality assurance report; (62-701.400(7), FAC)

S ☐ _____ N/A ☑ N/C ☐ 5. Declaration to the public; (62-701.600(7), FAC)

S ☐ _____ N/A ☑ N/C ☐ 6. Official date of closing; (62-701.600(8), FAC)

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ _____ 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)

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ See Section 16.1 N/A ☑ N/C ☐ 1. Maintaining the gas collection and monitoring system; (62-701.620(5), FAC)

S ☐ _____ N/A ☑ N/C ☐ 2. Stabilization report requirements; (62-701.620(6), FAC)

S ☐ _____ N/A ☑ N/C ☐ 3. Right of access; (62-701.620(7), FAC)

S ☐ _____ N/A ☑ N/C ☐ 4. Requirements for replacement of monitoring devices; (62-701.620(8), FAC)

S ☐ _____ N/A ☑ N/C ☐ 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)

LOCATION

S ☐ _____ N/A ☑ N/C ☐	1. Provide cost estimates for closing, long-term care, and corrective action costs estimated by a P.E. for a third party performing the work, on a per unit basis, with the source of estimates indicated; (62-701.630(3) & (7), FAC)
S ☐ _____ N/A ☑ N/C ☐	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)
S ☐ _____ N/A ☑ N/C ☐	3. Describe funding mechanisms for providing proof of financial assurance and include appropriate financial assurance forms. (62-701.630(5), (6), & (9), 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 minor modification - GCCS Dewatering 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, Southeast Region Engineer
Name and Title (please type)

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

1501 Omni Way
Mailing Address

St. Cloud, FL 34773
City, State, Zip Code

(904) 673-0446
Telephone Number

Date: 5/12/16

Attach letter of authorization if agent is not a government 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.

Signature

Brandon K. Boiencot, Project Engineer
Name and Title (please type)

77044
Florida Registration Number (please affix seal)

BRANDON K. BOIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

9428 Baymeadows Road, Suite 400
Mailing Address

Jacksonville, FL 32256
City, State, Zip Code

bpoiencot@golder.com
E-Mail Address (if available)

(904) 363-3430
Telephone Number

Date: 5/16/16

Table of Contents

List of Attachments

1.0 A. GENERAL INFORMATION

This minor permit modification application (permit modification) was prepared by Golder Associates Inc. (Golder) on behalf of Omni Waste of Osceola County, LLC (Omni) for a dewatering maintenance system associated with the landfill gas collection and control system (GCCS) at the J.E.D. Solid Waste Management Facility (JED Facility) located in Osceola County, Florida. Omni, a Progressive Waste Solutions Company (Progressive), owns and operates the JED 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 JED Facility is a Class I Landfill that currently occupies approximately 135.9 acres of constructed disposal area. The complete build-out of the JED 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 been issued air permits including a Title V Air Permit (No. 0970079-012-AV) and a Construction Permit (No. 0970079-013AC/PSD-429A for the 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 the JED Facility Solid Waste Facility Operation Permit No. SO49-0199726-022 encompasses the following design and operational changes to the facility:

1. Design of a dewatering system for the existing Phases 1-3 disposal areas and future Phases 4 and 5 as they are developed.

2.0 B. DISPOSAL FACILITY GENERAL INFORMATION

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

1. Design and installation of a dewatering system for existing Phases 1-3 and future Phases 4 and 5.

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

1. Installation of above and below grade pressurized air supply and leachate force main piping to all existing and proposed vertical extraction wells
2. Connection to the existing air compressor located at the landfill gas management area via the air supply line along the exterior conveyance header
3. Installation of pneumatic pumps (as needed) for dewatering of vertical extraction wells
4. Installation of a dewatering transmission line from the dewatering collection system within the landfill foot print to the existing leachate storage ponds
5. Identified area for a temporary pump lift station and/or sediment management tanks if necessary in management of dewatered fluids

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

3.0 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.

4.0 D. SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL

4.1 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.

4.2 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), F.A.C.

4.3 D.3 Transmittal Letter

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

4.4 D.4 Application Form

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

4.5 D.5 Permit Fee

A check in the amount of $250 payable to FDEP is being submitted with this application. This is the amount required for a “Minor” Operations/Construction Permit Modification Application.

4.6 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), F.A.C.

4.7 D.7 Operations Plan

Operation of the 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.

4.8 D.8 Contingency Plan

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

4.9 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.

4.10 D.10 Proof of Ownership

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

4.11 D.11 Recycling Goals

This item is not applicable.

4.12 D.12 Enforcement History

No enforcement actions have been taken by the FDEP against the JED Facility or Omni within the past five years.

4.13 D.13 Proof of Publication

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

4.14 D.14 Airport Safety

This item is not applicable.

4.15 D.15 Operator Training

This item is not applicable.

5.0 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.

6.0 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.

7.0 G. LANDFILL CONSTRUCTION REQUIREMENTS

7.1.1 G.3 Leachate Collection Removal System

There are no changes proposed to the existing leachate collection and removal system. Omni is voluntarily upgrading leachate removal with the proposed dewatering system for the GCCS. The system will consist of 2" and 4" SDR 9 and 11 HDPE piping. Air supply piping and leachate force main will be run to the existing gas extraction wells in new trenches. For the future Phase 4 and 5 GCCS, dewatering system piping will be constructed together with the gas lateral and header piping as expansion occurs. Pipe specifications, capacity analysis, and pipe crush calculations are included in Appendix G. Note that the Phase 4 layout is conceptual in nature and shown only for illustrational purposes. Phase 5 will be developed and implemented in general accordance with the facility's GCCS Design Plan. Exact locations and details will be refined as the cells in Phase 5 are developed and constructed.

8.0 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.

9.0 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.

10.0 K. LANDFILL OPERATION REQUIREMENTS

10.1 K.1 Trained Operators

This item is not applicable.

10.2 K.2 Landfill Operation Plan

This item is not applicable.

10.3 K.3 Operating Record

This item is not applicable.

10.4 K.4 Waste Records

This item is not applicable.

10.5 K.5 Access Controls

This item is not applicable.

10.6 K.6 Load Checking Program

This item is not applicable.

10.7 K.7 Spreading and Compacting

This item is not applicable.

10.8 K.8 Leachate Management

This item is not applicable.

10.9 K.9 Gas Management System

This permit modification application includes the design and installation of a dewatering system for the existing and future GCCS. The dewatering system is being implemented to enhance gas extraction capability and optimize landfill gas flows to the landfill gas to energy facility. The dewatering system should not be required to be installed by regulation.

10.9.1 K.9.1 Dewatering System

The addition of the dewatering system will not change the routine operation of the GCCS. The proposed dewatering system consists of pressurized air supply piping, leachate forcemain piping, pneumatic pumps, air compressor(s), and all necessary valves and appurtenances. Gas extraction wells will be dewatered as needed via the pneumatic pumps, which will discharge liquids from the extraction wells into the dewatering forcemain piping network. The collected liquids will travel from the forcemain within the landfill footprint to the existing leachate collection ponds via a new transmission pipe line. The exact

location of the force main may be modified based upon constructability requirements and interaction with existing and proposed infrastructure. Additionally, a location has been identified southeast off the Cell 15 limits for a pump lift station and/or sediment removal tanks if necessary to manage sediments in the dewatered fluids if necessary. The layout and all construction details are presented on the drawings in Appendix D-1. . Note that the Phase 4 layout is conceptual in nature and shown only for illustrational purposes. Phase 5 will be developed and implemented in general accordance with the facility's GCCS Design Plan. Exact locations and details will be refined as the cells in Phase 5 are developed and constructed. Operation and maintenance of the dewatering system is presented in Attachment K-1, which will become Appendix H of the facility's existing operation plan.

10.10 K.10 Stormwater Management

This item is not applicable.

10.11 K.11 Equipment and Operations

This item is not applicable.

10.12 K.12 All-Weather Access Road

This item is not applicable.

10.13 K.13 Additional Recordkeeping

This item is not applicable.

11.0 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.

12.0 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.

13.0 N. GAS MANAGEMENT SYSTEM REQUIREMENTS

13.1 N.1 Landfill Gas Management System

The design and installation of a permanent LFG extraction well dewatering system is to enhance gas collection and optimize flows going to the Landfill Gas to Energy Facility. These revisions are not required by the Federal New Source Performance Standards (NSPS) or other known regulation. The dewatering system will consist of the following components:

- HDPE piping (various sizes as shown on the design drawings)
- Pneumatic pumps (installed as needed in vertical gas extraction wells)
- Air compressor and associated conditioning system (existing near the landfill gas to energy project location)
- Various valves, access and cleanout risers, and other appurtenances

Air supply piping and liquid forcemain will be run to selected vertical gas extraction wells. The pressurized airline will have isolation valves located approximately every 2,000 feet to assist in maintenance and repairs. At each isolation valve, blow off valves will be included. The existing air compressor system located at the landfill gas management area will be utilized and augmented as needed by air demand (given the nature of dewatering operations within the disposal footprint, exact demand is difficult to estimate).. Oil coalescing filters are recommended to reduce the amount of oil vapor in the pressurized air system to minimize the effect of chemical solvation on the pipe system. Refer to the Pressurized Air Pipe Design Calculation located in Attachment N-1 for additional information. Air release valves will be included in the forcemain approximately every 2,000 feet to manage any trapped air in the system. Additionally, isolation valves with cleanouts will be located approximately every 1,000 feet for maintenance purposes. The forcemain will include a conveyance pipeline (outside of the disposal footprint) to deliver the liquids to the existing leachate storage ponds. For conservatism, a back-up forcemain and air supply line may be installed with the proposed forcemain. The backup pipes will be utilized only if the original piping systems become damaged and/or unserviceable. The route of the pipeline will be along the eastern landfill perimeter berm near the existing leachate forcemain.

Based upon historical knowledge of similar systems once installed, peak flow rates based upon pump capacity are seldom, if ever seen. Additionally, the system of pumps will be installed in phases and only in affected wells. The system is designed to handle 75 gpm using the following assumptions:

- 100 pumps may be operating at any given time
- Each pump may be flowing ¾ gallon per minute

Pneumatic pumps will be installed in the vertical wells on an as-needed basis, as determined by well depth, monitored liquid levels, and landfill gas flow rates. Pumps may be relocated from well to well as dewatering activities progress. During construction and operation, Omni will choose which wells are

connected and actively pumping. Typical dewatering will be implemented in a controlled manner as follows:

- Pumps will be typically set at approximately 50% of the determined water column depth to limit siltation of the well. Pump depth may be adjusted based upon operational conditions and demands of the GCCS.
- Pumps may be operated in phases to minimize the amount of liquid being removed at any given time.

13.1.1 N.1.1 Gas Migration Control

The proposed dewatering system should improve the overall effectiveness of the GCCS to extract landfill gas from the waste mass.

13.1.2 N.1.2 Site Specific Design Conditions

See Design Drawings contained in Appendix D-1.

13.1.3 N.1.3 Reducing Gas Pressure

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

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

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

13.2 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 in accordance with facility permits and applicable regulations.

13.3 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.

13.4 N.4 Landfill Gas Recovery Facilities

No proposed modifications are being proposed to the Landfill Gas Recovery Facilities.

13.4.1 N.4.1 Application Information

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

13.4.2 N.4.2 Closure Information

Waste disposal activities are on-going at the site. Operation of the dewatering system beyond the closure has not yet been determined, but would likely continue based on dewatering needs of the gas extraction wells.

13.4.3 N.4.3 Gas Generation and Condensate Management

No changes to the gas generating potential are being proposed.

13.4.4 N.4.4 Condensate Sampling, Analyzing, and Data Reporting

No changes are proposed for this modification.

13.4.5 N.4.5 Closure Plan

No changes are proposed for this modification.

13.4.6 N.4.6 Closure Costs

Since the proposed dewatering system is being implemented at the owner's request and option, these changes to the GCCS do not affect the closure costs, as it is not required by applicable regulations.

14.0 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.

15.0 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.

16.0 Q. LONG-TERM CARE

16.1 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), F.A.C. and as previously permitted. The operation of the dewatering system is optional and can be discontinued, thus there should be no associated long term care requirements.

16.2 Q.2 Stabilization Report

This item is not applicable.

16.3 Q.3 Right of Access

This item is not applicable.

16.4 Q.4 Replacement of Monitoring Devices

This item is not applicable.

16.5 Q.5 Completion of Long-Term Care

This item is not applicable.

17.0 R. FINANCIAL ASSURANCE

17.1 R.1 Cost Estimates

This item is not applicable.

17.2 R.2 Annual Cost Estimates

This item is not applicable.

17.3 R.3 Funding Mechanisms

This item is not applicable.

17.4 R.4 Proof for Delaying Submitting Proof of Financial Assurance

This item is not applicable.

18.0 S. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

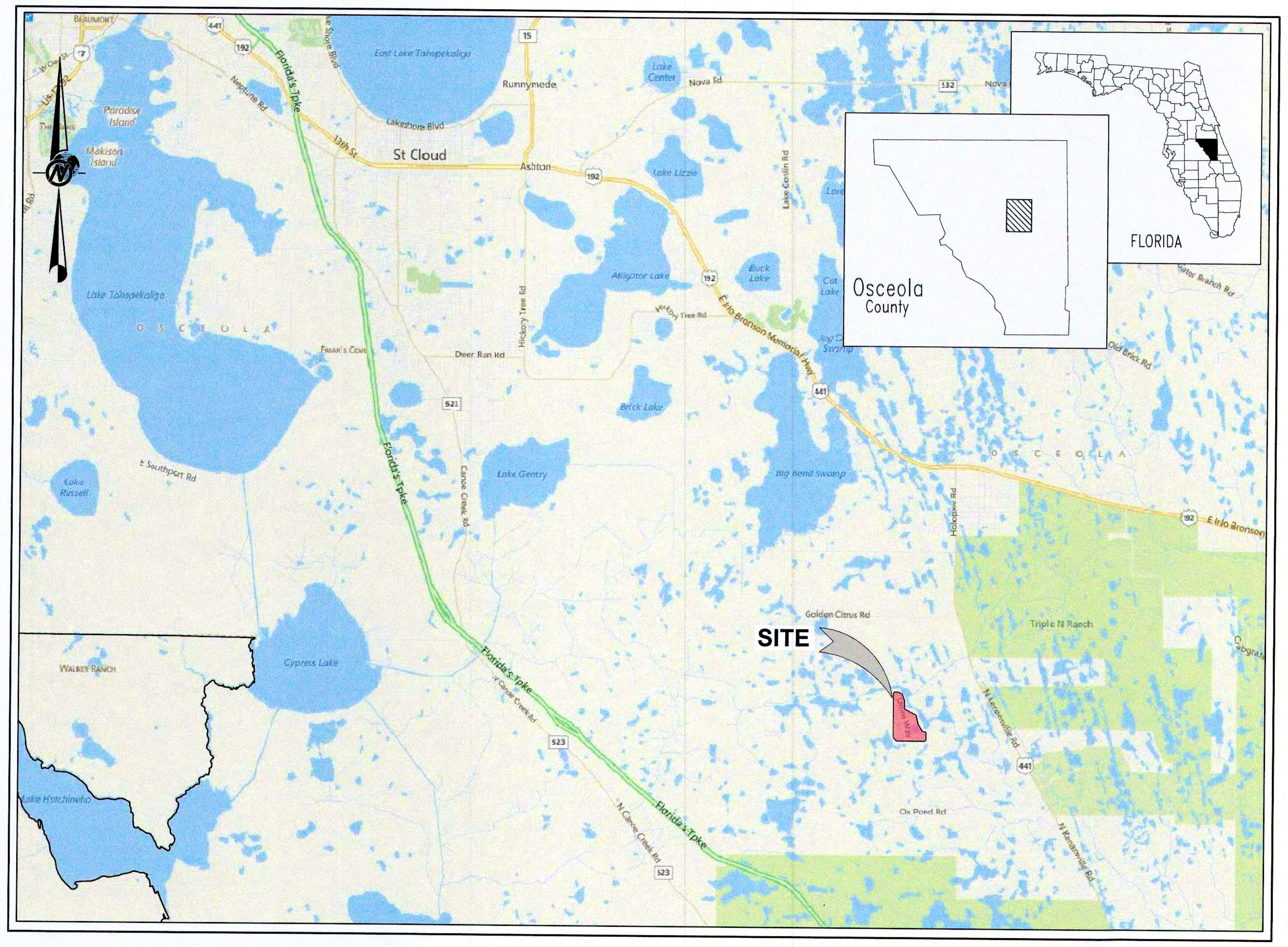
Part S of the FDEP Application for a Permit to Construct, Operate, Modify or Close a Solid Waste Management Facility Application Form 62-701.900(1) has been certified by the Applicant and by a Registered Professional Engineer in the State of Florida.

ATTACHMENT D-1

DRAWINGS

J.E.D. SOLID WASTE MANAGEMENT FACILITY
LANDFILL GAS COLLECTION AND CONTROL SYSTEM (GCCS)
DEWATERING DESIGN AND PERMITTING

ST. CLOUD, OSCEOLA COUNTY, FLORIDA



SITE LOCATION MAP

LIST OF DRAWINGS

SHEET	TITLE	REVISION
1	TITLE SHEET	
2	EXISTING CONDITIONS	
3	PHASE 1-4 GCCS PLAN	
4	PROPOSED DEWATERING SYSTEM PLAN (1 OF 3)	
5	PROPOSED DEWATERING SYSTEM PLAN (2 OF 3)	
6	PROPOSED DEWATERING SYSTEM PLAN (3 OF 3)	
7	DEWATERING DETAILS (1 OF 3)	
8	DEWATERING DETAILS (2 OF 3)	
9	DEWATERING DETAILS (3 OF 3)	

Prepared for:

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

Prepared by:

Golder Associates
Jacksonville, Florida

May 2016

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

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/16

Brandon K. Poiencot, P.E.
Florida Registration No. 77044

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

TITLE SHEET/LIST OF DRAWINGS

SHEET 1

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 20, 2015.

LEGEND

Symbol	Description	Symbol	Description
GW-1	EXIST. LFG EXTRACTION WELL		EXIST. LEACHATE CLEANOUT RISER
	EXIST. HEADER/LATERAL		EXIST. J-TRAP
	TEMPORARY LATERAL	6"	EXIST. HEADER/LATERAL PIPE SIZE
	EXIST. HEADER ACCESS RISER	XXXXXXXX	CAPPED AND ABANDONED PIPE/FEATURE
	EXIST. HEADER VALVE	HGC-1	HORIZONTAL GAS COLLECTOR
	EXIST. HEADER/LATERAL PIPE REDUCER		HORIZONTAL GAS COLLECTOR WELLHEAD
	EXIST. BLIND FLANGE		CELL LIMIT
	EXIST. ROAD CROSSING	SEW1	EXIST. 4" PVC GAS WELL

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/16

Brandon K. Poiencot, P.E.
Florida Registration No. 77044

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

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

TITLE
EXISTING CONDITIONS

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

PROJECT No.		083-82734.47	FILE No.	08382734-T002
DESIGN	BKP/HH	03/17/16	SCALE	AS SHOWN
CADD	BCL	03/17/16		
CHECK	BKP/DEG	05/12/16		
REVIEW	KSB	05/12/16		

SHEET 2

NOTES

1. NORTHING AND EASTING COORDINATES SHOWN REPRESENT FLORIDA STATE PLANE EAST ZONE NORTH AMERICAN DATUM OF 1983 (NAD83).
2. THE ELEVATIONS SHOWN REPRESENT NATIONAL GEODETIC VERTICAL DATUM OF1929 (NGVD29)(FEET).
3. GRADES INDICATED ON THIS SHEET WITHIN THE WASTE DISPOSAL BOUNDARY ARE TOP OF FINAL COVER SYSTEM GRADES.
4. THE LOCATIONS OF GCCS COMPONENTS FOR PHASES 1-3 ARE GENERALLY TAKEN FROM AS-BUILT CONDITIONS. FUTURE GCCS COMPONENT LOCATION IS TAKEN FROM THE PHASE 3 GCCS CONSTRUCTION DRAWINGS, AND THE FACILITY'S PERMIT DRAWINGS. EXACT LOCATIONS AND DETAILS WILL BE REFINED AS THE CELLS ARE DEVELOPED AND CONSTRUCTED.
5. THE PHASE 4 LAYOUT IS CONCEPTUAL IN NATURE ANS SHOWN ONLY FOR THE ILLUSTRATIONAL PURPOSES. PHASE 5 WILL BE DEVELOPED AND IMPLEMENTED IN GENERAL ACCORDANCE WITH THE FACILITY'S GCCS DESIGN PLAN. EXACT LOCATIONS AND DETAILS WILL BE REFINED AS THE CELLS IN PHASE 5 ARE DEVELOPED AND CONSTRUCTED.

LEGEND

- GW-1 EXIST. LFG EXTRACTION WELL
- EXIST. HEADER/LATERAL
- TEMPORARY LATERAL
- EXIST. HEADER ACCESS RISER
- EXIST. HEADER VALVE
- EXIST. HEADER/LATERAL PIPE REDUCER
- EXIST. BLIND FLANGE
- EXIST. ROAD CROSSING
- EXIST. LEACHATE CLEANOUT RISER
- EXIST. J-TRAP
- 6" EXIST. HEADER/LATERAL PIPE SIZE
- CAPPED AND ABANDONED PIPE/FEATURE
- HGC-1 HORIZONTAL GAS COLLECTOR
- HORIZONTAL GAS COLLECTOR WELLHEAD
- CELL LIMIT
- SEW1 EXIST. 4" PVC GAS WELL
- PROPOSED PHASE 3 EXTRACTION WELL
- PROPOSED PHASE 3 HGC
- PROPOSED PHASE 3 LATERAL
- PROPOSED PHASE 4 EXTRACTION WELL
- PROPOSED PHASE 4 HGC
- PROPOSED PHASE 4 LATERAL
- PROPOSED PHASE 4 HDPE HEADER PIPE

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/16

Brandon K. Poiencot, P.E.
Florida Registration No. 77044

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

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

TITLE
PHASE 1-4 GCCS PLAN

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

PROJECT No.		083-82734.47
DESIGN	BKP	03/17/16
CADD	BCL	03/17/16
CHECK	BKP/DEG	05/12/16
REVIEW	KSB	05/12/16

FILE No.	08382734-T003
SCALE	AS SHOWN

SHEET 3

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 20, 2015.
4) AIR/FORCEMAIN PIPING TO BE INSTALLED TO EXISTING WELLS ON AS-NEEDED BASIS.
5) THE PHASE 4 LAYOUT IS CONCEPTUAL IN NATURE ANS SHOWN ONLY FOR THE ILLUSTRATIONAL PURPOSES. PHASE 5 WILL BE DEVELOPED AND IMPLEMENTED IN GENERAL ACCORDANCE WITH THE FACILITY'S GCCS DESIGN PLAN. EXACT LOCATIONS AND DETAILS WILL BE REFINED AS THE CELLS IN PHASE 5 ARE DEVELOPED AND CONSTRUCTED.

LEGEND

- GW-1 — EXIST. LFG EXTRACTION WELL
- EXIST. HEADER/LATERAL
- TEMPORARY LATERAL
- EXIST. HEADER ACCESS RISER
- EXIST. HEADER VALVE
- EXIST. HEADER/LATERAL PIPE REDUCER
- EXIST. BLIND FLANGE
- EXIST. ROAD CROSSING
- EXIST. LEACHATE CLEANOUT RISER
- EXIST. J-TRAP
- 6" — EXIST. HEADER/LATERAL PIPE SIZE
- XXXXXXXX — CAPPED AND ABANDONED PIPE/FEATURE
- HGC-1 — HORIZONTAL GAS COLLECTOR
- HORIZONTAL GAS COLLECTOR WELLHEAD
- CELL LIMIT
- SEW1 — EXIST. 4" PVC GAS WELL
- PROPOSED CONTROL VALVE
- PROPOSED FORCEMAIN CLEANOUT
- PROPOSED FORCEMAIN CLEANOUT, CONTROL VALVE, AIR ISOLATION VALVE, AND AIR RELEASE VALVE
- PROPOSED PHASE 3 EXTRACTION WELL
- PROPOSED PHASE 3 HGC
- PROPOSED PHASE 3 LATERAL
- PROPOSED PHASE 4 EXTRACTION WELL
- PROPOSED PHASE 4 HGC
- PROPOSED PHASE 4 LATERAL
- PROPOSED 2" AIR LINE & 2" FORCEMAIN
- PROPOSED 2" AIR LINE & 2" FORCEMAIN (PHASE 3)
- PROPOSED 2" AIR LINE & 2" FORCEMAIN(PHASE 4)
- PROPOSED 2" AIR & 4" FORCEMAIN LINE
- PROPOSED 4" DEWATERING LEACHATE TRANSMISSION LINE

SCALE: 120 0 120 240 FEET

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER
5/16/16
Brandon K. Poiencot, P.E.
Florida Registration No. 77044

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

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

TITLE
PROPOSED DEWATERING SYSTEM PLAN (1 OF 3)

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

PROJECT No.		083-82734.47
DESIGN	BKP/HH	03/17/16
CADD	BCL	03/17/16
CHECK	BKP/DEG	05/12/16
REVIEW	KSB	05/12/16

FILE No. 08382734-T006
SCALE AS SHOWN

SHEET 4

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).
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4) AIR/FORCEMAIN PIPING TO BE INSTALLED TO EXISTING WELLS ON AS-NEEDED BASIS.
5) THE PHASE 4 LAYOUT IS CONCEPTUAL IN NATURE ANS SHOWN ONLY FOR THE ILLUSTRATIONAL PURPOSES. PHASE 5 WILL BE DEVELOPED AND IMPLEMENTED IN GENERAL ACCORDANCE WITH THE FACILITY'S GCCS DESIGN PLAN. EXACT LOCATIONS AND DETAILS WILL BE REFINED AS THE CELLS IN PHASE 5 ARE DEVELOPED AND CONSTRUCTED.

120 0 120 240
SCALE FEET

FOR CONTINUATION SEE SHEET 6

LEGEND

- GW-1 EXIST. LFG EXTRACTION WELL
- EXIST. HEADER/LATERAL
- TEMPORARY LATERAL
- EXIST. HEADER ACCESS RISER
- EXIST. HEADER VALVE
- EXIST. HEADER/LATERAL PIPE REDUCER
- EXIST. BLIND FLANGE
- EXIST. ROAD CROSSING
- EXIST. LEACHATE CLEANOUT RISER
- EXIST. J-TRAP
- 6" EXIST. HEADER/LATERAL PIPE SIZE
- XXXXXXXX CAPPED AND ABANDONED PIPE/FEATURE
- HGC-1 HORIZONTAL GAS COLLECTOR
- HORIZONTAL GAS COLLECTOR WELLHEAD
- CELL LIMIT
- SEW1 EXIST. 4" PVC GAS WELL
- PROPOSED CONTROL VALVE
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- PROPOSED FORCEMAIN CLEANOUT, CONTROL VALVE, AIR ISOLATION VALVE, AND AIR RELEASE VALVE
- PROPOSED PHASE 3 EXTRACTION WELL
- PROPOSED PHASE 3 HGC
- PROPOSED PHASE 3 LATERAL
- PROPOSED PHASE 4 EXTRACTION WELL
- PROPOSED PHASE 4 HGC
- PROPOSED PHASE 4 LATERAL
- PROPOSED 2" AIR LINE & 2" FORCEMAIN
- PROPOSED 2" AIR LINE & 2" FORCEMAIN (PHASE 3)
- PROPOSED 2" AIR LINE & 2" FORCEMAIN(PHASE 4)
- PROPOSED 2" AIR & 4" FORCEMAIN LINE
- PROPOSED 4" DEWATERING LEACHATE TRANSMISSION LINE

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER
5/16/16
Brandon K. Poiencot, P.E.
Florida Registration No. 77044

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

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

TITLE
PROPOSED DEWATERING SYSTEM PLAN (2 OF 3)

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

PROJECT No.		083-82734.47
DESIGN	BKP/HH	03/17/16
CADD	BCL	03/17/16
CHECK	BKP/DEG	05/12/16
REVIEW	KSB	05/12/16

FILE No. 08382734-T006
SCALE AS SHOWN

SHEET 5

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 20, 2015.
4) FORCEMAIN CONVEYANCE PIPE ALONG LANDFILL PERIMETER BERM BETWEEN POINTS A & B LOCATION MAY BE ADJUSTED FOR CONSTRUCTABILITY AND CONFLICTS WITH EXISTING AND FUTURE INFRASTRUCTURE.
5) TEMPORARY PUMP STATION/STORAGE TANK APPROXIMATE LOCATION TO BE INSTALLED ONLY IF NEEDED TO ASSIST WITH TRANSFER OF LIQUIDS AND/OR SEDIMENT MANAGEMENT.
6) 4" FORCEMAIN BETWEEN POINTS B & C TO BE TEMPORARILY LOCATED AS NEEDED UNTIL CELL 11 & CELL 13 GAS HEADER IS INSTALLED.
7) THE PHASE 4 LAYOUT IS CONCEPTUAL IN NATURE ANS SHOWN ONLY FOR THE ILLUSTRATIONAL PURPOSES. PHASE 5 WILL BE DEVELOPED AND IMPLEMENTED IN GENERAL ACCORDANCE WITH THE FACILITY'S GCCS DESIGN PLAN. EXACT LOCATIONS AND DETAILS WILL BE REFINED AS THE CELLS IN PHASE 5 ARE DEVELOPED AND CONSTRUCTED.

LEGEND

- GW-1 EXIST. LFG EXTRACTION WELL
- EXIST. HEADER/LATERAL
- TEMPORARY LATERAL
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- EXIST. HEADER VALVE
- EXIST. HEADER/LATERAL PIPE REDUCER
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- EXIST. LEACHATE CLEANOUT RISER
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- CELL LIMIT
- SEW1 EXIST. 4" PVC GAS WELL
- PROPOSED CONTROL VALVE
- PROPOSED FORCEMAIN CLEANOUT
- PROPOSED FORCEMAIN CLEANOUT, CONTROL VALVE, AIR ISOLATION VALVE, AND AIR RELEASE VALVE
- PROPOSED PHASE 3 EXTRACTION WELL
- PROPOSED PHASE 3 HGC
- PROPOSED PHASE 3 LATERAL
- PROPOSED PHASE 4 EXTRACTION WELL
- PROPOSED PHASE 4 HGC
- PROPOSED PHASE 4 LATERAL
- PROPOSED 2" AIR LINE & 2" FORCEMAIN
- PROPOSED 2" AIR LINE & 2" FORCEMAIN (PHASE 3)
- PROPOSED 2" AIR LINE & 2" FORCEMAIN(PHASE 4)
- PROPOSED 2" AIR & 4" FORCEMAIN LINE
- PROPOSED 4" DEWATERING LEACHATE TRANSMISSION LINE

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/16

Brandon K. Poiencot, P.E.
Florida Registration No. 77044

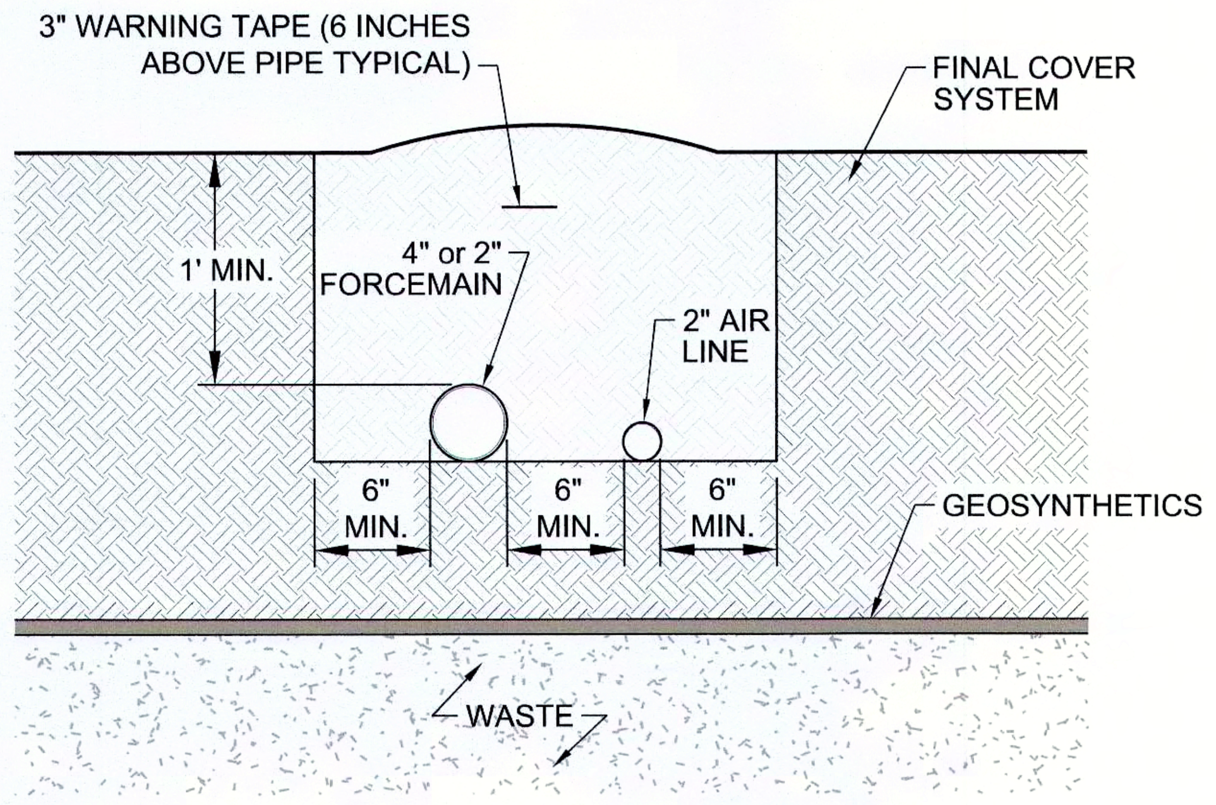
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

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

TITLE
PROPOSED DEWATERING SYSTEM PLAN (3 OF 3)

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

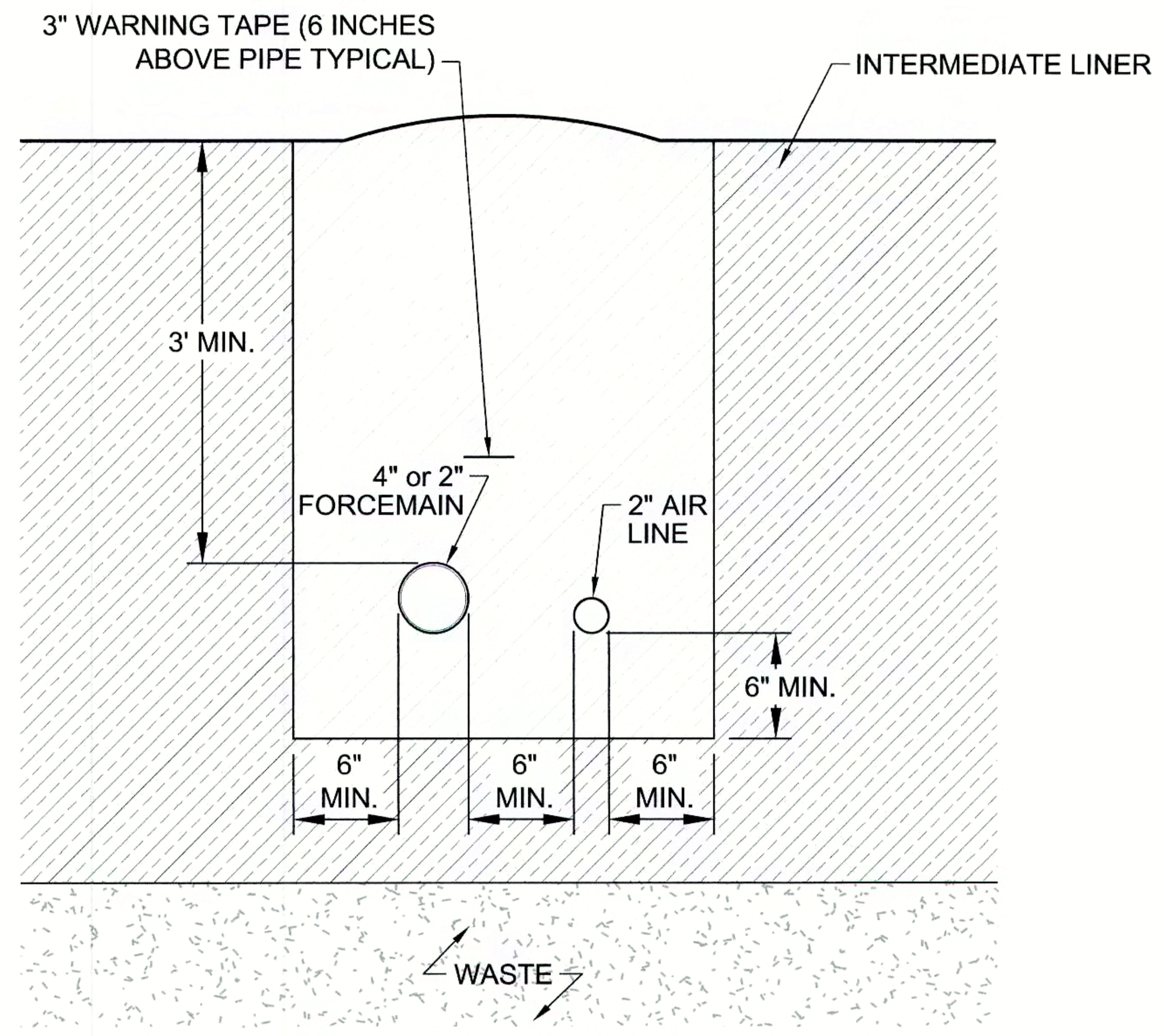
PROJECT No.		083-82734.47	FILE No. 08382734-T006
DESIGN	BKP/HH	03/17/16	SCALE AS SHOWN
CADD	BCL	03/17/16	
CHECK	BKP/DEG	05/12/16	SHEET 6
REVIEW	KSB	05/12/16	



AIR & FORCEMAIN PIPE TRENCH IN CLOSURE AREA (1/7)

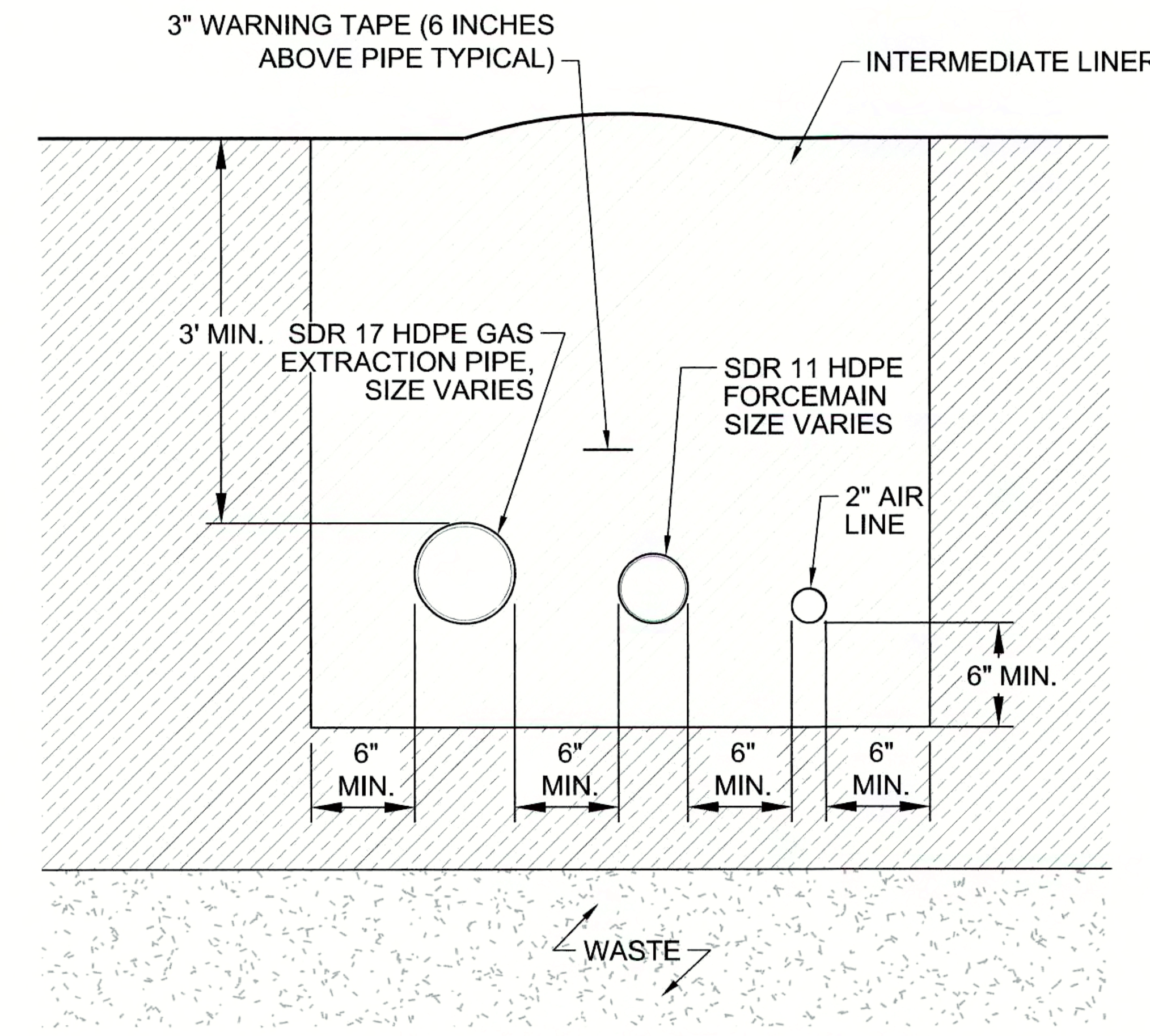
NTS

NOTES:
1. CONNECTIONS TO EXISTING GAS EXTRACTION WELLS WILL BE COMPLETED AS DIRECTED BY OWNER.



AIR & FORCEMAIN TRENCH IN NON-CLOSED AREAS (2/7)

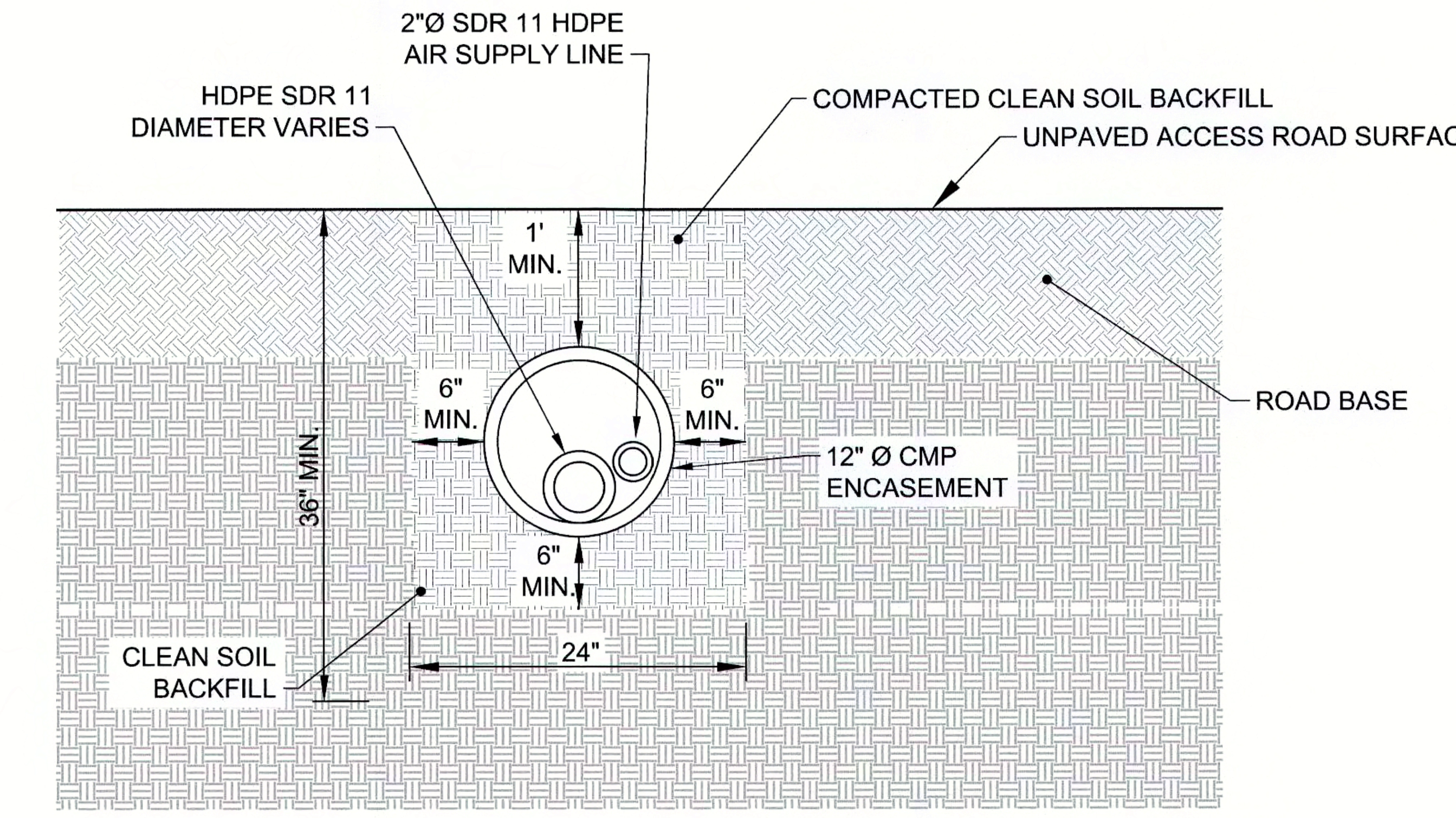
NTS



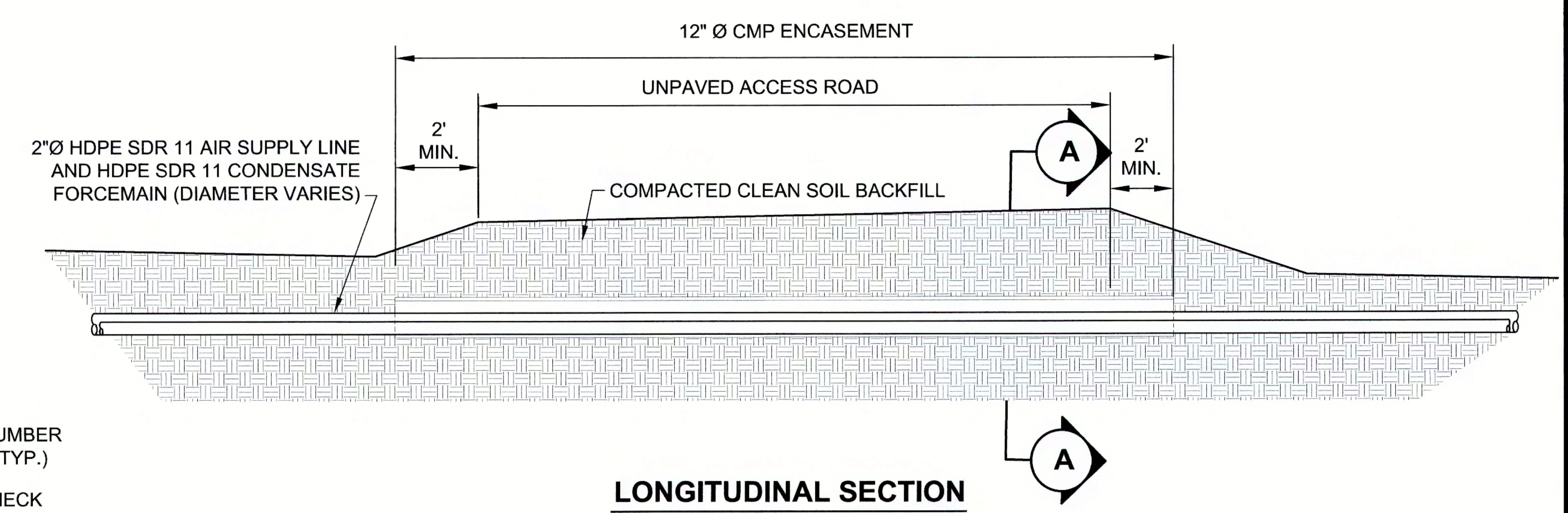
COMMON PIPE TRENCH IN EXPANSION AREAS (3/7)

NTS

NOTES:
1. DURING ALL FUTURE HEADER AND LATERAL EXPANSIONS FOR PHASES 3 & 4, AIR & FORCEMAIN LINES WILL BE INSTALLED IN A COMMON TRENCH WITH GAS EXTRACTION PIPES.
2. RELATIVE LOCATION OF AIR/FORCEMAIN PIPING TO HEADER/LATERAL PIPES WILL BE DETERMINED AT TIME OF CONSTRUCTION.



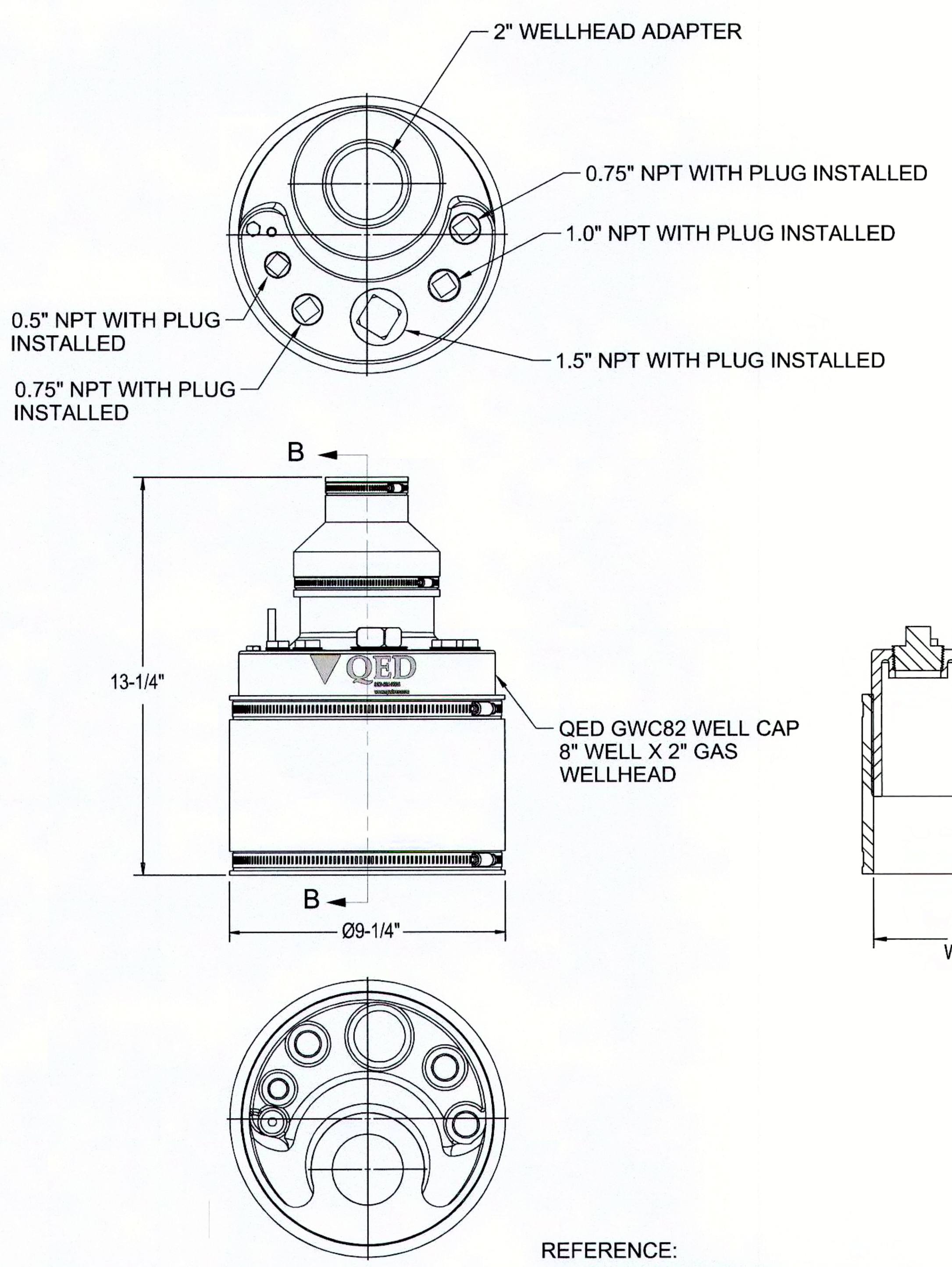
SECTION A - A



LONGITUDINAL SECTION

ROAD CROSSING (6/7)

NTS



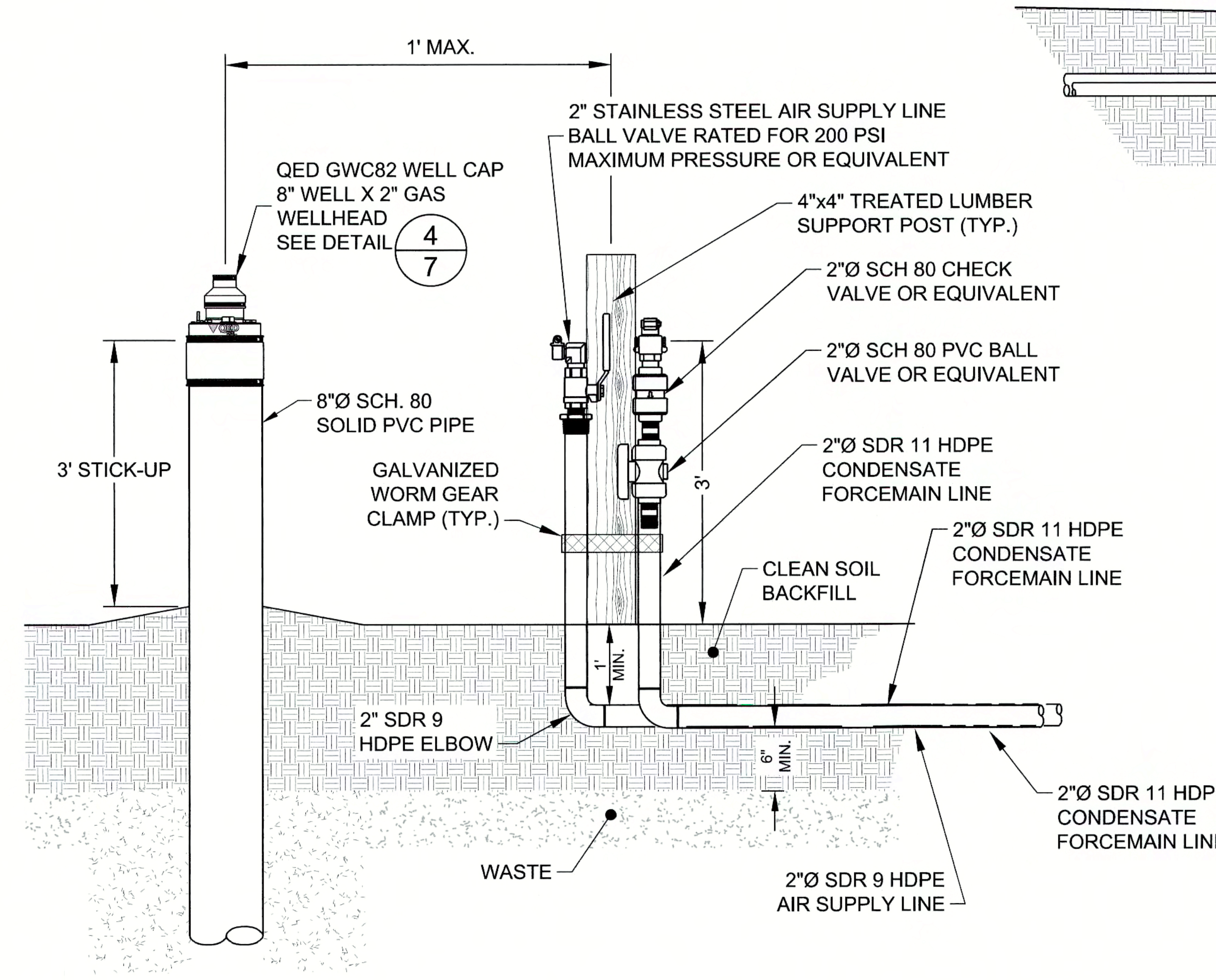
SECTION B-B

REFERENCE:
1. QED ENVIRONMENTAL SYSTEMS DRAWINGS No. 602421 GWC82 LF GAS WELL CAP 8"x2".

DEWATERING WELL CAP ASSEMBLY (4/7)

NTS

NOTES:
1. QED 8" HIGH VISIBILITY STABILIZER WELL CAP.
2. OTHER PUMPING WELL CAPS MAY BE UTILIZED AT OWNER'S DISCRETION. QED SHOWN FOR ILLUSTRATION ONLY.



AIR & FORCEMAIN TERMINATION DETAIL AT EXISTING WELLS (5/7)

NTS

NOTES:
1. CONNECTIONS TO EXISTING GAS EXTRACTION WELLS WILL BE COMPLETED AS DIRECTED BY OWNER.

BRANDON K. POIENCOT LICENSE No. 77044 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/16/16

Brandon K. Poiencot, P.E.
Florida Registration No. 77044

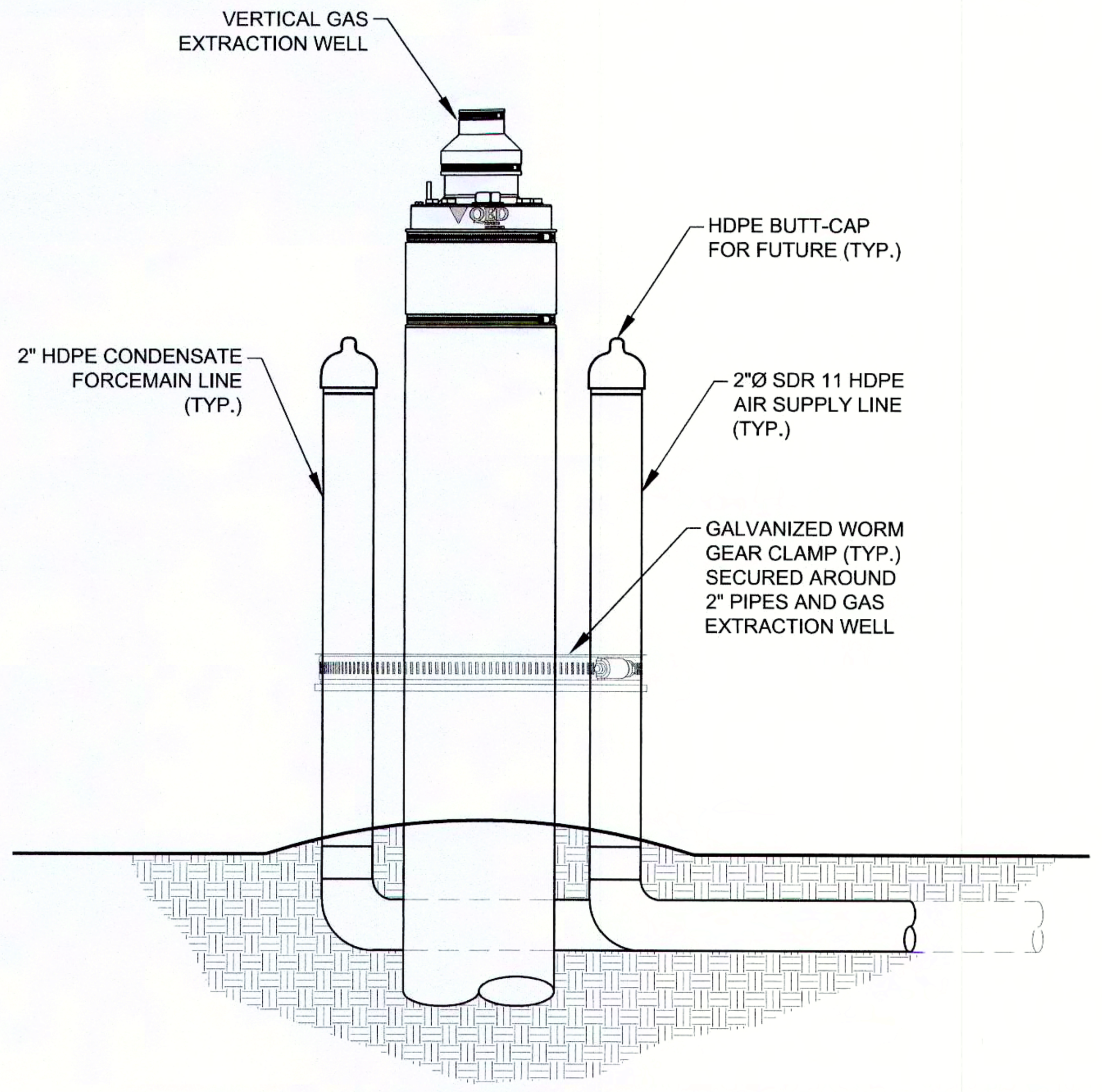
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

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

TITLE
DEWATERING DETAILS (1 OF 3)

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

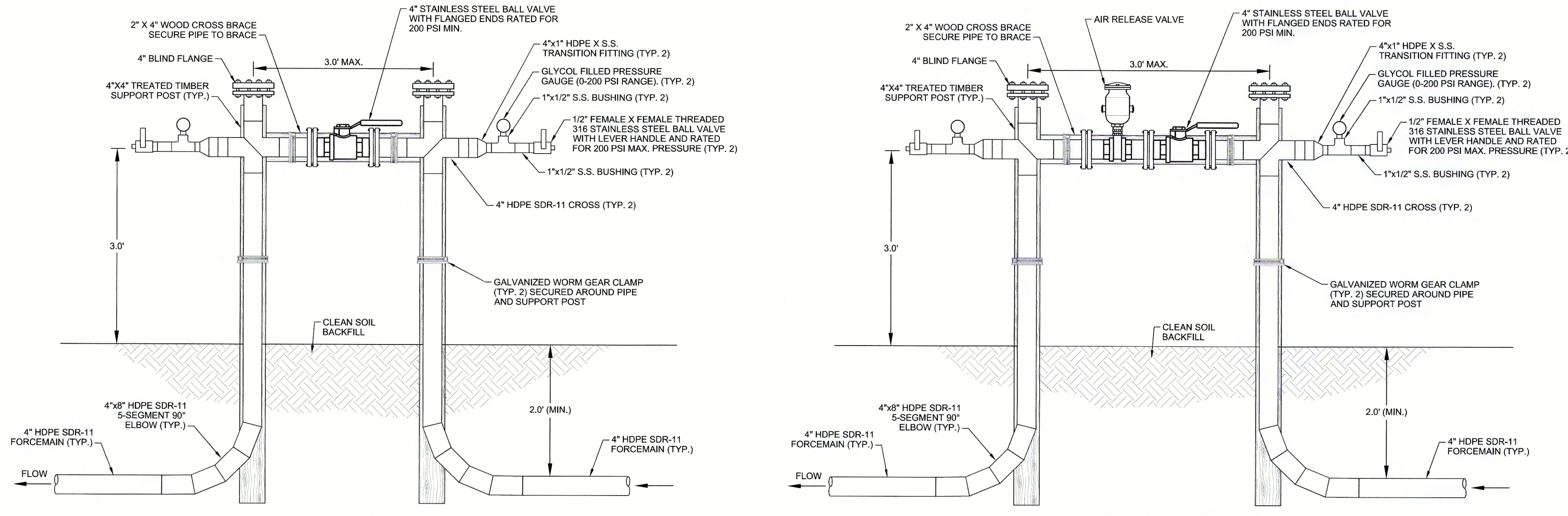
PROJECT No.		083-82734.47	FILE No.	08382734-T007
DESIGN	BKP/HH	03/16/16	SCALE	NOT TO SCALE
CADD	BCL	03/17/16	SHEET 7	
CHECK	BKP/DEG	05/12/16		
REVIEW	KSB	05/12/16		



1/8 AIR & FORCEMAIN TERMINATION DETAIL AT FUTURE WELLS

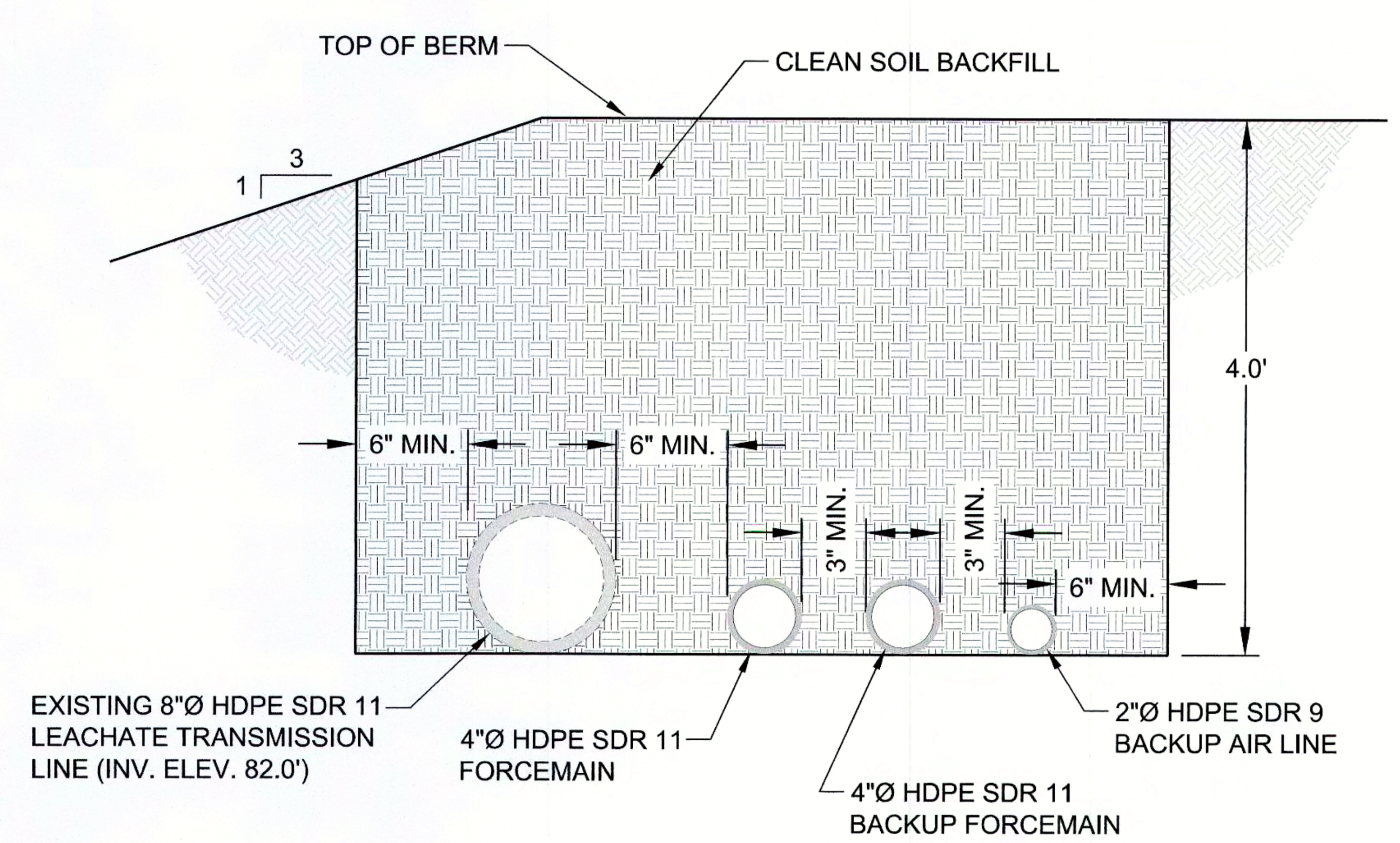
NTS

NOTE:
1. DURING ALL PHASE 3 & 4 LATERAL EXPANSIONS AIR & FORCEMAIN WILL BE INSTALLED WITH GAS EXTRACTION LATERAL PIPING AND CAPPED FOR FUTURE CONNECTION AS SHOWN ABOVE.



2/8 LIQUIDS FORCEMAIN ISOLATION VALVE AND CLEANOUT

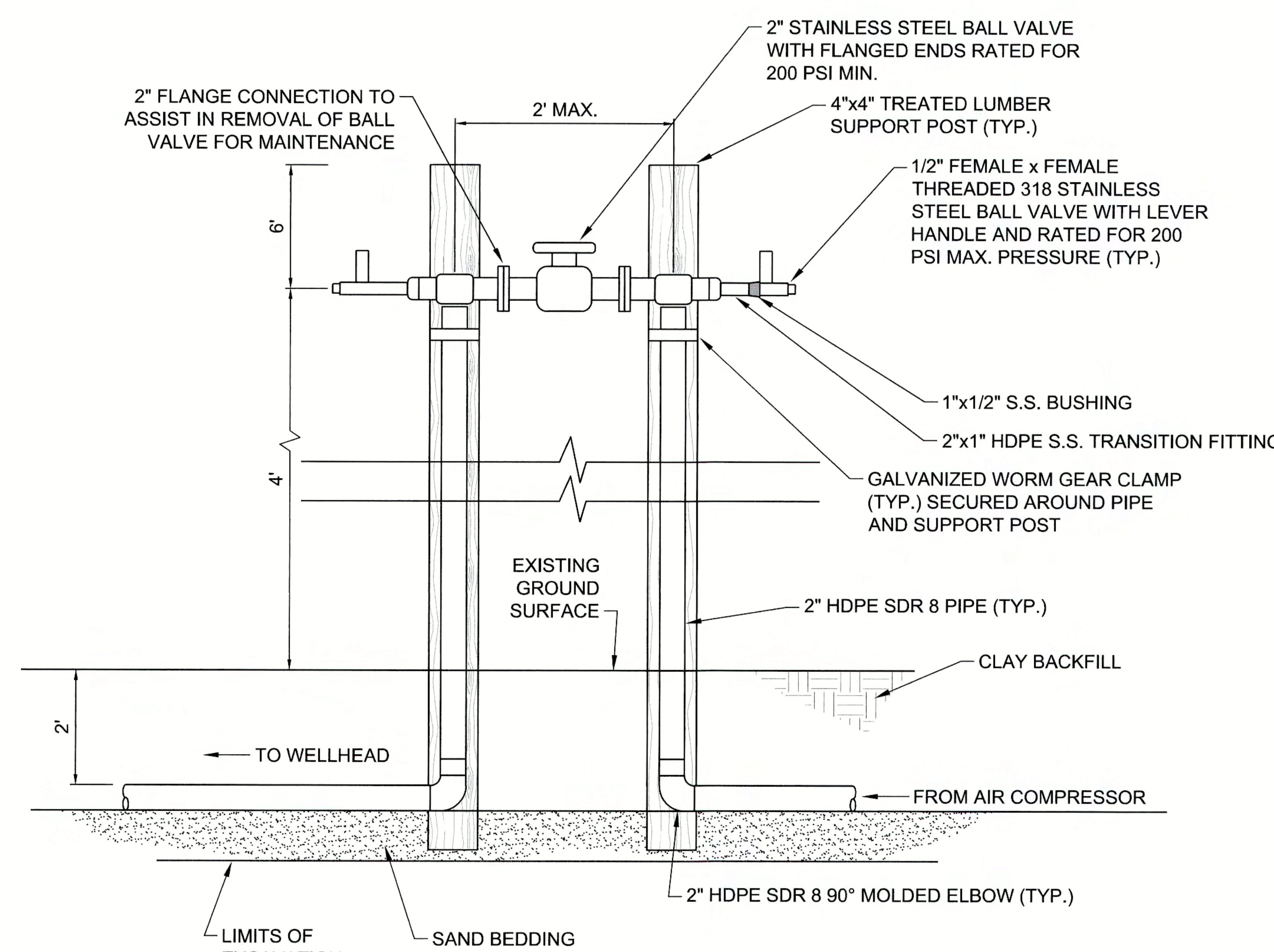
NTS



3/8 FORCEMAIN TRENCH DETAIL

NTS

NOTE:
1. INVERT ELEVATION OF EXISTING 8" LEACHATE TRANSMISSION LINE FROM LEACHATE STORAGE FACILITY RELOCATION RECORD DRAWINGS, BY GEOSYNTEC, DATED APRIL 2013.
2. FORCEMAIN CONVEYANCE PIPE ALONG LANDFILL PERIMETER BERM BETWEEN POINTS A & B LOCATION MAY BE ADJUSTED FOR CONSTRUCTABILITY AND CONFLICTS WITH EXISTING AND FUTURE INFRASTRUCTURE.
3. SPACING BETWEEN PIPES MAY BE ADJUSTED.



NOTE:
1. VALVES INSTALLED EVERY 1,000 FEET.

4/8 AIR LINE ISOLATION AND BLOWOFF VALVES DETAILS

NTS

NOTE:
1. ISOLATION & BLOWOFF VALVES INSTALLED EVERY 2,000 FEET ALONG AIR LINE.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

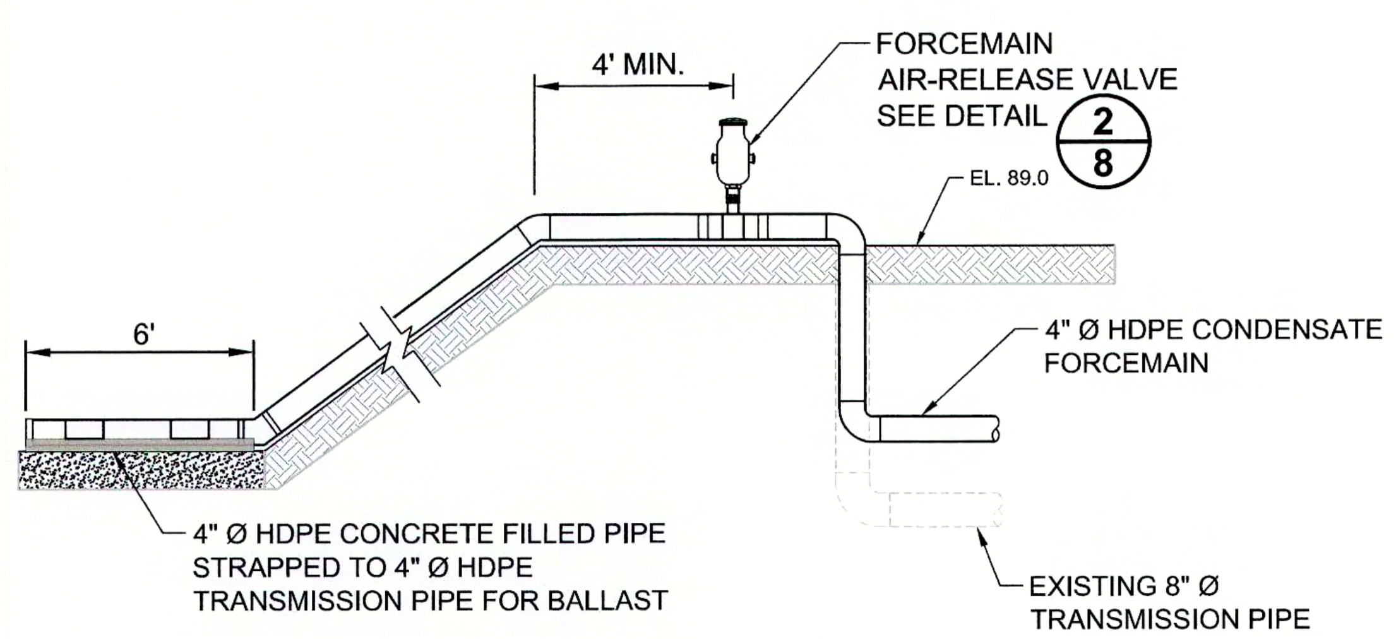
PROJECT
J.E.D. SOLID WASTE MANAGEMENT FACILITY
ST. CLOUD, OSCEOLA COUNTY, FLORIDA

TITLE
DEWATERING DETAILS (2 OF 3)

5/16/16
Brandon K. Poiencot, P.E.
Florida Registration No. 77044

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

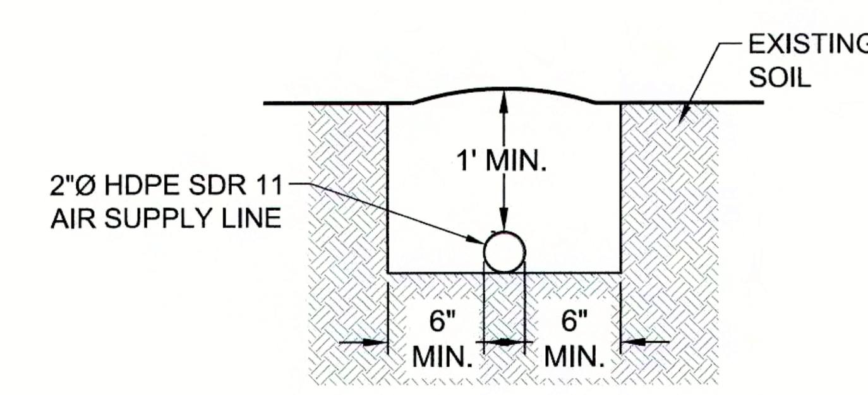
PROJECT No.		083-82734.47	FILE No.	08382734-T007
DESIGN	BKP/HH	03/16/16	SCALE	NOT TO SCALE
CADD	BCL	03/17/16	SHEET 8	
CHECK	BKP/DEG	05/12/16		
REVIEW	KSB	05/12/16		



NOTE:
1. ABOVEGROUND PIPING WILL RUN ADJACENT TO EXISTING 8" LINE

1/9 **LEACHATE COLLECTION POND CONNECTION DETAIL**

NTS



2/9 **AIR SUPPLY LINE TRENCH DETAIL**

NTS

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
0						

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

TITLE
DEWATERING DETAILS (3 OF 3)

5/16/16
Brandon K. Poiencot, P.E.
Florida Registration No. 77044

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

PROJECT No.		083-82734.47	FILE No.	08382734-T007
DESIGN	BKP	03/24/16	SCALE	NOT TO SCALE
CADD	BCL	03/28/16		
CHECK	BKP/DEG	05/12/16	**SHEET 9**	
REVIEW	KSB	05/12/16		

ATTACHMENT K-1
DEWATERING SYSTEM MAINTENANCE PLAN

LANDFILL GAS COLLECTION AND CONTROL SYSTEM DEWATERING MAINTENANCE PLAN

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

Submitted to: Florida Department of Environmental Protection
Solid Waste Section, 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 Solid Waste Section
1 Copy	Omni Waste of Osceola County, LLC
1 Copy	Golder Associates Inc.

May 2016 **083-82734.47**

A world of capabilities delivered locally

Golder Associates

Table of Contents

1.0 MAINTENANCE PLAN

1.1 Introduction

Golder Associates Inc. (Golder) has prepared this Landfill Gas Collection and Control System (GCCS) Dewatering Maintenance Plan (GCCS Dewatering Plan) to describe the process and operations associated with the GCCS at the J.E.D. Solid Waste Management Facility (JED. Facility). Information included in this GCCS Dewatering Plan will be incorporated as Appendix H to the approved Operation Plan prepared by Geosyntec Consultants dated June 30, 2015.

1.2 GCCS Dewatering System General Information

The proposed GCCS dewatering system will be located within the waste mass as shown on the design and permitting drawings. For existing wells, piping will be run to wells as needed based upon watered-in conditions at each well. For future phases of the GCCS, the dewatering system will be installed at the same time and in the same trenches as the landfill gas lateral and header piping. The GCCS Dewatering System will be owned and operated by Omni Waste of Osceola County, LLC (Omni).

The goal of the dewatering system is to remove perched liquids in the vicinity of gas extraction wells to optimize landfill gas extraction and associated flow rates. Generally, automatic pneumatic pumps supplied with compressed air will be utilized to pump liquid within well screens to increase the GCCS's ability to extract landfill gas. Pumped liquids will be conveyed to the leachate storage ponds via an independent forcemain located along the perimeter berm of the landfill. A second set of forcemain and air supply piping is installed as a backup in case the original (in service) pipes become damaged or unserviceable.

1.2.1 System Components

The dewatering system will consist of the following items as shown on the design and permitting drawings:

- Pneumatic Pumps (Pumpone Environmental XP4-BL, or similar)
- Wellhead cap and accessories (air isolation valve, pressure regulator, liquid check valve, liquid isolation valve, air hose, liquid discharge hose, and associated fittings)
- Air compressor (existing – Champion R-Series, Model HRA20-12), augmented as needed.
- Oil Coalescing Filters
- Air supply piping, 2-inch SDR9 HDPE pipe
- Forcemain piping, 2-inch and 4-inch SDR 11 HDPE pipe
- Air release valves (for forcemain piping)
- Isolation valves (for air supply and forcemain piping)

- Air blow-off valves (for air supply piping)
- Associated appurtenances

1.3 System Operation

Pumps will be installed in gas extraction wells as determined by liquid level measurements, total well depth, and landfill gas flow rates. Pumps may be moved from one gas extraction well to another to minimize cost and allow for phased dewatering.

Typically, at a minimum a pump will be installed at approximately 50% of the determined water column depth to limit siltation of the well. Pump depth may be adjusted based upon operational conditions and demands of the GCCS such as liquid depths and other well operating factors including LFG production and temperatures. Pump elevations may be adjusted as dewatering operations progress. Operation of each pump is automatic and will cycle as the head above the pump increases to the pump's setpoint. Pumps can be shut off by isolating the air supply from the pump, reducing the supplied pressure, or by closing the liquid discharge valve.

Pumped liquids will flow through the forcemain piping within the landfill and along the east side perimeter berm which will discharge into the leachate storage ponds. Once the liquid reaches the leachate storage ponds, it will be managed as leachate in accordance with the facility's existing permits.

Air release valves will be located along the forcemain to prevent buildup of air, which may decrease the flow capacity of the forcemain. Cleanout pipes will also be located along the forcemain pipe approximately every 1,000 feet to allow for period cleaning and inspection.

1.3.1 System Inspection/Maintenance

Routine checks of the integrity of the dewatering system will be conducted with routine landfill gas well adjustments and monitoring. Should leaks develop within the system, replacement parts will be ordered and replaced as needed.

Pumps will have to be pulled for maintenance and cleaning on a regular basis. Procedures from the pump manufacturer will be followed. In addition to routine pump maintenance, cleaning of air release valves may be required, as well as periodic blowing off of water from the air supply piping.

1.4 Closure

Closure of the dewatering system will be dependent on the need to remove liquids from the GCCS and the owner's desire to optimize landfill gas flow rates. The dewatering system may be shutdown at any point. Typical operation will be associated with the landfill gas to energy facility, located adjacent to the landfill gas management area and leachate storage ponds. Closure of the dewatering system can be

performed by isolating (closing) air valves to each pump. No formal closure construction/removal of the dewatering system is required once the dewatering system ceases operation.

ATTACHMENT N-1

CALCULATIONS AND DESIGN SUPPORT

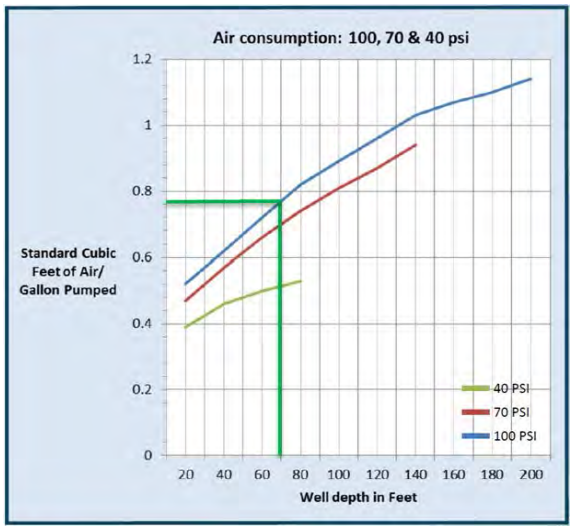
Date:	4/22/2016	**Made by:**	HH
Project No.:	083-82734.47	**Checked by:**	DEG
Subject:	Presurrized Air Demand	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill GCCS Dewatering System Design		

Objective

Calculate the estimated air demand for the dewatering system. 100 pumps will be operated at the same time. Each pump will be pumping 0.75 gallon of leachate per minute with supplied air pressure of 100 psi.

Approach

1. Utilize the PumpOne online Flow Rate/Air Consumption table shown below based upon the following inputs:



Assumed average depths of pumps = 60 ft
Supplied air pressure = 100 psi
Pumping rate = 0.75 gpm

Pump air consumption = 0.8 cubic feet of air / gallon pumped

Air demand per pump = 0.57 cfm
System air demand (with 15% safty factor) = 66 cfm

Existing compressor capacity = 76 cfm

Existing compressor capacity > System air demand

Conclusion

With a 15% safety factor, the calculated air demand of the dewatering system 66 cfm. The existing compressor in JED Lanfill is able to supply air at 76 cfm, which indicates this compressor should satisfy the air demand of the dewatering system.

COMPRESSED AIR SYSTEMS, INC.

9303 Stannum Street
Tampa FL 33619

11609 South Orange Blossom Tr.
Orlando FL 32837 [Suite 201]

The Air Specialist Since 1963.

PH: 813-626-8177 Toll Free 800-626-8177 FAX: 813-628-0187

www.compressedairsystems.com

May 15, 2015 Quote Number: 15 - 1114

Michael Kaiser
Progressive Waste Solutions
1099 Miller Dr.
Altamonte Springs, Fl. 32701

E-Mail: michael.kaiser@progressivewaste.com

(ph) 904-673-0466

Compressed Air Systems, Inc is pleased to offer Progressive Waste Solutions the following quotation for your review.

Champion "R-Series" Compressor

Model:	HRA20-12
Flow:	76cfm @ 175psi
Horsepower:	20-Hp

* Photo May Differ From Actual Package *

Standard Equipment:

- 460V / 3Ph / 60Hz –Includes Magnetic Starter
- Low Oil Level Monitor
- Totally-Enclosed Belt Guard w/ After-Cooler
- Intake Filter-Silencers
- 120-Gallon ASME Air Receiver w/ Safety Valve
- Pneumatic Tank Drain
- Vibration Pads
- Pressure switch operated automatic start/stop control
- 5 Year Warranty (All Major Parts)

Price of "R-Series" Compressor w/ Flex Line (HRA20-12):	$ 8,315.00
Price of GreatLakes Dryer GRF-75A-116):	$ 1,695.00
Price of Compressor Package:	**$ 10,010.00**

The above prices are F.O.B. Factory, valid for 30-days and **subject to shipping/handling charges & applicable taxes**. Shipment can be made in approximately 2 - 3 weeks after receipt of purchase order. Payment terms are 50% down at the time the order is placed (Equipment will be ordered when payment is received); remainder due NET 30 (with prior credit approval) after the equipment is delivered and/or the job is completed. Otherwise payment will be C.O.D. Leasing options are also available.

Jeff Guzzo
COMPRESSED AIR SYSTEMS, INC.
Jeff Guzzo, Regional Sales Manager

ACCEPTANCE OF PROPOSAL: *The above prices, specifications and conditions are satisfactory and are hereby accepted. The payment is to be as outlined above*

Date of Acceptance:_____ Signature:_____

P. O. Number_____ Printed Name:_____

PUMPONE ENVIRONMENTAL LLC

XP4 X-SERIES

Description:

The XP4-BL series (short) is a bottom filling , float-activated, air-powered positive displacement pump, designed for severe conditions found in landfill and remediation applications.

The XP4 is designed to operate in both simple and arduous conditions such as chemical attack, (corrosion) and elevated temperatures.

Corrosion & Temperature Resistance:

Exceptional corrosion & temperature resistance due to the highest quality materials of construction which includes:

- **316L Stainless Steel for all major metal parts & fasteners**
- **17/4 Stainless Steel for magnetic parts**
- **PEEK rocker assembly**
- **PTFE (Teflon®) discharge check valve ball**
- **UHMW PE actuator rod & inlet check valve shuttle**
- **FKM (Viton®) for all 'o'-ring seals**
- **PVDF (Kynar®) for minor plastic parts**
- **Syntactic high performance float, max. operating temp. 250°F**
- **FRP high performance filament wound fiberglass casing with integral epoxy liner, max operating temp. 210°F**
- **316L Stainless Steel casing available on request**

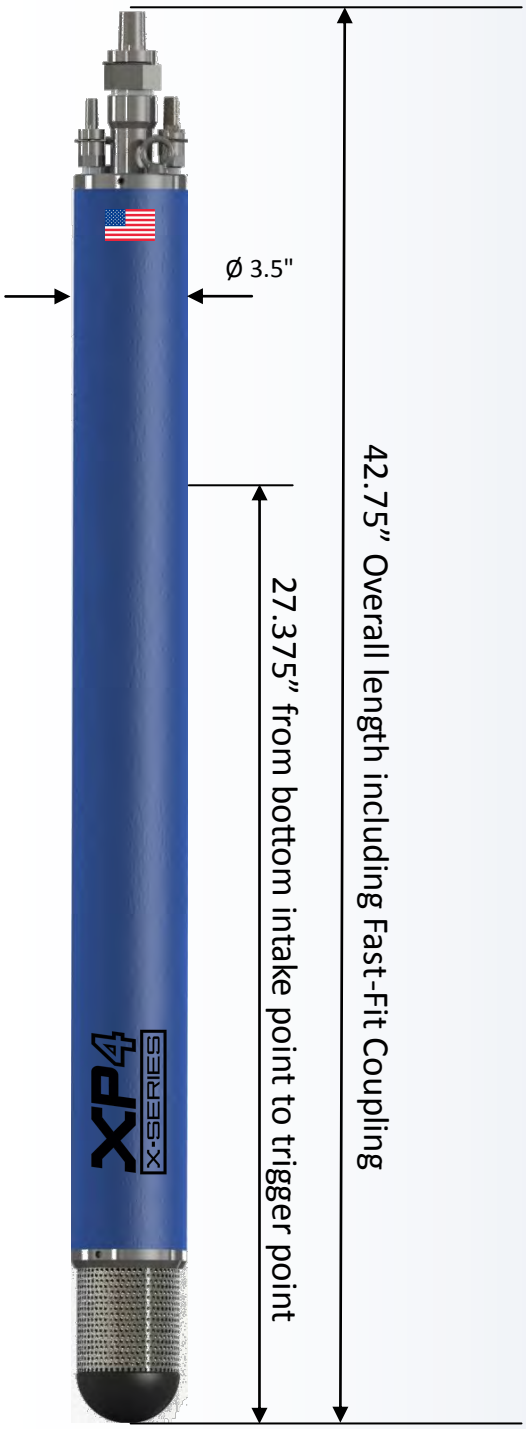
Enhanced Design:

- **Solid, machined pump head with integral discharge check valve**
- **No penetrations through the center discharge tube meaning no air leakage into discharge**
- **Solid machined bottom check valve assembly with minimal parts and easy disassembly**
- **Adjustable air and exhaust poppets**
- **Air inlet and exhaust valves secured with cotter-pins**
- **Compatible with Fast-Fit couplings or standard hose-barbs**
- **Unmatched service and support**
- **5 Year standard warranty**

Leachate & Remediation Pumping Systems

41 H Odell School Rd. Concord, NC 28027 T: 704-786-8158 F: 704-788-6814

PUMPONE ENVIRONMENTAL LLC



Specifications	
Pump Type	XP4-BL bottom loading pneumatic pump
Actuation	Float activated, fully automatic
Weight: FRP / 316 SS casing	17.2 lbs / 21.2 lbs
Volume of liquid displaced per cycle	0.32-0.37 Gallons (US)
Maximum flow rate	15.85 GPM (US)
Air pressure operating range	5 - 260 psi
Maximum operating temperature	210°F
Air consumption	0-5 SCFM
pH range	2-13
Minimum liquid density	0.7 SG

Materials	
All non metallic parts	316L Stainless Steel
Magnetic parts	17/4 Stainless Steel & NdFeB
Rocker assembly	PEEK
Discharge check valve ball	PTFE (Teflon®)
Actuator rod & inlet check valve shuttle	UHMW PE
'o'-ring seals	FKM (Viton®)
All minor plastic parts	PVDF (Kynar®)
Option on pump casing	FRP / 316 SS
Float	Syntactic high performance float, max. operating temp. 250°F
Casing	FRP high performance filament wound epoxy composite tube, max operating temp. 210°F

Down-Well Tube & Connection Options	
Tube material	High performance nylon
Discharge	1" OD
Air supply	1/2" OD
Air Exhaust	5/8" OD
Fast Fit Couplings	1", 1/2"& 5/8"
Standard hose barbs	1", 1/2" & 5/8"

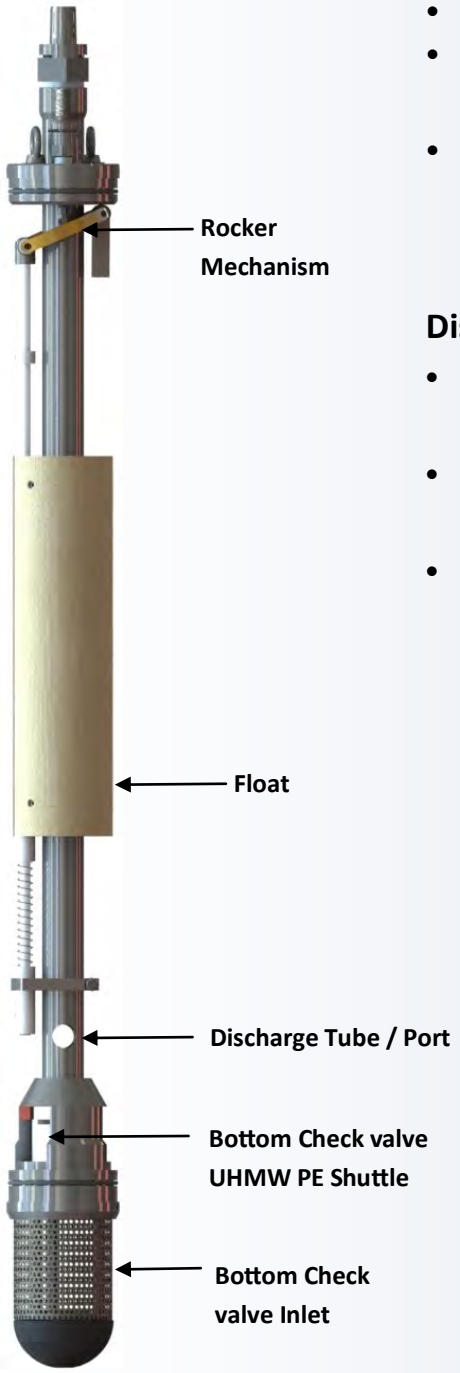
Leachate & Remediation Pumping Systems

41 H Odell School Rd. Concord, NC 28027 T: 704-786-8158 F: 704-788-6814

PUMPONE ENVIRONMENTAL LLC

How It Works:

The XP Series pumps are air powered and require no sensors, timers, solar, or control panels. The pump is activated by an internal float that is triggered by the recharge in gas wells & condensate sumps.



Fill Cycle:

- The fluid pushes the BCV shuttle open which allows the pump to fill
- When the fluid rises, air is forced out of the pump via the air exhaust valve. As the fluid rises, so does the float, causing the rocker mechanism to trip and close the exhaust valve.
- After the pump has completely filled, and the float has tripped the rocker mechanism, the air inlet valve opens allowing air to enter the pump and pressurize the chamber of the pump.

Discharge Cycle:

- When the air inlet valve is open and the pump chamber is pressurized the BCV shuttle closes, and forces the fluid up the discharge tube through the discharge port.
- As the fluid is displaced the level will fall along with the float, causing the rocker mechanism to trip, closing the air inlet valve and opening the exhaust valve.
- The cycle repeats until the well or sump is pumped down to level.

Leachate & Remediation Pumping Systems

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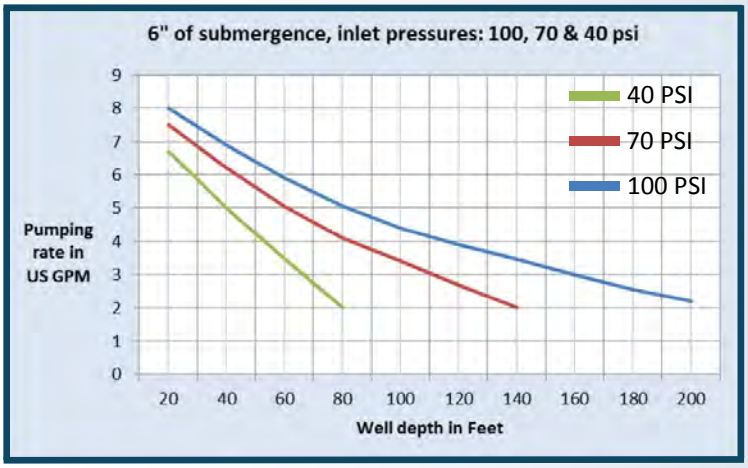
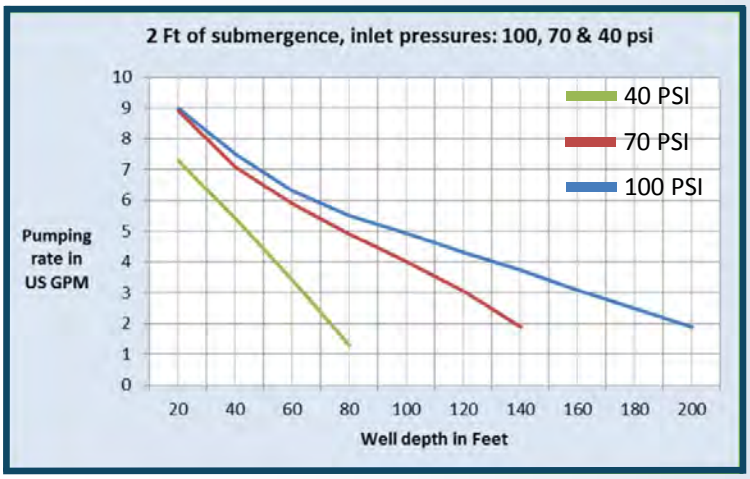
PUMPONE ENVIRONMENTAL LLC

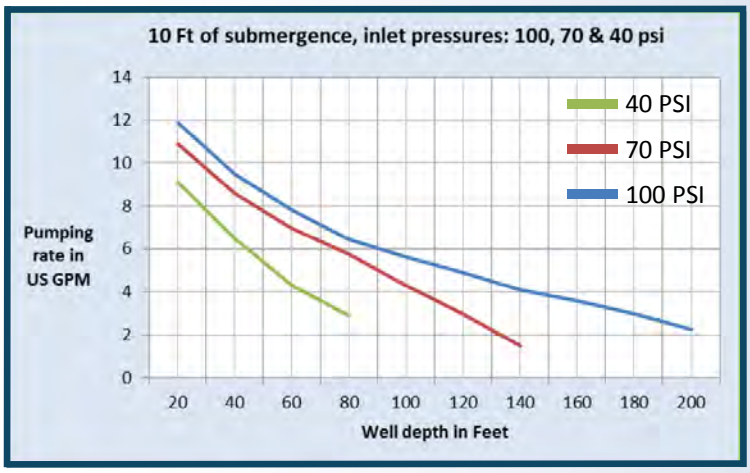
Flow performance graphs:

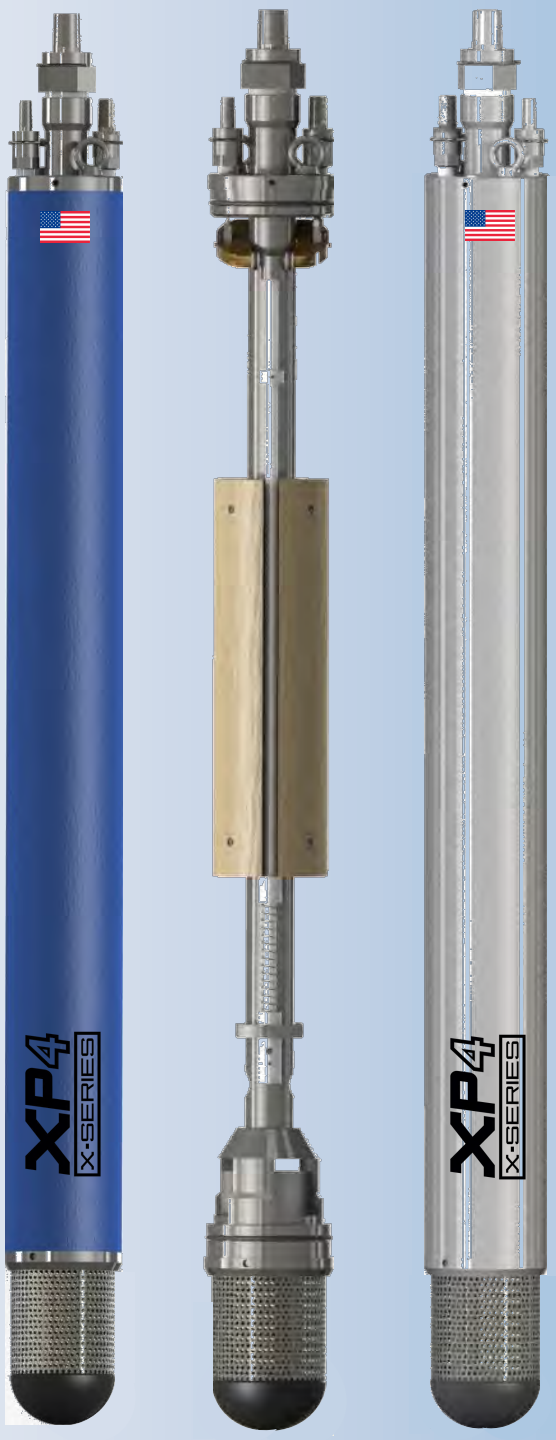
The curves are based on 1" OD discharge tubing.

Flow rates will vary with site conditions









Leachate & Remediation Pumping Systems

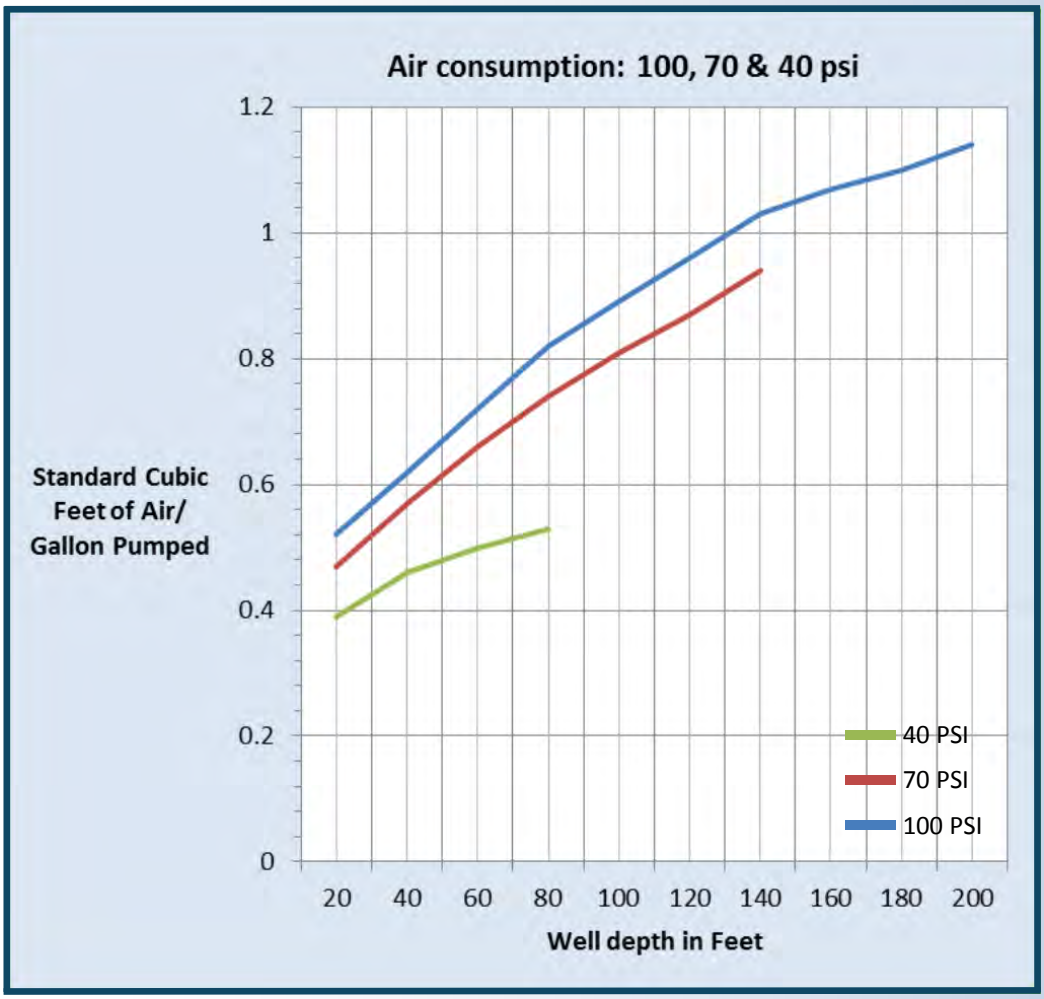
41 H Odell School Rd. Concord, NC 28027 T: 704-786-8158 F: 704-788-6814

PUMPONE ENVIRONMENTAL LLC

Air Consumption graph:

The curves are based on 1" OD discharge tubing.

Air consumption rates will vary with site conditions



XP4 X-SERIES

5 Year Standard Warranty

Leachate & Remediation Pumping Systems

41 H Odell School Rd. Concord, NC 28027 T: 704-786-8158 F: 704-788-6814

Date:	4/22/2016	**Made by:**	DEG
Project No.:	083-82734.47	**Checked by:**	BKP
Subject:	Presurrized Air Pipe Design	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill GCCS Dewatering System Design		

Objective

Calculate the allowable pressure in the 2-inch HDPE SDR 9 air supply piping with supplied air pressure of 100 psi, taking into account chemical and temperature effects on HDPE pipe. Technical Note PP 831-TN from Performance Pipe (Reference 1) provides guidance to account for the effectes of chemical solvation in compressed air pipe systems.

Approach

1. Utilize the equation given in the technical note, along with various environmental and service temperature (100°F) design factors to determine the maximum operating pressure of the air aupply line in order to minimize the potential for premature failure.

Use the equation in Reference 1:

$$P = \frac{2(HDB)f_E f_T}{(DR-1)}$$

where:

P	= internal pressure rating, psi		
HDB	= hydrostatic design basis at 73F, psi	1,600	psi, Reference 1
f_E	= environmental design factor =	0.32	Reference 1
f_T	= service temperature design factor =	0.78	100°F, Reference 1
DR	= pipe dimension ratio =	9	Permit application

P = 100 psi

Conclusion

To minimize the potential for premature failure, the maximum pressure for the 2-inch HDPE SDR 9 air supply pipe is 100 psi, based upon taking into account the above reduction factors. Oil coalescing filters are recommended to be used at the air compressor to minimize oil vapors in the pressurized air supply system.

Technical Note PP 831-TN

PE4710 Pipe in Compressed Air or Compressed Gas Service

When compressed gases are to be conveyed in high-density polyethylene piping, the system designer must account for chemical and environmental effects, installation related effects and conditions, and other application-related limitations such as possible regulatory requirements.

Chemical Effects

Some gases such as argon, helium, methane, carbon dioxide and nitrogen have little or no known chemical effect on polyethylene. Other gases such as oxygen, oxygen in air, chlorine, fluorine and bromine can impair polyethylene to varying levels of severity by oxidizing or directly attacking the material. Further, when compressed gases are combined with other gases or vapors, deleterious effects from the combination may occur. For example, chemicals such as vapors from compressor oils that may be present in compressed air or other compressed gases can deposit and liquefy on the pipe surface and reduce material strength by chemical solvation. Overall chemical effects will vary depending upon the aggressiveness of the chemical gas and possible combinations with other chemicals and vapors. Chemical effects are increased by higher applied stress (higher internal pressure) and by increased service temperature. **Degrading chemical effects act to reduce service life, and in some cases, service life can be severely compromised.** Polyethylene pipe may not be suitable for use with some aggressive gases, especially in combination with some chemical vapors.

Installation

The system designer must address the mechanical safety aspects of compressed gas piping installations. The installation must not expose the pipeline to significant impact or possible mechanical damage, particularly in very cold conditions.
Underground installation is recommended. When properly buried, the pipe is restrained against movement and protected against most potential sources of mechanical damage. Underground installations should comply with ASTM D 2774, and be buried below grade at least 12” or one pipe diameter whichever is greater.

Surface or above grade installations require special precautions to protect the pipe against mechanical damage.

WARNINGS:

- **Severe mechanical damage can puncture HDPE pipe, and in some cases smaller pipe or tubing can be severed. If an unrestrained, pressurized HDPE line is severed, it can whip around and cause property damage or injury or death to persons.**
- **Significant impact under extreme cold conditions can shatter pressurized PE piping. Escaping gas can propel pipe fragments that can present a hazard of injury or death to persons.**
- **Where surface or above-grade PE compressed gas piping may be subject to extreme cold and the potential for mechanical impact, the piping must be installed so that the line is restrained and the risk of mechanical damage is minimized.**

Appropriate installation measures for surface or above grade pressurized gas piping can include:

- Continuous encasement in a shatter-resistant casing or enclosure;
- Frequent clamps or anchors; and
- Routing the pipe "out of harm's way", so that little or no possibility of external mechanical damage exists.

Polyethylene piping for transporting or distributing fuel gases such as natural gas, propane, butane, LP gas or landfill gas must be installed and operated in accordance with applicable Federal, State and Local regulations.

Internal Pressure

PE 4710 HDPE pipe is rated for internal pressure as follows:

$$P = \frac{2(HDB) f_E f_T}{(DR\text{-}1)}$$

Where P = internal pressure rating, lb/in^2
HDB = hydrostatic design basis at 73°F, lb/in^2 (1600 lb/in^2 for PE 4710)
f_E = environmental design factor
f_T = service temperature design factor
DR = pipe dimension ratio

$$DR = \frac{OD}{t}$$

OD = pipe outside diameter, in
t = pipe minimum wall thickness, in

The environmental design factor, f_E, addresses chemical effects. The service temperature design factor, f_T, addresses thermal effects for suitable dry, oil-free gases. The designer should determine appropriate design factor values for the application. Some values are presented below, however, other values may be appropriate depending upon chemical and application conditions. ***CAUTION - Compressed air or oxygen service at elevated temperatures is not recommended.***

Environmental Design Factor, f_E	
≤ 0.63	Suitable dry, oil-free gases
≤ 0.32	Clean, dry, oil-free gases having mild oxidizing effects (air, oxygen, et.) at 73° F or below
≤ 0.25	Gases having mild oxidizing effects (air, oxygen, etc.) that contain solvating or permeating chemical vapors (lubricants, solvents, etc.) at 73° F or below

Temperature Design Factor for PE 4710 for suitable dry, oil-free gas only, f_T					
Temperature	60° F	73° F	100° F	120° F	140°F
f_T	1.08	1.00	0.78	0.63	0.50

Performance Pipe, a division of Chevron Phillips Chemical Company LP
5085 West Park Boulevard Suite 500, Plano, TX 75093
Phone: 800-233-6495 / Fax: 972-599-7329

June 2014 Supercedes all previous publications

Date:	4/22/2016	**Made by:**	HH
Project No.:	083-82734.47	**Checked by:**	DEG
Subject:	Leachate Transmission Line Pipe Sizing	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill GCCS Dewatering System Design		

Objective

Evaluate the capacity of leachate force main pipe based on the estimated system parameters.

Approach

1. Assume maximum velocity in leachate force main pipe is 6 fps. Calculate flow rate capacity of pipe based on the maximum velocity. Select size of pipe with capacity to handle the system's pressure and flow rate. Detailed calculations and formulas are provided in the attachment.

4 inch DR11 pipe capacity:

Max velocity in pipe =	6	fps
Flow capacity =	194	gpm
Pressure capacity =	200	psi

System operating parameters:

Estimated pressure in pipe =	10	psi
Estimated system flow rate =	75	gpm

Flow capacity of pipe >	Estimated system flow rate
Pressure capacity of pipe >	Estimated pressure in pipe

Conclusion

The 4 inch DR 11 HDPE pipe is able to handle up to 194 gpm of flow rate, which is more than the estimated system flow rate 75 gpm. According to the pressure rating, the pipe is able to withstand the highest pressure in the pipe calculated at 10 psi. Therefore, the 4 inch DR 11 HDPE pipe will be sufficient to deliver leachate pumped from the wells to the leachate pond.

PIPE SIZING
PERIMETER LEACHATE FORCEMAIN
J.E.D. SOLID WASTE MANAGEMENT FACILITY

System Parameters

Proposed Number of Active Pumps =	100	
Estimated Flow Rate per Pump =	0.75	gpm
Total Proposed Flow in Dewatering Transmission Line =	75	gpm
Maximum Forcemain Length =	10,867	ft
Start Elevation =	130.0	ft
End Elevation =	88.0	ft

Pressure Pipe Sizing

Q = VA P= ρgh

Max Velocity = 6 fps h= head required in pump

	DR 11 Pipe Parameters				System Parameters	
Pipe Size (in)	Avg I.D. (in)	Area (sf)	Flow Capacity (gpm)	Pressure Capacity (psi)	System Flow Rate (gpm)	Forcemain Pressure (psi)
4	3.63	0.072	194	200	75	10
6	5.35	0.156	420	200	75	-14
8	6.96	0.264	711	200	75	-17
10	8.68	0.411	1107	200	75	-18

CALCULATION OF HEAD LOSSES (DR 11)

SYSTEM DATA			
viscosity (v)	=	0.0000141	ft^2/sec
g	=	32.2	ft/sec^2
flow rate (Q)	=	75	gpm
total length (L)	=	10867.37	ft
inlet elevation	=	130.0	ft
outlet elevation	=	88.0	ft

DATA FOR PIPES				
Pipe (in)	DR	OD(in)	ID(in)	Area ID (ft^2)
4	11	4.500	3.633	0.072
6	11	6.625	5.349	0.156
8	11	8.625	6.963	0.264
10	11	10.750	8.218	0.368

Equations

$$R_e = \frac{VD}{v} \qquad f = \frac{0.316}{R_e^{0.25}} \qquad V = \frac{Q}{A}$$

$$h_L = K \cdot \frac{V^2}{2g} \qquad h_f = f \cdot \frac{L}{D} \cdot \frac{V^2}{2g}$$

A= internal area of the pipe
D= internal diameter of pipe
f= coefficient of friction
h_L= head loss due to fittings
h_f= head loss due to friction
R_e= the Reynolds number
V= velocity within pipe
K= resistance coefficient

4 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	10867.37	0.303	0.072	0.167	2.322	49866.11	0.021	1	64	-42	22
				6.6												

6 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	10867.37	0.446	0.156	0.167	1.071	33868.68	0.023	0	10	-42	-32
				6.6												

8 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	10867.37	0.580	0.264	0.167	0.632	26018.03	0.025	0	3	-42	-39
				6.6												

10 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88	10867.37	0.685	0.368	0.167	0.454	22044.73	0.026	0	1	-42	-41
				6.6												

Date:	4/22/2016	**Made by:**	BKP/HH
Project No.:	083-82734.47	**Checked by:**	DEG
Subject:	Dewatering Force Main Capacity Analysis	**Reviewed by:**	KSB
Project Short Title:	J.E.D. Solid Waste Management Facility Landfill GCCS Dewatering System Design		

Objective

Calculate the estimated system pressure within the dewatering force main. Assume 100 pumps will be running at each operating period.

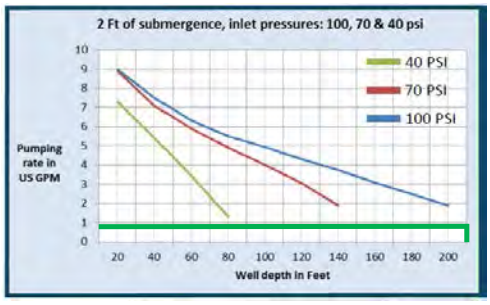
Approach

1. Calculate the required system head to pump leachate from the furthest point in the system to the leachate storage ponds. System parameters are included below. Detailed calculations and formulas are provided in the attachment.

Assumed average depths of pumps (100 pumps@60-ft):	60	feet	(1)
Assumed liquid flow-rate needed:	0.75	gpm	(2)
Assumed number of pumps operating at once:	100	pumps	
Assumed total flow in system:	75	gpm	
Approximate elevation of force main inlet:	130	ft	
Approximate elevation of force main outlet (assumed surface of storage ponds):	88	ft	
Diameter of force main:	4	in	
Length of pipe:	8825	ft	
System Head:	10	ft	
Total Head Required:	70	ft	
Total Head Required (with 25% safety factor):	88		

2. Determine if the specified pneumatic pumps are sufficient to pump directly from the landfill footprint to the leachate storage ponds.

Assumed submergence of pump in well:	2	ft	
Supplied air pressure:	100	psi	
Maximum head for pump:	200	ft	estimated from PumpOne curve
Total Head Required	<	Max Head Allowable	



Courtesy of PumpOne Environmental LLC

Conclusion

At 0.75 gpm with an air supply of 100 psi, the pneumatic pump is able to perform at least 200 ft of head. The total required head for the system is 88 ft; therefore, the pumps should be sufficient to dewater the well field and pump leachate to the leachate storage ponds.

HEAD LOSS CALCULATIONS (75 GPM/DR 11)

DEWATERING LEACHATE FORCEMAIN

J.E.D. SOLID WASTE MANAGEMENT FACILITY

SYSTEM DATA			
viscosity (v)	=	0.0000141	ft^2/sec
g	=	32.2	ft/sec^2
flow rate (Q)	=	75	gpm
total length (L)	=	8825	ft
inlet elevation	=	130.0	ft
outlet elevation	=	88.0	ft

DATA FOR PIPES				
Pipe (in)	DR	OD(in)	ID(in)	Area ID (ft^2)
4	11	4.500	3.633	0.072
6	11	6.625	5.349	0.156
8	11	8.625	6.963	0.264
10	11	10.750	8.218	0.368

Equations

$$R_e = \frac{VD}{v} \qquad f = \frac{0.316}{R_e^{0.25}} \qquad V = \frac{Q}{A}$$

$$h_L = K \cdot \frac{V^2}{2g} \qquad h_f = f \cdot \frac{L}{D} \cdot \frac{V^2}{2g}$$

A= internal area of the pipe
D= internal diameter of pipe
f= coefficient of friction
h_L= head loss due to fittings
h_f= head loss due to friction
R_e= the Reynolds number
V= velocity within pipe
K= resistance coefficient

4 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	8825	0.303	0.072	0.167	2.322	49866.1	0.021	1	52	-42	10
				6.6												

6 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	8825	0.446	0.156	0.167	1.071	33868.7	0.023	0	8	-42	-34
				6.6												

8 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130.0											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88.0	8825	0.580	0.264	0.167	0.632	26018	0.025	0	2	-42	-40
				6.6												

10 INCH PIPE

SECTION	FITTING	K	Number	Total K	Elevation (ft)	Pipe Length (ft)	PIPE ID (ft)	Area ID (ft^2)	Q (ft^3/sec)	V(ft/sec)	Re	f	Fittings head lost (ft)	Friction Head Lost (ft)	Potential Head (ft)	Head Required (ft)
A	Inlet	0.5	1	0.5	130											
	90 elbow	0.9	2	1.8												
	Check valve	1.7	1	1.7												
	Gate valve	0.2	8	1.6												
B	Outlet	1	1	1	88	8825	0.685	0.368	0.167	0.454	22044.7	0.026	0	1	-42	-41
				6.6												

Golder Associates 3730 Chamblee Tucker Road Atlanta, Georgia 30341	Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
	Job No.	083-82734.47	By:	HH	Date	3/25/2016
	Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
			Rev:	KSB		

OBJECTIVE

Determine the structural stability of the dewatering pipes under the asumed design height of refuse, given the new design of the landfill.

METHOD

1. Determine the maximum vertical pressure acting on the leachate collection pipe.

2. Evaluate the pipe for:

a. Wall Crushing b. Wall Buckling c. Ring Deflection
as described in Reference 1.

PARAMETERS

Final Cover Max. Elevation:	330	ft (Permitted maximum height)			
Elevation of Protective Cover at Cover Max. Elev:		329.5	ft.		
Height of Refuse	327 ft		Unit wt. of refuse =	75 pcf	= 2,030lb/yd^3
Height of Veg. Layer	0.5 ft		Unit weight of soil =	120 pcf	
Height of Barrier Layer	1.5 ft				
Height of Intermediate Cover	1.0 ft				
Height of Pipe Tench	3.0 ft	conservative			
(Soil Modulus (E') =	2,250	(Ref. 1, p. 214 reduced by 25%)	Unit weight of soil =	120 pcf	
Nominal Pipe Diameter	4.0 in				
Compressive Strength of pipe	1,150	(Ref. 1, p.102)			
Elastic Mod. of HDPE (E)	130,000	(Ref. 1, p.101)			
Allow. Ring Deflection	5%	(Ref. 1, p.218)			
DR	11				
Outside Pipe Diameter	4.5	in.			
Inside Diameter (D_I)	3.63	in.			
Mean Diamter (D_M)	4.09	(Ref. 1, p. 211)			
Wall Thickness	0.41	in.			

CALCULATIONS

Computation of the vertical stress acting on pipe -

s_v = Soil unit weight x (H_{cover} + $H_{barrier}$ + $H_{intermediate}$) + Unit weight of rock x H_{rock} + Unit weight of refuse x H_{refuse}

s_v = 25,245 psf or 175.3 psi (Prism Load)

Design for Wall Crushing -

$$S_A = \frac{D_o \times s_v}{288 \times t} = 964 \text{ psi}$$ (ref. 1 , page 220) < 1,150 psi for PE4710 pipe strength, therefore **OK**.

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	Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
			Rev:	KSB		

Design for Wall Buckling -

$$P_{wc} = \frac{5.65}{FOS}\sqrt{\frac{RB'E' * E}{12(DR-1)^3}} =$$ (ref. 1, page 221)

Where

P_{wc} = allowable constrained bucklingpressure, lb/in^2

FOS = saftey factor

R = buoyancy reduction factor

R = 1-0.33*H'/H

H' = groundwater height above pipe, ft

H = cover above pipe, ft

B' = elastic support factor

$B' = 1/ (1+4\ e^{(-0.065H)})$

E' = soil reaction modulus, lb/in^2

Therefore

R = 1 (H' = 0)

B'= 1

For FOS = 2

P_{wc} = 441 psi or 63,512 psf

> the Prism Load of 25,245 psf

therefore pipes will not crush

Design for Ring Deflection

Spangler's Modified Iowa Formula for Plexco pipe is used to calculate the ring deflection (ref. 1, page 211).

$$\frac{\Delta X}{D_I} = \frac{P_T}{144}\left(\frac{KL}{\frac{2E}{3}\left(\frac{1}{DR-1}\right)^3 + 0.061E'}\right)$$

Where:

ΔX = in, horizontal deflection

K = 0.1 bedding factor

L = 1.00 deflection lag factor (page 216, ref. 1)

P_T = 25,245 lb/ft^2, pipe crown vertical pressure

E = 130,000 psi (tensile modulus of elasticity)

E' = 2,250 psi, Soil modulus 3000-25% = 750

DR = 11 Dimension ratio

D_I = 3.63 in, Inside diameter

$\frac{\Delta X}{D_I}$ = 0.0783

% Deflection = 7.8293636 %

Then calculate ring bending strain to verify that calculated % Deflection is acceptable:

$$\in = f_D \frac{\Delta X}{D_M} \frac{2C}{D_M}$$ (Ref. 2, P. 112)

Where:

Є =	wall strain, %		
ΔX =	0.2844	Deflection, in	
f_D =	6	deformation shape factor	
D_M =	4.09	mean diameter, in	$D_M = D_O - 1.06t$
t =	0.41	min. wall thickness for ISCO PE4710 IPS, in	
C =	0.21677	outer fiber to wall centroid, in	C=0.5(1.06t)

Є = 4.42 % is < 5% Pipes will not crush

CONCLUSIONS

Based on the calculations, all 4" liquid conveyance pipes will maintain integrity.

REFERENCES

(1) Plastic Pipe Handbook of Polyethylene Pipe, 2009.

(2) Chevron Phillips Engineering Manual, 2003. "Buried Pipe Design"

Golder Associates
3730 Chamblee Tucker Road
Atlanta, Georgia 30341

Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
Job No.	083-82734.47	By:	HH	Date	3/25/2016
Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
		Rev:	KSB		

OBJECTIVE

Determine the structural stability of the dewatering pipes under the asumed design height of refuse, given the new design of the landfill.

METHOD

1. Determine the maximum vertical pressure acting on the leachate collection pipe.

2. Evaluate the pipe for:

a. Wall Crushing b. Wall Buckling c. Ring Deflection
as described in Reference 1.

PARAMETERS

Final Cover Max. Elevation:	330	ft (Permitted maximum height)			
Elevation of Protective Cover at Cover Max. Elev:		329.5	ft.		
Height of Refuse	327 ft		Unit wt. of refuse =	75 pcf	= 2030lb/yd^3
Height of Veg. Layer	0.5 ft		Unit weight of soil =	120 pcf	
Height of Barrier Layer	1.5 ft				
Height of Intermediate Cover	1.0 ft				
Height of Pipe Tench	3.0 ft				
(Soil Modulus (E') =	2,250	(Ref. 1, p. 214 reduced by 25%)	Unit weight of soil =	120 pcf	
Nominal Pipe Diameter	4.0 in				
Compressive Strength of pipe	1,150	(Ref. 1, p.102)			
Elastic Mod. of HDPE (E)	130,000	(Ref. 1, p.101)			
Allow. Ring Deflection	5%	(Ref. 1, p.218)			
DR	11				
Outside Pipe Diameter	2.38	in.			
Inside Diameter (D_I)	1.92	in.			
Mean Diamter (D_M)	2.16	(Ref. 1, p. 211)			
Wall Thickness	0.22	in.			

CALCULATIONS

Computation of the vertical stress acting on pipe -

s_v = Soil unit weight x (H_{cover} + $H_{barrier}$ + $H_{intermediate}$) + Unit weight of rock x H_{rock} + Unit weight of refuse x H_{refuse}

s_v = 25,245 psf or 175.3 psi (Prism Load)

Design for Wall Crushing -

$$S_A = \frac{D_o \times s_v}{288 \times t} = 966 \text{ psi}$$ (ref. 1 , page 220) < 1,150 psi for PE4710 pipe strength, therefore **OK**.

Golder Associates 3730 Chamblee Tucker Road Atlanta, Georgia 30341	Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
	Job No.	083-82734.47	By:	HH	Date	3/25/2016
	Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
			Rev:	KSB		

Design for Wall Buckling -

$$P_{wc} = \frac{5.65}{FOS}\sqrt{\frac{RB'E' * E}{12(DR-1)^3}} =$$ (ref. 1, page 221)

Where

P_{wc} = allowable constrained bucklingpressure, lb/in^2

FOS = saftey factor

R = buoyancy reduction factor

R = 1-0.33*H'/H

H' = groundwater height above pipe, ft

H = cover above pipe, ft

B = elastic support factor

$B' = 1/ (1+4\ e^{(-0.065H)})$

E' = soil reaction modulus, lb/in^2

Therefore

R = 1 (H' = 0)

B'= 1

For FOS = 2

P_{wc} = 441 psi or 63,512 psf

> the Prism Load of 25,245 psf

therefore pipes will not crush

Design for Ring Deflection

Spangler's Modified Iowa Formula for Plexco pipe is used to calculate the ring deflection (ref. 1, page 211).

$$\frac{\Delta X}{D_I} = \frac{P_T}{144}\left(\frac{KL}{\frac{2E}{3}\left(\frac{1}{DR-1}\right)^3 + 0.061E'}\right)$$

Where:

ΔX = in, horizontal deflection

K = 0.1 bedding factor

L = 1.00 deflection lag factor (page 216, ref. 1)

P_T = 25,245 lb/ft^2, pipe crown vertical pressure

E = 130,000 psi (tensile modulus of elasticity)

E' = 2,250 psi, Soil modulus 3000-25% = 750

DR = 11 Dimension ratio

D_I = 1.92 in, Inside diameter

$\frac{\Delta X}{D_I}$ = 0.0783

% Deflection = 7.8293636 %

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Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
Job No.	083-82734.47	**By:**	HH	**Date**	3/25/2016
Ref.	Dewatering System Design	**Chk'd:**	DEG	**Sheet**	
		Rev:	KSB		

Then calculate ring bending strain to verify that calculated % Deflection is acceptable:

$$\in = f_D \frac{\Delta X}{D_M} \frac{2C}{D_M}$$ (Ref. 2, P. 112)

Where:

Є =	wall strain, %		
ΔX =	0.1501	Deflection, in	
f_D =	6	deformation shape factor	
D_M =	2.16	mean diameter, in	$D_M = D_O - 1.06t$
t =	0.22	min. wall thickness for ISCO PE4710 IPS, in	
C =	0.11448	outer fiber to wall centroid, in	C=0.5(1.06t)

Є = 4.40 % is < 5% Pipes will not crush

CONCLUSIONS

Based on the calculations, 2" liquid conveyance pipes will maintain integrity.

REFERENCES

(1) Plastic Pipe Handbook of Polyethylene Pipe, 2009.
(2) Chevron Phillips Engineering Manual, 2003. "Buried Pipe Design"

Golder Associates
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Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
Job No.	083-82734.47	By:	HH	Date	3/25/2016
Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
		Rev:	KSB		

OBJECTIVE

Determine the structural stability of the dewatering pipes under the asumed design height of refuse, given the new design of the landfill.

METHOD

1. Determine the maximum vertical pressure acting on the leachate collection pipe.

2. Evaluate the pipe for:

a. Wall Crushing b. Wall Buckling c. Ring Deflection
as described in Reference 1.

PARAMETERS

Final Cover Max. Elevation:	330	ft (Permitted maximum height)			
Elevation of Protective Cover at Cover Max. Elev:		329.5	ft.		
Height of Refuse	327 ft		Unit wt. of refuse =	75 pcf	= 2030lb/yd^3
Height of Veg. Layer	0.5 ft		Unit weight of soil =	120 pcf	
Height of Barrier Layer	1.5 ft				
Height of Intermediate Cover	1.0 ft				
Height of Pipe Tench	3.0 ft				
(Soil Modulus (E') =	2,250	(Ref. 1, p. 214 reduced by 25%)	Unit weight of soil =	120 pcf	
Nominal Pipe Diameter	4.0 in				
Compressive Strength of pipe	1,150	(Ref. 1, p.102)			
Elastic Mod. of HDPE (E)	130,000	(Ref. 1, p.101)			
Allow. Ring Deflection	4%	(Ref. 1, p.218)			
DR	9				
Outside Pipe Diameter	2.38	in.			
Inside Diameter (D_I)	1.82	in.			
Mean Diamter (D_M)	2.12	(Ref. 1, p. 211)			
Wall Thickness	0.26	in.			

CALCULATIONS

Computation of the vertical stress acting on pipe -

s_v = Soil unit weight x (H_{cover} + $H_{barrier}$ + $H_{intermediate}$) + Unit weight of rock x H_{rock} + Unit weight of refuse x H_{refuse}

s_v = 25,245 or 175.3 psi (Prism Load)

Design for Wall Crushing -

$$S_A = \frac{D_o \times s_v}{288 \times t} = 790 \text{ psi}$$ (ref. 1 , page 220) < 1,150 psi for PE4710 pipe strength, therefore **OK**.

Golder Associates 3730 Chamblee Tucker Road Atlanta, Georgia 30341	Subject:	STABILITY OF LFG COLLECTION PIPES UNDER MAXIMUM HEIGHT OF REFUSE				
	Job No.	083-82734.47	By:	HH	Date	3/25/2016
	Ref.	Dewatering System Design	Chk'd:	DEG	Sheet	
			Rev:	KSB		

Design for Wall Buckling -

$$P_{wc} = \frac{5.65}{FOS}\sqrt{\frac{RB'E' * E}{12(DR-1)^3}} =$$ (ref. 1, page 221)

Where

P_{wc} = allowable constrained bucklingpressure, lb/in^2

FOS = saftey factor

R = buoyancy reduction factor

R = 1-0.33*H'/H

H' = groundwater height above pipe, ft

H = cover above pipe, ft

B = elastic support factor

$B' = 1/ (1+4\ e^{(-0.065H)})$

E' = soil reaction modulus, lb/in^2

Therefore

R = 1 (H' = 0)

B'= 1

For FOS = 2

P_{wc} = 616 psi or 88,760 psf

> the Prism Load of 25,245 psf

therefore pipes will not crush

Design for Ring Deflection

Spangler's Modified Iowa Formula for Plexco pipe is used to calculate the ring deflection (ref. 1, page 211).

$$\frac{\Delta X}{D_I} = \frac{P_T}{144}\left(\frac{KL}{\frac{2E}{3}\left(\frac{1}{DR-1}\right)^3 + 0.061E'}\right)$$

Where:

ΔX = in, horizontal deflection

K = 0.1 bedding factor

L = 1.00 deflection lag factor (page 216, ref. 1)

P_T = 25,245 lb/ft^2, pipe crown vertical pressure

E = 130,000 psi (tensile modulus of elasticity)

E' = 2,250 psi, Soil modulus 3000-25% = 750

DR = 9 Dimension ratio

D_I = 1.82 in, Inside diameter

$\frac{\Delta X}{D_I}$ = 0.0572

% Deflection = 5.7194318 %

Then calculate ring bending strain to verify that calculated % Deflection is acceptable:

$$\in = f_D \frac{\Delta X}{D_M} \frac{2C}{D_M}$$ (Ref. 2, P. 112)

Where:

Є =	wall strain, %		
ΔX =	0.1039	Deflection, in	
f_D =	6	deformation shape factor	
D_M =	2.12	mean diameter, in	$D_M = D_O - 1.06t$
t =	0.26	min. wall thickness for ISCO PE4710 IPS, in	
C =	0.13992	outer fiber to wall centroid, in	C=0.5(1.06t)

Є = 3.89 % is < 4% Pipes will not crush

CONCLUSIONS

Based on the calculations, 2" air supply pipes will maintain integrity.

REFERENCES

(1) Plastic Pipe Handbook of Polyethylene Pipe, 2009.

(2) Chevron Phillips Engineering Manual, 2003. "Buried Pipe Design"

B.2 – Approximate Values for the Condition of a Rapidly Increasing Stress OR Strain

B.2.1 – Values for the Base Temperature of 73°F (23°C)

TABLE B.2.1

Rate of Increasing Stress	Approximate Values of Apparent Modulus for 73°F (23°C)					
	For Materials Coded PE2XXX (1)		For Materials Coded PE3XXX (1)		For Materials Coded PE4XXX (1)	
	psi	MPa	psi	MPa	psi	MPa
"Short term" (Results Obtained Under Tensile Testing) (2)	100,000	690	125,000	862	130,000	896
"Dynamic" (3)	150,000psi (1,034MPa), For All Designation Codes					

(1) See Chapter 5 for an explanation of the PE Pipe Material Designation Code. The X's designate any numeral that is recognized under this code.

(2) Under ASTM D638, "Standard Test Method for Tensile Properties of Plastics", a dog–bone shaped specimen is subjected to a constant rate of pull. The "apparent modulus" under this method is the ratio of stress to strain that is achieved at a certain defined strain. This apparent modulus is of limited value for engineering design.

(3) The dynamic modulus is the ratio of stress to strain that occurs under instantaneous rate of increasing stress, such as can occur in a water-hammer reaction in a pipeline. This modulus is used as a parameter for the computing of a localized surge pressure that results from a water hammer event.

B.2.2 – Values for Other Temperatures

The values for other temperatures may be determined by applying a multiplier, as follows, to the base temperature value:

- For Short-Term Apparent Modulus – Apply the multipliers in Table B.1.2
- For Dynamic Apparent Modulus – Apply the multipliers in Table B.2.2

TABLE B.2.2
Dynamic Modulus, Temperature Compensating Multipliers

Temperature , °F (°C)	Multiplier
40 (4)	1.78
50 (10)	1.52
60 (16)	1.28
73.4 (23)	1.00
80 (27)	0.86
90 (32)	0.69
100 (38)	0.53
110 (43)	0.40
120 (49)	0.29

Appendix C
Allowable Compressive Stress

Table C.1 lists allowable compressive stress values for 73°F (23°C). Values for allowable compressive stress for other temperatures may be determined by application of the same multipliers that are used for pipe pressure rating (See Table A.2).

TABLE C.1
Allowable Compressive Stress for 73°F (23°C)

	Pe Pipe Material Designation Code (1)					
	PE 2406		PE3408		PE 4710	
	PE 2708		PE 3608			
			PE 3708			
			PE 3710			
			PE 4708			
	psi	MPa	psi	MPa	psi	MPa
Allowable Compressive Stress	800	5.52	1000	6.90	1150	7.93

(1) See Chapter 5 for an explanation of the PE Pipe Material Designation Code.

Appendix D
Poisson's Ratio

Poisson's Ratio for ambient temperature for all PE pipe materials is approximately 0.45.

This 0.45 value applies both to the condition of tension and compression. While this value increases with temperature, and vice versa, the effect is relatively small over the range of typical working temperatures.

in the Iowa Formula in 1941. R. Watkins [5] modified this equation to allow a simpler approach for soil characterization, thus developing the Modified Iowa Formula. In 1964, Burns and Richards [6] published a closed-form solution for ring deflection and pipe stress based on classical linear elasticity. In 1976 M. Katona et. al. [7] developed a finite element program called CANDE (Culvert Analysis and Design) which is now available in a PC version and can be used to predict pipe deflection and stresses.

The more recent solutions may make better predictions than the Iowa Formula, but they require detailed information on soil and pipe properties, e.g. more soil lab testing. Often the improvement in precision is all but lost in construction variability. Therefore, the Modified Iowa Formula remains the most frequently used method of determining ring deflection.

Spangler's Modified Iowa Formula can be written for use with solid wall PE pipe as:

(3-10)

$$\frac{\Delta X}{D_M} = \frac{1}{144}\left(\frac{K_{BED}\, L_{DL} P_E + \mathrm{K_{BED}P_L}}{\frac{2E}{3}\left(\frac{1}{DR - 1}\right)^3 + 0.061 F_S E'} \right)$$

and for use with ASTM F894 profile wall pipe as:

(3-11)

$$\frac{\Delta X}{D_I} = \frac{P}{144}\left(\frac{K_{BED} L_{\mathrm{DL}}}{\frac{1.24(RSC)}{D_M} + 0.061 F_S E'} \right)$$

WHERE

ΔX = **Horizontal deflection, in**

K_{BED} = **Bedding factor, typically 0.1**

L_{DL} = **Deflection lag factor**

P_E = **Vertical soil pressure due to earth load, psf**

P_L = **Vertical soil pressure due to live load, psf**

E = **Apparent modulus of elasticity of pipe material, lb/in^2**

E' = **Modulus of Soil reaction, psi**

F_S = **Soil Support Factor**

RSC = **Ring Stiffness Constant, lb/ft**

DR = **Dimension Ratio, OD/t**

D_M = **Mean diameter (D_I+2z or D_O-t), in**

z = **Centroid of wall section, in**

t = **Minimum wall thickness, in**

D_I = **pipe inside diameter, in**

D_O = **pipe outside diameter, in**

TABLE 3-7
Values of E' for Pipe Embedment (See Howard [8])

Soil Type-pipe Embedment Material (Unified Classification System)[1]	E' for Degree of Embedment Compaction, lb/in^2			
	Dumped	Slight, <85% Proctor, <40% Relative Density	Moderate, 85%-95% Proctor, 40%-70% Relative Density	High, >95% Proctor, >70% Relative Density
Fine-grained Soils (LL > 50)[2] Soils with medium to high plasticity; CH, MH, CH-MH	No data available: consult a competent soils engineer, otherwise, use E' = 0.			
Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with less than 25% coarse grained particles.	50	200	400	1000
Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with more than 25% coarse grained particles; Coarse-grained Soils with Fines, GM, GC, SM, SC[3] containing more than 12% fines.	100	400	1000	2000
Coarse-grained soils with Little or No Fines GW, GP, SW, SP[3] containing less than 12% fines	200	1000	2000	3000
Crushed Rock	1000	3000	3000	3000
Accuracy in Terms of Percentage Deflection[4]	±2%	±2%	±1%	±0.5%

[1] ASTM D-2487, USBR Designation E-3
[2] LL = Liquid Limit
[3] Or any borderline soil beginning with one of these symbols (i.e., GM-GC, GC-SC).
[4] For ±1% accuracy and predicted deflection of 3%, actual deflection would be between 2% and 4%.

Note: Values applicable only for fills less than 50 ft (15 m). Table does not include any safety factor. For use in predicting initial deflections only; appropriate Deflection Lag Factor must be applied for long-term deflections. If embedment falls on the borderline between two compaction categories, select lower E' value, or average the two values. Percentage Proctor based on laboratory maximum dry density from test standards using 12,500 ft-lb/cu ft (598,000 J/m^2) (ASTM D-698, AASHTO T-99, USBR Designation E-11). 1 psi = 6.9 KPa.

TABLE 3-9
Values of E'_N, Native Soil Modulus of Soil Reaction, Howard [3]

Native In Situ Soils				
Granular		Cohesive		E'_N (psi)
Std. Pentration ASTM D1586 Blows/ft	Description	Unconfined Compressive Strength (TSF)	Description	
> 0 - 1	very, very loose	> 0 - 0.125	very, very soft	50
1 - 2	very loose	0.125 - 0.25	very soft	200
2 - 4	very loose	0.25 - 0.50	soft	700
4 - 8	loose	0.50 - 1.00	medium	1,500
8 - 15	slightly compact	1.00 - 2.00	stiff	3,000
15 - 30	compact	2.00 - 4.00	very stiff	5,000
30 - 50	dense	4.00 - 6.00	hard	10,000
> 50	very dense	> 6.00	very hard	20,000
Rock	–	–	–	50,000

TABLE 3-10
Soil Support Factor, F_S

E'_N/E'	B_d/D_O 1.5	B_d/D_O 2.0	B_d/D_O 2.5	B_d/D_O 3.0	B_d/D_O 4.0	B_d/D_O 5.0
0.1	0.15	0.30	0.60	0.80	0.90	1.00
0.2	0.30	0.45	0.70	0.85	0.92	1.00
0.4	0.50	0.60	0.80	0.90	0.95	1.00
0.6	0.70	0.80	0.90	0.95	1.00	1.00
0.8	0.85	0.90	0.95	0.98	1.00	1.00
1.0	1.00	1.00	1.00	1.00	1.00	1.00
1.5	1.30	1.15	1.10	1.05	1.00	1.00
2.0	1.50	1.30	1.15	1.10	1.05	1.00
3.0	1.75	1.45	1.30	1.20	1.08	1.00
5.0	2.00	1.60	1.40	1.25	1.10	1.00

Lag Factor and Long-Term Deflection

Spangler observed an increase in ring deflection with time. Settlement of the backfill and consolidation of the embedment under the lateral pressure from the pipe continue to occur after initial installation. To account for this, he recommended applying a lag factor to the Iowa Formula in the range of from 1.25 to 1.5. Lag occurs in installations of both plastic and metal pipes. Howard [3, 11] has shown that the lag factor varies with the type of embedment and the degree of compaction. Many plastic pipe designers use a Lag Factor of 1.0 when using the prism load as it

crown may completely reverse its curvature inward and collapse. See Figure 3-1A. A deflection limit of 7.5% provides at least a 3 to 1 safety factor against reverse curvature.

Bending strain occurs in the pipe wall as a result of ring deflection—outer-fiber tensile strain at the pipe springline and outer-fiber compressive strain at the crown and invert. While strain limits of 5% have been proposed, Jansen [12] reported that, on tests of PE pipe manufactured from pressure-rated resins and subjected to soil pressure only, "no upper limit from a practical design point of view seems to exist for the bending strain." In other words, as deflection increases, the pipe's performance limit will not be overstraining but reverse curvature collapse.

Thus, for non-pressure applications, a 7.5 percent deflection limit provides a large safety factor against instability and strain and is considered a safe design deflection. Some engineers will design profile wall pipe and other non-pressure pipe applications to a 5% deflection limit, but allow spot deflections up to 7.5% during field inspection.

The deflection limits for pressurized pipe are generally lower than for non-pressurized pipe. This is primarily due to strain considerations. Hoop strain from pressurization adds to the outer-fiber tensile strain. But the internal pressure acts to reround the pipe and, therefore, Eq. 3-10 overpredicts the actual long-term deflection for pressurized pipe. Safe allowable deflections for pressurized pipe are given in Table 3-11. Spangler and Handy [13] give equations for correcting deflection to account for rerounding.

TABLE 3-11
Safe Deflection Limits for Pressurized Pipe

DR or SDR	Safe Deflection as % of Diameter
32.5	7.5
26	7.5
21	7.5
17	6.0
13.5	6.0
11	5.0
9	4.0
7.3	3.0

*Based on Long-Term Design Deflection of Buried Pressurized Pipe given in ASTM F1962.

Equation 3-14 may overstate the wall stress in profile pipe. Ring deflection in profile wall pipe induces arching. The "Deep Fill Installation" section of this chapter discusses arching and gives equations for calculating the earth pressure resulting from arching, P_{RD}. P_{RD} is given by Equation 3-23 and may be substituted for PE to determine the wall compressive stress when arching occurs.

The compressive stress in the pipe wall can be compared to the pipe material allowable compressive stress. If the calculated compressive stress exceeds the allowable stress, then a lower DR (heavier wall thickness) or heavier profile wall is required.

Allowable Compressive Stress

Allowable long-term compressive stress values for the several PE material designation codes can be found in Appendix, Chapter 3.

The long-term compressive stress value should be reduced for elevated temperature pipeline operation. Temperature design factors used for hydrostatic pressure may be used. See temperature re-rating or adjustment factors in the Appendix, Chapter 3.

Ring Compression Example

Find the pipe wall compressive ring stress in a DR 32.5 PE4710 pipe buried under 46 ft of cover. The ground water level is at the surface, the saturated weight of the insitu silty-clay soil is 120 lbs/ft3.

SOLUTION: Find the vertical earth pressure acting on the pipe. Use Equation 3-1.

Although the net soil pressure is equal to the buoyant weight of the soil, the water pressure is also acting on the pipe. Therefore the total pressure (water and earth load) can be found using the saturated unit weight of the soil.

Next, solve for the compressive stress.

$$P_E = (120\quad)(46\ ) = \quad 20$$

$$S = \frac{(\quad 20\qquad ^2)(32.\ )}{2} = 623\qquad ^2$$

The compressive stress is well below the allowable limit of 1150 psi for the PE4710 material given in the Appendix, Chapter 3.

Constrained (Buried) Pipe Wall Buckling

Excessive compressive stress (or thrust) may cause the pipe wall to become unstable and buckle. Buckling from ring compressive stress initiates locally as a large "dimple," and then grows to reverse curvature followed by structural collapse. Resistance to buckling is proportional to the wall thickness divided by the diameter

DriscoPlex™ 2000 SPIROLITE® pipe is manufactured to ASTM F 894, which states that profile pipe designed for 7.5% deflection will perform satisfactorily when installed in accordance with ASTM D 2321. Deflection is measured at least 30 days after installation.

Manufacturing processes for DriscoPlex™ 2000 SPIROLITE® and DriscoPlex™ OD controlled pipe differ. Deflection limitations for OD controlled pipe are controlled by long-term material strain.

Ring Bending Strain

As pipe deflects, bending strains occur in the pipe wall. For an elliptically deformed pipe, the pipe wall ring bending strain, ε, can be related to deflection:

$$\varepsilon = f_D \frac{\Delta X}{D_M} \frac{2C}{D_M} \qquad \textbf{(7-39)}$$

Where

ε	=	wall strain
f_D	=	deformation shape factor
ΔX	=	deflection, in
D_M	=	mean diameter, in
C	=	distance from outer fiber to wall centroid, in

For DriscoPlex™ 2000 SPIROLITE® pipe

$$C = h - z \qquad \textbf{(7-40)}$$

For DriscoPlex™ OD Controlled pipe

$$C = 0.5(1.06t) \qquad \textbf{(7-41)}$$

Where

h	=	pipe wall height, in
z	=	pipe wall centroid, in
t	=	pipe minimum wall thickness, in

For elliptical deformation, $f_D = 4.28$. However, buried pipe rarely has a perfectly elliptical shape. Irregular deformation can occur from installation forces such as compaction variation alongside the pipe. To account for the non-elliptical shape many designers use $f_D = 6.0$.

Lytton and Chua report that for high performance polyethylene materials such as those used by Performance Pipe, 4.2% ring bending strain is a conservative value for non-pressure pipe. Jansen reports that high performance polyethylene material at an 8% strain level has a life expectancy of at least 50 years.

When designing non-pressure heavy wall OD controlled pipe (DR less than 17), and high RSC (above 200) DriscoPlex™ 2000 SPIROLITE® pipe, the ring bending strain at the predicted deflection should be calculated and compared to the allowable strain.

In pressure pipe, the combined stress from deflection and internal pressure should not exceed the material's long-term design stress rating. Combined stresses are incorporated into Table 7-9 values, which presumes deflected pipe at full pressure. At reduced pressure, greater deflection is allowable.