Citrus County
Citrus Co. LF
Permit File

4009C00086
NAC 39859

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

January 18, 2001

Mr Kim B. Ford, P.E.
Florida Department of Environmental Protection
Southwest District - Solid Waste Section
3804 Coconut Palm Drive
Tampa, FL 33619-8318

RE: Citrus County Central Landfill
Class I Landfill Geomembrane Remediation
Permit No. SO09-247381
JEA Project No.: 03860-004-01-1000

Dear Mr. Ford:

Enclosed please find the construction permit application, construction drawings, and supporting information for the project referenced above. Additional copies of the permit application package have been forwarded to Mr. Bob Butera, and Mr. Richard Tedder, as requested.

The objective of the proposed construction project is to remediate sections of the existing geomembrane bottom liner which has suffered from, or will be subject to, stress-cracking. The geomembrane liner and causes of stress-cracking were investigated by Dr. Ian Peggs of I-CORP International, Inc. (July 20, 2000). Liner remediation alternatives, based on Dr. Peggs' investigative conclusions, and additional analyses, were assessed by Jones, Edmunds & Associates, Inc. and forwarded to the Florida Department of Environmental Protection (FDEP) in correspondence dated October 10, 2000. The proposed liner remediation consists of contracting with a geomembrane installer to place a new, 60-mil, HDPE, textured, geomembrane in the presently-exposed liner areas, as shown on enclosed construction drawings. In addition, a stormwater geomembrane will be installed once a layer of solid waste is placed along the side slope. The stormwater geomembrane will provide erosion control and better leachate management.

If you have any questions, please call me at 352/377-5821.

Sincerely,

David A. Keough, P.E.
Vice President

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Enclosures

XC: Bob Butera, FDEP-Tampa
Richard Tedder, FDEP-Tallahassee
Susan Metcalfe, Citrus Co.

RECEIVED
JAN 2 2 2001
Solid Waste Section

730 NE Waldo Road, Bldg. A • Gainesville, Florida 32641 • Telephone (352) 377-5821 • FAX (352) 377-3166

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

DEP FORM # _____
Form Title Solid Waste Management Facility Permit
Effective Date May 19, 1994

DEP Application No. _____
(Filed by DEP)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOLID WASTE MANAGEMENT FACILITY PERMIT

APPLICATION INSTRUCTIONS AND FORMS

INSTRUCTIONS TO APPLY FOR A SOLID WASTE AGREEMENT PERMIT

1. General

Solid Waste Management Facilities shall be permitted pursuant to Section 403.707, Florida Statutes, (FS) and in accordance with Florida Administrative Code (FAC) Chapter 62-701. A minimum of six copies of the application shall be submitted to the Department District Office having jurisdiction over the facility. The appropriate fee in accordance with Chapter 62-4, FAC, and Rule 62-701.320(5)(c), 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, B, D through R, and T
B. Asbestos Monofills - Submit parts A, B, D, E, F, I, K, M through Q, and T
C. Industrial Solid Waste Facilities - Submit parts A, B, D through Q, and T
D. Volume Reduction Facilities - Submit parts A, C, D, S, and T
E. Materials Recovery Facilities - Submit parts A, C, D, S, and T

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, C, D, and E 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, N through R, and T
B. Asbestos Monofills - Submit parts A, B, M through Q, and T
C. Industrial Solid Waste Facilities - Submit parts A, B, N through Q, and T
D. Volume Reduction Facilities - Submit parts A, C, S, and T
E. Materials Recovery Facilities - Submit parts A, C, S, and T

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 - MATERIALS RECOVERY / VOLUME REDUCTION FACILITY GENERAL INFORMATION

PART D - SOLID WASTE MANAGEMENT FACILITY PERMIT GENERAL REQUIREMENTS

PART E - LANDFILL PERMIT GENERAL 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 - LANDFILL CLOSURE REQUIREMENTS

PART O - CLOSURE PROCEDURES

PART P - LONG-TERM CARE REQUIREMENTS

PART Q - FINANCIAL RESPONSIBILITY REQUIREMENTS

PART R - CLOSURE OF EXISTING LANDFILL REQUIREMENTS

PART S - MATERIALS RECOVERY FACILITY REQUIREMENTS

PART T - CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

Please Type or Print

A. GENERAL INFORMATION

1. Type of Facility

Disposal [X]

Class I Landfill	[X]	Ash Monofill	[ ]
Class II Landfill	[ ]	Asbestos Monofill	[ ]
Class III Landfill	[ ]	Industrial Solid Waste	[ ]
Other	[ ]	_____	

Volume Reduction [ ]

Incinerator	[ ]	Pulverizer / Shredder	[ ]
Composing	[ ]	Compactor / Baling Plant	[ ]
Materials Recovery	[ ]	Energy Recovery	[ ]
Other	[ ]	_____	

2. Type of Application:

Construction	[X]	Construction / Operation	[ ]
Operation	[ ]	Closure	[ ]

3. Classification of application:

New	[X]	Substantial Modification	[ ]
Renewal	[ ]	Minor Modification	[ ]

4. Facility name: Citrus County Central Landfill

5. DEP ID number: 4009C00086 County: Citrus

6. Facility location (main entrance): State Road 44 between Lecanto and Inverness, Florida

7. Location coordinates: _____

Section: 1 Township: 19S Range: 18E

UTMs: Zone _____ _____ km E _____ km N

Latitude: 28 ° 51 ' 08 " Longitude: 82 ° 26 ' 38 "

8. Applicant name (operating authority): Citrus County Board of County Commissioners

Mailing address: P.O. Box 340 Lecanto FL 34460

Street or P.O. Box City State Zip

Contact person: Susan Metcalfe, PG Telephone: (904) 746-5000

Title: Solid Waste Management Division Director

9. Authorized agent / Consultant: Jones, Edmunds & Associates, Inc.

Mailing address: 730 NE Waldo Road, Building A Gainesville FL 32641

Street or P.O. Box City State Zip

Contact person: David A. Keough, PE Telephone(352) 377-5821

Title: Project Manager

10. Landowner (if different than applicant): _____

Mailing address: _____

Street or P.O. Box City State Zip

Contact person: _____ Telephone ( )

11. Cities, towns, and areas to be served: Citrus County

12. Population to be served:

Current: 117,500 (FY2000) Five-year Projection: 129,500 (FY2005)

13. Volume of solid waste to be received: 90,000 (FY2001 estimated) tons/year

14. Date site will be ready to be inspected for completion: March 2001

15. Estimated life of facility: 3 years years

16. Estimated costs:

Total Construction: $ 750,000* Closing Costs: $ 2,756,705 (1 & 1A)

17. Anticipated construction starting and completion dates:

From: February 2001 To: March 2001

* Cost of Geomembrane Remediation

B. DISPOSAL FACILITY GENERAL INFORMATION

1. Provide brief description of disposal facility design and operations planned by this application:
Remediate exposed geomembrane areas by installing new geomembrane.

2. Facility site supervisor: David Chamblin
Title: Section Chief Telephone: (352) 745-5000

3. Disposal area: Total 80* acres; Used 19.1** acres; Available 60.9 acres

4. Weighing scales used: Yes [X] No [ ]

5. Security to prevent unauthorized use: Yes [X] No [ ]

6. Charge for waste received: _____ $/yds^3 varies* $/ton

7. Surrounding land use, zoning:

Residential	[ ]	Industrial	[X]
Agricultural	[ ]	None	[ ]
Commercial	[X]	Other	[X] Conservation

8. Types of waste received:

Residential	[X]	C & D debris (mixed loads only)	[X]
Commercial	[X]	Shredded / cut tires	[ ]
Incinerator / WTE ash	[ ]	Yard trash	[X]
Treated biohazardous	[ ]	Septic tank	[ ]
Water treatment sludge	[ ]	Industrial	[X]
Air treatment sludge	[ ]	Industrial sludge	[ ]
Agricultural	[ ]	Domestic sludge	[X]
Asbestos	[X]		
Other	[ ]		

9. Salvaging permitted: Yes [ ] No [X]

10. Attendant: Yes [X] No [ ] Trained operator: Yes [X] No [ ]

11. Spotters: Yes [X] No [ ] Number of spotters used: minimum of one

12. Site located in: Floodplain [ ] Wetlands [ ] Other [X] upland

13. Property recorded as a Disposal Site in County Land Records: Yes [X] No [ ]

14. Days of operation: Monday - Saturday

15. Hours of operation: Monday-Friday: 6:30am-4:30pm; Holidays and Saturdays: 6:30am-2:30pm

16. Days Working Face covered: Monday - Saturday

17. Elevation of water table: 7 Ft. NGVD

* Total Citrus County Central Landfill Site
** Existing Phase 1 and 1A Disposal Area

18. Number of monitoring wells: 12

19. Number of surface monitoring points: 0

20. Gas controls used: Yes [ ] No [X] Type controls: Active [ ] Passive [ ]

Gas flaring: Yes [ ] No [ ] Gas recovery: Yes [ ] No [ ]

21. Landfill Unit - liner type:

Natural soils	[ ]	Double geomembrane	[X] 1A
Single clay liner	[ ]	Geomembrane & composite	[X] 1
Single geomembrane	[ ]	Double composite	[ ]
Single composite	[ ]	None	[ ]
Slurry wall	[ ]		
Other	[ ]		

22. Leachate collection method:

Collection pipes	[X]	Sand layer	[ ]
Geonets	[X]	Gravel layer	[ ]
Well points	[ ]	Interceptor trench	[ ]
Perimeter ditch	[ ]	None	[ ]
Other	[ ]		

23. Leachate storage method:

Tanks	[X]	Surface impoundments	[ ]
Other	[ ]		

24. Leachate treatment method:

Oxidation	[ ]	Chemical treatment	[X]
Secondary	[ ]	Settling	[ ]
Advanced	[X]	None	[ ]
Other	[ ]		

25. Leachate disposal method:

Recirculated	[ ]	Pumped to WWTP	[ ]
Transported to WWTP	[X]	Discharged to surface water	[ ]
Injection well	[ ]	Evaporation (i.e.: Perc Pond)	[X]
Other	[ ]		

26. For leachate discharged to surface waters:

Name and Class of receiving water:

27. Storm Water:

Collected: Yes [X] No [ ] Type of treatment: Dry retention

Name of Class of receiving water: None

28. Management and Storage of Surface Waters (MSSW) Permit number or status: Southwest Florida Water Management District #402023.02

C. MATERIALS RECOVERY / VOLUME REDUCTION FACILITY GENERAL INFORMATION

1. Provide brief description of materials recovery / volume reduction facility design and operations planned by this application:

   N/A _____

   _____

   _____

2. Facility site supervisor: _____

   Title: _____ Telephone: ( ) _____

3. Disposal area: Total ____acres; Used _____acres; Available_____acres

4. Security to prevent unauthorized use: Yes [ ] No [ ]

5. Site located in: Floodplain [ ] Wetlands [ ] Other [ ] _____

6. Days of operation: _____

7. Hours of operation: _____

8. Number of operating staff: _____

9. Expected useful life: _____Years

10. Weighing scales used: Yes [ ] No [ ]

11. Normal processing rate: _____yd^3/day _____ tons/day _____gal/day

12. Maximum processing rate: _____yd^3/day _____ tons/day _____gal/day

13. Charge for waste received: _____

14. Type of facility (check one or more):

Incinerator	[ ]	Composting	[ ]
Pulverizer/shredder	[ ]	Materials recovery	[ ]
Compactor/baling	[ ]	Energy recovery	[ ]
Sludge concentration	[ ]	Pyrolysis	[ ]
Other	[ ]	_____	

15. Material recovered, tons/week:

_____	Paper	_____	Glass
_____	Ferrous metals	_____	Non-ferrous metals
_____	Aluminum	_____	Plastics
_____	Other:	_____	

16. Energy recovery, in units shown:

_____	High pressure steam, lb/hr	_____	Chilled water, gal/hr
_____	Low pressure steam, lb/hr	_____	Oil, gal/hr
_____	Electricity, kw/hr	_____	Oil, BTU/hr
_____	Gas, ft^3/hr	_____	Gas, BTU/hr
_____	Other:	_____	

17. Process water management:

Recycled: Yes No

Treatment method used: _____

Discharged to: Surface waters [ ] Underground [ ] Other [ ]

18. Storm Water:

Collected: Yes [ ] No [ ] Type of treatment: _____

Name and Class of receiving water: _____

19. ERP Permit number or status: _____

20. Final residue produced:

_____ % of normal processing rate

_____ % of maximum processing rate

Disposed of at (Site name): _____

21. Supplemental fuel used:

Type: _____ Quantity used/hour: _____

22. Costs:

Estimated operating costs (material-energy revenue): $ _____

Total cost/ton: $ _____ Net cost/ton: $ _____

23. State pollution control bond financing amount: $ _____

24. Estimated amount of tax exemptions that will be requested: $ _____

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

S	LOCATION	N/A	N/C		
X				1.	Six copies, at minimum, of the completed application form, all supporting data and reports; (62-701.320(5)(a), FAC)
X				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)
X				3.	A letter of transmittal to the Department; (62-701.320(7) (a), FAC)
X				4.	A completed application form dated and signed by the applicant; (62-701.320(7)(b), FAC)
X				5.	Permit fee specified in Rule 62-4.050, FAC and Rule 62-701.320(5)(c), FAC in check or money order, payable to the Department; (62-701.320(7)(c), FAC)
	App. 1995, Letter 10/00, D.7		X	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)
	App. 1995, D.8		X	7.	Operation Plan; (62-701.320(7)(e)1, FAC)
	App. 1995, D.9		X	8.	Contingency Plan; (62-701.320(7)(e)2, FAC)
				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) showing; (62-702.320(7)(f), FAC)
	App. 1995, D.9		X		a. A regional map or plan with the project location;
	App. 1995, D.9		X		b. A vicinity map or aerial photograph no more than 1 year old;
	App. 1995, D.9		X		c. A site plan showing all property boundaries certified by a registered Florida land surveyor;

S	LOCATION	N/A	N/C		
X	App. 1995, Letter 10/00, D.9				d. Other necessary details to support the engineering report.
	App. 1995, D.10		X	10.	Proof of property ownership or a copy of appropriate agreements between the facility operator and property owner authorizing use of property; (62-701.320(7)(g), FAC)
	App. 1995, D.11		X	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 recycling goals contained in Section 403.706,FS; (62-701.320(7)(h), FAC)
	App. 1995, D.12		X	12.	Provide a history and description of any enforcement actions taken by the Department against the applicant for violations of applicable statutes, rules, orders or permit conditions relating to the operation of any solid waste management facility in this state; (62-701.320(7)(i), FAC)
	App. 1995, D.13		X	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)
	App. 1995, D.14		X	14.	Provide a description of how the requirements for airport safety will be achieved including proof of required notices if applicable; (62-701.320(12), FAC)

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

S	LOCATION	N/A	N/C		
____	App. 1995, E.1	____	X	1.	Vicinity map or aerial photograph no more than 1 year old and of appropriate scale showing land use and local zoning within one mile of the landfill and of sufficient scale to show all homes or other structures, water bodies, and roads other significant features of the vicinity. All significant features shall be labeled; (62-701.330(4)(a), FAC)
____	App. 1995, E.2	____	X	2.	Vicinity map or aerial photograph no more than 1 year old showing all airports that are located within five miles of the proposed landfill; (62-701.330(4)(b), FAC)
____	App. 1995, E.3	____	X	3.	Plot plan with a scale not greater than 200 feet to the inch showing; (62-701.330(4)(c), FAC)
____	App. 1995, E.3	____	X		a. Dimensions;
____	App. 1995, E.3	____	X		b. Locations of proposed and existing water quality monitoring wells;
____	App. 1995, E.3	____	X		c. Locations of soil borings;
____	App. 1995, E.3	____	X		d. Proposed plan of trenching or disposal areas;
____	App. 1995, E.3	____	X		e. Cross sections showing original elevations and proposed final contours which shall be included either on the plot plan or on separate sheets;
____	App. 1995, E.3	____	X		f. Any previously filled waste disposal areas;
____	App. 1995, E.3	____	X		g. Fencing or other measures to restrict access.
				4.	Topographic maps with a scale not greater than 200 feet to the inch with 5-foot contour intervals showing; (62-701.330(4)(d), FAC):
____	App. 1995, E.4	____	X		a. Proposed fill areas;
____	App. 1995, E.4	____	X		b. Borrow areas;
____	App. 1995, E.4	____	X		c. Access roads;
____	App. 1995, E.4	____	X		d. Grades required for proper drainage;
____	App. 1995, E.4	____	X		e. Cross sections of lifts;
____	App. 1995, E.4	____	X		f. Special drainage devices if necessary;
____	App. 1995, E.4	____	X		g. Fencing;
____	App. 1995, E.4	____	X		h. Equipment facilities.

S	LOCATION	N/A	N/C		
				5.	A report on the landfill describing the following; (62-701.330(4)(e), FAC)
____	App. 1995, E.5	____	X		a. The current and projected population and area to be served by the proposed site;
____	App. 1995, E.5	____	X		b. The anticipated type, annual quantity, and source of solid waste, expressed in tons;
____	App. 1995, E.5	____	X		c. The anticipated facility life;
____	App. 1995, E.5	____	X		d. The source and type of cover material used for the landfill.
____	App. 1995, E.5	____	X	6.	Provide evidence that an approved laboratory shall conduct water quality monitoring for the facility in accordance with Rule 62-160, FAC; (62-701.330(4)(h), FAC)
____	App. 1995, E.5	____	X	7.	Provide a statement of how the applicant will demonstrate financial responsibility for the closing and long-term care of the landfill; (62-701.330(4)(i), FAC)

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

____	App. 1995, F.1	____	X	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 is a washout of solid waste; (62-701.340(4)(b), FAC)
____	App. 1995, F.2	____	X	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(4)(c), FAC)
____	App. 1995, F.3	____	X	3.	Describe what methods shall be taken to screen the landfill from public view where such screening can practically be provided; (62-701.340(4)(d), FAC)

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

S	LOCATION	N/A	N/C	
____	App. 1995, G.1	____	X	1. Describe how the landfill shall be designed so that solid waste disposal units will be constructed and closed at planned intervals throughout the design period of the landfill; (62-701.400(2), FAC)
				2. Landfill liner requirements; (62-701.400(3), FAC)
				a. General construction requirements; (62-701.400(3)(a), FAC):
X	CQA, 12/00	____	____	(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;
____	App. 1995, G.2.a	____	X	(2) Document foundation is adequate to prevent liner failure;
____	App. 1995, G.2.a	____	X	(3) Constructed so bottom liner will not be adversely impacted by fluctuations of the ground water;
____	App. 1995, G.2.a	____	X	(4) Designed to resist hydrostatic uplift if bottom liner located below seasonal high ground water table;
____	App. 1995, G.2.a	____	X	(5) Installed to cover all surrounding earth which could come into contact with the waste or leachate.
				b. Composite liners; (62-701.400(3)(b), FAC)
____	App. 1995, G.2.b	X	____	(1) Upper geomembrane thickness and properties;
____	App. 1995, G.2.b	____	X	(2) Design leachate head for primary LCRS including leachate recirculation if appropriate;
____	App. 1995, G.2.b	____	X	(3) Design thickness in accordance with Table A and number of lifts planned for lower soil component.
				c. Double liners; (62-701.400(3)(c), FAC)
____	App. 1995, G.2.c	X	____	(1) Upper and lower geomembrane thicknesses and properties;
____	App. 1995, G.2.c	X	____	(2) Design leachate head for primary LCRS to limit the head to one foot above the liner;
____	App. 1995, G.2.c	X	____	(3) Lower geomembrane sub-base design;
____	App. 1995, G.2.c	X	____	(4) Leak detection and secondary leachate collection system minimum design criteria ($k \geq 1$ cm/sec, head on lower liner ≤ 1 inch, head not to exceed thickness of drainage layer);

S	LOCATION	N/A	N/C	
				d. Standards for geomembranes; (62-701.400 (3) (d), FAC)
X	CQA, 12/00			(1) Field seam test methods to ensure all field seams are at least 90 percent of the yield strength for the lining material;
X	App. 1995 G.2.d, Letter 10/00			(2) Design of 24-inch-thick protective layer above upper geomembrane liner;
	App. 1995 G.2.d		X	(3) Describe operational plans to protect the liner and leachate collection system when placing the first layer of waste above 24-inch-thick protective layer.
				e. Geosynthetic specification requirements; (62-701.400(3) (e), FAC)
X	CQA, 12/00			(1) Definition and qualifications of the designer, manufacturer, installer, QA consultant and laboratory, and QA program;
X	CQA, 12/00			(2) Material specifications for geomembranes, geotextiles, geogrids, and geonets;
X	CQA, 12/00			(3) Manufacturing and fabrication specifications including geomembrane raw material and roll QA, fabrication personnel qualifications, seaming equipment and procedures, overlaps, trial seams, destructive and nondestructive seam testing, seam testing location, frequency, procedure, sample size and geomembrane repairs;
X	CQA, 12/00			(4) Geomembrane installation specifications including earthwork, conformance testing, geomembrane placement, installation personnel qualifications, field seaming and testing, overlapping and repairs, materials in contact with geomembrane and procedures for lining system acceptance;
	App. 1995, G.2.e		X	(5) Geotextile and geogrid specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials;
	App. 1995, G.2.e		X	(6) Geonet specification. including handling and placement, conformance testing, stacking and joining, repair, and placement of soil materials;

S	LOCATION	N/A	N/C	
				f. Standards for soil components (62-701.400(3)(f), FAC):
____	App. 1995, G.2.f	X	____	(1) Description of construction procedures including over-excavation and backfilling to preclude structural inconsistencies and procedures for placing and compacting soil component in layers;
____	App. 1995, G.2.f	X	____	(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;
____	App. 1995, G.2.f	X	____	(3) Procedures for testing in-situ soils to demonstrate they meet the specifications for soil liners;
				(4) Specifications for soil component of liner including at a minimum:
____	App. 1995, G.2.f	X	____	(a) Allowable particle size distribution, Atterberg limits, shrinkage limit;
____	App. 1995, G.2.f	X	____	(b) Placement moisture and dry density criteria;
____	App. 1995, G.2.f	X	____	(c) Maximum laboratory-determined saturated hydraulic conductivity using simulated leachate;
____	App. 1995, G.2.f	X	____	(d) Minimum thickness of soil liner;
____	App. 1995, G.2.f	X	____	(e) Lift thickness;
____	App. 1995, G.2.f	X	____	(f) Surface preparation (scarification);
____	App. 1995, G.2.f	X	____	(g) Type and percentage of clay mineral within the soil component;
____	App. 1995, G.2.f	X	____	(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.
				3. Leachate collection and removal system (LCRS); (62-701.400(4), FAC)
				a. The primary and secondary LCRS requirements; (62-701.400(4)(a), FAC)
____	App. 1995, G.3.a	____	X	(1) Constructed of materials chemically resistant to the waste and leachate;
____	App. 1995, G.3.a	____	X	(2) Have sufficient mechanical properties to prevent collapse under pressure;

S	LOCATION	N/A	N/C	
____	App. 1995, G.3.a	X	____	(3) Have granular material or synthetic geotextile to prevent clogging;
____	App. 1995, G.3.a	X	____	(4) Have method for testing and cleaning clogged pipes or contingent designs for rerouting leachate around failed areas;
				b. Primary LCRS requirements; (62-701.400(4)(b), FAC)
____	App. 1995, G.3.b	X	____	(1) Bottom 12 inches having hydraulic conductivity $\geq 1 \times 10^{-3}$ cm/sec;
____	App. 1995, G.3.b	X	____	(2) Total thickness of 24 inches of material chemically resistant to the waste and leachate;
____	App. 1995, G.3.b	X	____	(3) Bottom slope design to accommodate for predicted settlement;
____	App. 1995, G.3.b	X	____	(4) Demonstration that synthetic drainage material, if used, is equivalent or better than granular material in chemical compatibility, flow under load and protection of geomembrane liner.
				4. Leachate recirculation; (62-701.400(5), FAC)
____	App. 1995, G.4	X	____	a. Describe general procedures for recirculating leachate;
____	App. 1995, G.4	X	____	b. Describe procedures for controlling leachate runoff and minimizing mixing of leachate runoff with storm water;
____	App. 1995, G.4	X	____	c. Describe procedures for preventing perched water conditions and gas buildup;
____	App. 1995, G.4	X	____	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;
____	App. 1995, G.4	X	____	e. Describe methods of gas management to control odors and migration of methane;
____	App. 1995, G.4	X	____	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	LOCATION	N/A	N/C	
				5. Leachate storage tanks and leachate surface impoundments; (62-701.400(6), FAC)
				a. Surface impoundment requirements; (62-701.400(6)(b), FAC)
____	App. 1995, G.5.a	X	____	(1) Documentation that the design of the bottom liner will not be adversely impacted by fluctuations of the ground water;
____	App. 1995, G.5.a	X	____	(2) Designed in segments to allow for inspection and repair as needed without interruption of service;
				(3) General design requirements;
____	App. 1995, G.5.a	X	____	(a) Double liner system consisting of an upper and lower 60-mil minimum thickness geomembrane;
____	App. 1995, G.5.a	X	____	(b) Leak detection and collection system with hydraulic conductivity $\geq$ 1 cm/sec;
____	App. 1995, G.5.a	X	____	(c) Lower geomembrane placed on subbase $\geq$ 6 inches thick with $k \leq 1x10^{-5}$ cm/sec;
____	App. 1995, G.5.a	X	____	(d) Design calculation to predict potential leakage through the upper liner;
____	App. 1995, G.5.a	X	____	(e) Daily inspection requirements and notification and corrective action requirements if leakage rates exceed that predicted by design calculations;
____	App. 1995, G.5.a	X	____	(4) Description of procedures to prevent uplift, if applicable;
____	App. 1995, G.5.a	X	____	(5) Design calculations to demonstrate minimum two feet of freeboard will be maintained;
____	App. 1995, G.5.a	X	____	(6) Procedures for controlling vectors and off-site odors.
				b. Above-ground leachate storage tanks; (62-701.400(6)(c), FAC) .
____	App. 1995, G.5.b	X	____	(1) Describe tank materials of construction and ensure foundation is sufficient to support tank;
____	App. 1995, G.5.b	X	____	(2) Describe procedures for cathodic protection if needed for the tank;

S	LOCATION	N/A	N/C	
____	App. 1995, G.5.b	X	____	(3) Describe exterior painting and interior lining of the tank to protect it from the weather and the leachate stored;
____	App. 1995, G.5.b	X	____	(4) Describe secondary containment design to ensure adequate capacity will be provided and compatibility of materials of construction;
____	App. 1995, G.5.b	X	____	(5) Describe design to remove and dispose of stormwater from the secondary containment system;
____	App. 1995, G.5.b	X	____	(6) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling;
				(7) Inspections, corrective action and reporting requirements;
____	App. 1995, G.5.b	X	____	(a) Overfill prevention system weekly;
____	App. 1995, G.5.b	X	____	(b) Exposed tank exteriors weekly;
____	App. 1995, G.5.b	X	____	(c) Tank interiors when tank is drained or at least every three years;
____	App. 1995, G.5.b	X	____	(d) Procedures for immediate corrective action if failures detected;
____	App. 1995, G.5.b	X	____	(e) Inspection reports available for department review.
				c. Underground leachate storage tanks; (62-701.400(6)(d), FAC)
____	App. 1995, G.5.c	X	____	(1) Describe materials of construction;
____	App. 1995, G.5.c	X	____	(2) A-double-walled tank design system to be used with the following requirements;
____	App. 1995, G.5.c	X	____	(a) Interstitial space monitoring at least weekly;
____	App. 1995, G.5.c	X	____	(b) Corrosion protection provided for primary tank interior and external surface of outer shell;
____	App. 1995, G.5.c	X	____	(c) Interior tank coatings compatible with stored leachate;
____	App. 1995, G.5.c	X	____	(d) Cathodic protection inspected weekly and repaired as needed;
____	App. 1995, G.5.c	X	____	(3) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling and provide for weekly inspections;
____	App. 1995, G.5.c	X	____	(4) Inspection reports available for department review.
____	App. 1995, G.5.d	____	X	d. Schedule provided for routine maintenance of LCRS; (62-701.400(6)(e), FAC)

S	LOCATION	N/A	N/C	
				6. Liner systems construction quality assurance (CQA): (62-701.400(7), FAC)
X	CQA 12/00			a. Provide CQA Plan including:
X	CQA 12/00			(1) Specifications and construction requirements for liner system;
X	CQA 12/00			(2) Detailed description of quality control testing procedures and frequencies;
X	CQA 12/00			(3) Identification of supervising professional engineer;
X	CQA 12/00			(4) Identify responsibility and authority of all appropriate organizations and key personnel involved in the construction project;
X	CQA 12/00			(5) State qualifications of CQA professional engineer and support personnel;
X	CQA 12/00			(6) Description of CQA reporting forms and documents;
X	CQA 12/00			b. An independent laboratory experienced in the testing of geosynthetics to perform required testing;
				7. Soil Liner CQA (62-701.400(8)FAC)
	App. 1995, G.7	X		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;
	App. 1995, G.7	X		b. Description of field test section construction and test methods to be implemented prior to liner installation;
	App. 1995, G.7	X		c. Description of field test methods including rejection criteria and corrective measures to insure proper liner installation.
				8. Surface water management systems; (62-701.400(9), FAC)
	App. 1995, G.8.a	X		a. Design of surface water management system to isolate surface water from waste filled areas and to control stormwater run-off;
	App. 1995, G.8.a	X		b. Details of stormwater control design including retention ponds, detention ponds, and drainage ways;

S	LOCATION	N/A	N/C		
				9.	Gas control systems; (62-701.400(10), FAC)
____	App. 1995, G.9.a	____	X	a.	Design details for gas control system including collection pipes and vents, and passive venting or vacuum extraction details;
____	App. 1995, G.9.b	____	X	b.	Documentation that the gas control system will not impact the liner or leachate control system;
____	App. 1995, G.9.c	____	X	c.	Proposed methods of odor control including flaring designs in accordance with Chapter 62-296, FAC;
				d.	Description of a routine gas monitoring program to ensure gas control system is operating properly including:
____	App. 1995, G.9.d	____	X	(1)	Location of monitoring points;
____	App. 1995, G.9.d	____	X	(2)	Requirements for quarterly sampling of all monitoring points;
____	App. 1995, G.9.d	____	X	(3)	Description of corrective measures to be completed within 60 days of detection of elevated levels of explosive gases;
____	App. 1995, G.9.e	____	X	e.	Description of condensate collection and disposal methods.
				10.	Landfill gas recovery facilities; (62-701.400(11), FAC)
____	App. 1995, G.10.a	____	X	a.	Information required in Rules 62-701.320(7) and 62-701.330(4), FAC supplied;
____	App. 1995, G.10.b	____	X	b.	Information required in Rule 62-701.600(4), FAC supplied where relevant and practical;
____	App. 1995, G.10.c	____	X	c.	Estimate of current and expected gas generation rates and description of condensate disposal methods provided;
____	App. 1995, G.10.d	____	X	d.	Description of procedures for condensate sampling, analyzing and data reporting provided;
____	App. 1995, G.10.e	____	X	e.	Closure plan provided describing methods to control gas after recovery facility ceases operation;
____	App. 1995, G.10.f	____	X	f.	Performance bond provided to cover closure costs if not already included in other landfill closure costs.
____	App. 1995, G.11	X	____	11.	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 (12), FAC)

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

S	LOCATION	N/A	N/C		
				1.	Submit a hydrogeological investigation and site report including at least the following information:
____	App. 1995, H.1.a	____	X	a.	Regional and site specific geology and hydrogeology;
____	App. 1995, H.1.b	____	X	b.	Direction and rate of ground water and surface water flow including seasonal variations;
____	App. 1995, H.1.c	____	X	c.	Background quality of ground water and surface water;
____	App. 1995, H.1.d	____	X	d.	Any on-site hydraulic connections between aquifers;
____	App. 1995, H.1.e	____	X	e.	Site stratigraphy and aquifer characteristics for confining layers, semi-confining layers, and all aquifers below the landfill site that may be affected by the landfill;
____	App. 1995, H.1.f	____	X	f.	Site topography and soil characteristics;
____	App. 1995, H.1.g	____	X	g.	Inventory of all public and private water wells within a one-mile radius of the landfill including 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;
____	App. 1995, H.1.h	____	X	h.	Description of topography, soil types and surface water drainage systems;
____	App. 1995, H.1.i	____	X	i.	An inventory of all public and private water wells within one mile of the landfill.
____	App. 1995, H.1.j	____	X	j.	Existing contaminated areas on landfill site.
____	App. 1995, H.2	____	X	2.	Report signed, sealed and dated by PE or PG.

I. GEOTECHNICAL INVESTIGATION REQUIREMENTS (62-701.420, FAC)

S	LOCATION	N/A	N/C		
				1.	Submit a geotechnical site investigation report defining the engineering properties of the site including at least the following:
____	App. 1995, I.1.a	____	X	a.	Description of subsurface conditions including soil stratigraphy and ground water table conditions;
____	App. 1995, I.1.b	____	X	b.	Investigate for the presence of muck, previously filled areas, soft ground, lineaments and sink holes;
____	App. 1995, I.1.c	____	X	c.	Estimates of average and maximum high water table across the site;
				d.	Foundation analysis including:
____	App. 1995, I.1.d	____	X		(1) Foundation bearing capacity analysis;
____	App. 1995, I.1.d	____	X		(2) Total and differential subgrade settlement analysis;
____	App. 1995, I.1.d	____	X		(3) Slope stability analysis;
____	App. 1995, I.1.e	____	X	e.	Description of methods used in the investigation and includes soil boring logs, laboratory results, analytical calculations, cross sections, interpretations and conclusions;
____	App. 1995, I.1.f	____	X	f.	An evaluation of fault areas, seismic impact zones, and unstable areas as described in 40 CFR 258.13, 40 CFR 258.14 and 40 CFR 258.15.
____	App. 1995, I.2	____	X	2.	Report signed, sealed and dated by PE or PG.

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

S	LOCATION	N/A	N/C		
____	App. 1995, J	X	____	1.	Describe how the vertical expansion shall not cause or contribute to leachate leakage from the existing landfill or adversely affect the closure design of the existing landfill;
____	App. 1995, J	X	____	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;
____	App. 1995, J	X	____	3.	Provide foundation and settlement analysis for the vertical expansion;
____	App. 1995, J	X	____	4.	Provide total settlement calculations demonstrating that the final elevations of the lining system, that gravity drainage, and that no other component of the design will be adversely affected;
____	App. 1995, J	X	____	5.	Minimum stability safety factor of 1.5 for the lining system component interface stability and deep stability;
____	App. 1995, J	X	____	6.	Provide documentation to show the surface water management system will not be adversely affected by the vertical expansion;
____	App. 1995, J	X	____	7.	Provide gas control designs to prevent accumulation of gas under the new liner for the vertical expansion.

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

____	Op. Plan, 1996	____	X	1.	Provide documentation that landfill will have at least one trained operator during operation and at least one trained spotter at each working face; (62-701.500(1), FAC)
				2.	Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)
____	Op. Plan, 1996	____	X	a.	Designating responsible operating and maintenance personnel;
____	Op. Plan, 1996	____	X	b.	Contingency operations for emergencies;
____	Op. Plan, 1996	____	X	c.	Controlling types of waste received at the landfill;
____	Op. Plan, 1996	____	X	d.	Weighing incoming waste;
____	Op. Plan, 1996	____	X	e.	Vehicle traffic control and unloading;
____	Op. Plan, 1996	____	X	f.	Method and sequence of filling waste;
____	Op. Plan, 1996	____	X	g.	Waste compaction and application of cover;
____	Op. Plan, 1996	____	X	h.	Operations of gas, leachate, and stormwater controls;
____	Op. Plan, 1996	____	X	i.	Water quality monitoring.

S	LOCATION	N/A	N/C		
	Op. Plan, 1996		X	3.	Provide a description of the landfill operation record to be used at the landfill; details as to location of where various operational records will be kept (i.e. FDEP permit, engineering drawings, water quality records, etc.) (62-701.500(3), FAC)
	Op. Plan, 1996		X	4.	Describe the waste records that will be compiled monthly and provided to the Department quarterly; (62-701.500(4), FAC)
	Op. Plan, 1996		X	5.	Describe methods of access control; (62-701.500(5), FAC)
	Op. Plan, 1996		X	6.	Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized wastes at the landfill; (62-701.500(6), FAC)
				7.	Describe procedures for spreading and compacting waste at the landfill that include: (62-701.500(7), FAC)
	Op. Plan, 1996		X	a.	Waste layer thickness and compaction frequencies;
	Op. Plan, 1996		X	b.	Special considerations for first layer of waste placed above liner and leachate collection system;
X	App. 2000, Att. 1			c.	Slopes of cell working face and side grades above land surface, planned lift depths during operation;
	Op. Plan, 1996		X	d.	Maximum width of working face;
				e.	Description of type of initial cover to be used at the facility that controls:
	Op. Plan, 1996		X	(1)	Disease vector breeding/animal attraction
	Op. Plan, 1996		X	(2)	Fires
	Op. Plan, 1996		X	(3)	Odors
	Op. Plan, 1996		X	(4)	Blowing litter
	Op. Plan, 1996		X	(5)	Moisture infiltration
	Op. Plan, 1996		X	f.	Procedures for applying initial cover including minimum cover frequencies;
	Op. Plan, 1996		X	g.	Procedures for applying intermediate cover;
	Op. Plan, 1996		X	h.	Time frames for applying final cover;
	Op. Plan, 1996		X	i.	Description of litter policing methods;
	Op. Plan, 1996		X	j.	Erosion control procedures.

S	LOCATION	N/A	N/C		
				8.	Describe operational procedures for leachate management including; (62-701.500(8), FAC)
____	Op. Plan, 1996	____	X	a.	Leachate level monitoring, sampling, analysis and data results submitted to the Department;
____	Op. Plan, 1996	____	X	b.	Operation and maintenance of leachate collection and removal system, and treatment as required;
____	Op. Plan, 1996	____	X	c.	Procedures for managing leachate if it becomes regulated as a hazardous waste;
____	Op. Plan, 1996	____	X	d.	Agreements for off-site discharge and treatment of leachate;
____	Op. Plan, 1996	____	X	e.	Contingency plan for managing leachate during emergencies or equipment problems;
____	Op. Plan, 1996	____	X	f.	Procedures for recording quantities of leachate generated in gal/day;
____	Op. Plan, 1996	____	X	g.	Procedures for comparing precipitation experienced at the landfill with leachate generation rates.

S	LOCATION	N/A	N/C		
____	Op. Plan, 1996	____	X	9.	Describe routine gas monitoring program for the landfill as required by Rule 62-701.400(10), FAC; (62-701.500(9), FAC)
____	Op. Plan, 1996	____	X	10.	Describe procedures for operating and maintaining the landfill stormwater management system to comply with the standards of Chapters 62-3, 62-302 and 62-25, FAC; (62-701.500(10), FAC)
				11.	Equipment and operation feature requirements; (62- 701.500(11), FAC)
____	Op. Plan, 1996	____	X	a.	Sufficient equipment for excavating, spreading, compacting and covering waste;
____	Op. Plan, 1996	____	X	b.	Reserve equipment or arrangements to obtain additional equipment within 24 hours of breakdown;
____	Op. Plan, 1996	____	X	c.	Communications equipment;
____	Op. Plan, 1996	____	X	d.	Personnel shelter and sanitary facilities, first aid equipment;
____	Op. Plan, 1996	____	X	e.	Dust control methods;
____	Op. Plan, 1996	____	X	f.	Fire protection capabilities and procedures for notifying local fire department authorities in emergencies;
____	Op. Plan, 1996	____	X	g.	Litter control devices;
____	Op. Plan, 1996	____	X	h.	Signs indicating operating authority, traffic flow, hours of operation, disposal restrictions.
____	Op. Plan, 1996	____	X	12.	Provide a descriptions of all-weather access road, inside perimeter road and other roads necessary for access which shall be provided at the landfill; (62-701.500(12), FAC)
				13.	Additional record keeping and reporting requirements; (62-701.500(13), FAC)
____	Op. Plan, 1996	____	X	a.	Records used for developing permit applications and supplemental information maintained for the design period of the landfill;
____	Op. Plan, 1996	____	X	b.	Monitoring information, calibration and maintenance records, copies of reports required by permit maintained for at least 10 years;
____	Op. Plan, 1996	____	X	c.	Background water quality records shall be maintained for the design period of the landfill;
____	Op. Plan, 1996	____	X	d.	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.

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

S	LOCATION	N/A	N/C		
____	Op. Plan, 1996	____	X	1.	Water quality and leachate monitoring plan shall be submitted describing the proposed ground water, surface water and leachate monitoring systems and shall meet at least the following requirements;
____	Op. Plan, 1996	____	X	a.	Based on the information obtained in the hydrogeological investigation and signed, dated and sealed by the PG or PE who prepared it; (62-701.510(2)(a), FAC)
____	Op. Plan, 1996	____	X	b.	All sampling and analysis preformed by organizations having Department approved Comprehensive Quality Assurance Plans; (62 701.510(2)(b), FAC)
				c.	Ground water monitoring requirements; (62-701.510(3), FAC)
____	Op. Plan, 1996	____	X	(1)	Detection wells located downgradient from and within 50 feet of disposal units;
____	Op. Plan, 1996	____	X	(2)	Downgradient compliance wells as required;
____	Op. Plan, 1996	____	X	(3)	Background wells screened in all aquifers below the landfill that may be affected by the landfill;
____	Op. Plan, 1996	____	X	(4)	Location information for each monitoring well;
____	Op. Plan, 1996	____	X	(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;
____	Op. Plan, 1996	____	X	(6)	Well screen locations properly selected;
____	Op. Plan, 1996	____	X	(7)	Procedures for properly abandoning monitoring wells;
____	Op. Plan, 1996	____	X	(8)	Detailed description of detection sensors if proposed.

S	LOCATION	N/A	N/C	
				d. Surface water monitoring requirements; (62-701.510(4), FAC)
____	Op. Plan, 1996	____	X	(1) Location of and justification for all proposed surface water monitoring points;
____	Op. Plan, 1996	____	X	(2) Each monitoring location to be marked and its position determined by a registered Florida land surveyor;
____	Op. Plan, 1996	____	X	e. Leachate sampling locations proposed; (62-701.510(5), FAC)
				f. Routine sampling frequency and requirements; (62-701.510(6), FAC)
____	Op. Plan, 1996	____	X	(1) Background ground water and surface water sampling and analysis requirements;
____	Op. Plan, 1996	____	X	(2) Leachate semi-annual and annual sampling and analysis requirements;
____	Op. Plan, 1996	____	X	(3) Detection well semi-annual sampling and analysis requirements;
____	Op. Plan, 1996	____	X	(4) Compliance well sampling and analysis requirements;
____	Op. Plan, 1996	____	X	(5) Surface water sampling and analysis requirements.
____	Op. Plan, 1996	____	X	g. Describe procedures for implementing assessment monitoring and corrective action as required; (62-701.510 (7), FAC)
____	Op. Plan, 1996	____	X	h. Water quality monitoring report requirements; (62-701.510 (9), FAC)
____	Op. Plan, 1996	____	X	(1) Semi-annual report requirements;
____	Op. Plan, 1996	____	X	(2) Bi-annual report requirements signed, dated and sealed by PG or PE.

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

S	LOCATION	N/A	N/C		
____	App. 1995, M	X	____	1.	Describe procedures for managing motor vehicles; (62-701.520(1), FAC)
____	App. 1995, M	X	____	2.	Describe procedures for landfilling shredded waste; (62-701.520(3), FAC)
____	App. 1995, M	____	X	3.	Describe procedures for asbestos waste disposal; (62-701.520(4), FAC)
____	App. 1995, M	____	X	4.	Describe procedures for contaminated soil disposal; (62-701.520(5), FAC)

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

				1.	Closure schedule requirements; (62-701.600(2), FAC)
____	App. 1995, N.1	____	X	a.	Documentation that a written notice including a schedule for closure will be provided to the Department at least one year prior to final receipt of wastes;
____	App. 1995, N.1	____	X	b.	Notice to user requirements within 120 days of final receipt of wastes;
____	App. 1995, N.1	____	X	c.	Notice to public requirements within 10 days of final receipt of wastes.
				2.	Closure permit general requirements; (62-701.600(3), FAC)
____	App. 1995, N.2	X	____	a.	Application submitted to Department at least 90 days prior to final receipt of wastes;
				b.	Closure plan shall include the following:
____	App. 1995, N.2	X	____	(1)	Closure report;
____	App. 1995, N.2	X	____	(2)	Closure design plan;
____	App. 1995, N.2	X	____	(3)	Closure operation plan;
____	App. 1995, N.2	X	____	(4)	Closure procedures;
____	App. 1995, N.2	X	____	(5)	Plan for long term care;
____	App. 1995, N.2	X	____	(6)	A demonstration that proof of financial responsibility for long term care will be provided.

S	LOCATION	N/A	N/C		
				3.	Closure report requirements; (62-701.600(4), FAC)
				a.	General information requirements;
____	App. 1995, N.3	X	____	(1)	Identification of landfill;
____	App. 1995, N.3	X	____	(2)	Location, description and vicinity map;
____	App. 1995, N.3	X	____	(3)	Total acres of disposal area and landfill property;
____	App. 1995, N.3	X	____	(4)	Legal property description;
____	App. 1995, N.3	X	____	(5)	History of landfill;
____	App. 1995, N.3	X	____	(6)	Identification of types of waste disposed of at the landfill.
____	App. 1995, N.3	X	____	b.	Geotechnical investigation report and water quality monitoring plan required by Rule 62-701.330(4), FAC;
____	App. 1995, N.3	X	____	c.	Land use information report indicating: identification of adjacent landowners; zoning; present land uses; and roads, highways right-of-way, or easements.
____	App. 1995, N.3	X	____	d.	Report on actual or potential gas migration at landfills containing biodegradable wastes including detailed description of test and investigation methods used;
____	App. 1995, N.3	X	____	e.	Report assessing the effectiveness of the landfill design and operation including results of geotechnical investigations, surface water and storm water management, gas migration and concentrations, condition of existing cover, and nature of waste disposed of at the landfill;
				4.	Closure design requirements to be included in the closure design plan: (52-701.600(5), FAC)
____	App. 1995, N.4	X	____	a.	Plan sheet showing phases of site closing;
____	App. 1995, N.4	X	____	b.	Drawings showing existing topography and proposed final grades;
____	App. 1995, N.4	X	____	c.	Provisions to close units when they reach approved design dimensions;
____	App. 1995, N.4	X	____	d.	Final elevations before settlement;
____	App. 1995, N.4	X	____	e.	Side slope design including benches, terraces, down slope drainage ways, energy dissipaters and discussion of expected precipitation effects;

S	LOCATION	N/A	N/C	
				f. Final cover installation plans including:
____	Appendix 1995, N.4	X	____	(1) CQA plan for installing and testing final cover;
____	App. 1995, N.4	X	____	(2) Schedule for installing final cover after final receipt of waste;
____	App. 1995, N.4	X	____	(3) Description of drought-resistant species to be used in the vegetative cover;
____	App. 1995, N.4	X	____	(4) Top gradient design to maximize runoff and minimize erosion;
____	App. 1995, N.4	X	____	(5) Provisions for cover material to be used for final cover maintenance.
				g. Final cover design requirements:
____	App. 1995, N.4	X	____	(1) Protective soil layer design;
____	App. 1995, N.4	X	____	(2) Barrier soil layer design;
____	App. 1995, N.4	X	____	(3) Erosion control vegetation;
____	App. 1995, N.4	X	____	(4) Geomembrane barrier layer design.
____	App. 1995, N.4	X	____	h. Proposed method of stormwater control;
____	App. 1995, N.4	X	____	i. Proposed method of access control;
____	App. 1995, N.4	X	____	j. Description of proposed final use of the closed landfill, if any;
				5. Closure operation plan shall include: (62-701.600(6), FAC)
____	App. 1995, N.5	X	____	a. Detailed description of actions which will be taken to close the landfill;
____	App. 1995, N.5	X	____	b. Time schedule for completion of closing and long term care;
____	App. 1995, N.5	X	____	c. Describe proposed method for demonstrating financial responsibility;
____	App. 1995, N.5	X	____	d. Indicate any additional equipment and personnel needed to complete closure.
____	App. 1995, N.5	X	____	e. Development and implementation of the water quality monitoring plan required in Rule 62-701.510, FAC.
____	App. 1995, N.5	X	____	f. Development and implementation of routine gas monitoring program required in Rule 62-701.400(10)(c), FAC
____	App. 1995, N.6	X	____	6. Justification for and detailed description of procedures to be followed for temporary closure of the landfill, if desired; (62-701.600(7), FAC)

O. CLOSURE PROCEDURES (62-701.610, FAC)

S	LOCATION	N/A	N/C		
____	App. 1995, O	X	____	1.	Survey monuments; (62-701.610(2), FAC)
____	App. 1995, O	X	____	2.	Final survey report; (62-701.610(3), FAC)
____	App. 1995, O	X	____	3.	Certification of closure construction completion; (62-701.610(4), FAC)
____	App. 1995, O	X	____	4.	Declaration to the public; (62-701.610(5), FAC)
____	App. 1995, O	X	____	5.	Official date of closing; (62-701.610(6), FAC)
____	App. 1995, O	X	____	6.	Use of closed landfill areas; (62-701.610(7), FAC)

P. LONG TERM CARE REQUIREMENTS (62-701.620, FAC)

____	App. 1995, P.1	____	X	1.	Right of property access requirements; (62-701.620(4), FAC)
____	App. 1995, P.2	____	X	2.	Successors of interest requirements; (62-701.620(5), FAC)
____	App. 1995, P.3	____	X	3.	Requirements for replacement of monitoring devices; (62-701.620(7), FAC)
____	App. 1995, P.4	____	X	4.	Completion of long term care signed and sealed by professional engineer (62-701.620(8), FAC).

Q. FINANCIAL RESPONSIBILITY REQUIREMENTS (62-701.630, FAC)

____	App. 1995, Q.1	____	X	1.	Provide cost estimates for closing, long term care, and corrective action costs estimated by a PE for a third party performing the work, on a per unit basis, with the source of estimates indicated; (62-701.630(3)&(7), FAC).
____	App. 1995, Q.2	____	X	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).
____	App. 1995, Q.3	____	X	3.	Describe funding mechanisms for providing proof of financial assurance and include appropriate financial assurance forms; (62-701.630(5),(6),&(9), FAC).

R. CLOSURE OF EXISTING LANDFILLS (62-701.640, FAC)

____	App. 1995, R	X	____	1.	Demonstration that facility does not pose a bird hazard to aircraft as specified in Rule 62-701.320(12)(b), FAC.
____	App. 1995, R	X	____	2.	Demonstration that facility does not restrict the flow of the 100-year flood, reduce water storage capacity or result in wash-out of solid waste as specified in Rule 62-701.340(4)(b), FAC.

S	LOCATION	N/A	N/C		
____	App. 1995, R	X	____	3.	Demonstration that facility is not located in a fault area, seismic zone or unstable area as specified in Rule 62-701.420(1)(c), FAC.
				4.	Request for extension of closure criteria as specified in Rule 62-701.640(2)(a) & (2)(b), FAC.
____	App. 1995, R	X	____	a.	Demonstration of no alternative disposal capacity.
____	App. 1995, R	X	____	b.	Demonstration of no threat to human health or the environment.

S. MATERIALS RECOVERY FACILITY REQUIREMENTS (62-701.700, FAC)

____	App. 1995, S	X	____	1.	Proof of posting a performance bond payable to the Department to cover closing costs, if required; (62-701.700(4), FAC)
____	App. 1995, S	X	____	2.	Materials recovery facility requirements; (62-701.700, FAC)
____	App. 1995, S	X	____	a.	Submit information required in Rule 62-701.320, FAC
____	App. 1995, S	X	____	b.	Submit an engineering report including the following:
____	App. 1995, S	X	____	(1)	Description of the solid waste proposed to be collected, stored, processed or disposed;
____	App. 1995, S	X	____	(2)	Projection with assumptions for waste types and quantities expected in future years;
____	App. 1995, S	X	____	(3)	Description of operation and functions of all processing equipment with design criteria and expected performance;
____	App. 1995, S	X	____	(4)	Description of flow of solid waste, expected regular facility operations, procedures for start up and shut down, potential safety hazards and control methods including fire protection;
____	App. 1995, S	X	____	(5)	Description of loading, unloading, and processing areas;
____	App. 1995, S	X	____	(6)	Identification and capacity of temporary on-site storage areas for materials handled and provisions for solid waste and leachate containment;
____	App. 1995, S	X	____	(7)	Identification of potential ground water and surface water contamination;

S	LOCATION	N/A	N/C	
____	App. 1995, S	X	____	(8) Plan for disposal of unmarketable recyclables and residue and contingencies for waste handling during breakdowns.
				c. Submit the following operational information:
____	App. 1995, S	X	____	(1) Operation and maintenance manual;
____	App. 1995, S	X	____	(2) Waste control plan to manage unauthorized wastes;
____	App. 1995, S	X	____	(3) Contingency plan for emergencies;
____	App. 1995, S	X	____	(4) Closure plan including the following:
____	App. 1995, S	X	____	(a) Notification to Department 180 days prior to closure;
____	App. 1995, S	X	____	(b) Procedures for removal of all waste within 30 days of receipt of final waste;
____	App. 1995, S	X	____	(c) Completion of closure activities within 180 days of receipt of final waste and notification to the Department that closure is complete.

T. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

A. Applicant

The undersigned applicant or authorized representative of Citrus County Board of County Commissioners is aware that statements made in this form and attached information are an application for a Solid Waste Management Facility Permit from the Florida Department of Environmental Regulation and certifies that the information in this application is true, correct and complete to the best of his 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.

Susan J Metcalfe

Signature of Applicant or Agent

Susan J. Metcalfe, Director, Division of Solid Waste Management

Name and Title

Date: 1/19/01

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

B. Professional Engineer Registered in Florida or Public Officer as required in Section 403.707 and 403.707(5), 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 principals applicable to such facilities. In my professional judgement, 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

Jones, Edmunds & Associates, Inc.
730 NE Waldo Road, Building A

Mailing Address

David A. Keough, PE, Project Manager

Name and Title (please type)

Gainesville, Florida 32641

City, State, Zip

#33164

Florida Registration Number
(Please affix seal)

352-377-5821

Telephone Number

Date: 1-18-01

ABBREVIATION	REFERENCE
App. 1995	Citrus County Central Landfill Permit Application and Engineering Report Phase 1A Expansion CH2M HILL, 1995
Op. Plan 1996	Citrus County Central Landfill Operations Plan Phase 1A Expansion CH2M HILL, 1996
Letter 10/00	Jones, Edmunds & Associates, Inc. Correspondence October 10, 2000 Class I Landfill Geomembrane Remediation
App. 2000	Citrus County Central Landfill Permit Application Geomembrane Remediation Jones, Edmunds & Associates, Inc., 2000
CQA 12/00	Citrus County Central Landfill Construction Quality Assurance Plan Geomembrane Remediation Jones, Edmunds & Associates, Inc., 2000

ATTACHMENT 1

OPERATION PLAN REVISIONS

7.b First Layer (62-701.500(7)(b), FAC)

Prior to placing waste on the landfill side slopes and interior of the northern berm, a minimum of two feet of protective soil material must be placed on the lining. Required material properties are included in the Phase 1A Expansion Technical Specifications. In addition, the geomembrane stormwater diversion sheet on the side slopes of Phase 1A must be removed and raised as protective soil material is placed on the side slopes. The protective soil material in Phase 1A placed directly on the underlying geogrid (reference the lining section in the Phase 1A Expansion Construction Plans). The raised geomembrane stormwater diversion sheet will be used to form lined stormwater conveyance ditches as discussed in Section 7.j.2. Solid waste and stormwater diversion sheets will be placed along the sideslopes of Phase 1 as shown in the Geomembrane Remediation drawings (JEA 2000).

The first lift of material placed above the lining and leachate collection system will be a minimum of four feet in thickness before conventional compacting and heavy equipment are used. Waste loads in this first lift will be screened for any materials which would damage the lining.

7.c Slopes of Working Face (62-701.500(7)(c), FAC)

The working face will be sloped no greater than 3 feet horizontal to one foot vertical rise. The lift depth will be minimum of 10 feet. A plan and cross-section of a typical working face is shown on Figure 7-1.

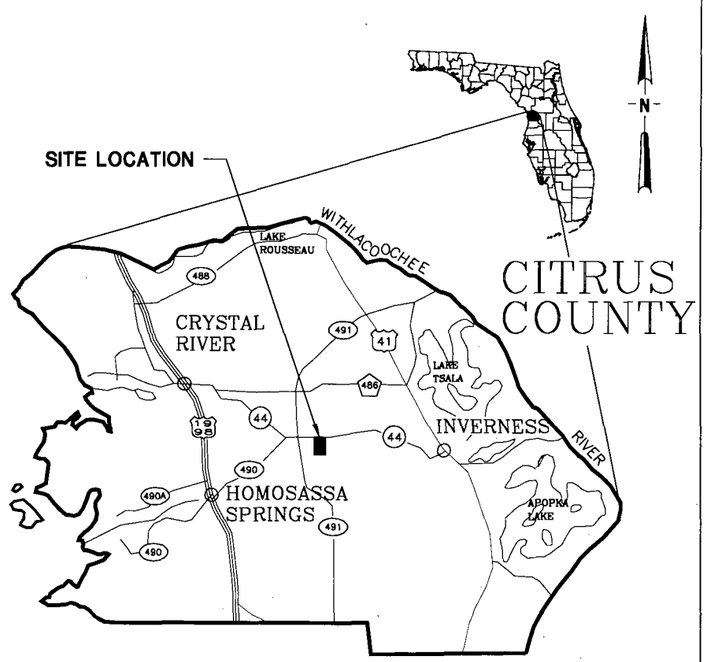
4009 C000 86 WAC 39859 SOD-297381

CITRUS COUNTY CENTRAL LANDFILL

LINER REMEDIATION

PREPARED FOR:

CITRUS COUNTY BOARD OF COUNTY COMMISSIONERS
CITRUS COUNTY, FLORIDA



SITE VICINITY MAP

PREPARED BY:

Jones Edmunds & Associates, Inc. JEA
730 Northeast Waldo Road/Gainesville, Florida 32641 / (352) 377-5821
CONSULTING ENGINEERS AND SCIENTISTS

DRAWING INDEX	
DWG No	DESCRIPTION
1 OF 4	COVER SHEET
2 OF 4	GENERAL NOTES AND ABBREVIATIONS
3 OF 4	LINER REMEDIATION
4 OF 4	LINER REMEDIATION SECTION

PERMIT SET

JAN 1 8 2001

JEA PROJECT No: 03860-004-01

DECEMBER 2000

22x34

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GENERAL NOTES

1. ALL ELEVATIONS ARE BASED ON USGS MEAN SEA LEVEL DATUM OF 1929, UNLESS OTHERWISE NOTED.

2. ANY NGVD '29 MONUMENT WITHIN THE LIMITS OF CONSTRUCTION IS TO BE PROTECTED. IF IN DANGER OF DAMAGE, THE CONTRACTOR SHALL NOTIFY:

   MR. RONNIE TAYLOR
   FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
   BUREAU OF SURVEYS AND MAPPING
   3900 COMMONWEALTH BLVD
   MS 105
   TALLAHASSEE, FLORIDA 32399-3000
   TELEPHONE #(904)488-2427

3. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE PLANS. THE CONTRACTOR SHALL VERIFY, PRIOR TO CONSTRUCTION, THE LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES (WHETHER OR NOT SHOWN ON THE PLANS) AFFECTING THEIR OWN WORK.

4. THE INFORMATION PROVIDED IN THESE PLANS IS SOLELY TO ASSIST THE CONTRACTOR IN ASSESSING THE NATURE AND EXTENT OF THE CONDITIONS WHICH MAY BE ENCOUNTERED DURING THE COURSE OF WORK. ALL CONTRACTORS ARE DIRECTED, PRIOR TO BIDDING, TO CONDUCT WHATEVER INVESTIGATIONS THEY MAY DEEM NECESSARY TO ARRIVE AT THEIR OWN CONCLUSIONS REGARDING THE ACTUAL CONDITIONS THAT WILL BE ENCOUNTERED, AND UPON WHICH THEIR BIDS SHALL BE BASED.

5. THE CONTRACTOR SHALL BE AWARE THAT THERE MAY BE SOME UTILITY CONFLICTS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ANY AND ALL EXISTING UTILITIES ON THIS PROJECT WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

6. FIELD CONDITIONS MAY NECESSITATE SLIGHT ALIGNMENT AND GRADE DEVIATION OF THE PROPOSED CONSTRUCTION TO AVOID OBSTACLES, AS ORDERED BY THE ENGINEER. THE CONTRACTOR SHALL CONSTRUCT THE PROPOSED FACILITIES TO THE ORDERED DEVIATION WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

7. THE CONTRACTOR SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT THE LOCATION OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION. CONTACT UTILITIES NOTIFICATION CENTER AT 1-800-432-4770

8. THE CONTRACTOR SHALL REPLACE ALL EXISTING PAVING, STABILIZED EARTH, CURBS, DRIVEWAYS, SIDEWALKS, FENCES, MAILBOXES, GRASSING, SIGNS, AND OTHER IMPROVEMENTS WITH SAME TYPE OF MATERIAL THAT WAS REMOVED DURING CONSTRUCTION OR AS DIRECTED BY THE ENGINEER WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

9. THE CONTRACTOR SHALL MAINTAIN A CLEAR PATH FOR ALL SURFACE WATER DRAINAGE STRUCTURES AND DITCHES DURING ALL PHASES OF CONSTRUCTION AND SHALL USE WHATEVER MEANS NECESSARY TO MANAGE STORMWATER SUCH THAT THE IMPACT TO CONSTRUCTION IS MINIMIZED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF DAMAGE DUE TO STORMWATER.

10. THE CONTRACTOR SHALL PROVIDE WARNING SIGNALS, SIGNS, LIGHTS, BARRICADES, FLAGMEN, ETC. IN ACCORDANCE WITH OSHA, DOT, AND OTHER APPLICABLE REGULATORY REQUIREMENTS AND AS OTHERWISE NECESSARY TO PROVIDE FOR SITE SAFETY DURING CONSTRUCTION.

11. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY WHEN CONFLICTS BETWEEN DRAWINGS AND ACTUAL CONDITIONS ARE DISCOVERED.

12. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH EXISTING COUNTY DESIGN AND CONSTRUCTION STANDARDS UNLESS THOSE STANDARDS CONFLICT WITH THESE CONTRACT DOCUMENTS IN WHICH CASE THESE CONTRACT DOCUMENTS SHALL GOVERN. SUCH CONFLICTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.

13. THE CONTRACTOR SHALL PREVENT DISTURBANCE TO AND UNDERMINING OF ADJACENT STRUCTURES, SLABS, PIPING, AND OTHER UTILITIES OR FACILITIES DURING CONSTRUCTION.

14. THE CONTRACTOR SHALL VERIFY ALL CLEARANCES PRIOR TO CONSTRUCTION.

15. DEWATERING SHALL BE PROVIDED BY THE CONTRACTOR AS NECESSARY TO INSTALL/CONSTRUCT THE WORK PROPERLY. DEWATERING DISCHARGE SHALL BE IN ACCORDANCE WITH APPLICABLE REGULATIONS AND REQUIREMENTS OF AGENCIES HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, AS REQUIRED, WITHOUT INCREASE IN PRICE OR TIME.

16. ALL PIPING SHALL BE PROPERLY SUPPORTED. ALL PIPING WHICH WILL BE PRESSURIZED DURING OPERATION SHALL BE PROPERLY RESTRAINED.

17. FACILITIES PROVIDED UNDER THIS PROJECT SHALL BE CLEANED AT THE CLOSE OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

18. CONSTRUCTION MONUMENTS FOR VERTICAL AND HORIZONTAL CONTROL HAVE BEEN PROVIDED AT THE PROJECT SITE. THE CONTRACTOR SHALL VERIFY THE ACCURACY OF THESE MONUMENTS TO THEIR OWN SATISFACTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROPER VERTICAL AND HORIZONTAL ALIGNMENT OF CONSTRUCTED FACILITIES AND FINISHED GRADE.

19. THE CONTRACTOR SHALL PROVIDE A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF FLORIDA TO ESTABLISH THE CONSTRUCTION SITE LAYOUT, PERFORM TOPOGRAPHIC SURVEYS, AND PERFORM ALL OTHER REQUIRED SURVEYING SERVICES.

20. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BECOME FAMILIAR WITH THE OSHA EXCAVATION SAFETY STANDARDS AND TO ABIDE BY THEM AS COVERED UNDER THE FLORIDA TRENCH SAFETY ACT (LAWS OF FLORIDA 90-96) EFFECTIVE OCTOBER 1, 1990.

21. THE CONTRACTOR SHALL COMPLY WITH ALL TERMS, CONDITIONS, AND REQUIREMENTS OF ALL APPLICABLE PERMITS, INCLUDING FDEP AND WATER MANAGEMENT DISTRICT PERMITS FOR THE SITE.

22. THE CONTRACTOR SHALL BE AWARE THAT THE CONSTRUCTION SITE IS ADJACENT AND CONNECTS TO ACTIVE LANDFILL CELLS, AND THAT LANDFILL GAS MAY MIGRATE ONTO THE CONSTRUCTION SITE. THE CONTRACTOR SHALL TAKE WHATEVER MEANS NECESSARY TO PROTECT PERSONNEL AND FACILITIES FROM RELATED HAZARDS, INCLUDING EXPLOSION, ASPHYXIATION, AND POISONING DUE TO THE PRESENCE OF LANDFILL GASES.

23. THE CONTRACTOR SHALL PREVENT DAMAGE TO THE EXISTING GEOMEMBRANE. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY SHOULD DAMAGE OCCUR AND PERFORM REPAIRS AS DIRECTED BY THE ENGINEER WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

24. THE CONTRACTOR SHALL NOT INTERFERE WITH FACILITY OPERATIONS. THE CONTRACTOR SHALL COORDINATE WITH AND NOTIFY THE OWNER A MINIMUM OF 48 HOURS IN ADVANCE OF ALL PLANNED UTILITY OUTAGES AND ROAD CROSSINGS.

25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING STORMWATER RUNOFF, SOLID WASTE, LANDFILL GAS, AND LEACHATE FROM ENTERING OR IMPACTING THE AREAS OF THE WORK. THE CONTRACTOR SHALL INSTALL AND MAINTAIN MANAGEMENT AND CONTROL DEVICES INCLUDING DIVERSION/COLLECTION BERMS, DITCHES, PUMPING STATIONS, WALLS, LINERS, ETC. TO COMPLY WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS WITHOUT INCREASE IN THE CONTRACT PRICE OR TIME.

26. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN ENVIRONMENTAL PROTECTION DURING THE LIFE OF THE CONTRACT, INCLUDING THE WARRANTY PERIOD. THE CONTRACTORS' OPERATIONS SHALL COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS, INCLUDING THOSE PERTAINING TO WATER, AIR, SOLID WASTE, HAZARDOUS WASTE MATERIALS, OILY SUBSTANCES, AND NOISE POLLUTION. THE CONTRACTOR SHALL IMPLEMENT EROSION AND SEDIMENTATION CONTROL MEASURES AS NECESSARY TO COMPLY WITH THESE REGULATIONS FOR BOTH TEMPORARY AND PERMANENT CONSTRUCTION.

ABBREVIATIONS

GENERAL

APPROX	APPROXIMATE, APPROXIMATELY
BLDG	BUILDING
BTM	BOTTOM
CB	CATCH BASIN
CM	CONCRETE MONUMENT
CO	COMPANY
CONC	CONCRETE
CONT	CONTINUOUS
CORR	CORRUGATED
DET	DETAIL
DOT	DEPARTMENT OF TRANSPORTATION (FLORIDA)
DI	DUCTILE IRON
DIA	DIAMETER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DWG	DRAWING
EA	EACH
ETC	ET CETERA
EI	ENGINEERING INTERN
ENCL	ENCLOSE, ENCLOSURE
EL	ELEVATION
EQUIP	EQUIPMENT
EXIST	EXISTING
F	FEMALE
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FIN	FINISHED
GALV	GALVANIZED
GR	GRADE
GS	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
HP	HIGH POINT
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
L	LENGTH
M	MALE
MAX	MAXIMUM
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MSL	(ABOVE) MEAN SEA LEVEL
MT	MOUNT
N/A	NOT APPLICABLE
N/AVAIL	NOT AVAILABLE
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NIC	NOT IN CONTRACT
No	NUMBER
NP	NONPERFORATED
NTS	NOT TO SCALE
OAE	OR ENGINEER APPROVED EQUAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
RLS	PROFESSIONAL LAND SURVEYOR
	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF	REFERENCE
R/W	RIGHT OF WAY
REQD	REQUIRED
	SLOPE
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SHT	SHEET
SIM	SIMILAR
SRWMD	SUWANNEE RIVER WATER MANAGEMENT DISTRICT
SS	STAINLESS STEEL
STD	STANDARD
STL	STEEL
	TANGENT
TBM	TURNING BENCH MARK
TYP	TYPICAL
USC&GS	UNITED STATES COASTAL AND GEODETIC SURVEY
USGS	UNITED STATES GEOLOGICAL SURVEY
WGT	WEIGHT
Δ	DELTA, ANGULAR CHANGE

MECHANICAL

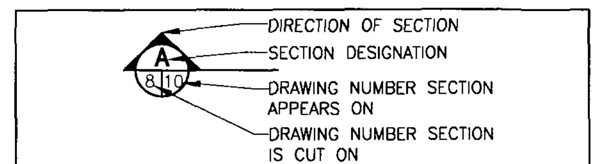
BCCMP	BITUMINOUS COATED CORRUGATED METAL PIPE
BLD	BLIND
BWJ	BUTT-WELDED JOINT
CMP	CORRUGATED METAL PIPE
ELL	ELBOW
FJ	FLANGED JOINT
FLG	FLANGE
LR	LONG RADIUS
NPT	AMER. STD. TAPER PIPE THREAD
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
RED	REDUCER
SOF	SLIP-ON FLANGE
WJ	WELDED JOINT

STRUCTURAL

ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
B/	BOTTOM OF
℄	CENTERLINE
CM/SEC	CENTIMETERS PER SECOND
CLR	CLEAR
EF	EACH FACE
EQ	EQUAL, EQUALLY
EW	EACH WAY
FT	FOOT, FEET
FTG	FOOTING
HORIZ	HORIZONTAL
LBR	LOAD BEARING RATIO
NOM	NOMINAL
P	PLATE
PSI	POUNDS PER SQUARE INCH
REINF	REINFORCEMENT, REINFORCING
SP	SPACING, SPACED
SQ	SQUARE
T/	TOP OF
VERT	VERTICAL
W	WIRE
W/	WITH
WWF	WELDED WIRE FABRIC
@	AT
ø	DIAMETER
#/IN	POUNDS PER INCH

ELECTRICAL

A	AMPS
C/B	CIRCUIT BREAKER
CAB	CABLE
COMB	COMBINATION
FVNR	FULL VOLTAGE NON-REVERSING
GFI	GROUND FAULT INTERRUPT
GND	GROUND
KVA	KILOVOLT AMP
LEV	LEVEL
NEMA	NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION
P	POLE
PWR	POWER
SW	SWITCH
V	VOLT(S)
WP	WATER PROOF
XFMR	TRANSFORMER
Y	WYE
Z	IMPEDANCE



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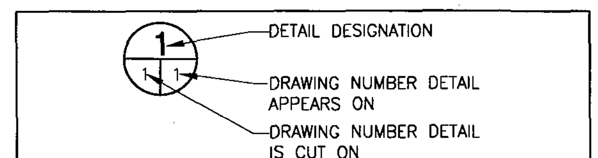

DETAIL DESIGNATION

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED JLD
DRAWN TA
CHECKED DAK
J.L DeVITA, EI
PROJECT ENGINEER

Jones Edmunds & Associates, Inc. JEA
730 Northeast Waldo Road/Gainesville, Florida 32641 / (352) 377-5821 CONSULTING ENGINEERS AND SCIENTISTS

CITRUS COUNTY CENTRAL LANDFILL
CITRUS COUNTY, FLORIDA

GENERAL NOTES AND ABBREVIATIONS

APPROVED FOR
D. A. KEOUGH
P.E. # 33564
SCALE: NONE

PROJECT NO. 03860-004-01
DWG. NO. 2 OF 4

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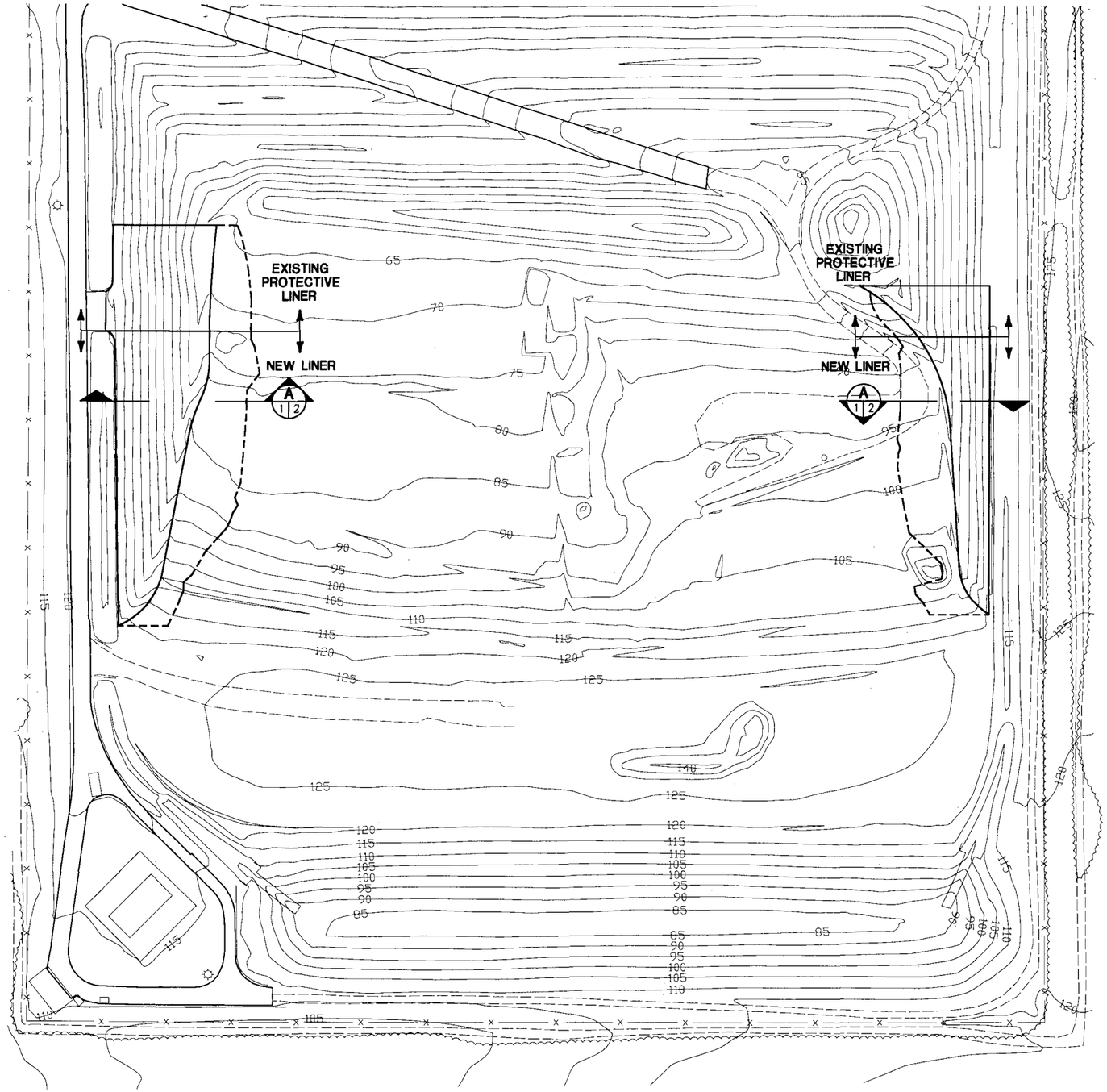

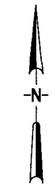

GRAPHIC SCALE

0 40 80 160

SCALE IN FEET

LEGEND

LIMITS OF EXISTING EXPOSED GEOMEMBRANE

LIMITS OF SOIL/SOLID WASTE 3H:1V SLOPE

NOTE:
SURVEY DATA PROVIDED BY PTI, 6/20/00

LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED JLD
DRAWN JAW
CHECKED DAK
J. L. DeVITA, EI
PROJECT ENGINEER

Jones Edmunds & Associates, Inc. JEA
730 Northeast Waldo Road/Gainesville, Florida 32641 / (352) 377-5821
CONSULTING ENGINEERS AND SCIENTISTS

CITRUS COUNTY CENTRAL LANDFILL
CITRUS COUNTY, FLORIDA

LINER REMEDIATION

APPROVED FOR CONSTRUCTION
P.E.

DATE 2000
SCALE 80

PROJECT NO. 03860-004-01
DWG. NO. 3 OF 4

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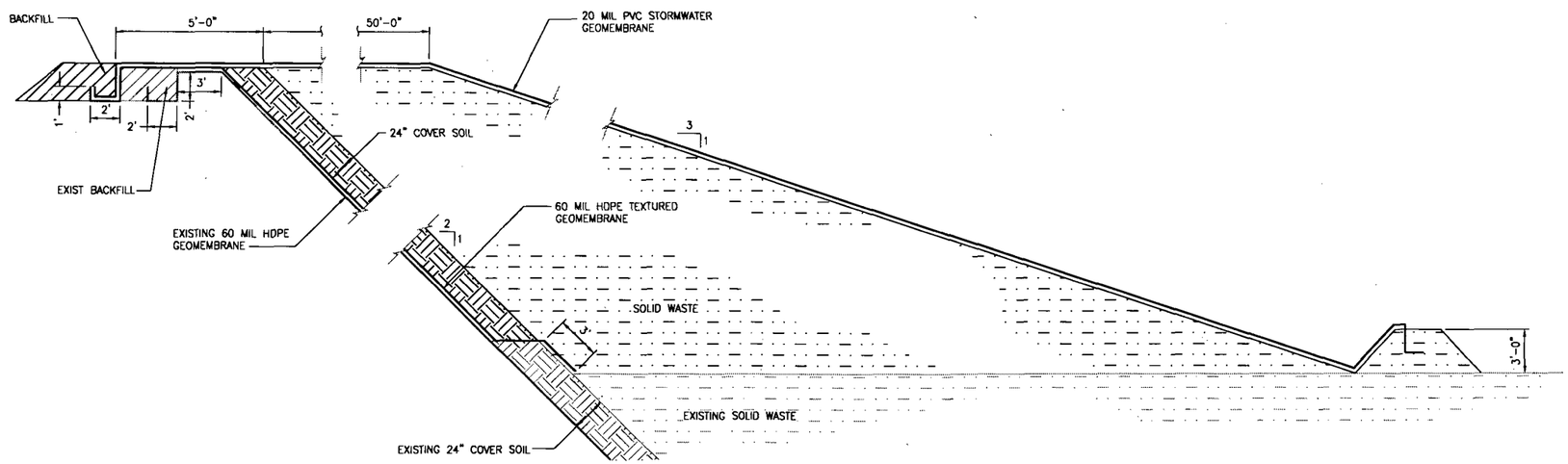

TYPICAL SECTION A (1 | 2)
1"=5'

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LTR.	DATE	REVISIONS	BY	APPRD.

DESIGNED JLD
DRAWN JAW
CHECKED DAK
J. L. DeVITA, EI
PROJECT ENGINEER

Jones Edmunds & Associates, Inc. JEA
730 Northeast Waldo Road/Gainesville, Florida 32641 / (352) 377-5821
CONSULTING ENGINEERS AND SCIENTISTS

CITRUS COUNTY CENTRAL LANDFILL
CITRUS COUNTY, FLORIDA

LINER REMEDIATION SECTION

APPROVED FOR JEA BY
D. A. KEOUGH
P.E. #031641

DATE DEC. 2000
SCALE 1"=5'

PROJECT NO. 03860-004-01
DWG. NO. 4 OF 4

4009C00086
WAC 39859
SO09-247381

[redacted]

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

Gainesville • Jacksonville • Tampa • Destin • Titusville

CITRUS COUNTY CENTRAL LANDFILL
GEOMEMBRANE REMEDIATION

CONSTRUCTION QUALITY ASSURANCE PLAN

Prepared for:

CITRUS COUNTY BOARD OF COUNTY COMMISSIONERS
P.O. Box 340
Lecanto, Florida 34460

Prepared by:

JONES, EDMUNDS & ASSOCIATES, INC.
730 NE Waldo Road, Building A
Gainesville, Florida 32641

RECEIVED
JAN 2 2 2001
Solid Waste Section

December 2000

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1.0 INTRODUCTION

This document is intended to serve as the Construction Quality Assurance (CQA) plan for the Geomembrane Remediation to the Citrus County Central Landfill in Lecanto, Florida.

Elements of this CQA plan are based on the U.S. Environmental Protection Agency (EPA) Technical Guidance Document entitled, "Construction Quality Assurance for Hazardous Waste Land Disposal Facilities" (EPA/530-SW-86-031).

2.0 RESPONSIBILITY AND AUTHORITY

2.1 PERMITTING AND DESIGN

Jones, Edmunds & Associates, Inc. (JEA), has been retained by the Citrus County Board of County Commissioners to prepare investigative studies, reports, and construction documents necessary to obtain permits for the Central Landfill Geomembrane Remediation.

2.2 ORGANIZATION AND PERSONNEL

The following organization and personnel have the authority in the performance of this work:

2.2.1 Permitting Agency

The permitting agency is the Florida Department of Environmental Protection (DEP), Southwest District.

The permitting agency is authorized by law to issue a permit for the construction and operation of a solid waste disposal facility. It is the responsibility of the permitting agency to review the facility Owner/Operator's permit application, including the site-specific CQA plan, for compliance with the agency's regulations and to make a decision to issue or deny a permit based on this review. The permitting agency will have the responsibility and authority to review and accept or reject any design revisions or requests for variance that are submitted by the facility Owner/Operator after the permit is issued. The agency also has the responsibility and authority to review all CQA documentation during or after facility construction to confirm that the approved CQA plan was followed and that the facility was constructed as specified.

2.2.2 Facility Owner/Operator

The facility Owner/Operator is the Citrus County Board of County Commissioners with personnel including Susan Metcalfe, Director.

The facility Owner/Operator is responsible for the design, construction, and operation of the solid waste disposal facility. This responsibility includes complying with the requirements of the permitting agency in order to obtain a permit and assuring the permitting agency, by the submission of CQA documentation, that the facility was constructed as specified. The Owner/Operator has the authority to select and dismiss organizations charged with design, CQA, and construction activities. The Owner/Operator also has the authority to accept or reject design plans and specifications, CQA plans, reports and recommendations of the CQA officer, and the materials and workmanship of the Contractor.

2.2.3 Design Engineer

The Design Engineer is Darabi and Associates, Inc., with personnel including: David A. Keough, P.E., Project Manager, and Judy L. DeVita, E.I., Project Engineer.

JEA has the primary responsibility to design a solid waste disposal facility that fulfills the operational requirements of the facility Owner/Operator and the performance requirements of the permitting agency. JEA's activities will not end until the facility is completed; the Project Engineer may be requested to change some component designs if unexpected site conditions are encountered or changes in construction methodology occur that could adversely affect facility performance. CQA provides assurance that these unexpected changes or conditions will be detected, documented, and addressed during construction.

Additional responsibility and authority may be delegated to the Project Engineer by the expressed consent (i.e., a contractual agreement) of the facility Owner/Operator. Additional responsibility and authority includes formulating and implementing a site-specific CQA plan, periodic review of CQA documentation, modifying construction site activity, and specifying specific corrective measures in cases where deviation from the specified design or failure to meet design criteria, plans, and specifications is detected by CQA personnel.

2.2.4 CQA Responsibility

JEA's CQA Officer and personnel include: David A. Keough, P.E., CQA Officer, Steven J. Laux, P.E., and Kenneth S. Vogel, P.E.

The overall responsibility of the CQA personnel is to perform those activities specified in the CQA plan (e.g., inspection, sampling, documentation). At a minimum, CQA personnel will include a CQA officer and the necessary supporting CQA inspection personnel. The specific responsibilities and authority of each of these individuals will be defined clearly in the CQA plan and in the associated contractual agreements with the facility Owner/Operator.

Specific responsibilities of the CQA Officer will include:

A. Reviewing design criteria, plans, and specifications for clarity and completeness so that the CQA plan be implemented.

B. Educating CQA inspection personnel on CQA requirements and procedures.

C. Scheduling and coordinating CQA inspection activities.

D. Directing and supporting the CQA inspection personnel in performing observations and tests by:

   1. Submitting blind samples (knowns, duplicates, and blanks) for analysis by the CQA inspection personnel and one or more independent laboratories.

   2. Confirming that regular calibration of testing equipment is properly conducted and recorded.

   3. Confirming that the testing equipment, personnel, and procedures do not change over time or making sure that any changes do not adversely impact the inspection process.

4. Confirming that the test data are accurately recorded and maintained (this may involve selecting reported results and backtracking them to the original observation and test data sheets).

5. Verifying that the raw data are properly recorded, validated, reduced, summarized, and interpreted.

E. Providing to the facility Owner/Operator reports on the inspection results including:

1. Review and interpretation of all data sheets and reports.

2. Identification of work that the CQA Officer believes should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval.

3. Rejection of defective work and verification that corrective measures are implemented.

F. Verifying that a Contractor's construction quality control plan is in accordance with the site-specific CQA plan.

G. At the Owner/Operator's request, reporting to the Contractor results of all observations and tests as the work progresses and interacting with the Contractor to provide assistance in modifying the materials and work to comply with the specified design.

2.2.5 Responsibility of CQA Inspection Personnel

JEA's CQA Inspection Personnel have not been selected at this time; however, the specific responsibilities of the supporting CQA inspection personnel will include:

A. Performing independent on-site inspection of the work in progress to assess compliance with the facility design criteria, plans, and specifications.

B. Verifying that the equipment used in testing meets the test requirements and that the tests are conducted according to the standardized procedures defined by the CQA plan.

C. Reporting to the CQA Officer results of all inspections including work that is not of acceptable quality or that fails to meet the specified design.

D. Assist the CQA Officer in review and interpretation of all data sheets and reports.

2.2.6 Construction Contractor

The Construction Contractor with their associated personnel have not been designated at this time; however, the following responsibilities pertain:

A. It is the responsibility of the Construction Contractor to construct the geomembrane remediation in strict accordance with design criteria, plans, and specifications, using the necessary construction procedures and techniques. This responsibility may be expanded, as part of the contractual agreement with the facility Owner/Operator, to include formulating and implementing a formal plan for construction quality control.

B. Discussing procedures for the location and protection of construction materials and for the prevention of damage of the materials from inclement weather or other adverse events.

C. Conducting a site walk-around to review construction material and inspection equipment storage locations.

2.2.7 Other Project Responsibilities

Other project responsibilities shall consist of:

- Project Meetings
- Preconstruction CQA Meetings
- Progress Meetings
- Problem or Work Deficiency Meetings

3.0 QUALIFICATIONS OF THE CQA TEAM

The CQA plan will identify the qualifications of the CQA team and describe the expected duties of all team members.

3.1 CQA OFFICER

The CQA Officer is that individual assigned singular responsibility for all aspects of the CQA plan implementation. The CQA Officer is responsible to the facility Owner/Operator and will function independently of the Owner/Operator.

The CQA Officer is a Florida Registered Professional Engineer who possesses adequate formal academic training in engineering and managerial experience to successfully oversee and implement construction quality assurance activities for solid waste disposal facilities. The CQA Officer will be expected to ensure that communication of all CQA-related matters is conveyed to and acted upon by the affected organizations.

3.2 CQA INSPECTION PERSONNEL

The CQA inspection personnel possess adequate formal training and sufficient practical, technical, and administrative experience to execute and record inspection activities successfully. This includes knowledge of specific field practices relating to construction techniques used for solid waste disposal facilities, all codes and regulations concerning material and equipment installation, observation and testing procedures, equipment, documentation procedures, and site safety.

4.0 INSPECTION ACTIVITIES

This section of the CQA plan describes the inspection activities (observations and tests) that will be performed by the CQA personnel during the geomembrane remediation. The presented discussion will address only the construction and installation of the facility components and the manufacture/fabrication of various compounds when pertinent. This section addresses the inspection activities that are necessary to ensure that the facility has been constructed to meet or exceed all design criteria, plans, and specifications. The first subsection addresses general preconstruction activities applicable to all facility compounds. The subsequent subsections discuss each facility component in the areas of preconstruction, construction, and post-construction inspection activities unique to each component. Technical specifications for construction of the geomembrane remediation are provided as Appendix A. Appendices B (Sample Geomembrane Manufacturer's/Installer's QA/QC Plan) and C (CQA and Project Management Forms) contain sample CQA and Project Management Forms. These are included for information only and are indicative of the forms that will be part of the routine management and construction completion report. The blank sample geomembrane manufacturer and installer forms that are included in Appendix C are representative of the types of forms and paperwork that will be required of the geomembrane manufacturer and installer. The Contractor will select the installer and manufacturer in accordance with the project specifications. The inclusion of these manufacturer's and installer's plans and forms in no way constitutes recommendation or pre-approval of these companies.

4.1 GENERAL PRECONSTRUCTION ACTIVITIES

The drawings and specifications will be reviewed prior to construction commencement by the CQA team. All members of the CQA team working on this project have considerable experience in landfill design and construction. Engineering considerations, CQA control procedures, and required results will be discussed.

4.2 GEOMEMBRANE LINER

The geomembrane liner to be installed is to be compatible with the waste liquid constituents that may contact it and be of sufficient strength and thickness to withstand the forces expected to be encountered during construction and operation.

4.2.1 Preconstruction

Preconstruction activities include:

- Inspection of the raw material, manufacturing, fabrication, and product quality control documents.
- Inspection of the transportation, storage, and handling of the geomembrane.
- Evaluation of installation personnel and field QA/QC documentation.

A discussion of submittals/shop drawings and specific testing frequencies and properties is contained in Appendix A (technical specifications) of this report. The technical specifications list in detail all of the parameters that are to be achieved during production, fabrication, and installation aspects of the geomembrane liner.

4.2.2 Construction

During construction, the CQA inspection personnel will collect all roll labels, record placement of the geomembrane rolls on a location map, and document other various aspects of construction that include:

- Conformance to submitted and approved panel layout plans.
- Observation of weather conditions.
- Measurement, inspection, and documentation of the geomembrane liner seaming, destructive and non-destructive testing, repairs, and protective layer placement.

4.2.3 Post Construction

The installed geomembrane liner will be visually inspected prior to waste acceptance.

5.0 SAMPLING STRATEGIES

Sampling strategies shall consist of the following two different methods: statistical sampling and judgmental sampling.

5.1 STATISTICAL SAMPLING METHODS

Statistical sampling methods include sample size, sample locations, frequency of testing, acceptance and rejection criteria, along with plans for implementing corrective measures that may be necessary.

5.2 JUDGMENTAL SAMPLING METHODS

Judgmental sampling methods include any sampling strategy where decisions concerning sample size, selection scheme, and/or locations are based on criteria other than statistical considerations. The objective will be to select a typical sample element or elements to represent a whole process or to identify zones of suspected poor quality.

6.0 DOCUMENTATION

The documents outlined below describe the various elements of CQA inspection, reporting, and final completion documentation. Each of the presented items is essential to document that the completed facility has been constructed to meet or exceed design criteria, plans, and specifications. The various elements are briefly discussed below, and sample documents from previously completed projects are presented in Appendix C.

6.1 DAILY REPORTS

The standard daily report from the CQA inspector will include a work summary with supporting inspection/documentation sheets that are completed daily during construction. Items included are:

- Unique document number.
- Date, project name, location, and other identification.
- Reports on any meetings held and their results.
- Activities and locations of construction under way during the time frame of the daily summary report.
- Equipment and personnel involved in construction activities including subcontractors.
- Descriptions of areas of work being inspected and documented.
- Description of offsite materials received, including any quality verification (vendor certification) documentation.
- Calibrations, or recalibrations, of test equipment, including actions taken as a result of recalibration.
- Decisions made regarding approval of material and/or corrective actions to be taken in instances of substandard quality.
- Signature of the CQA inspector.

6.2 INSPECTION DATA SHEETS

The inspection data sheets record the observations of field and laboratory test data. The formats range from reports, charts, graphs, notes, sketches, and photographs. At a minimum, items included are:

- Unique identifying sheet number for cross-reference and document control.
- Description or title of the inspection activity.
- Location of the inspection activity or location from which the sample increment was obtained.
- Type of inspection activity; procedure used (reference to standard method when appropriate).
- Recorded observation or test data, with all necessary calculations.
- Results of the inspection activity; comparison with specification requirements.
- Personnel involved in the inspection activity.
- Signature of the appropriate testing laboratory personnel.

6.3 PHOTOGRAPHIC REPORTING DATA SHEETS

The CQA inspector will take photographs and maintain a log of photographs throughout the construction period. At a minimum, the photographic information will include the following:

- The date, time, and location where the photograph was taken and weather conditions.
- The size, scale, and orientation of the subject matter photographed.
- Location and description of the work.

These photographs will serve as a pictorial record of work progress, problems, and corrective measures. The photographs and log will be kept in a permanent protective file in chronological order. The file will contain color prints, and negatives will be stored separately.

6.4 FINAL DOCUMENTATION

After the completion of the project, the facility Owner/Operator will submit a final report to the permitting agency which will include a statement of acceptance by the CQA officer, inspection data sheets, independent testing agency reports, identification of major deviations from the approved permit documents, and as-built drawings.

6.4.1 Responsibility and Authority

The final documentation will describe the as-built sequence of construction. The document will be sealed and signed by the CQA officer which will serve as certification that the project is constructed in accordance with the Contract Documents and the DEP permit.

6.4.2 Relationship to Permitting Agencies

Final documentation submitted to the permitting agency as part of the CQA plan documentation does not sanction the CQA plan as a guarantee of facility construction and performance. The purpose of the final documentation is to certify that the CQA plan was implemented as proposed and that the facility was constructed in accordance with the Contract Documents and DEP permit.

APPENDIX A

TECHNICAL SPECIFICATIONS

SECTION 06800
GEOMEMBRANE

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1.02 RELATED WORK 06800-1
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SECTION 06800
GEOMEMBRANE

PART 1 GENERAL

1.01 SUMMARY

This section covers the work required to furnish and install the high-density polyethylene (HDPE) geomembranes including all necessary labor, equipment, and appurtenances.

1.02 RELATED WORK

A. The Standard and Supplementary Conditions of these specifications are a part of this section as if incorporated herein.

B. Other related specification sections contained herein are listed below:

Section 01300, Schedule, Reports, Records, and Submittals

1.03 DEFINITIONS

A. "Manufacturer" is defined as a person or company that is in the business of processing and manufacturing the polyethylene resin and other components into the extruded, usable form of geomembrane sheet material. This person or company will be responsible for all Quality Assurance/Quality Control (QA/QC) requirements of the resin material testing, factory testing, and the material warranty.

B. "Installer" is defined as a person or company that is in the business of joining the extruded, rolled panels and other related products and permanently installing the material in a manner consistent with the project plans and specifications. This person or company shall be responsible for all QA/QC requirements of "field testing" and is responsible for the complete and proper installation of the geomembrane material and the related products. This person or company must act as a manufacturer's authorized installer.

C. "Technical Representative" is defined as a person who has demonstrated, in the Engineer's opinion, sufficient technical competence and geomembrane material installation supervision, and is a designated representative of the manufacturer. This person shall possess a thorough knowledge and understanding of the project plans and specifications as well as the submitted and approved QA/QC plan.

D. Quality Assurance (QA): A program establishing policies, procedures, standards, training, guidelines, testing, and systems necessary to provide quality in the work to meet the project requirements and accepted industry standards.

E. Quality Control (QC): The specific implementation of the Quality Assurance program, including checking and review of activities.

1.04 REFERENCE STANDARDS

A. Reference standards and recommended practices referred to herein shall be the latest revision of any such document.

B. Standards referenced herein are as listed below:

1.	ASTM D 638	Tensile Properties of Plastics
2.	ASTM D 696	Coefficient of Thermal Expansion of Plastics
3.	ASTM D 1004	Initial Tear Resistance of Plastic Film and Sheeting
4.	ASTM D 1204	Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
5.	ASTM D 1238	Flow Rates of Thermoplastics by Extrusion Plastometer
6.	ASTM D 1505	Density of Plastics by the Density-Gradient Technique
7.	ASTM D 1603	Carbon Black in Olefin Plastics
8.	ASTM D 3895	Carbon Dispersion
9.	ASTM D 4437	Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
10.	ASTM D 4885	Standard Test Method for Determining Performance Strength of Geomembranes by the Wide Strip Tensile Method
11.	ASTM D 5321	Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
12.	ASTM D 5397	Evaluation of Stress Crack Resistance of Polyolefin Geomembrane Using Notched Constant Tensile Load Test
13.	ASTM D 5596	Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics

14.	ASTM D 5641	Geomembrane Seam Evaluation by Vacuum Chamber
15.	ASTM D 5820	Pressurized Air Channels Evaluation of Dual Seamed Geomembranes
16.	ASTM D 5994	Measuring Core Thickness of Textured Geomembranes
17.	ASTM D 6365	Standard Practice for the Nondestructive Testing of Geomembrane Seams Using Spark Test
18.	ASTM D 6392	Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
19.	ASTM E 96	Water Vapor Transmission of Materials
20.	GRI GM13	Test Properties, Test Frequency, and Recommended Warrant for High Density

1.05 SUBMITTALS, SHOP DRAWINGS, AND SAMPLES

A. All submittals shall be in accordance with Section 01300, Schedules, Reports, Records, and Submittals, and shall be in sufficient detail to show full compliance with these specifications.

B. The Installer shall submit a copy of the geomembrane liner manufacture and installation QA/QC plan. This information shall include information regarding repair of geomembrane defects. The QA/QC plan and the records of experience as specified herein shall be provided with the executed agreement/documents submitted to the Owner.

C. The Installer shall submit the printed product data for all materials, including material specifications and drawing details. The Installer shall submit the printed installation instructions including a complete description of methods to be used for seaming, splicing, patching, repairs, anchoring, and penetrating the geomembrane. Submittals shall include manufacturer's recommended methods for handling and storage.

D. Installer shall submit all installation drawings and procedures for carrying out the work. Shop drawings shall include a panel layout drawing to show the geomembrane sheet layout including the proposed configuration, size, number, position of all sheets, and the sequence of placements. The submittal shall include the location and direction of all seams.

E. Installer shall submit samples of HDPE geomembrane, penetration materials, anchor strips, anchor bolts, clamps, and other appurtenances.

F. Product data, samples, certifications, and shop drawings shall be submitted by the Installer for review and approval by the Engineer.

G. Testing certification as specified herein shall be submitted to the Engineer.

H. Laboratory test results shall be provided to the Engineer by the Installer no later than 48 hours after receipt of the test results. The Installer shall also provide test results, certifications, and submittals as required to conform to these specifications.

I. During construction, the Installer shall submit installation reports to the Engineer. Reports of installation shall include the following:

1. Material delivery report.
2. Pre-start site inspection.
3. Soil subgrade acceptance.
4. Daily records of construction (text documentation).
5. Daily personnel activity reports.
6. Equipment list, including manufacturer and serial number.
7. Chain-of-custody for destructive samples.
8. Field seam strength test reports and patch testing (destructive).
9. Meeting reports.
10. Problem/solution reports.
11. Seam records.
    a. Name of welder.
    b. Date of weld.
    c. Time of weld.
    d. Location of weld.
    e. Equipment used.
    f. Equipment temperature; start and finish.
    g. Ambient air temperature
12. Nondestructive test records.
13. Certification of completed installation.
14. Maps-updated weekly.

J. The following schedule of submittals identifies, but does not limit, the submittals/shop drawings referenced in this specification section. Refer to the specification paragraph referenced for additional information and/or requirements.

ITEM	SPECIFICATION PARAGRAPH	NUMBER REQUIRED	WHEN REQUIRED
QA/QC Plan	06800-1.5.B	-----	At contract execution
Material specification, installation instructions, handling and storage recommendations	06800-1.5.C	-----	At contract execution or within 10 days
Shop and installation drawings	06800-1.5.D	-----	At contract execution or within 10 days
HDPE material product data, and certifications	06800-1.5.E	-----	At contract execution or within 10 days
Testing certifications and results	06800-1.5.G	-----	Field results within 48 hours of receipt
Documentation of experience	06800-1.6.B, C	-----	Bid/proposal
Subgrade acceptance certificate	06800-1.6.D	As required	Prior to placement of geomembrane
Factory material tests and manufacturer's certification	06800-1.8	1/50,000 SF, unless noted otherwise	Within 60 days of contract execution and 30 days prior to material shipment
Nondestructive field seam, penetrations, and repair test results	06800-1.9.B, C, -1.5.J	All seams	Within 24 hours after testing is performed
Destructive field seam test results	06800-1.9.D, -1.5.J	1/500 LF of seam or 3/seam period (greater) and start up test strips	Within 48 hours of receipt of test results from the approved independent testing lab
Destructive cap (patch) testing	06800-1.9.G, -1.5.J	If required, as needed	Within 48 hours of receipt of test results from the approved independent testing lab
Record documents	06800-3.9.A,B,&C, -1.6H	As required by specification	30 days prior to project closeout

1.06 QUALITY ASSURANCE AND CONTROL (QA/QC) - GENERAL

A. Geomembrane installation shall be performed by an Installer certified, in writing, by the Manufacturer of the geomembrane.

B. <u>Documentation</u>

1. The Manufacturer shall submit documented evidence of proven technical competence, past record of satisfactory performance on similar projects totaling at least 100 million square feet -- including at least 20 acres (871,000 square feet) of green surface exposed liner -- and sufficient capacity to do the volume of work within the required time frame for total project completion within the contract time period. Documentation shall include a typewritten

list indicating the name and location of each project which geomembrane was supplied by the manufacturer; Owner's name, address, and telephone number; square footage of installed geomembrane; type and thickness of geomembrane material installed; seaming method(s) used; and name of installer. This information shall be submitted with the bid or within 10 days of that date.

2. The Installer shall submit documented evidence of proven technical competence, past record of satisfactory performance on five HDPE liner installation jobs and sufficient capacity to do the volume of work within the required time frame for total project completion within the contract time period. Documentation shall include a typewritten list indicating the name and location of each geomembrane installation performed by the Installer; the final construction cost of the geomembrane (if known); Owner's name, address, and telephone number; square footage of installed geomembrane; type and thickness of geomembrane material installed; seaming method(s) used; and resumes of senior installation personnel. This information shall be submitted at Contract execution or within 10 days of that date.

C. The Installer shall, at his expense, provide a geomembrane Manufacturer's Technical Representative at the job site full-time to ensure compliance with the geomembrane Manufacturer's and Installer's submitted and approved QA/QC plan. The geomembrane Manufacturer's Technical Representative shall be present during geomembrane construction and provide technical supervision and assistance at all times during the installation of the geomembrane and as may be required by the Engineer. The Manufacturer's Technical Representative shall have supervised a minimum of 4 million square feet of geomembrane installation. The Manufacturer's Technical Representative shall be responsible for a thorough knowledge and understanding of the project specifications and approved QA/QC plan. The Manufacturer's Technical Representative shall be excluded from routine physical installation of the geomembrane material.

D. Testing and test results shall be performed and certified as specified herein.

E. The finished geomembrane installation shall be inspected by the Installer, the Engineer, and the geomembrane Manufacturer's Technical Representative. The geomembrane Manufacturer's Technical Representative shall provide a letter to the Engineer certifying that, without exception, the geomembrane system has been installed in complete accordance with the project Contract Documents, the approved QA/QC plan, and the Manufacturer's recommendations. All items precluding this certification shall be remedied by and at the expense of the Installer.

1.07 GEOMEMBRANE MANUFACTURER'S QA/QC

A. The manufacturer shall submit factory material test results representative of every 40,000 square feet of geomembrane per batch, and as stated herein, showing conformance with the requirements of these specifications. In the case of a failure,

subsequent testing shall be performed at the Installer's expense on all geomembrane material produced from the same batch of compounds to determine if rolls produced from the entire batch are unsatisfactory. Additional testing of individual rolls may be required at the Installer's expense to identify the noncomplying rolls and/or to qualify individual rolls. All rolls not conforming to the requirements of the Contract Documents will be rejected.

B. The Installer shall submit the manufacturer's certification stating the lot, panel number, and location of each test specimen taken and that the geomembrane material meets the specifications and is suitable for the intended application.

C. There shall be no holes, blisters, or areas of undisbursed resin.

D. The cost of all testing required for the manufacturer's QA/QC program or as specified herein shall be borne by the Installer. Materials failing testing and/or inspection shall be repaired, reinspected, and retested by, and at the expense of, the Installer until compliance is attained.

E. Geomembrane material shall not be shipped to the project site until the results of all manufacturer's QA/QC testing have been submitted and approved by the Engineer.

1.08 FIELD SEAMING QA/QC

A. The cost of all testing, both destructive and nondestructive, required for the field seaming QA/QC program shall be borne by the Installer with the exception of testing on samples submitted to the Engineer as described herein. Seams failing testing and/or inspection shall be repaired, reinspected, and retested by, and at the expense of, the Installer until compliance is attained. All laboratory test reports shall be reviewed and approved for project conformance by a Professional Engineer registered in the state of Florida. All test reports shall be signed and sealed by the Professional Engineer.

B. The Installer shall nondestructively test all field seams over their full length. Continuity testing shall be carried out as the seaming work progresses. The Installer shall complete any required repairs in accordance with the approved QA/QC program. All nondestructive testing shall be observed by the Engineer and the geomembrane Manufacturer's Technical Representative. Documentation of these tests shall be submitted daily to the Engineer's field representative.

1. All extrusion seams, penetrations, and repairs shall be continuously nondestructively tested using vacuum box methods in accordance with ASTM D 5641. Alternatively, a holiday spark test method may be employed on all penetrations, seams, and repairs.

2. Split-wedge seams shall be pressure tested in accordance with ASTM D 5820. The repaired seam will be retested and repaired until the seam passes the pressure test.

C. All holes in the geomembrane due to destructive seam sampling shall be immediately repaired by the Installer. The continuity of the new seams in the repaired area shall be nondestructively tested as specified herein.

D. All field seam sample specimens tested by the independent testing agencies retained by both the Installer and the Owner shall be required to pass the minimum material properties specified herein. If any specimen fails, the entire sample from which it was taken shall be considered as a failure and the field seam shall be rejected due to nonconformance with the specifications. Seam shear and peel test requirements are for both wedge and extrusion welds. Seam shear strength shall have a minimum value of 121 pounds per inch (ppi) of width (fusion) and 117 ppi (extrusion). Peel test strength shall have a minimum value of 91 pounds per inch of width (fusion) and 80 ppi (extrusion).

E. The Installer shall comply with the following corrective measures if a seam sample test failure is recorded:

1. Cap each field seam represented by the failed sample and submit 1 new destructive test sample for each seam made during the capping procedure. Failed seam must be completely bounded by new cap.

2. Perform a visual inspection of the geomembrane sheets, seams, anchors, seals, and repairs for defects as the installation progresses and again on completion.

3. Defective and questionable areas (per visual inspection) shall be clearly marked and repaired to the Engineer's satisfaction. Each area showing damage due to scuffing, penetration by foreign objects, or distress from rough subsurface shall, at the expense of the Installer, be replaced or covered with an additional layer of geomembrane material.

F. The Installer shall retain responsibility for the integrity of the geomembrane system until acceptance by the Engineer. The geomembrane will not be accepted by the Engineer until:

1. Installation is completed in accordance with the Contract Documents.

2. Written certification letters, warranty, installation record documents, and record drawings have been received by the Owner.

3. Documentation of completed installation test results, including all reports, is complete.

4. Verification of adequacy of field seams and repairs, including all testing, is complete.

PART 2 PRODUCTS

2.01 GEOMEMBRANE MATERIAL

A. The geomembrane shall be a co-extruded, textured, HDPE and shall consist of products designed and manufactured specifically for the intended purpose which shall have been satisfactorily demonstrated by prior use to be suitable and durable.

B. The geomembrane shall be manufactured completely of virgin poly-ethylene resin.

C. The geomembrane shall be supplied as a factory-fabricated sheet with no factory seams, individually packaged on a heavy cardboard roll which shall have a minimum width of 22 feet or as available from the Manufacturer and approved by the Engineer. The roll length and width shall be maximized to provide the largest manageable sheet for the fewest field seams.

D. The HDPE geomembrane shall have the following physical properties when measured in accordance with the referenced standard.

Table 2 Conformance Testing

Property	Frequency of Testing	Test Method	Value
Geomembrane Thickness (mils) (min)	Every roll	GRI GM 13	60
Geomembrane Density (g/cubic cm) (min-max)	Every 5th roll	GRI GM 13	0.920 - 0.935
Carbon Content (%)	Every 5th roll	GRI GM 13	2.5 ± 0.5
A. Tensile Properties (min) Table and graph of stress versus strain with stress recorded at every 1% strain. Tensile stress and elongation at yield shall be clearly indicated.	Every 5th roll	ASTM D 4885	
B. Tensile Stress at Yield (lbs/inch width) (minimum)			130
C. Elongation at Yield (%)(2.5" Gage Length) (minimum)			12
Oxidation Induction Time (hr)	Every 5th roll	GRI GM 13	24
Notched Constant Tensile Load Stress Cracking (NCTL) Test (hr)	Every 5th roll	GRI GM 13	>200

E. Each roll shall be given a prominent, unique, indelible identifying marking indicating the sheet number, date of fabrication, and proper direction of unrolling and/or unfolding to facilitate layout and positioning in the field. This marking shall be on the top of the sheet.

2.02 SEAMS

A. All seams shall be of sufficient strength to withstand all loads applied during handling, installation, and operation and to prevent seam leaks over the life of the geomembrane. Seam shear strength and peel strength shall be as specified herein for split-wedge (fusion) and extrusion-type welds. Seams shall be sealed smooth and provide a film-tearing bond mode of failure when tested for shear and peel.

B. Resin used for extrudate material shall be compatible with the geomembrane material resin.

C. The fusion welding equipment used shall be capable of continuously monitoring and controlling the temperatures and pressures in the zone of contact where the machine is actually fusing the geomembrane material, so as to ensure that changes in environmental conditions will not affect the integrity of the weld.

2.03 PENETRATIONS AND ACCESSORIES

A. All required accessories (i.e., vents, battens, gaskets, sealants, ballast tubes, fasteners, etc.) shall be designed, fabricated, and supplied by the geomembrane installer.

B. Anchor strips shall be continuous for straight runs.

C. Boots are to be fabricated so as to allow excess material to be gathered around the pipe below the stainless steel mechanical clamps in a "socked" fashion or otherwise constructed to allow for 1 foot of landfill settlement before requiring clamp adjustment. Boots' construction technique and details shall be approved by the Engineer.

PART 3 EXECUTION

3.01 GENERAL

All installation procedures shall conform to the requirements of the submitted and approved QA/QC documentation and the requirements of these specifications.

3.02 SURFACE PREPARATION

A. Surfaces to be covered shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind.

B. The prepared surface underlying the geomembrane shall not be allowed to deteriorate after acceptance and shall remain acceptable up to the time of geomembrane placement.

3.03 STORAGE AND HANDLING

A. Geomembrane materials shall be transported, stored, and handled in strict conformance with the fabricator's submitted and approved QA/QC plan.

B. Material is to be stored in an area designated by the Owner until the material is to be deployed for seaming. Geomembrane material shall not be deployed as a measure to protect the completed subgrade from inclement weather.

3.04 GEOMEMBRANE INSTALLATION

A. Geomembrane installation shall not commence until geomembrane shop drawings and QA/QC plans have been approved and the letters of certification and required documentation, as specified herein, have been received, accepted, and approved by the Engineer.

B. The geomembrane shall be placed over the prepared surfaces in such a manner as to minimize handling. It shall be attached/sealed to all structures in accordance with details shown on the drawings and/or in accordance with details prepared by the geomembrane Manufacturer which have been submitted by the Installer and approved by the Engineer. The geomembrane shall be closely fitted and completely sealed around projections through the geomembrane. Sufficient excess geomembrane material shall be provided to accommodate thermal expansion and contraction and normal settlement; but not excessive to the extent that folds left in the geomembrane material could cause it to crack, break, or pond liquid. All folds shall be repaired or the material realigned to remove any folds.

C. Hardware shall not protrude against the geomembrane so as to cause abrasion or other damage.

D. No equipment used shall damage the geomembrane by handling, trafficking, leaking of hydrocarbons, or other means.

E. No persons in contact with the geomembrane shall smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane.

F. The method used to unroll the panels shall not cause scratches or crimps in the geomembrane and shall not damage the supporting soil.

G. The Installer shall provide adequate temporary ballasting and/or anchoring to prevent uplift by wind. Selection of ballast (e.g., sand bags, tires, etc.) shall not contain sharp edges (e.g., steel-belted radials) which would damage the geomembrane. Wind-

blown geomembrane shall be considered damaged and shall be replaced at the Installer's expense.

H. The geomembrane in high-traffic areas shall be protected by geotextiles, extra geomembrane, or other suitable materials.

3.05 REPAIRS

A. Repairs to the geomembrane shall be made with the geomembrane material meeting the requirements of the specifications listed herein. All wrinkles shall be smoothed out. All patches shall be round or have rounded corners. Patch size shall be sufficient to cover the defective area plus 6 inches in all directions from the boundary of the defective area.

B. Any necessary repairs to the geomembrane shall be made with the geomembrane material itself. The contact surfaces shall be prepared and the patch applied by extrusion welding methods.

C. Repair methods shall conform to the submitted and approved QA/QC plan, as approved by the Engineer.

3.06 SUBMITTALS REQUIRED FOR PROJECT CLOSEOUT

A. Certifications: Submit certification by the geomembrane Manufacturer and Installer that the geomembrane was installed in substantial accordance with their recommendations and to the Manufacturer's satisfaction. Certification shall be made on the forms attached at the end of this section.

B. Record Drawings: Submit reproducible drawings of record showing changes from the approved installation drawings. The record drawings shall include the identity and location of each repair, cap strip, penetration, and sample taken from the installed geomembrane for testing.

C. Quality Control Records: Submit three original copies of a Quality Control Record Document containing copies of all material and seam test results. Each test shall be identified by date of sampling, date of testing, location of sampling, individual who performed the test, standard test used, departures from standard test methods, and any other pertinent information. These records are submitted in addition to any previously required quality control records.

D. Records of Installation: These include daily records of construction, seaming logs, Installer's and welder's resumes, nondestructive test reports, problem/solution sheets, and other record documents of installation.

HDPE GEOMEMBRANE MANUFACTURER'S CERTIFICATE
OF
ACCEPTABLE INSTALLATION

The HDPE manufacturer _____ for the (Project) _____ _____ hereby certifies that the installation of the geomembrane liner is in accordance with our recommendations, approved QA/QC Plan, and the quality of the work has been to our satisfaction.

Signed: _____

(Representative of Geomembrane Manufacturer)

_____
(Position)

Date: _____

Witness: _____

APPENDIX B

SAMPLE GEOMEMBRANE MANUFACTURER'S/INSTALLER'S QA/QC PLAN

AGRU/AMERICA, INC.

MANUFACTURING QUALITY CONTROL

SALES OFFICE:

AGRU/AMERICA, INC.

600 Rockmead, Suite 103

KINGWOOD, TEXAS 77339

Telephone: (281) 358-4741

Fax: (281) 358-5297

Toll Free: (800) 373-2478

E-Mail: salesmkg@agruamerica.com

Webpage: http//www.agruamerica.com

April 13, 1999

AGRU / AMERICA, INC. - QA/QC

Manufacturing - Quality Assurance - Quality Control

AGRU AMERICA, Inc. extrudes high density polyethylene (HDPE) and linear low density polyethylene (LLDPE) geomembrane at its plant located at 500 Garrison Road, Georgetown, SC 29440. This geomembrane is available as per attached packaging standard - Attachment "A".

Our Quality Assurance Manufacturing Program is dependent on the utilization of an in-house laboratory which is, when necessary, complemented with testing performed by certified outside laboratories such as:

- Geosyntec Laboratories, Boca Raton, Florida
- Telephone (561) 995-0900; Fax (561) 995-0925
- Geotechnics Laboratories, Pittsburgh, Pennsylvania
- Telephone (412) 823-7600; Fax (412) 823-8999
- TRI/Environmental, Inc., Austin, Texas
- Telephone (512) 263-2101; Fax (512) 263-2558

When required, we can also enlist the support of our parent technical laboratory, Agru-Alois Gruber GmbH, Bad Hall, Austria.

Raw Material - Data Sheet

HDPE and LLDPE resin is supplied to our plant in bulk and subjected to the following procedures:

- Prior to shipment, our resin supplier submits a certificate of analysis (Attachment "B") and a resin sample which is tested for melt index compliance. Once approved, the resin is released for shipment to our plant.
- One sample is taken from each rail car section and tested as follows:
  - Melt Index ASTM D-1238 Condition E
- Once the test has been completed and results found to be in compliance with our requirements (.20-.30g/10min), the resin is then unloaded into our silo system.
- At this stage, our supplier has performed one battery of tests and AGRU has performed 5 tests.
- Off specification HDPE resin is returned to the supplier.

Executive Offices: 500 Garrison Road, Georgetown, S.C. 29440 • 843-546-0600 • 800-321-1379 • Fax 843-546-0516
Sales Office: 600 Rockmead, Suite 103, Kingwood, TX 77339 • 281-358-4741 • 800-373-2478 • Fax 281-358-5297
email: salesmkg@agruamerica.com

The Extrusion Process

The resin is conveyed through a vacuum pump system and flexible hoses to a dryer hopper, feeding the resin by gravity into an 8-inch barrel. This barrel is divided into 5 heating zones, each heating zone being computer controlled and constantly monitored.

A screw in the barrel turns at a prescribed and monitored speed. It conveys slowly, plasticating the resin to full plastication, and then the plasticated resin is fed through a manifold into a coat hanger die having a width of approximately 24 feet. The die lips are open to a prescribed distance governed by the thickness of the geomembrane to be extruded.

Exiting the die, the plasticated resin forms a controlled and monitored bead which feeds into a three chrome roll stack in a prescribed pattern. Each chrome roll is set at a prescribed temperature, controlled by water circulation.

Exiting the controlled cooling of the roll stack, the geomembrane starts to travel down the take off haulers towards the winder. On the way down the take off, the liner is trimmed to bring the finished width to the applicable standard. Trimmings are granulated.

The trimmed edge of one side of the geomembrane is marked at every 3.28 ft with meter length, thickness, roll number and Agru America name. This marking also serves as product identification.

The geomembrane is visually inspected for surface defects as it travels down the take off by both the extruder and the winder operators.

The geomembrane is wound on a recycled HDPE core having 6" ID (150mm), 7" OD (175mm) and 22'8" (6.8m) length. Each roll weighs approximately 3,000 pounds (1360 kg) or 4,500 pounds (2045 kg) and is fitted with two nylon slings.

Post Extrusion Quality Control

Once start up conditions are over and commercial extrusion is initiated, post production quality control comes into operation. A series of test procedures are performed at an approximate frequency based upon the weight of the resin extruded at intervals of : each roll, 20,000, 40,000, and 180,000 pounds.

A sample approximately 10" by the full width of the geomembrane is taken from <u>every</u> roll. Based on the above weight frequencies, certain specimens are die cut, tested and the results summarized on the Certificate of Conformity (Attachments C-G) issued by our Quality Control Department. The certificate is signed by the Quality Control Manager. The Quality Control Manager reports directly to the President of the Company.

Rolls failing to comply with either specific project specification and/or our own latest revision to our published data sheets are set aside for granulation.

Certificates of Conformity are provided for the following products:

Smooth Liner - Attachment "C"
Textured Liner - Attachment "D"
Drain Liner - Attachment "E"
Grip Liner - Attachment "F"
Super Grip Net Liner - Attachment "G"

Often a third party Quality Assurance representative is mandated by the owner of a project to oversee our manufacturing QA. We gladly subscribe to this procedure and make all our records available to this person 24 hours a day for the duration of the mandate.

Test Procedures Performed

The following reported items are incorporated in our Certificate of Conformity:

Roll number

(example) **206306 99**

First digit	machine
Second and third digits	week of year
Fourth digit	day of week (Monday=1, Sunday=7)
Last two digits	roll number (first roll of week is 01, etc.)

The two last digits separated from the others indicate the year the roll was produced (Starting in 1999)

Using the above key:

roll # 206306 99 was produced on Liner Machine #2 on Wednesday, February 10, 1999.

Product Description (liner type: Smooth, Microspike™, Drainage, etc.)

Raw material lot and/or batch number and supplier/product identification

Measurements:

Nominal thickness in mils and millimeters
Roll length in feet and meters
Roll width in feet and meters

The following test results are reported in our Certificate of Conformity:

Density by Displacement Attachment "J"	Frequency: 1 test every 180,000lbs Reported: g/cc	ASTM D-792
Melt Flow Index	Frequency: 1 test every 180,000lbs Reported: g/10min 190°C	ASTM D-1238 Condition E
Carbon Black Content Attachment "K"	Frequency: 1 test every 20,000lbs Reported: % carbon black	ASTM D-4218 or D 1603
Carbon Black Dispersion Attachment "L"	Frequency: 1 test every 40,000lbs Reported: category	ASTM D-5596
Environmental Stress Crack Resistance Attachment "S"	Frequency: 1 test every 180,000lbs Reported: Pass or Fail	ASTM D-1693
Notched Constant Tensile Load Stress Crack Resistance (NCTL) Attachment "T"	Frequency: 1 test every 180,000lbs Reported: Pass or Fail	ASTM D-5397 Appendix A
Asperity Height Attachment "U"	Frequency: 1 test per roll Reported: Average Height in mils	GRI GM-12 For Textured Liner

The following test results are also reported on our certificate of Conformity, but are derived from tests **Modified** from the original Standards:

Puncture Resistance Attachment "R"	Frequency: 1 test every 40,000lbs Reported: Resistance in lbs (both)	FTM Stn 101C Meth. 2065 and ASTM D-4833 (Both Modified) [1]
Tear Resistance Attachment "Q"	Frequency: 1 test every 40,000lbs Reported: Resistance in lbs	ASTM D-1004 (Modified)[2]
Tensile Strength Attachment "M"	Frequency: 1 test every 20,000lbs Reported: Strength @ Yield in psi Strength @ Break in psi	ASTM D-638 (Modified)[3]
Elongation Attachment "M"	Frequency: 1 test every 20,000lbs Reported: % Elongation @ Yield % Elongation @ Break	ASTM D-638 (Modified)[3]
Thickness Attachment "H"	Frequency: 1 test per roll Reported: Minimum, Maximum, and Average thickness in inches and millimeters	ASTM D-751, D-5199, or D-5994, depending on liner type (D-5199,D-5994 Modified)[4]
Dimensional Stability Attachment "P"	Frequency: 1 test every 180,000lbs Reported: Average Dimensional Change	ASTM D-1204 (Modified)[5]

Modifications

1 Puncture specimens for both methods are conditioned for a minimum of 1 hour.

2 Tear Resistance specimens are conditioned for a minimum of 1 hour. Average of MD & TD results is reported.

3 For Type IV specimen: @ yield, $L_o = 1.3"$ @ break, $L_o = 2.0"$
For Type I specimen: @ yield, $L_o = 2.0"$ @ break, $L_o = 2.0"$
The specimen type is determined by Liner type:
Type IV: Smooth, Microspike™
Type I: Drainage, Grip, Super Grip Net
Average of MD & TD results is reported.

4 Thickness specimens for both methods are conditioned for a minimum of 1 hour.

5 Average Dimensional Change of MD & TD is reported.

MD = Machine Direction TD = Transverse (Cross) Machine Direction

Additional Test Procedures
(Available if Specified)

Low Temperature Brittleness	ASTM D-746
Hydrostatic Resistance	ASTM D-751
Volatile Loss	ASTM D-1203
Resistance to Soil Burial	ASTM D-3083 using ASTM D-638 Type IV dumbbell at 2"/min.
Water Absorption	ASTM D-570
Coefficient of Thermal Expansion	ASTM D-696
Friction Angle Direct Shear Method	ASTM D-5321-92
Moisture Vapor Transmission Rate	ASTM E-96 *100°F - 100% RH*
Oxidation Induction Time at 200°C	ASTM D-3895 Al pan
Transmissivity Various gradients & confining pressure	ASTM D-4716
Multi-axial Tensile Strain at Rupture (percent)	GRI GM-4

Accreditation number:
GAI-LAP - 26 - 97

TEL (610) 522-8440

Geosynthetic Institute
475 Kedron, Ave.
Folsom, PA 19033

AGRU / AMERICA Inc.

is granted accreditation

for designated geosynthetic test methods in accordance with the

Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP)

as published in its annual directory.

This accreditation is valid until June 30, 1999.

Robert M. Koerner, Ph.D., P.E.
Director

George R. Koerner, Ph.D., P.E. & CQA
Auditor

© GOES 74

DREXEL UNIVERSITY

Geosynthetic Research Institute
33rd & Lancaster Walk
Rush Building - West Wing
Philadelphia, PA 19104
TEL 215 895-2343
FAX 215 895-1437

Geotextiles, Geomembranes, Geogrids, Geocomposites, Geosynthetic Clay Liners, Geopipes, Geonets

June 22, 1998

Quality Manager
Agru America, Inc.
500 Garrison Road
Georgetown, SC 29440

Re: GAI-LAP Accreditation

The Geosynthetic Institute (GSI) is pleased to acknowledge Agru America, Inc. on its repertoire of Geosynthetic Accreditation Institute's-Laboratory Accreditation Program (GAI-LAP) accredited tests. This letter should serve as notification that Agru America, Inc.'s geosynthetic laboratory located in Georgetown, SC, is currently accredited for the following fifteen test methods until June 30, 1999.

1)	ASTM D 638-94,	Test Method for Tensile Properties of Plastics, [08.01]
2)	ASTM D 751-95,	Test Methods for Coated Fabrics (thickness only), [09.02]
3)	ASTM D 792-91,	Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement, [08.01]
4)	ASTM D 1004-94,	Test Method for Initial Tear Resistance of Plastic Film and Sheeting, [08.01]
5)	ASTM D 1204-94,	Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature, [08.01]
6)	ASTM D 1238-90,	Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer, [08.01]
7)	ASTM D 1603-94,	Test Method for Carbon Black in Olefin Plastics, [08.01]
8)	ASTM D 1693-88,	Test Method for Environmental Stress-Cracking of Ethylene Plastics, [08.01]
9)	ASTM D 4218-91,	Test Method for Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique, [08.02]
10)	ASTM D 4833-88,	Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products, [04.08]
11)	ASTM D 5199-91,	Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes, [04.08]
12)	ASTM D 5397-93,	Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes using Notched Constant Tension Load Test, [04.08]
13)	ASTM D 5596-94,	Test Methods for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics, [04.09]
14)	ASTM D 5994-96,	Test Method for Measuring the Core Thickness of Textured Geomembrane, [04.08]
15)	FTM 101C, method 2065,	Puncture Resistance and Elongation Test (1/8 inch radius probe)

A certificate to this affect has been enclosed, signed and sealed. Any questions regarding your accreditation should be directed to myself or Robert Koerner at (610) 522-8440.

Regards,

George R. Koerner

George R. Koerner, Ph.D., P.E & CQA
Research Associate Professor

Attachment "A"

AGRU/AMERICA, INC.

HIGH DENSITY POLYETHYLENE SMOOTH SHEET

Product Data (Minimum Average Roll Values)

Property	Test Method	Values				
Thickness (mils nominal)	ASTM D751	30	40	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	66	88	132	176	220
Tensile Strength at Break (lbs/in. width)	Type IV Specimen	120	160	240	320	400
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	500	700	700	700	700
Tear Resistance (lbs)	ASTM D1004 - Die C	20	30	45	60	72
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	±2	±2	±2	±2	±2
Environmental Stress Crack (hrs)	ASTM D1693	3000	3000	3000	3000	3000
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	36	52	80	105	130
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2	A2	A2

Supply Information (Standard Roll Dimensions)

	Thickness		Width		Length		Area		Weight	
	mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
Long Rolls	30	.75	22.5	6.86	1,312	400	29,520	2,744	4,970	2,254
	40	1.0	22.5	6.86	984	300	22,140	2,058	4,661	2,114
	60	1.5	22.5	6.86	656	200	14,760	1,372	4,639	2,104
	80	2.0	22.5	6.86	492	150	11,070	1,029	4,662	2,114
	100	2.5	22.5	6.86	328	100	7,380	686	3,898	1,768
Medium Rolls	30	.75	22.5	6.86	840	256	18,900	1,756	3,218	1,459
	40	1.0	22.5	6.86	650	198	14,625	1,359	3,113	1,412
	60	1.5	22.5	6.86	420	128	9,450	878	3,006	1,363
	80	2.0	22.5	6.86	320	98	7,200	669	3,067	1,391
	100	2.5	22.5	6.86	250	76	5,625	523	2,995	1,313

NOTES: *1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 long rolls and 15 medium rolls. 6.) A 48 foot flatbed will hold 9 long rolls and 15 medium rolls.*

HIGH DENSITY POLYETHYLENE MICROSPIKE™ LINER

Product Data (Minimum Average Roll Values)

Property	Test Method	Values				
Thickness (mils nominal)	ASTM D5994	30	40	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238-E	.28	.28	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	70	90	135	180	225
Tensile Strength at Break (lbs/in. width)	Type IV Specimen	72	96	144	192	240
Elongation at Yield (%)	Gauge length 2 in. break	12	12	12	12	12
Elongation at Break (%)	1.3 in. yield, 2 ipm	400	400	400	400	400
Tear Resistance (lbs)	ASTM D1004 - Die C	23	30	45	60	75
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	+/-2	+/-2	+/-2	+/-2	+/-2
Environmental Stress Crack (hrs)	ASTM D1693	3000	3000	3000	3000	3000
Environmental Stress Crack (hrs)	ASTM D5397	200	200	200	200	200
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	45	60	90	120	150
Carbon Black Content (%)	ASTM D1603/D4218	2-3	2-3	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	1,2	1,2	1,2	1,2	1,2

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
30	0.75	23.0	7.0	492	150	11,316	1,051	2,430	1,104
40	1.0	23.0	7.0	492	150	11,316	1,051	2,731	1,241
60	1.5	23.0	7.0	410	125	9,430	876	3,283	1,492
80	2.0	23.0	7.0	328	100	7,544	700	3,413	1,551
100	2.5	23.0	7.0	246	75	5,658	525	3,167	1,439

Note: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4. Standard rolls have a diameter of 29 inches (750mm). 5.) A 40-foot standard container will hold 12 rolls. 6.) A 48 foot flatbed will hold 12 rolls.

Information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for his own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru America as to the effects of such use or the results to be obtained, nor does Agru America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein contained is to be construed as permission or as a recommendation infringe any patent.

January 19, 1999

AGRU/AMERICA, INC.

LINEAR LOW DENSITY POLYETHYLENE SMOOTH SHEET

Product Data (Minimum Average Roll Values)

Property	Test Method	Values			
Thickness (mils nominal)	ASTM D751	40	60	80	100
Density (g/cm³ min)	ASTM D792 or D1505	.92	.92	.92	.92
Tensile Strength at Break (lbs/in. width)	ASTM D638 (Modified)Type IV Specimen	160	240	320	400
Elongation at Break (%)	Gauge Length, 2 in. break, 2 ipm	800	800	800	800
Tear Resistance (lbs)	ASTM D1004 - Die C	25	37	48	62
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103	-103
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	55	80	105	130
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2	A2

Supply Information (Standard Roll Dimensions)

	Thickness		Width		Length		Area		Weight	
	mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
Long Rolls	40	1.0	22.5	6.86	984	300	22,140	2,058	4,661	2,114
	60	1.5	22.5	6.86	656	200	14,760	1,372	4,639	2,104
	80	2.0	22.5	6.86	492	150	11,070	1,029	4,662	2,114
	100	2.5	22.5	6.86	328	100	7,380	686	3,898	1,768
Medium Rolls	40	1.0	22.5	6.86	650	198	14,625	1,359	3,113	1,412
	60	1.5	22.5	6.86	420	128	9,450	878	3,006	1,363
	80	2.0	22.5	6.86	320	98	7,200	669	3,067	1,391
	100	2.5	22.5	6.86	250	76	5,625	523	2,995	1,313

NOTES: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 long rolls and 15 medium rolls. 6.) A 48 foot flatbed will hold 9 long rolls and 15 medium rolls.

formation, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein contained is to be construed as permission or as a recommendation to infringe any patent.

LINEAR LOW DENSITY POLYETHYLENE MICROSPIKE™ LINER

Product Data (Minimum Average Roll Values)

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D5994	40	60	80
Melt Flow Index (g/10 minutes)	ASTM D1238-E	.50	.50	.50
Density (g/cm³ min)	ASTM D792 or D1505	.92	.92	.92
Tensile Strength at Break (lbs/in. width)	ASTM D638 (Modified) Type IV Specimen	112	168	224
Elongation at Break (%)	Gauge length 2 in. break 1.3 in. yield, 2 ipm	400	400	400
Tear Resistance (lbs)	ASTM D1004 - Die C	25	36	50
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	+/-2	+/-2	+/-2
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	75	90	140
Carbon Black Content (%)	ASTM D1603/D4218	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	1,2	1,2	1,2

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
40	1.0	23.0	7.0	492	150	11,316	1,051	2,731	1,241
60	1.5	23.0	7.0	410	125	9,430	876	3,283	1,492
80	2.0	23.0	7.0	328	100	7,544	700	3,413	1,551

Notes: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4. Standard rolls have a diameter of 29 inches (750mm). 5.) A 40-foot standard container will hold 12 rolls. 6.) A 48 foot flatbed will hold 12 rolls.

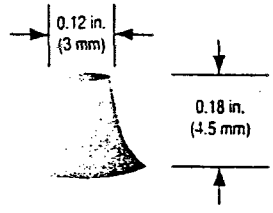
All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for his own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru America as to the effects of such use or the results to be obtained, nor does Agru America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein contained is to be construed as permission or as a recommendation to infringe any patent.

February 16, 1999

AGRU/AMERICA, INC.

A/A DRAIN LINER®

Designed for Drainage and Anchor Performance

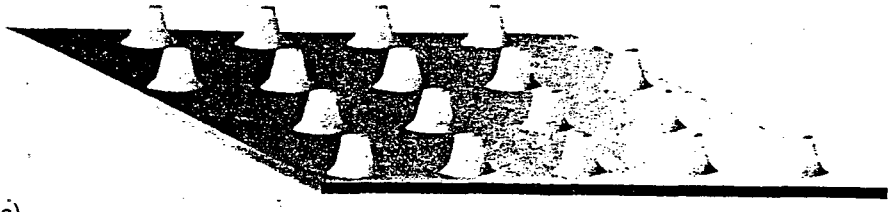


Extruded homogeneously to provide a minimum 60 mil (1.5 mm) containment liner with solid stud drainage structures at 0.8 inch (20 mm) centers.

When used in conjunction with a smooth or textured upper sheet, the composite provides an effective double liner system without the necessity of a geonet.

Features/Benefits

- Excellent interfacial friction with soils
- Excellent hydraulic transmissivity



Product Data (Minimum Average Roll Values)

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D751	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	120	160	200
Tensile Strength at Break (lbs/in. width)	Type I Specimen	132	176	220
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	200	200	200
Tear Resistance (lbs)	ASTM D1004 - Die C	50	67	83
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	±2	±2	±2
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	95	126	158
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2

Supply Information (Standard Roll Dimensions) 465 studs/ft² = 5,000 studs/m²

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
60	1.5	22.5	6.86	263	80	5,917	550	2,295	1,041
80	2.0	22.5	6.86	230	70	5,175	480	2,489	1,129
100	2.5	22.5	6.86	197	60	4,433	412	2,637	1,196

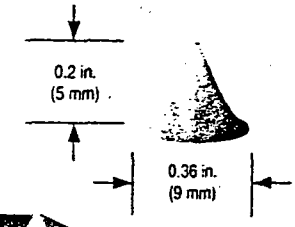
NOTES: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 rolls. 6.) A 48 foot flatbed will hold 14 rolls.

AGRU/AMERICA, INC.

A/A GRIP LINER®

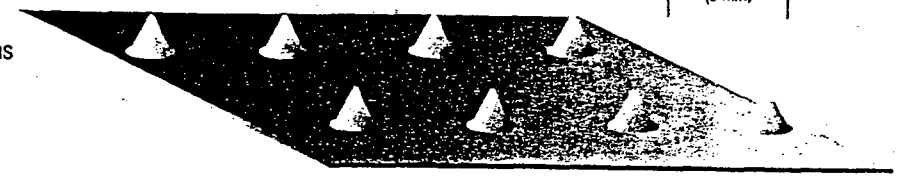
Anchor Structure

Extruded homogeneously to provide a minimum 60 mil (1.5 mm) containment liner with textured surface and spiked structure on a special offset matrix at 1.2 inch (30 mm) centers, maximizing shear load capacity for every soil type and condition.



Features/Benefits

- Superior interfacial friction with all soil types and conditions
- Allows steepest possible slopes



Product Data (Minimum Average Roll Values)

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D751	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	96	128	160
Tensile Strength at Break (lbs/in. width)	Type I Specimen	96	128	160
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	200	200	200
Tear Resistance (lbs)	ASTM D1004 - Die C	50	67	83
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	±2	±2	±2
Environmental Stress Crack (hrs)	ASTM D1693	1500	1500	1500
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	95	126	158
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2

Supply Information (Standard Roll Dimensions) 93 spikes/ft² = 1,000 spikes/m²

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
60	1.5	22.5	6.86	263	80	5,917	550	2,148	974
80	2.0	22.5	6.86	230	70	5,175	480	2,261	1,025
100	2.5	22.5	6.86	197	60	4,433	412	2,368	1,074

NOTES: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 rolls. 6.) A 48 foot flatbed will hold 14 rolls.

Attachment "A"

AGRU/AMERICA, INC.

SUPER GRIPNET® LINER

Drainage + Anchor Structure Liner

Extruded homogeneously to provide a minimum 60 mil (1.5 mm) containment liner with drainage and anchor structure capability.
These multi-structural products enhance steep composite slope designs with maximum interfacial shear resistance and superior drainage capacity.

Features/Benefits
- Superior interfacial friction with all soil types and conditions
- Allows steepest possible slopes

Product Data (Minimum Average Roll Values)

US. Patent - No. 5.258.217

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D751	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948
nsile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	114	152	190
Tensile Strength at Break (lbs/in. width)	Type I Specimen	126	168	210
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	200	200	200
Tear Resistance (lbs)	ASTM D1004 - Die C	40	53	67
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	±2	±2	±2
Environmental Stress Crack (hrs)	ASTM D1693	1500	1500	1500
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	75	100	125
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
60	1.5	22.5	6.86	197	60	4,433	412	2,060	934
80	2.0	22.5	6.86	165	50	3,713	343	1,973	895
100	2.5	22.5	6.86	165	50	3,713	343	2,418	1,096

OTES: 1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request.
ndard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 rolls. 6.) A 48 foot flatbed will hold 14 rolls.

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Attachment "B"

Chevron

U.S. Chemical

March 15, 1999

Grant Palmer
Agru-America Inc
500 Garison Rd
Georgetown, SC 29440

CERTIFICATE OF ANALYSIS

Product:	9638	Lot Number:	J011070
Chevron Order #:	203828 - 6000	Destination:	Georgetown
Package:	CHVX898067	Weight (lbs):	197,700
Customer Order #:	1342	Ship Date:	1/15/99

Following is the data on the subject material as determined by the Quality Control Department:

Property	Value	Units
Melt Index	0.26	gms/10 min
HLMI	20.8	gms/10 min
Density	0.9366	gms/cc
OIT	141.0	

The data set forth herein has been carefully compiled by Chevron Chemical Company. However, there is no warranty of any kind, either expressed or implied, applicable to its use and the user assumes all risk and liability in connection therewith.

Sincerely,

Gary MacMurtrie

Gary MacMurtrie
Supervisor
Quality Control

Customer Fax: 843-546-0516

For inquiry, contact Customer Service at the following number:
Film, Coating, Pipe Applications: 1-800-231-3826
Molding Applications: 1-800-231-3828

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL # Lot # **Liner Type:SMOOTH HDPE**

Measurement ASTM D-751/5199 (Modified)		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
	AVE:	mm	mil

Thickness	**1.5mm**	**60mil**
Length	m	feet
Width	m	feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.940min	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g - g /10 min			
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Yield	psi	2200	
	Average Strength @ Break	psi	4000	
Elongation ASTM D - 638 (Modified) (2 inches / minute) Lo = 1.3" Yield	Average Elongation @ Yield	%	13	
Lo = 2.0" Break	Average Elongation @ Break	%	700	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional Change	%	±1	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs	45	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	80	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D - 1693	Minimum Hrs w / o Failures	hrs	3,000	
Notched Constant Tensile Load ASTM D -5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION:

Form SM60AA.FRM

Date:.....

Signature.....

Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL #

Lot #:

Liner Type: SMOOTH LLDPE

Measurement ASTM D-751/5994 (Modified)	METRIC	ENGLISH
MIN:	mm	mil
MAX:	mm	mil
AVE:	mm	mil

Thickness..... **1.0 mm** **40 mil**
Length..... m; feet
Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.92	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10		
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Break	psi	4000	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Break	%	800	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional Change	%	± 2	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs	25	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	55	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3,000	

CUSTOMER:

P.O.#:

DESTINATION

Form 40MSDSLL.FRM

Date:.....

Signature.....
Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL # Lot #: **Liner Type: MICROSPIKE™ HDPE**

Measurement ASTM D-751/5994 (Modified)		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
Asperity GRI GM12: mil	AVE:	mm	mil

Thickness..... 1.5 mm 60 mil
Length..... m; feet
Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.940min.	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10		
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Yield	psi	2250	
	Average Strength @ Break	psi	2400	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield	Average Elongation @ Yield	%	12	
Lo = 2.0" Break	Average Elongation @ Break	%	400	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional change	%	± 2	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs.	45	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	90	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3,000	
Notched Constant Tensile Load ASTM D-5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION

Form 60MSDS.FRM

Date:.....

Signature.....
Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL #

Lot #:

Liner Type: MICROSPIKE™lldpe

Measurement ASTM D-751/5994 (Modified)		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
Asperity GRI GM12: mil	AVE:	mm	mil

Thickness..... 1.0 mm 40 mil
Length..... m; feet
Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.92	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10		
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Break	psi	2800	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Break	%	400	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional Change	%	± 2	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs	25	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	75	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3,000	

CUSTOMER:

P.O.#:

DESTINATION

Date:.....

Signature:.....

Quality Control Department

Form 40MSDSLL.FRM

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL # Lot #: **Liner Type: MICROSPIKE™Ildpe**

Measurement ASTM D-751/5994 (Modified)		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
Asperity GRI GM12: mil	AVE:	mm	mil

Thickness..... 1.5 mm 60 mil
Length..... m; feet
Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.92	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10		
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Break	psi	2800	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Break	%	400	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional Change	%	± 2	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs	36	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	90	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3,000	

CUSTOMER:

P.O.#:

DESTINATION

Form 40MSDSLL.FRM

Date:.....

Signature.....

Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL # Lot #: **Liner Type: MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH
ASTM D-751/5994 (Modified)	MIN:	mm	mil
	MAX:	mm	mil
Asperity GRI GM12: mil	AVE:	mm	mil

Thickness.....	1.5 mm	60 mil
Length.....	m;	feet
Width.....	m;	feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.948	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10		
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Yield	psi	2250	
	Average Strength @ Break	psi	2400	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield	Average Elongation @ Yield	%	12	
Lo = 2.0" Break	Average Elongation @ Break	%	400	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional change	%	± 2	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs.	45	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	90	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3,000	
Notched Constant Tensile Load ASTM D-5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION

Form 60MSDS.FRM

Date:.....

Signature.....

Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL #

Lot #:

Liner Type: DRAIN LINER

Thickness..... **1.5mm, 60 mil**

Length..... m; feet

Width..... m; feet

Measurement ASTM D-751/5199		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
	AVE:	mm	mil

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.948	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10 min	.28	
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (Modified) (2 inches / minute)	Average Strength @ Yield	psi	2,000	
	Average Strength @ Break	psi	2,200	
Elongation ASTM D-638 (Modified) (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	psi	13	
	Average Elongation @ Break	psi	200	
Dimensional Stability ASTM D-1204 (Modified)	Average Dimensional Change	%	±1	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	lbs	50	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	lbs	95	
Puncture Resistance ASTM D-4833 (Modified)	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	1,500	
Notched Constant Tensile Load ASTM D-5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION

Form DR60AA.FRM

Date:.....

Signature.....

Quality Control Department

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL #

Lot #:

Liner Type: GRIP LINER

Measurement ASTM D-751/5199		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
	AVE:	mm	mil

Thickness..... **1.5mm, 60 mil**

Length..... m; feet

Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.948	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10 min	.28	
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (2 inches / minute)	Yield M.D.	psi	1,600	
	YieldT.D.	psi	1,600	
	BreakM.D.	psi	1,600	
	BreakT.D.	psi	1,600	
Elongation ASTM D-638 Modified (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Yield M.D	%.	13	
	YieldT.D.	%	13	
	BreakM.D.	%	200	
	BreakT.D.	%	200	
Dimensional Stability ASTM D-1204	M.D.	%	±1	
	T.D.	%	±1	
Tear Resistance ASTM D-1004	M.D.	lbs	50	
	T.D.	lbs	50	
Puncture Resistance FTMS 101 Method 2065	Load	lbs	95	
Puncture Resistance ASTM D-4833	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3000	
Notched Constant Tensile Load ASTM D-5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION

Date:.....

Signature.....

Quality Control Department

FormGR60AA.FRM

AGRU / AMERICA, INC.

CERTIFICATE OF CONFORMITY

ROLL # Lot #: **Liner Type: SUPER GRIPNET LINER**

Measurement ASTM D-751/5199		METRIC	ENGLISH
	MIN:	mm	mil
	MAX:	mm	mil
	AVE:	mm	mil

Thickness..... **1.5mm, 60 mil**
Length..... m; feet
Width..... m; feet

			A/A'S DATA SHEET	TEST RESULTS
Specific Gravity ASTM D-792	Density	g/cc	.948	
MFI ASTM D-1238 COND. E GRADE:	Melt Flow Index 190°C /2160 g	g/10 min	.28	
Carbon Black Content ASTM D-1603/4218	Range	%	2-3	
Carbon Black Dispersion ASTM D-5596	Category		1,2	
Tensile Strength ASTM D-638 (2 inches / minute)	Yield M.D.	psi	1,900	
	YieldT.D.	psi	1,900	
	BreakM.D.	psi	2,100	
	BreakT.D.	psi	2,100	
Elongation ASTM D-638 Modified (2 inches/minute) Lo = 1.3" Yield Lo = 2.0" Break	Yield M.D	%.	13	
	YieldT.D.	%	13	
	BreakM.D.	%	200	
	BreakT.D.	%	200	
Dimensional Stability ASTM D-1204	M.D.	%	±1	
	T.D.	%	±1	
Tear Resistance ASTM D-1004	M.D.	lbs	40	
	T.D.	lbs	40	
Puncture Resistance FTMS 101 Method 2065	Load	lbs	75	
Puncture Resistance ASTM D-4833	Load	lbs		
ESCR ASTM D-1693	Minimum Hrs w/o Failures	hrs	3000	
Notched Constant Tensile Load ASTM D-5397	pass / fail @ 30%	hrs	200	

CUSTOMER:

P.O.#:

DESTINATION

Date:.....

Signature.....
Quality Control Department

FormSG60AA.FRM

AGRU / AMERICA, INC.

LINER MEASUREMENT FORM

THIS CHART FOR PRODUCTION USE ONLY

#1	#2			#1	#2		
10	1			29	20		
11	2			30	21		
12	3			31	22		
13	4			32	23		
14	5			33	24		
15	6			34	25		
16	7			35	26		
17	8			36	27		
18	9			37	28		
19	10			38	29		
20	11			39	30		
21	12			40	31		
22	13			41	32		
23	14			42	33		
24	15			43	34		
25	16			44	35		
26	17			45	36		
27	18			46	37		
28	19				38		

PLACE ROLL IDENTIFICATION STICKER HERE

LOT # : _____ MATERIAL : _____

TOLERANCE : _____

MEASUREMENTS ASTM D 751 / ASTM D 5199 / ASTM D 5994

1. _____ mm # 6. _____ mm

2. _____ mm # 7. _____ mm

3. _____ mm # 8. _____ mm

4. _____ mm # 9. _____ mm

5. _____ mm #10. _____ mm

MINIMUM THICKNESS: _____ mm _____ mil

MAXIMUM THICKNESS: _____ mm _____ mil

AVERAGE THICKNESS: _____ mm _____ mil

Test Conditions *Temperature:* *Humidity:*

ASTM STANDARD	GAGE ACCURACY	PRESSER FOOT / TIP DIMENSIONS	DEADWEIGHT OR PSI APPLIED	SPECIMEN DIMENSIONS	DWELL TIME (SEC)
D751	.00005"	foot 0.375±0.004"diameter	6.0±0.1oz	variable	5
D5199	.00005"	foot 0.250"diameter	.29±0.003psi	3" diameter	10
D5994	.00005"	tip diam. 0.031±0.004" angle of tip 60°±2°	2.0±.2oz	3" diameter	10

DATE : _____ OPERATORS : _____

AGRU / AMERICA, INC.

DENSITY TEST ASTM D792-91

DATE	TESTED BY	LOT #	ROLL #	WEIGHT / AIR (g)	WEIGHT / LIQUID (g)	DENSITY (g / cm³)
Test Conditions	Temperature:		Humidity:	Average:		

DATE	TESTED BY	LOT #	ROLL #	WEIGHT / AIR (g)	WEIGHT / LIQUID (g)	DENSITY (g / cm³)
Test Conditions	Temperature:		Humidity:	Average:		

DATE	TESTED BY	LOT #	ROLL #	WEIGHT / AIR (g)	WEIGHT / LIQUID (g)	DENSITY (g / cm³)
Test Conditions	Temperature:		Humidity:	Average:		

DATE	TESTED BY	LOT #	ROLL #	WEIGHT / AIR (g)	WEIGHT / LIQUID (g)	DENSITY (g / cm³)
Test Conditions	Temperature:		Humidity:	Average:		

DATE	TESTED BY	LOT #	ROLL #	WEIGHT / AIR (g)	WEIGHT / LIQUID (g)	DENSITY (g / cm³)
Test Conditions	Temperature:		Humidity:	Average:		

AGRU / AMERICA, INC.

CARBON BLACK CONTENT ASTM D 1603-94 OR ASTM D 4218-96

LOT # : _____ ROLL # : _____ MATERIAL : _____

BOAT / DISH #: _____

BOAT TARE _____ g

BOAT + SAMPLE _____ g

BOAT + CARBON _____ g

SAMPLE _____ g

CARBON _____ g

% CARBON

BOAT / DISH #: _____

BOAT TARE _____ g

BOAT + SAMPLE _____ g

BOAT + CARBON _____ g

SAMPLE _____ g

CARBON _____ g

% CARBON

COMMENTS : Test Conditons Temperature: Humidity:

Method used (circle) 1603-94 4218-96

DATE: _____

Average

TESTED BY: _____

CHECKED BY: _____

AGRU / AMERICA, INC.

CARBON BLACK DISPERSION ASTM D 5596-94

LOT #:	
ROLL #	
MATERIAL:	
SPECIMEN	CATEGORY
Lowest Rating	**Average**
Comments: **Test Conditons** **Temperature:** **Humidity:**	

DATE:_____ **TESTED BY:**_____

CHECKED BY:_____

Attachment "M"

AGRU AMERICA QUALITY CONTROL DEPARTMENT
500 GARRISON ROAD GEORGETOWN, SC 29440
TEL: 843 546-0600 FAX: 843 546-0516
04/09/1999

Sample ID: 212607 99TL.mss

Test Date : 03/28/1999
Method : 5 Head Tensile 638 Modified.msm
Operator : Trey

Sample Information:

Name	Value
Direction of Force	LONGITUDINAL
Liner Type	SMOOTH
Lot Number	JO11089
Method type	ASTM D 638 NSF 54 Specifications
Production Date	3-27-99
Relative Humidity	50%
Resin Type	HDPE
Roll Number	212607
Temperature	70°F
Thickness	60mil (1.5mm)

Specimen Results:

Specimen #	Thickness in	Stength @ Yield psi	Elong. @ Yield %	Strength @ Break psi	Elong. @ Break %		
1	0.0615	2447	17.43	4678	814.7		
2	0.0628	2491	18.17	4459	757.1		
3	0.0598	2565	17.81	4730	793.2		
4	0.0609	2481	18.29	4488	759.2		
5	0.0595	2464	16.88	4683	790.0		
Mean	**0.0609**	**2489**	**17.72**	**4608**	**782.8**		
Std Dev	0.0013	45	0.58	124	24.4		
COV	2.1938	2	3.26	3	3.1		

Specimen Comments:

Specimen #	Comments
1	
2	
3	
4	
5	

AGRU AMERICA QUALITY CONTROL DEPARTMENT
500 GARRISON ROAD GEORGETOWN, SC 29440
TEL: 843 546-0600 FAX: 843 546-0516
04/09/1999

Sample ID: **212626 99TW.mss**

Test Date : 03/28/1999
Method : 5 Head Tensile 638 Modified.msm
Operator : Trey

Sample Information:

Name	Value
Direction of Force	TRANSVERSAL
Liner Type	SMOOTH
Lot Number	JO11089
Method type	ASTM D 638 NSF 54 Specifications
Production Date	3-27-99
Relative Humidity	50%
Resin Type	HDPE
Roll Number	212626
Temperature	70°F
Thickness	80mil (2.0mm)

Specimen Results:

Specimen #	Thickness in	Stength @ Yield psi	Elong. @ Yield %	Strength @ Break psi	Elong. @ Break %		
1	0.0832	2477	16.48	4839	907.4		
2	0.0833	2541	16.41	5120	947.3		
3	0.0802	2485	17.20	5048	947.8		
4	0.0806	2648	17.34	5269	965.3		
5	0.0810	2534	17.54	5177	976.7		
Mean	**0.0817**	**2537**	**16.99**	**5091**	**948.9**		
Std Dev	0.0015	68	0.52	162	26.3		
COV	1.8114	3	3.05	3	2.8		

Specimen Comments:

Specimen #	Comments
1	
2	
3	
4	
5	

AGRU / AMERICA, INC.

DIMENSIONAL STABILITY TEST ASTM D-1204-94

LOT # :_____

ROLL# :_____ MATERIAL :_____

TESTING CONDITIONS

Conditioned at _____ degrees F (+ or - 3.6 degrees) and _____ % relative humidity for _____ hours.

Exposed at_____degrees C for _____hours.

Reconditioned at _____degrees F and _____% relative humidity for_____hours.

Specimen #	Direction	Before (mm)	After (mm)	Change (%)
1. (mid)	XY			
	AB			
2. (end)	XY			
	AB			
Average	XY (MD)			
	AB (TD)			

Comments:

DATE:_____ TESTED BY:_____

CHECKED BY:_____

AGRU AMERICA QUALITY CONTROL DEPARTMENT
500 GARRISON ROAD GEORGETOWN, SC 29440
TEL: 843 546-0600 FAX: 843 546-0516
04/09/1999

Sample ID: **212607 99RW.mss**

Test Date : 03/28/1999
Method : 5 Head Tear 1004 Modified.msm
Operator : Trey

Sample Information:

Name	Value
Direction of Force	TRANSVERSAL
Liner Type	SMOOTH
Lot Number	JO11089
Production Date	3-27-99
Relative Humidity	50%
Resin type	HDPE
Roll Number	212607
Temperature	70°F
Thickness	60mil (1.5mm)

Specimen Results:

Specimen #	Thickness in	Max. Tear Resistance lbf	Tear Resistance Max. Load lbf/in				
1	0.0616	47.783	775.7				
2	0.0619	48.301	780.3				
3	0.0622	48.450	778.9				
4	0.0627	48.916	780.2				
5	0.0617	47.472	769.4				
6	0.0612	47.243	771.9				
7	0.0615	47.410	770.9				
8	0.0600	46.575	776.2				
9	0.0589	46.013	781.2				
10	0.0601	46.829	779.2				
Mean	**0.0612**	**47.499**	**776.4**				
Std Dev	0.0012	0.896	4.3				
COV	1.9012	1.886	0.6				

Specimen Comments:

Specimen #	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

AGRU AMERICA QUALITY CONTROL DEPARTMENT
500 GARRISON ROAD GEORGETOWN, SC 29440
TEL: 843 546-0600 FAX: 843 546-0516
04/09/1999

Sample ID: **212626 99RL.mss**

Test Date : 03/28/1999
Method : 5 Head Tear 1004 Modified.msm
Operator : Trey

Sample Information:

Name	Value
Direction of Force	LONGITUDINAL
Liner Type	SMOOTH
Lot Number	JO11089
Production Date	3-27-99
Relative Humidity	50%
Resin type	HDPE
Roll Number	212626
Temperature	70°F
Thickness	80mil (2.0mm)

Specimen Results:

Specimen #	Thickness in	Max. Tear Resistance lbf	Tear Resistance Max. Load lbf/in				
1	0.0849	70.784	833.7				
2	0.0817	67.071	820.9				
3	0.0822	67.602	822.4				
4	0.0838	69.481	829.1				
5	0.0816	65.421	801.7				
6	0.0799	66.799	836.0				
7	0.0794	65.034	819.1				
8	0.0807	66.893	828.9				
9	0.0818	67.611	826.5				
10	0.0824	67.966	824.8				
Mean	**0.0818**	**67.466**	**824.3**				
Std Dev	0.0016	1.712	9.6				
COV	2.0260	2.538	1.2				

Specimen Comments:

Specimen #	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Attachment "K"

AGRU AMERICA QUALITY CONTROL DEPT.
500 GARRISON ROAD GEORGETOWN, SC 29440
TEL.(843) 546-0600 FAX (843) 546-0516

Puncture Resistance Test
Fed Test Std No 101C, Method 2065
1/2" Probe with 1/8" end radius

Test type: Compression
Operator name: JAMIE
Sample Identification: 210546P
Interface Type: 4200

Instron Corporation
Series IX Automated Materials Testing System 7.49.00
Test Date: Wednesday, March 10, 1999

Sample Rate (pts/secs): 20.0000
Crosshead Speed: 20.0000 in/min
2nd Crosshead Speed: 0.0000 in/min

Full Scale Load Range: 2000.000 lbf

Humidity (%): 55
Temperature: 72 F

LINER TYPE/THICKNESSA/A LINER 1.5mm (60mil)

MATERIAL / LOT NO. CHEVRON 9638 / J011115

ROLL NO. / PROD DATE210546/ 3-12-99

CUSTOMER/ PROJECT

Sample comments:

	Load at Max.Load (lbs)	Load/Thick at Max.Load (lbs/in)	Displcment at Max.Load (in)	Displcment at Auto. Break (in)	Thickness (in)
1	100.200	1616.129	0.511	0.827	0.062
2	99.010	1612.541	0.527	0.843	0.061
3	102.600	1662.885	0.542	0.876	0.062
4	99.650	1649.834	0.538	0.838	0.060
5	96.320	1563.636	0.478	0.778	0.062
Mean	99.556	1621.005	0.519	0.833	0.061
S.D.	2.262	38.638	0.026	0.035	6.1E-4
C.V.	2.272	2.384	4.978	4.258	0.993
Minimum	96.320	1563.636	0.478	0.778	0.060
Maximum	102.600	1662.885	0.542	0.876	0.062

AGRU / AMERICA, INC.

ENVIRONMENTAL STRESS CRACK RESISTANCE
ASTM D-1693-96

Material : _____

Lot # : _____

Reagent : IGEPAL Strength : 10 %

ASTM D-1693	Specimen Thickness	Notch Depth	Bath Temp.
Test Conditon 'B'	_____	*0.3 to 0.4 mm*	*50°C*

Duration _____ hrs Failure Rate _____ %

ROLL NUMBER: _____

LOCATION: _____

START DATE: _____

PASS DATE: _____

REMOVED ON: _____

COMMENTS: Test Conditons Temperature: Humidity:

DATE : _____ TESTED BY : _____

CHECKED BY : _____

AGRU / AMERICA, INC.

NOTCHED CONSTANT TENSILE LOAD ASTM D 5397-93 APPENDIX A

LOT # :_____ MATERIAL :_____ DATE :_____

ROLL # :_____ LINER TYPE :_____ THICKNESS :_____

FORMULA FOR APPLIED LOAD :

Load = str@yld x 30%* x thickness x 80% x width

where :

str@yld = Tensile strength @ yield (Transverse Direction) from ASTM D-638 in psi

thickness = Thickness of sample at notch point in inches

width = Width of sample in inches (.125" constant)

Therefore, for each sample, **load = str@yld x thickness x .0300----->(.3 x .8 x .125)**

*** This number may change due to customer specifications. Formula will be changed also.**

Strength @ yield for this roll : _____ psi % of yield tested : _____ %

SAMPLE # 1 NOTCH DEPTH:_____ THICKNESS : _____in LOAD = str@yld x thickness x .03 LOAD = _____ x _____ x .03 LOAD = _____lbs STATION # : PASS @ _____ HRS PASS / FAIL FAILURE @ _____ HRS	SAMPLE # 2 NOTCH DEPTH:_____ THICKNESS : _____in LOAD = str@yld x thickness x .03 LOAD = _____ x _____ x .03 LOAD = _____lbs STATION # : PASS @ _____ HRS PASS / FAIL FAILURE @ _____ HRS	SAMPLE # 3 NOTCH DEPTH:_____ THICKNESS : _____in LOAD = str@yld x thickness x .03 LOAD = _____ x _____ x .03 LOAD = _____lbs STATION # : PASS @ _____ HRS PASS / FAIL FAILURE @ _____ HRS
SAMPLE # 4 NOTCH DEPTH:_____ THICKNESS : _____in LOAD = str@yld x thickness x .03 LOAD = _____ x _____ x .03 LOAD = _____lbs STATION # : PASS @ _____ HRS PASS / FAIL FAILURE @ _____ HRS	SAMPLE # 5 NOTCH DEPTH:_____ THICKNESS : _____in LOAD = str@yld x thickness x .03 LOAD = _____ x _____ x .03 LOAD = _____lbs STATION # : PASS @ _____ HRS PASS / FAIL FAILURE @ _____ HRS	COMMENTS :_____ _____ _____ _____ _____ _____ TESTED BY :_____ CHECKED BY :_____ Test Conditons Temperature: Humidity:

COMANCO ENVIRONMENTAL CORPORATION

QUALITY

ASSURANCE

MANUAL

THIS QUALITY ASSURANCE MANUAL IS INTENTED TO COMPLEMENT THE SPECIFICATIONS FOR THIS PROJECT.

COMANCO

1. GEOMEMBRANE TRANSPORTATION, DELIVERY AND STORAGE

1.01 The responsibility for the transportation of geomembrane rolls or panels shall be designated by the owner. The geomembrane rolls or panels shall be packaged and shipped by appropriate means so that no damage is caused.

1.02 DELIVERY

At the time of delivery, before and after the unloading of the material, the owner, the owner's representative, and/or liner installer shall conduct a visual inspection of the geomembrane rolls or panels for imperfections and/or damage. Any damage occurring during unloading shall be documented by third-party inspector or installer at the time of unloading.

1.03 ON-SITE STORAGE

The geomembrane rolls or panels shall be stored so as to be protected from damage, and stored as close to the job operation as possible. The geomembrane material shall be stored on an unyielding base free of sharp objects or protrusions to minimize risk of damage.

2. EARTHWORK

2.01 The owner, owner's representative, or general and/or earthwork contractor shall be responsible for the preparation of the subgrade. Prior to liner installation, the exposed subgrade shall be smooth, clear of all foreign and organic material, angular or sharp objects, roots, or debris of any kind. The subgrade shall be compacted in accordance with design specifications, but in no circumstance shall the subgrade be compacted below the minimum required to provide a firm, unyielding foundation with no sharp changes or abrupt breaks in the grade.

2.02 VEGETATION CONTROL

The general contractor, if necessary, shall sterilize the liner installation area using an effective soil sterilizing agent specifically formulated for the vegetation present in the area. The sterilizing agent shall not be harmful to the liner, and shall be applied according to the manufacturer recommendations.

2.03 ANCHOR TRENCH EXCAVATION

The anchor trench shall be excavated to the line, grade and width shown on the construction drawings prior to the placement of the liner system. If the liner system is located in a clay that is susceptible to dessication, the anchor trench shall be excavated in a manner so as to minimize the dessication of the anchor trench soils.

5.01.03 If loss of pressure exceeds four (4) psi, or the pressure does not stabilize, locate the area of the leak and repair. Retest the repaired area using the Vacuum Box Testing Method.

5.01.04 At the end of the five (5) minute period, cut the seam at the far end of the test area to allow air to escape, and remove needle.

5.02 VACUUM BOX TESTING METHOD PROCEDURES

5.02.01 Acceptable equipment for the Vacuum Box Testing Method include:

A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, and a vacuum gauge. A vacuum pump equipped with a pressure controller. A rubber pressure-vacuum hose with fittings and connections (if necessary). A plastic bucket and applicator. A soapy solution.

5.02.02 For double fusion seams, the excess sheet overlap shall be trimmed.

5.02.03 Clean the vacuum box viewing window, gasket surfaces and check for leaks.

5.02.04 Wet a strip of geomembrane approximately the size of the box with the soapy solution, and place the box over the wetted area and compress.

5.02.05 Commence with the vacuum process ensuring an air-tight seal is created, and for a period of approximately fifteen (15) seconds, examine the seam through the viewing window for the presence of a stream of moving soap bubbles indicating a leak.

5.02.06 If bubbles do not appear after fifteen (15) seconds, cease the vacuum process, move the box over the adjoining area with a minimum of three (3) inches overlap and repeat the process. All areas where leaks were detected shall be marked, repaired, and retested.

6. TESTING AND SAMPLING PROCEDURES

6.01 DESTRUCTIVE TESTING

Destructive test samples shall be randomly selected in accordance with site specific requirements in a manner consistent with actual field conditions.

6.02 SAMPLING PROCEDURE

Sampling times and locations shall be randomly selected as the seaming progresses. All holes in the geomembrane resulting from obtaining the seam samples shall be repaired. All patches shall be vacuum tested.

6.03 SIZE AND DISPOSITION OF SAMPLES

The samples shall ideally be twelve (12) inches wide by twenty-four (24) inches long with the seam centered lengthwise. Actual sample sizes may vary.

6.04 FIELD LABORATORY TESTING

Five (5) specimens shall be tested for seam strength and five (5) specimens shall be tested for peel strength. To be acceptable, four (4) out of the five (5) specimens must pass.

6.05 INDEPENDENT LABORATORY TESTING

Upon request and at the expense of the Owner or Purchaser, the installer shall package and ship the seam samples to an independent laboratory for the determination of shear and peel strengths. The test method and procedures to be used by the independent laboratory shall be the same as used in the field testing, where the seam samples are one (1) inch wide and the grip separation rate is two (2) inches per minute (ipm). Four (4) out of the five (5) specimens per sample must pass.

6.06 PROCEDURES FOR DESTRUCTIVE TESTING

The following procedures shall apply whenever a sample fails the field destructive test:

6.06.01 The installer shall reconstruct the seam between the failed location and any passed test location.

6.06.02 The installer can retrace the welding path to an intermediate location (at a minimum of ten feet from the location of the failed test) at the discretion of the inspector, and take a sample for an additional field test. If this test passes, then the seam shall be reconstructed between the location and the original failed location. The process is to be repeated if the test fails.

6.06.03 Over the length of the seam failure, the contractor shall either cut out the old seam, reposition the panel and reseam, or add a cap strip.

6.06.04 After reseaming or placement of the cap strip, additional destructive field testing shall be taken within the reseamed area. The reseamed sample shall be tested, and if the results are not acceptable, this process shall be repeated until the reseamed length is judged satisfactory.

6.06.05 In the event that a sample fails a laboratory destructive test, the above procedures shall also be followed.

7. REPAIR PROCEDURES

7.01 DEFECTS AND REPAIRS

All seam and non-seam areas of the geomembrane shall be inspected for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.

7.02 EVALUATION

Each suspect location in seam and non-seam areas shall be non-destructively tested as appropriate. Each location that fails the non-destructive testing shall be repaired.

7.03 REPAIR PROCEDURES

7.03.01 Defective seams shall be reseamed. Small holes shall be repaired by extrusion welding. Tears shall be repaired by patching. When the tear is on a slope, an area of stress, and/or has a sharp end, it must be rounded prior to patching. Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Surfaces of HDPE which are to be patched shall be abraded and cleaned prior to the repair.

7.03.02 Patches shall be round or oval in shape, made of the same geomembrane and extend a minimum of six (6) inches beyond the edge of defects. All patches shall have their top edge beveled with an angular grinder prior to placement on the geomembrane.

7.04 VERIFICATION OF REPAIRS

Each repair shall be non-destructively tested. Repairs that pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

8. WARRANTY

A written warranty for the material may be obtained from the geomembrane material manufacturer. A written warranty for the workmanship may be obtained from the installation contractor. Samples of these warranties are available upon request.

- - END OF MANUAL - -

APPENDIX C

CQA AND PROJECT MANAGEMENT FORMS

9.
Paper Flow Forms

9.1
Product Quality Report

This report documents the raw material manufacturer's test results for the physical properties of the inco resin. Each incoming shipment to Poly•Flex is accompanied by such a report. A copy of this report is sen the engineer/client with the finished product.

PRODUCT QUALITY REPORT

FAX NO. 214-966-6331
POLY•FLEX, INC.
INC.
GRAND PRAIRIE, TEXAS 75051
ATTN: SALES ASSISTANT

UNION CARBIDE CHEMICALS
AND PLASTICS COMPANY.

POLYOLEFINS DIVISION
P.O. BOX 186
PORT LAVACA, TEXAS 77979

FEBRUARY 12, 1991

PRODUCT NAME	DGDD-1828 BK	
BLEND NUMBERS	431914	431915
QUANTITY, LBS.	91,700	91,700
CONTAINER	BAIX60051	BAIX60051
CUSTOMER ORDER NO.	4770	
CCC ORDER NO.	447466	
SHIPPING DATE	02/13	

SHIPPED TO: GRAND PRAIRIE, TX

THE FOLLOWING TEST DATA WAS OBTAINED:

	431914	431915
MELT INDEX	0.12	0.14
MFI I21	15.0	16.0
DENSITY	0.9478	0.9482
CARBON BLACK	2.3	2.4
IND TIME 200 C MIN	114.0	121.0
ANALYSIS NO.	660025	1820925

Dylina Thomas
QUALITY CONTROL DEPARTMENT
SEADRIFT PLANT LABORATORY

9.2
Railcar Resin Report

Used by Poly•Flex's in-house laboratory to document results of tests performed on incoming raw material. These results are checked against Poly•Flex's raw material specifications and the Product Quality Report issued by the material manufacturer.

POLY-FLEX, INC.

RAILCAR RESIN REPORT

VENDOR: _____ RAILCAR NO: _____

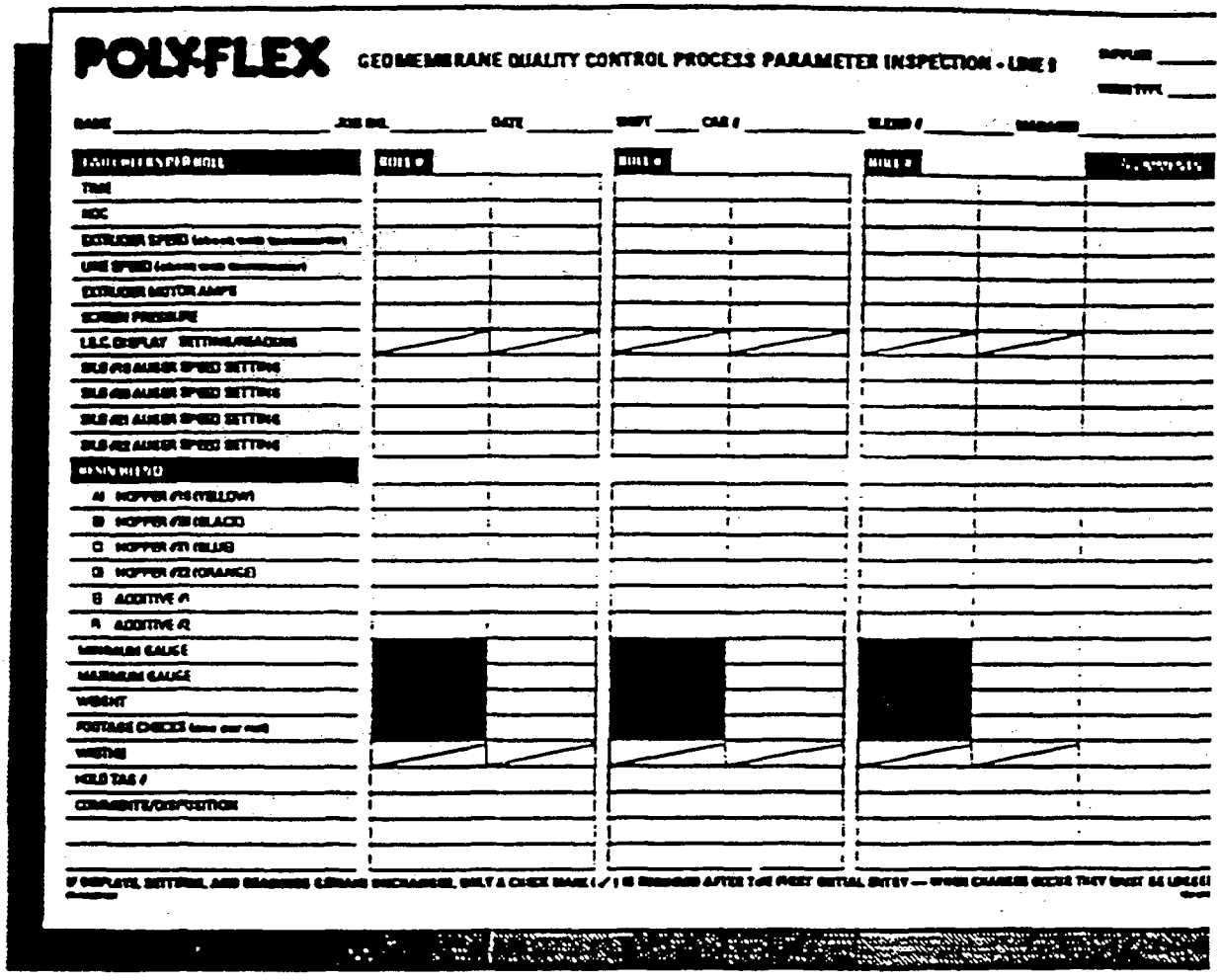
BLEND NO/TYPE	MELT INDEX	DENSITY	CARBON BLACK	O.I.T.
	D 1238/E g/10 min	D 1505 g/cc	D 1603 %	D 3895 200° C min.
/				
/				
/				
/				

Quality Control Department
Poly-Flex, Inc.

Date:

9.3
Geomembrane Quality Control Process Parameter Inspection

Statistical Process Control is conducted and extruder readings are logged. Readings are taken twice per and are recorded on a per-roll basis. Production history is constantly updated, and the enriched databa integral to the ongoing refinement of production efforts.



POLY-FLEX GEOMEMBRANE QUALITY CONTROL PROCESS PARAMETER INSPECTION - LINE 1

TIME						
NOC						
EXTRUDER SPEED						
LINE SPEED						
EXTRUDER MOTOR AMPS						
SCREEN PRESSURE						
L.E.C. DISPLAY SETTING/READING						
SILO #3 AUGER SPEED SETTING						
SILO #2 AUGER SPEED SETTING						
SILO #1 AUGER SPEED SETTING						
SILO #2 AUGER SPEED SETTING						
A HOPPER #3 (YELLOW)						
B HOPPER #2 (BLACK)						
C HOPPER #1 (BLUE)						
D HOPPER #2 (ORANGE)						
B ADDITIVE #1						
A ADDITIVE #2						
MINIMUM GAUGE						
MAXIMUM GAUGE						
WEIGHT						
FOOTAGE CHECK						
WIDTHS						
HOLD TAG #						
COMMENTS/DISPOSITION						

9.4
Quality Control Report - During Production

Sent to the engineer/client as Poly•Flex's standard quality control report. Documents the property values of the specific rolls shipped to a project.

QUALITY CONTROL REPORT - DURING PRODUCTION

POLY-FLEX, INC.

[illegible] West Mineral Drive
Grand Prairie, TX [illegible] USA
[illegible]
FAX [illegible]

[illegible] _____ of _____

Project Name _____ Customer _____ mil Poly-Flex

Project Number _____ Sheet Number _____

Report Date _____ Trip Number _____

Certified by: _____ Roll Number _____ _____ _____

_____ Sheet Number _____ _____ _____

Property	Test Method			
Sheet Thickness, mil	ASTM D [illegible]	_____	_____	_____
Melt Index, g/10	ASTM D [illegible]	_____	_____	_____
Sheet Density, g/cc	ASTM D [illegible]	_____	_____	_____
Tensile Properties	ASTM D [illegible]			
Strength at Yield, lbs/in.	-	_____	_____	_____
Strength at Break, lbs/in.	-	_____	_____	_____
Elongation at Yield, %	-	_____	_____	_____
Elongation at Break, %	-	_____	_____	_____
Secant Modulus @ 2% El., psi	-	_____	_____	_____
Tear Strength, lbs.	ASTM D [illegible]	_____	_____	_____
Puncture Resistance, lbs.	FTMS 101C [illegible]	_____	_____	_____
	FTMS 101C [illegible]	_____	_____	_____
Carbon Black Content, %	ASTM D [illegible]	_____	_____	_____
Carbon Black Dispersion	ASTM D [illegible]	_____	_____	_____
Dimensional Stability, %	ASTM D [illegible]	_____	_____	_____

The standard test results for Tensile Properties, tear strength, and dimensional stability are based on machine direction.

[illegible]

Quality Control & Quality Assurance

POLY-FLEX, INC.

9.5
Quality Control Report - Long Term Testing

Follow-up documentation of results from long-term tests. Submitted to the engineer/client upon request, at the completion of all specified tests.

QUALITY CONTROL REPORT - LONG TERM

POLY-FLEX, INC.

[illegible] West Marshall Drive
Grand Prairie, TX [illegible] USA
214-[illegible] [illegible]
FAX 214-[illegible]

page _____ of _____

Project Name _____ Geomembrane _____ mil Poly-Flex

Project Number _____ Sheet Number _____

Report Date _____ Trip Number _____

Certified by: Roll Number _____ _____ _____

_____ Sheet Number _____ _____ _____

LOT TESTING	YIELD % ELONG.	ELONG. @ YIELD % ELONG.	ASTM D 3083 SOIL BURIAL BREAK % ELONG.	ELONG. @ BREAK % ELONG.	BRCAST BRKL % ELONG.	ASTM D 746 COLD TEMP TEMP +-[illegible]°C TESTED PASSED	ASTM D 1693 ESCR TIME = [illegible] HR TESTED PASSED
DATE _____							
LOT _____							
[illegible]							

FLSI

POLYETHYLENE GEOMEMBRANES

material delivery report

date .....

job no. .....

p.o. no. .....

project .....

driver .....

truck no. .....

conditions of materials damaged

item	roll no.	panel no.	problem description

comments .....

.....

.....

how was material off-loaded? .....

how is material stored? .....

signed _____

certificate of acceptance

POLYETHYLENE GEOMEMBRANES

project name

date

poly-flex job no.

project location

details of work completed and measured

I, the undersigned, duly authorized representative of

do hereby take over and accept the work described above from the date hereof, subject to the exceptions detailed below, and confirm that the work has been completed in accordance with the specifications and the terms and conditions of the contract. There is no apparent damage to the plastic lining, nor is there any interference within or without the surrounding works.

I have evaluated and measured the work together with the Poly-Flex representative, and agree that the measurements shown above are true and correct, and that the installation has met our approval.

exceptions

authorized representative

name	signature	title	date

poly-flex representative

name	signature	title	date

pre-start site inspection

POLYETHYLENE GEOMEMBRANES

date .....

job no. .....

project name .....

	name	representing	position
persons present			

description of site conditions

.....

.....

___ photos enclosed ___ to follow

description of remedial site preparation work

.....

.....

.....

.....

date & conditions of startup

billing terms for additional inspection

.....

further inspection required ___ yes ___ no date

further comments

.....

prepared by

name	signature	title

FLSI

POLYETHYLENE GEOMEMBRANES

certificate of acceptance of soil subgrade

project name .....

project no. .....

location .....

installation contractor representative .....

area to be accepted .....

.....

.....

I, the undersigned, duly authorized representative of the installer, do hereby accept the soil subgrade surface conditions and shall be responsible for maintaining its integrity and suitability in accordance with these specifications from this date to completion of this installation. I do not accept any responsibility for the conditions or character of the subsurface soil, or any effects the soil might have on the liner system.

signature	title	date

geomembrane seam sample

POLYETHYLENE GEOMEMBRANES

project name .....

project no. .....

project location .....

seamer's name ..... welding machine no. ..... make .....

sample data: date seamed ..... date sampled .....

sample size

.....

sample i.d.

A B C

seam location .....

.....

remarks .....

.....

.....

	20	30	40	60	80	100
thickness	___	___	___	___	___	___

seam tests: shear ___ ASTM D3083 (modified by NSF App A)

peel ___ ASTM D413 (modified by NSF App A)

requested by ..... date .....

FLSI

POLYETHYLENE GEOMEMBRANES

meeting report

date

time

project name

project no.

purpose

	name	company
present 1		
2		
3		
4		
5		
6		
7		
8		

comments

items discussed

prepared by

date

c.c. to

FLSI

POLYETHYLENE GEOMEMBRANES

problem solution data sheet

data sheet no. .....

project no. .....

project name .....

project location .....

problem .....

implication .....

solutions .....

actions .....

prepared by ..... date .....

c.c. to .....

result .....

daily personnel activity

POLYETHYLENE GEOMEMBRANES

project no. _____ date _____

project name _____ project location _____

personnel	installer manager	deployment supervisor	quality control inspector	master seamer	welder	grinder	seam tester	laborer
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Attachment

POLYETHYLENE GEOMEMBRANES

chain of custody record

liquid |___

Poly-Flex (HDPE) |___

Dura-Flex (VLDPE-A) |___

soil |___

project no.

project name

project location

field record

sample type

container type

sample i.d.	sampled by	date

released to courier by field personnel

received by courier

Poly-Flex laboratory record

lab no.

received by	date	condition

released to lab courier

received by lab

contract laboratory record

laboratory name

received by	date	disposition

released to lab courier

received by lab

FLSI

geomembrane vacuum test record

POLYETHYLENE GEOMEMBRANES

project no. ______ project name ______

project location ______

vacuum box no. ______ make ______ model ______

seam interval tested	tester's name	test failure location	test failure no.	repair date	retest approval

inspected by ______ date ______

POLYETHYLENE GEOMEMBRANES

geomembrane field seam strength test sheet

project no. ..... project name .....

project location .....

field information

weather ..... sample no. .....

temperature ..... seam no. .....

time of day seamed ..... welding apparatus .....

date seamed ..... welder .....

testing information

location of testing ..... testing date .....

tested by ..... temp. during testing .....

sample width ..... in. grip separation rate ..... in./min.

seam strength — shear

specimen test	1	2	3	4	5
thickness mil					
strength at break lb./in.					
break description					
comment (pass/fail)					

seam adhesion strength — peel

strength at break lb./in.	1	2	3	4	5
break description					
comment (pass/fail)					

FLSI

POLYETHYLENE GEOMEMBRANES

daily field report
construction management services

project no. ..... date .....

project name ..... weather .....

project location ..... contract days remaining .....

contractor's equipment .....

contractor's personnel .....

observations

.....

.....

.....

.....

.....

___ photo ___ meeting ___ change order ___ problem sheet ___ conversation

time arrived ..... time departed .....

_____
signature

geomembrane seaming record

POLYETHYLENE GEOMEMBRANES

project no. ..... project name .....

project location .....

time	seamer's name	welding machine	seam i.d.	length	temperature sheet	temperature welding machine	weather

inspected by ..... date .....

equipment list

POLYETHYLENE GEOMEMBRANES

project no. ..... project name .....

project location .....

type	manufacturer	serial no.	status	date in use

FLSI

POLYETHYLENE GEOMEMBRANES

photography log

slides ____

prints ____

project no. ____ project name ____

project location ____ slide series no. (or print negative series no.) ____

photography date(s) ____

photographed by ____

comments ____

frame number	project number	date(s)	description
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

Note: see daily field report (attachment 12) for expanded description and references

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PROJECT IDENTIFICATION _____ PAGE ___ OF ___

OWNER/CLIENT _____ PROJECT NO _____ PROJECT MANAGER _____

DESIGN A/E _____ PROJECT NO _____ PROJECT MANAGER _____

CONSTRUCTION A/E _____ PROJECT NO _____ PROJECT MANAGER _____

CONTRACTOR _____ PROJECT NO _____ PROJECT MANAGER _____

SHOP DRAWING / SUBMITTAL LOG AND CONTROL SHEET

SUBMITTAL NO	DATE REC'D / OFFICE / DATE / BY	DESCRIPTION	SUBCONTRACTOR / REF SPEC SECTION/DWG	CONTRACTOR TRANS NO	NO COPIES REC'D	TO A/E REVIEWER / DATE / BY	REVIEWER / NAME / OFFICE	DATE REC'D / DATE / OFFICE	DATE REC'D / DATE / OFFICE	P M CHECK / DATE / BY	ACTION: NO EXCEPTIONS TAKEN	ACTION: MAKE CORRECTIONS NOTED	ACTION: AMEND & RESUBMIT	ACTION: REJECTED-SEE REMARKS	TRANS TO CONTRACTOR / DATE / BY	NO COPIES REC'D	TRANS VIA	REMARKS
ORIG																		
RESUB A																		
RESUB B																		
ORIG																		
RESUB A																		
RESUB B																		
ORIG																		
RESUB A																		
RESUB B																		

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Waldo Road • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3164

3010 Northdale Boulevard, Suite B-206 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 964-8164

QA/TESTING PLAN

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

SECTION	PART	CONTR. RESP.	ENGR. RESP.	OWNER RESP.	ITEM	REF. STD.	TEST	COMMENTS

= Responsibili to Coordinate X = Test to be Run by [illegible]

2.

Jones Edmunds & Associates, Inc.
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730 North Waldo Road • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3910 Northside Boulevard, Suite B-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 964-8196

AGENDA - PRE-CONSTRUCTION CONFERENCE

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

PRE-CONSTRUCTION CONFERENCE

I. INTRODUCTION

A. Verbal
B. Attendee Sign In Sheet

II. CONTRACT DOCUMENTS

A. Notice of Award _____
B. Contract Agreement Executed _____
C. Bonds Posted _____
D. Insurance Certificate _____
E. Certifications and Affidavits _____
F. Addenda Verified _____
G. Contract Drawings Verified _____
H. Other Requirements _____

III. CONSTRUCTION MANAGEMENT PLAN REVIEW

IV. CONTRACTOR PRESENTATION

A. Division 0 and 1 Pre-Construction Requirements
B. Construction Schedule
C. Monetary Draw-down Schedule
D. Temporary Facilities
E. Mobilization and Project Start

V. CONTRACT DATES

A. Notice to Proceed _____
B. Contract Completion _____

VI. OTHER

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Waldo • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3810 Northdale Boulevard, Suite B-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 964-8

ATTENDEE SIGN IN SHEET

PURPOSE OF MEETING: _____ DATE: _____

LOCATION OF MEETING: _____ TIME: _____

AGENCY: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

NAME	REPRESENTING	PHONE NUMBER

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

MINUTES - PRE-CONSTRUCTION CONFERENCE

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

PRE-CONSTRUCTION CONFERENCE

I. INTRODUCTION
- A. Verbal
- B. Attendee Sign In Sheet

II. CONTRACT DOCUMENTS
- A. Notice of Award _____
- B. Contract Agreement Executed_____
- C. Bonds Posted_____
- D. Insurance Certificates_____
- E. Certifications & Affidavits_____
- F. Addenda Verified_____
- G. Contract Drawings Verified_____
- H. Other Requirements_____

III. CONSTRUCTION MANAGEMENT PLAN REVIEW

IV. CONTRACTOR PRESENTATION
- A. Division 0 and 1 Pre-Construction Requirements
- B. Construction Schedule
- C. Monetary Draw-down Schedule
- D. Temporary Facilities
- E. Mobilization & Project Start

V. CONTRACT DATES
- A. Notice to Proceed_____
- B. Contract Completion_____

VI. OTHER

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

AGENDA - PROGRESS MEETING

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

I. INTRODUCTIONS
   A. Verbal
   B. Attendee Sign In Sheet

II. REQUESTS FOR INFORMATION (RFI)

III. PROPOSED CONTRACT MODIFICATIONS (PCM)

IV. SUBMITTALS/SHOP DRAWING STATUS

V. JOB PROGRESS REPORT

VI. PROGRESS PROJECTION REPORT

VII. SAFETY REPORT

VIII. PERIODIC PAYMENT REQUEST

IX. OTHER CONCERNS AND ISSUES

X. SCHEDULE DATE/TIME/PLACE FOR NEXT PROGRESS MEETING

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

MINUTES - PROGRESS MEETING

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

I. INTRODUCTIONS
   A. Verbal
   B. Attendee Sign In Sheet

II. REQUESTS FOR INFORMATION (RFI)

III. PROPOSED CONTRACT MODIFICATION (PCM)

IV. SUBMITTALS/SHOP DRAWING STATUS

V. JOB PROGRESS REPORT

VI. PROGRESS PROJECTION REPORT

VII. SAFETY REPORT

VIII. PERIODIC PAYMENT REQUEST

IX. OTHER CONCERNS AND ISSUES

X. SCHEDULE DATE/TIME/PLACE FOR NEXT PROGRESS MEETING

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS

Ship to the Following Address:

☐ 730 North Waldo Road • Gainesville, Florida 32601
(904) 377-5821

☐ 3910 Northdale Boulevard, Suite B-208 • Tampa, Florida 33624
(813) 960-3040 or (800) 535-5766

LETTER OF TRANSMITTAL

DATE:	JOB NO.:
ATTENTION:	
REGARDING:	

TO: _____

GENTLEMEN:

WE ARE SENDING YOU ☐ Attached ☐ Under Separate Cover via _____ the Following Items

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of Letter ☐ Change Order ☐ _____

COPIES	DATE	NO.	DESCRIPTION

THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For Approval ☐ Approved as Submitted ☐ Resubmit ____ Copies for Approval

☐ For Your Use ☐ Approved as Noted ☐ Submit ____ Copies for Distribution

☐ As Requested ☐ Returned for Corrections ☐ Return ____ Corrected Prints

☐ For Review and Comment ☐ Prints Returned After Loaned to U

☐ For Bids Due _____ 19_____ ☐ _____

REMARKS:

COPY TO: _____ SIGNED: _____

If enclosures are not as noted, kindly notify us at once.

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Walton • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3016 Northdale Boulevard, Suite 6-208 • Tampa, Florida, 33624 • (813) 960-2040 / FAX (813) 963-5166

REQUEST FOR INFORMATION (RFI) NO.: _____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

TO: _____ DATE: _____

RE: CONTRACT DOCUMENT REFERENCE(S) _____

FROM: _____

DESCRIPTION OF RFI:

☐ INFORMATION, ☐ CLARIFICATION, ☐ INTERPRETATION

is Requested for the Items Described Below or in the Attached:

_____

RESPONSE REQUESTED BY: _____ Date _____ Signature

TO: _____ DATE: _____

FROM: _____

RESPONSE TO RFI NO. _____

Our Response to your Request for ☐ INFORMATION, ☐ CLARIFICATION, ☐ INTERPRETATION

is Described Below or in the Attached: _____

XC: _____

_____ Signature

ATTACHMENT: _____

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Wales • Gainesville Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3810 Northdale Boulevard, Suite B-208 • Tampa, Florida 33624 • (813) 960-3040 / FAX (813) 968-6166

REQUEST FOR DESIGN REVIEW (RDR) NO.: _____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

TO: _____

FROM: _____

Review of the following is requested:

( ) SHOP DRAWING NO.: _____

( ) REQUEST FOR INFORMATION NO.: _____

( ) OTHER: _____

_____

_____

_____

_____

_____

Please provide response by: _____
DATE

If modification to contract drawings and or specifications are required, please provide the following:

_____ JUSTIFICATION FOR MODIFICATIONS

_____ COPIES OF TYPED SPECIFICATION REVISIONS

_____ PRINTS OF REVISED DRAWINGS

TO: _____ DATE: _____

FROM: _____

RESPONSE: _____

_____

_____

_____

_____

_____

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS

SUBMITTAL/SHOP DRAWING REVIEW STAMP

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

SUBMITTAL REVIEW

REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AND COMPLIANCE WITH INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS, QUANTITIES OR INSTALLATION REQUIREMENTS.

☐ NO EXCEPTIONS TAKEN ☐ MAKE CORRECTIONS NOTED

☐ AMEND AND RESUBMIT ☐ REJECTED-SEE REMARKS

BY_____ DATE_____ SUBMITTAL NO._____

JONES, EDMUNDS & ASSOCIATES, INC.

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

720 North Wilson • Gainesville, Florida [illegible] • (904) 377-4621 / FAX (904) 377-3188

3010 Northdale Boulevard, Suite [illegible] • Tampa, Florida, 33624 • (813) [illegible] / FAX (813) [illegible]

NOTICE OF NONCOMPLIANCE (NON)

NO.: _____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

TO: _____ DATE: _____

_____ TIME: _____

_____

NONCOMPLIANCE OBSERVATION: _____

DETAILS OF OBSERVATION: _____

_____

_____

_____

_____

_____

REFERENCE TO CONTRACT DOCUMENTS: _____

_____

_____

_____

_____

_____

_____

Your response to this notice is required by the close of business on the day following the date of issuance

Receipt of the above notice of noncompliance is hereby acknowledged by:

_____

THIS THE _____ DAY OF

_____ .

BY:

TITLE: _____ _____

CONTRACTOR'S
REPRESENTATIVE

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS
730 North Waldo • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3910 Northdale Boulevard, Suite B-206 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 968-6166

CONSTRUCTION CONTRACT FIELD ORDER (CFO)

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

THE CONTRACTOR IS HEREBY DIRECTED TO ACCOMPLISH THE FOLLOWING WORK:

_____

_____

_____

_____

REASON: _____

_____

SPECIFICATION REFERENCES: _____

DRAWING REFERENCE: _____

This WORK shall be performed within the confines of the contract unless the Contractor believes this work entitles him to a contract modification, and so notifies the Engineer, in writing, within seven (7) days after the date of this Field Order.

RESIDENT PROJECT REPRESENTATIVE

BY: _____

TITLE: _____

Receipt of the above Field Order is hereby acknowledged by

_____

this the _____ day of _____

_____, 19 _____

_____

By _____

Title _____

CONTRACTOR'S REPRESENTATIVE

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Waldo • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3010 Hardesty Boulevard, Suite B-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 946-6184

CONTRACT QUANTITY REPORT (CQR)

PAGE ____ OF ____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

CONTRACT ITEM NUMBER: _____ DESCRIPTION: _____

DATE:	LOCATION / MEASUREMENTS / COMPUTATION	QUANTITY:

TOTAL FOR THIS SHEET _____

TOTAL FROM PREVIOUS SHEET _____

TOTAL TO DATE _____

VERIFIED BY: _____

PERIODIC PAYMENT REQUEST (PPR)

PROJECT:

JEA PROJECT NO: _____ OWNER NO: _____

REQUEST NO:
PERIOD COVERING THROUGH
DATE SUBMITTED: _____

CONTRACTOR:
(NAME/ADDRESS)

OWNER:

ENGINEER/ARCH:

CHANGE ORDER STATUS

Change Orders approved in previous months by Owner TOTAL		ADDITIONS	DEDUCTIONS
Approved this Month			
Number	Date Approved		
	TOTALS		
Net change by Change Orders			

1. ORIGINAL CONTRACT SUM $ _____
2. Net change by Change Orders $ _____
3. CONTRACT SUM TO DATE (Line 1 ± 2) $ _____
4. TOTAL COMPLETED & STORED TO DATE $ _____
   (Column G on 16B)
5. RETAINAGE:
   a. ___% of Completed Work $ _____
   (Column D + E on 16B)
   b. ___% of Stored Work $ _____
   (Column F on 16B)
   Total Retainage (line 5a + 5b or Total in Column I of 16b) $ _____
6. TOTAL EARNED LESS RETAINAGE: $ _____
   (Line 4 less Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) $ _____
8. CURRENT PAYMENT DUE $ _____
9. BALANCE TO FINISH, PLUS RETAINAGE: $ _____
   (Line 3 less Line 6 Total)

CONTRACTOR'S APPLICATION FOR PAYMENT

As authorized agent for the Contractor, I, the undersigned, hereby certify that to the best of my knowledge and belief, this is true and correct statement of work performed and materials delivered. I further certify that the Contractor has good title for all materials delivered under this Partial Estimate and there are no vendor's liens, mechanic's liens, or other liens or rights to liens against this job, and that all previous Partial Payments received under this Contract have been applied to discharge in full all of the Contractor's obligations reflected in prior Partial Payment requests, and that hourly wages paid to all employees on this project for the period of this estimate are in accordance with the wage scale determination contained in the Contract Documents.

CONTRACTOR:

By: _____ Date: _____

State of:
Subscribed and sworn to before me this day of ,19
Notary Public:
My Commission expires:

ENGINEER'S CERTIFICATION

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Engineer certifies to the Owner that to the best of the Engineer's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT RECOMMENDED.

AMOUNT RECOMMENDED $ _____
(Attach explanation if amount recommended differs from the amount applied for.)

By: _____ Date: _____

OWNER APPROVAL

Title: _____ By: _____ Date: _____

NOTE: TYPE INFORMATION; DO NOT HAND WRITE

JEA DOCUMENT NO. 16A (USE WITH DOC. NO. 16B)

SCHEDULE OF VALUES FORM

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS

PROJECT:
JEA PROJECT NO:
REQUEST NO:
DATE SUBMITTED:
PERIOD COVERING: THROUGH

In tabulations below, amounts are stated to the nearest dollar and whole percent. Do not hand write.
Entries are to be typewritten. Use Column I on Contracts where variable retainage for line items may apply.

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G÷C)	BALANCE TO FINISH (C-G)	RETAINAGE
			FROM PREVIOUS APPLICATION (D+E)	THIS PERIOD					

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Walnut • Gainesville, Florida 32601 • (904) 377-6621 / FAX (904) 377-3146
3640 Northwest Boulevard, Suite 6-208 • Tampa, Florida 33624 • (813) 960-3049 / FAX (813) 964-6186

PROPOSED CONTRACT MODIFICATION (PCM) NO.: _____

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

TO: _____ DATE: _____

Please submit your proposal for an equitable adjustment in the contract amount and/or performance time in accordance with the following:

CONTRACT DOCUMENT REFERENCE(S): _____

DESCRIPTION OF MODIFICATION: _____

REASON FOR MODIFICATION: _____

WORK DIRECTIVE:

( ) Proceed with the work immediately.

( ) Do not proceed with the work until a change order is issued.

Your response is requested by _____.

XC: _____

Signature _____

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

CONTRACT CHANGE ORDER

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

USE FORMAT ACCEPTABLE TO OWNER OR AS SPECIFIED

IN THE CONTRACT DOCUMENTS

Jones Edmunds & Associates, Inc. JEA

PROJECT IDENTIFICATION _____ PAGE ___ OF ____

OWNER/CLIENT _____ PROJECT NO _____ PROJECT MANAGER _____

DESIGN A/E _____ PROJECT NO _____ PROJECT MANAGER _____

CONSTRUCTION A/E _____ PROJECT NO _____ PROJECT MANAGER _____

CONTRACTOR _____ PROJECT NO _____ PROJECT MANAGER: _____

CHANGE ORDER/STATUS REPORT

CHECK ORDER NUMBER	NUMBER OF PCM INITIATING CHANGE	DATE	STATUS THIS REPORT/ REMARKS	DATE APPROVED				ACTION DATE		CHANGE IN PRICE				CHANGE IN TIME				REASON FOR CHANGE					
		INITIATED		BY CONTRACTOR	BY A/E	BY OWNER/CLIENT	BY OTHER AGENCY	ORDER ISSUED	CANCELLED	ORIGINAL CONTRACT AMOUNT	AMOUNT ADD	AMOUNT DEDUCT	REVISED CONTRACT AMOUNT	ORIGINAL CONTRACT DATE/TIME	TIME ADD	TIME DEDUCT	REVISED COMPLETION DATE	DESIGN MODIFICATION	CONTRACTORS REQUEST	DIFFERENT/SITE CONDITIONS	CORRECTION OF DEFECTIVE WORK	OTHER REQUEST	CONTRACT COMPLETION

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA
730 North Wilson • Gainesville, Florida 32601 • (904) 377-5621 / FAX (904) 377-3166
3010 Northside Boulevard, Suite 6-205 • Tampa, Florida, 33614 • (813) [illegible] / FAX (813) [illegible]

MONTHLY PROGRESS REPORT

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

FORMAT, CONTENT AND DISTRIBUTION AS

REQUESTED BY OWNER

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA
730 North Wilder • Gainesville Florida 32601 • (904) 377-5621 / FAX (904) 377-3166
3010 Hartsdale Boulevard, Suite 8-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 964-6166

CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

DESCRIPTION OF WORK: _____

CONTRACT DOCUMENT REFERENCE: _____

The work performed under this Contract has been reviewed and found to be substantially complete. The date of substantial completion of the project or portion thereof designated above is hereby established as also the date of commencement of applicable warranties required by the contract documents.

The date of substantial completion of a project or specified part of a project is the date accepted by the Owner, that the construction is sufficiently completed, in accordance with the contract documents, so that the project or specified part can be utilized for the intended purpose.

A list of items to be completed or corrected, prepared by the Contractor and verified and amended by the Construction Engineer and the Owner is attached. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the contract documents.

The Contractor will complete or correct the work on the list of items attached hereto within _____ days from the Date of Substantial Completion.

_____	_____	_____
CONTRACTOR	*BY*	*DATE*
_____	_____	_____
RESIDENT ENGINEER	*BY*	*DATE*
_____	_____	_____
OWNER	*BY*	*DATE*

pc: Design Engineer - Construction Engineer - Contractor - Owner -

Other _____

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS
730 North Waldo • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3910 Northdale Boulevard, Suite B-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 968-6186

CERTIFICATE OF GUARANTEE

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

DESCRIPTION OF WORK: _____

CONTRACT DOCUMENT REFERENCE: _____

The work under the Contract, except as expressly excluded, and all of its subcontracts, severally and collectively, whether herein stipulated in each case or not, shall be guaranteed against faulty workmanship and/or material as specified below from date of acceptance of the work. The provisions of the guarantee and/or guarantees shall be incumbent on all parties of the work, including the Contractor, each subcontractor, all material supply houses and all manufacturers whose products and/or equipment are incorporated into the facilities.

Neither the Certificate of Substantial Completion, Final Certificate of Payment, nor any provisions in the Contract Documents, nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of work, materials, or equipment not performed or installed in accordance with the Contract Documents, or relieve the Contractor or his Sureties of liability in respect to any warranties or responsibility for faulty materials or workmanship.

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of Substantial Completion. The Contractor warrants and guarantees for a period of one (1) year from the date of Substantial Completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects, including the repairs of any damage to other parts of the system resulting from such defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Maintenance Bond shall remain in full force and effect through the guarantee period.

_____	_____	_____
CONTRACTOR	*BY*	*DATE*
_____	_____	_____
RESIDENT ENGINEER	*BY*	*DATE*
_____	_____	_____
OWNER	*BY*	*DATE*

pc: Design Engineer - Construction Engineer - Contractor - Owner -

Other _____

JONES, EDMUNDS & ASSOCIATES, INC.

CONSULTING ENGINEERS AND SCIENTISTS

730 North Waldo Road • Gainesville, Florida • (904) 377-5821 / FAX (904) 377-3166 2910 Northdale Boulevard, Suite B-208 • Tampa, Florida 33624 • (813) 960-3040 /FAX (813) 968-8186

LIST OF ITEMS TO BE COMPLETED OR CORRECTED - "PUNCH LIST"

DATE: _____ PAGE: 1 OF 3

PROJECT IDENTIFICATION: _____

OWNER: _____

DESIGN ENGINEER: _____

CONTRACTOR: _____

CONSTRUCTION ENGINEER: _____

DESCRIPTION OF WORK: _____

CONTRACT DOCUMENT REFERENCE: _____

_____

CONTRACTOR BY DATE

_____

RESIDENT ENGINEER BY DATE

_____

OWNER BY DATE

XC: DESIGN ENGINEER - CONSTRUCTION ENGINEER - CONTRACTOR - OWNER

OTHER: _____

24.

LIST OF ITEMS TO BE COMPLETED OR CORRECTED - "PUNCH LIST"

ITEM	DATE COMPLETED	CONFIRMED BY

LIST OF ITEMS TO BE COMPLETED OR CORRECTED - "PUNCH LIST"

ITEM	DATE COMPLETED	CONFIRMED BY

Jones Edmunds & Associates, Inc. JEA
CONSULTING ENGINEERS AND SCIENTISTS
730 North Waldo • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166
3010 Hartsdale Boulevard, Suite 8-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 968-6166

PROJECT CLOSEOUT REPORT (PCR)

OWNER/CLIENT: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT NO.: _____ PROJECT MANAGER: _____

PROJECT IDENTIFICATION: _____

SUBSTANTIAL COMPLETION DATE: _____ CONTRACT COMPLETION DATE: _____

ITEM - DESCRIPTION	CONTRACT DOCUMENT REFERENCE	DATE REC'D	DATE REVIEWED / BY	ACTION

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Waldo Road • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3164
3916 Northdale Boulevard, Suite 6-206 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 968-8186

SHOP DRAWING/SUBMITTAL CONTROL FORM

PROJECT IDENTIFICATION: _____

PROJECT NUMBER: _____

OWNER/CLIENT: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT MANAGER: _____

CONTRACTOR INFORMATION

SUBMITTAL DATE: _____ SUBMITTAL NUMBER: _____ NO. OF COPIES SENT: _____

☐ ORIGINAL SUBMITTAL ☐ RESUBMITTAL ☐ SUPPLEMENT ☐ INFORMATION ONLY

NOTE: If other than original then include: Date of Original _____ Submittal No. of Original _____

A. SPECIFICATION SECTION AND SUB-SECTION NUMBER: _____

B. DESCRIPTION: _____

C. MANUFACTURED BY: _____

D. INSTALLATION BY: _____

E. CRITICAL DATE ☐ NO ☐ YES WHEN: _____

NOTE: Engineer shall receive at least 30 days for review (reference General Requirements of the Documents)

ENGINEER INFORMATION

NO. OF COPIES RECEIVED _____ NO. OF COPIES RETURNED _____

ACTIVITY	DATE	PERSON	COMMENT
RECEIVED			
TO REVIEWER			
TO ADMINISTRATOR			
RETURNED			

STATUS: ☐ NO EXCEPTIONS TAKEN ☐ MAKE CORRECTIONS AS NOTED ☐ AMEND AND RESUBMIT ☐ REJECTED SEE REMARKS

COMMENTS: _____

Jones Edmunds & Associates, Inc.
CONSULTING ENGINEERS AND SCIENTISTS
JEA

730 North Waldo Road • Gainesville, Florida 32601 • (904) 377-5821 / FAX (904) 377-3166 3910 Northdale Boulevard, Suite B-208 • Tampa, Florida, 33624 • (813) 960-3040 / FAX (813) 968-8166

ENGINEER'S CERTIFICATE OF FINAL COMPLETION

PROJECT IDENTIFICATION: _____

PROJECT NUMBER: _____

OWNER/CLIENT: _____ PROJECT MANAGER: _____

DESIGN A/E: _____ PROJECT MANAGER: _____

CONSTRUCTION A/E: _____ PROJECT MANAGER: _____

CONTRACTOR: _____ PROJECT MANAGER: _____

CONTRACT INFORMATION

AGREEMENT EXECUTED: _____ NOTICE TO PROCEED: _____

	ORIGINAL	REVISED
SUBSTANTIAL COMPLETION:		
FINAL COMPLETION:		
CONTRACT AMOUNT:		

ENGINEER'S AFFIDAVIT

Jones, Edmunds & Associates, Inc. (JEA), the Engineer hereby certifies that it has provided certain professional services as set forth in its agreement with _____ _____. Dated: _____

JEA further certifies that, based upon its observations and available data, the construction of the above referenced project is to the best of its knowledge and belief, acceptably complete in accordance with the intent of the Contract Documents, as revised and amended to reflect design changes, and the construction conditions, as recorded, subject to the provisions of the Standard General Conditions of the Construction Contract.

JEA has forwarded to the owner the contractor's final Application for Payment in accordance with the Standard General Conditions of the Construction Contract.

Engineer of Record	Manager of Construction Services
(Signature)	(Signature)
Date	Date

CONTRACTOR'S AFFIDAVIT OF CONTRACT COMPLETION

PROJECT:

CONTRACTOR:

CONTRACT FOR:

CONTRACT DATE:

CONTRACTOR'S AFFIDAVIT

I solemnly swear and affirm: That the work under the above named contract and all amendments thereto have been completed in accordance with the requirements of said contract; that all costs incurred for equipment, materials, labor, and services against the project have been paid; that no liens have been attached against the project; that no suits are pending by reason of work on the project under the contract; that all Workmen's Compensation claims are covered by Workmen's Compensation insurance as required by law; that all public liability claims are adequately covered by insurance, and that the Contractor shall save, protect, defend, indemnify, and hold the Owners harmless form and against any and all claims which arise as a direct or indirect result of any transaction, event or occurrence related to performance of the work contemplated under said contract.

CONTRACTOR:

_____ SEAL

Title: _____

Date: _____

STATE OF
COUNTY OF

Personally appeared before me this _____ day of _____ 199__
known (or made known) to me to be _____

_____
(Owner)(Partner)(Corporate Officer - Title)

Contractor(s), who, being by me duly sworn, subscribed to the foregoing affidavit in my presence.

_____
(Notary Public)
(type name):

My Commission Expires _____