

**AGENDA**  
**LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION**  
**March 14, 2017**  
**6:30 p.m.**  
**LOUDON COUNTY COURTHOUSE ANNEX**  
**Loudon, Tennessee**

1. Opening of Meeting, Pledge of Allegiance, Invocation
2. Approval of Minutes – February 14, 2017
3. Items of Public Concern
4. Cash Activity Report
5. Operations Report
6. Draft 2016 Audit
7. Contract Modification Update
8. Poplar Springs Update
9. Investment Options Update
10. Attorney's Report
11. Election of Officers
12. Chairman's Report
13. Other Items of Commission's Consideration
14. Adjourn

**Loudon County Department of Accounts and Budgets**  
**Solid Waste Disposal Fund 207**  
**Monthly Cash Report**  
**February 2017**

January 2017 Combined Ending Cash Balance per Monthly Report	3,323,849.91	
Adjustments:	0.00	
	0.00	
Total Adjustments		0.00
<b>Adjusted January 2017 Combined Ending Balance per Loudon Co Trustee</b>		<b>3,323,849.91</b>

**Solid Waste Disposal Commission Operating Fund**

Operating Fund Ending Balance January 2017		3,077,244.95
Cash Receipts:		
Trustee's Collections - Prior Year	0.02	
Surcharge - Host Fees (Jan 2017)	12,296.48	
Surcharge - Security Fees (Jan 2017)	15,370.60	
Investment Income	1,967.06	
Total Monthly Revenue	29,634.16	29,634.16
Cash Disbursements:		
Board & Committee Members Fees	(300.00)	
Audit Services (Mitchell Emert & Hill)	0.00	
Contracts with Private Agencies (Santek)	0.00	
Engineering Services (Santek)	0.00	
Contributions (Loudon Utilities - Quarterly)	0.00	
Legal Services (Kennerly Dec 2016 & Jan 2017)	(5,000.00)	
Legal Notices	0.00	
Other Contracted Services (Mowing)	0.00	
Building & Content Insurance	0.00	
In-Service/Staff Development	(570.00)	
Trustee's Commission	(285.82)	
Total Cash Disbursements	(6,155.82)	(6,155.82)
Expenditure Credit:		
Trustee Commission Adjustment		0.00
<b><u>Operating Fund Ending Balance February 2017</u></b>		<b>3,100,723.29</b>

**Poplar Springs Subfund**

Poplar Springs Subfund Balance January 2017		246,604.96
Cash Receipts:		
	0.00	
Total Monthly Revenue	0.00	0.00
Cash Disbursements:		
Legal Services	0.00	
Total Cash Disbursements	0.00	0.00
<b><u>Poplar Springs Subfund Balance February 2017</u></b>		<b>246,604.96</b>

**TOTAL COMBINED OPERATING AND POPLAR SPRINGS FEBRUARY 2017 BALANCE** **3,347,328.25**

<b>Combined Summary - February 2017</b>		
Beginning Balance		3,323,849.91
Plus Operating Revenue		29,634.16
Less Operating and Poplar Springs Disbursements		(6,155.82)
<b>TOTAL COMBINED BALANCE - FEBRUARY 2017</b>		<b>3,347,328.25</b>



650 25th Street, N.W., Suite 100  
Cleveland, Tennessee 37311  
(423) 303-7101

Email: [mail@santekenviro.com](mailto:mail@santekenviro.com)  
Internet: [www.santekenviro.com](http://www.santekenviro.com)

**Monthly Operations Report  
Matlock Bend Landfill  
March 14, 2017**

**Presented by:  
Santek Environmental, Inc.**

- I. OPERATIONS**
  - A. Tonnage Report
  - B. Customer Report
  - C. Inspection
  - D. Materials Classification Report
  - E. Waste Characterization Report
  - F. Tire Report
  - G. Status of New Scales
  
- II. ENGINEERING**
  - A. Airspace Utilization Schedule
  - B. Remaining Airspace Report
  
- III. HOST & SECURITY FEES**

*Tellico Lake Cleanup - March 24, 2017*

**LANDFILL TONNAGE VOLUME  
MONTH ENDING -  
February 2017**

**MATLOCK BEND LANDFILL**

MONTH	2016	2017	2016 TO 2016
JANUARY	13,035.08	15,336.42	2,301.34
FEBRUARY	13,619.92	14,991.58	1,371.66
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	26,655.00	30,328.00	3,673.00

**DAILY AVG FOR ANY  
RUNNING 30 DAY  
PERIOD**                      **560.73**

**LOUDON COUNTY**

MONTH	2016	2017	2016 TO 2016
JANUARY	412.09	477.16	65.07
FEBRUARY	444.62	424.98	(19.64)
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	856.71	902.14	45.43

**LENOIR CITY**

MONTH	2016	2017	2016 TO 2016
JANUARY	260.26	320.21	59.95
FEBRUARY	296.65	280.52	(16.13)
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	556.91	600.73	43.82

**CITY OF LOUDON**

MONTH	2016	2017	2016 TO 2016
JANUARY	312.87	374.21	61.34
FEBRUARY	346.21	316.79	(29.42)
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	659.08	691.00	31.92

**WASTE SERVICES OF TN**

MONTH	2016	2017	2016 TO 2016
JANUARY	1,835.75	2,573.63	737.88
FEBRUARY	2,031.60	2,358.39	326.79
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	3,867.35	4,932.02	1,064.67

**TENNESSEE TRASH**

MONTH	2016	2017	2016 TO 2016
JANUARY	2,152.03	3,735.96	1,583.93
FEBRUARY	2,264.75	3,572.92	1,308.17
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	4,416.78	7,308.88	2,892.10

LANDFILL TONNAGE VOLUME  
MONTH ENDING -  
February 2017

KIMBERLY CLARK - PAPER WASTE

MONTH	2016	2017	2016 TO 2016
JANUARY	4,649.89	4,389.45	(260.44)
FEBRUARY	4,671.47	4,197.85	(473.62)
MARCH			0.00
APRIL			0.00
MAY			0.00
JUNE			0.00
JULY			0.00
AUGUST			0.00
SEPTEMBER			0.00
OCTOBER			0.00
NOVEMBER			0.00
DECEMBER			0.00
TOTAL	9,321.36	8,587.30	(734.06)



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Internet: [www.santekenviro.com](http://www.santekenviro.com)

March 14, 2017

Mr. Steve Field, Chairman  
Loudon County Solid Waste Disposal Commission  
!00 River Road  
Loudon, TN 37774

Dear Mr. Field,

I understand the members of the Loudon County Solid Waste Disposal Commission have requested the Matlock Bend Landfill's customer activity reports contain original customer information without Santek making any changes to them.

Santek provides the Commission with an annual report detailing the names of landfill customers and their respective landfill rates. On a monthly basis, we provide the Commission with a report containing a summary of all of the information required in Section 5.1 of the landfill management agreement including customer, tonnage received and fees charged. I believe this information meets our contractual requirement. However, if the Commission is not in agreement, please provide me with the information you believe is missing from the report.

Should you have any questions or need additional information, please don't hesitate to contact me.

Sincerely,

A handwritten signature in blue ink that reads "Joseph T. Watts". The signature is written in a cursive style.

Joseph T. Watts  
Chief Operations Officer



STATE OF TENNESSEE  
 DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
 DIVISION OF SOLID WASTE MANAGEMENT  
 WILLIAM R. SNODGRASS TENNESSEE TOWER  
 312 ROSA L. PARKS AVENUE, 14TH FLOOR  
 NASHVILLE, TN 37243

SOLID WASTE DISPOSAL FACILITY EVALUATION

RESET  
 PRINT

DATE 02/16/2017 TIME 9:36

WEATHER  
 52 OF SUNNY

SITE NAME Loudon County Landfill		REGISTRATION NUMBER SNL 53-0203	FACILITY <input checked="" type="checkbox"/> CLASS I <input type="checkbox"/> CLASS II <input type="checkbox"/> CLASS III <input type="checkbox"/> CLASS IV	PURPOSE <input checked="" type="checkbox"/> COMPLETE <input type="checkbox"/> COMPLAINT <input type="checkbox"/> FOLLOW UP <input type="checkbox"/> OTHER
PHYSICAL LOCATION 21712 Highway 72 North				
OWNER / OPERATOR Loudon County				

NVO	ADC	V1	V2	CODE	*NVO - NO VIOLATION OBSERVED	COMMENTS
1.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8010	INADEQUATE VECTOR CONTROL	
2.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8020	ACCESS NOT LIMITED TO OPERATING HOURS	
3.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8030	INADEQUATE ARTIFICIAL OR NATURAL BARRIER	
4.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8040	INADEQUATE INFORMATION SIGNS	
5.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8050	UNSATISFACTORY ACCESS ROAD(S) / PARKING AREA(S)	
6.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8060	CERTIFIED PERSONNEL NOT PRESENT DURING OPERATING HOURS	
7.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8070	UNAPPROVED SALVAGING OF WASTE	
8.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8080	EVIDENCE OF OPEN BURNING	
9.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8090	INADEQUATE FIRE PROTECTION	
10.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8110	UNSATISFACTORY LITTER CONTROL	
11.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8120	INADEQUATE EMPLOYEE FACILITIES	
12.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8130	NO COMMUNICATION DEVICES	
13.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8140	INADEQUATE OPERATING EQUIPMENT	
14.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8150	UNAVAILABILITY OF BACKUP EQUIPMENT	
15.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8160	UNAVAILABILITY OF COVER MATERIAL	
16.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8170	INADEQUATE MAINTENANCE OF RUNON / RUNOFF SYSTEM(S)	
17.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8180	INADEQUATE EROSION CONTROL	
18.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8190	INADEQUATE DUST CONTROL	
19.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8210	UNAUTHORIZED WASTE ACCEPTED	
20.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8220	UNAPPROVED SPECIAL WASTE ACCEPTED	
21.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8230	TIRES IMPROPERLY HANDLED	
22.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8240	MEDICAL WASTE IMPROPERLY HANDLED	
23.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8250	DEAD ANIMALS IMPROPERLY HANDLED	
24.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8270	WASHOUT OF SOLID WASTE	
25.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8280	NO PERMANENT BENCHMARK	

- East slope is showing erosion ripples, more control is required to shore up slope

FD081616

NVO	AOC	V1	V2	CODE	*NVO - NO VIOLATION OBSERVED	COMMENTS
26.	X				8290 INADEQUATE RANDOM INSPECTION PROGRAM	<i>overhead - site being Fixed and should be completed tomorrow</i>
27.	X				8300 MISHANDLING OF SPECIAL WASTE	
28.	X				8310 BUFFER ZONE STANDARD VIOLATED	
29.	X				8320 INADEQUATE MAINTENANCE OF LEACHATE MANAGEMENT SYSTEM	
30.	X				8330 LEACHATE IMPROPERLY MANAGED	
31.	X				8340 INADEQUATE LEACHATE COLLECTION SYSTEM	
32.		X			8350 LEACHATE OBSERVED AT THE SITE	
33.	X				8360 LEACHATE ENTERING RUNOFF	
34.	X				8370 LEACHATE ENTERING A WATER COURSE	
35.	X				8380 INADEQUATE GAS MIGRATION CONTROL SYSTEM	
36.	X				8390 INADEQUATE MAINTENANCE OF GAS MIGRATION CONTROL SYSTEM	
37.	X				8420 POTENTIAL FOR EXPLOSIONS OR UNCONTROLLED FIRES	
38.	X				8430 WASTE NOT CONFINED TO A MANAGEABLE AREA	
39.	X				8440 IMPROPER SPREADING OF WASTE	
40.	X				8450 IMPROPER COMPACTING OF WASTE	
41.	X				8460 UNSATISFACTORY INITIAL COVER	
42.	X				8470 UNSATISFACTORY INTERMEDIATE COVER	
43.	X				8480 UNSATISFACTORY FINAL COVER	
44.	X				8490 EXCESSIVE POOLING OF WATER	
45.	X				8510 UNSATISFACTORY STABILIZATION OF COVER	
46.	X				8520 DUMPING OF WASTE INTO WATER	
47.	X				8530 UNSATISFACTORY RECORDS OR REPORTS	
48.	X				8540 GROUNDWATER MONITORING SYSTEM IMPROPERLY MAINTAINED	
49.	X				8570 OPERATION DOES NOT CORRESPOND WITH ENGINEERING PLANS	
50.	X				8580 OPERATION DOES NOT CORRESPOND WITH PERMIT CONDITION(S)	
51.	X				8590 PERMIT, PLANS, OPERATION MANUAL NOT AVAILABLE	
52.	X				8610 NO OPERATING SCALES AND/OR FAILURE TO MAINTAIN WASTE RECORDS	

*Paul A...*

SIGNATURE OF PERSON INTERVIEWED

*[Signature]*

SIGNATURE OF INSPECTOR

16 FEB 17

DATE



**Materials Classification Report**  
**Matlock Bend Landfill**  
**Monthly Tonnage Summary February 2017**

Material	Tonnage	2015 Sludge %		2016 Sludge %	
<b>MSW</b>		January	2%	January	4%
		February	3%	February	3%
		March	3%	March	4%
		April	1%	April	3%
		May	2%	May	4%
		June	1%	June	2%
		July	5%	July	2%
		August	2%	August	3%
		September	2%	September	2%
		October	2%	October	3%
		November	3%	November	3%
		December	5%	December	3%
MSW	<b>9,455</b>				
<b>Special Waste</b>					
Other	4,406				
Ash	0				
Sludge	<u>1,131</u>				
<b>Total Special Waste</b>	<b><u>5,537</u></b>				
<b>Total MSW &amp; SW</b>	<b>14,992</b>				
Tires	25				
<b>Total Material</b>	<b><u>15,017</u></b>				
<b>% MSW</b>	<b><u>63%</u></b>				
<b>% Special Waste</b>	<b><u>37%</u></b>				
<b>% Sludge</b>	<b><u>8%</u></b>				

2017 Sludge %	
January	5%
February	8%
March	0%
April	0%
May	0%
June	0%
July	0%
August	0%
September	0%
October	0%
November	0%
December	0%



**2016-2017 Matlock Bend  
Landfill Tire Report**

<b>Month</b>	<b>Tonnage</b>
Jul-16	28.68
Aug-16	34.04
Sep-16	35.55
Oct-16	36.32
Nov-16	41.63
Dec-16	19.39
Jan-17	29.73
Feb-17	15.29
Mar-17	
Apr-17	
May-17	
Jun-17	
<b>Total (tons)</b>	<b>240.63</b>

## Matlock Bend Landfill - Module I-A 2017 Airspace Projection / Construction Schedule

DATE	REMAINING AIRSPACE <sup>1</sup> (CY)	MONTHLY TONNAGE	ACTUAL / PROJECTED <sup>2</sup>	UTILIZATION FACTOR	MONTHLY VOLUME CONSUMED (CY)	ENDING MONTHLY REMAINING AIRSPACE (CY)
		15,074		1.07		
Sept. 15, 2016	517,724	-	-	-	-	-
Sept. 16 - 30, 2016	-	2,301	A	1.07	2,462	515,262
October	-	16,097	A	1.07	17,224	498,038
November	-	16,532	A	1.07	17,689	480,348
December	-	15,079	A	1.07	16,134	464,214
January '17	-	15,172	A	1.07	16,234	447,980
February	-	14,970	A	1.07	16,018	431,962
March	-	15,074	P	1.07	16,129	415,833
April	-	15,074	P	1.07	16,129	399,704
May	-	15,074	P	1.07	16,129	383,575
June	-	15,074	P	1.07	16,129	367,446
July	-	15,074	P	1.07	16,129	351,318
August	-	15,074	P	1.07	16,129	335,189
September	-	15,074	P	1.07	16,129	319,060
October	-	15,074	P	1.07	16,129	302,931
November	-	15,074	P	1.07	16,129	286,802
December	-	15,074	P	1.07	16,129	270,673

<sup>1</sup> = Remaining airspace based on September 15, 2016 aerial survey.

Full Date

May-2019

<sup>2</sup> = Projected tonnages are based on a 3 month average per Matt Dillard on 6-2-09.

<sup>3</sup> = Utilization rate based on the annual utilization rate per October 27, 2008 construction meeting (Avg. Utilization = 1.24 cy/ton)

### Tonnage for Past 3 Months

December	15,079
January	15,172
February	14,970
<b>Average</b>	<b>15,074</b>

cc: Tim  
Matt  
Cheryl  
Ron  
Chris  
Raymond  
Jason  
Andy

March 7, 2017



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Cleveland, Tennessee 37311  
(423) 303-7101

Email: [mail@santekenviro.com](mailto:mail@santekenviro.com)  
Internet: [www.santekenviro.com](http://www.santekenviro.com)

Mr. Bassam Faleh  
Tennessee Department of Environment and Conservation  
Division of Solid Waste Management  
312 Rosa Parks Ave.  
12th Floor, Tennessee Tower  
Nashville, TN 37243-1535

Re: Remaining Life Form – Matlock Bend Landfill  
SNL 53-103-0203

Dear Mr. Faleh:

As required by Tennessee Rule 0400-11-01-.04(2)(t), enclosed is the "Estimate of Remaining Landfill Life" form for the Matlock Bend Landfill.

The annual tonnage received at the Matlock Bend Landfill during 2016 was 180,309 tons. Using 273 operational days per year, further calculation results in approximately 660 tons per day in 2016. Of the 40 acres of the permitted sanitary landfill site, approximately 35.3 acres have been developed and are being utilized for waste disposal.

The total airspace permitted is 4,748,110 cy. The airspace remaining as of September 15, 2016 is 1,629,569 cy. This is the volume available for waste and operational soil. The average consumption of airspace is calculated to be 1.24 cy/ton; this also is waste and required operational cover soil. Using 273 operational days per year, the calculated life is 7.3 years.

If you have any questions or comments regarding the information provided, please contact me at (423) 303-7101.

Sincerely,

A handwritten signature in black ink, appearing to read "R. Vail", is written over a light blue horizontal line.

Ron E. Vail, P.E.  
Executive V.P. of Engineering

Enclosure

cc: Mr. Steve Field, Loudon County Solid Waste Disposal Commission Chairman  
Mr. Matt Dillard, Executive V.P. of Operations, Santek  
Mrs. Cheryl Dunson, Executive V.P. of Marketing, Santek  
Mr. Raymond Givens, Landfill Manager, Santek

2017 ESTIMATE OF REMAINING LANDFILL LIFE

Registration No. SNL 53-103-0203

Name of Site Matlock Bend Landfill

Location 21712 Highway 72 North, Loudon, TN

Owner Loudon County Solid Waste Disposal Commission

Estimated Remaining Life of Site in Years 7 Months 3 as of Sept. 15, 2016 (Aerial Date)


Average Daily Weight (in tons) or Volume (cubic yards) of Waste Received:

660 Tons per day, or 818 Cubic yards per day

273 Number of days/operation per week

40 Number of Usable Acres Originally

4.7 Remaining Number of Usable Acres

Signature of person preparing form: 

Print name: Ron E. Vail, P.E.

Title: Executive Vice President of Engineering

Date prepared: 3/7/17

Spaces Below This Line For Office Use Only

-----

Reviewed by Solid Waste Representative \_\_\_\_\_

Agree with Estimate Yes \_\_\_\_\_ No \_\_\_\_\_

If Disagree With Estimate, Give Own Estimate \_\_\_\_\_ Years \_\_\_\_\_ Months

Date of Review \_\_\_\_\_



650 25<sup>th</sup> Street NW, Ste 100  
Cleveland, TN 37311

Phone: (423) 303-7101  
Toll Free: (800) 467-9160  
www.santekenviro.com

March 13, 2017

Loudon County Solid Waste Disposal Commission  
100 River Road  
P.O. Box 351  
Loudon, TN 37774

Dear Steve:

Pursuant to Section 10.6 and 10.7 of the Sanitary Landfill Operation Agreement between Loudon and Santek as of July 1, 2007, Santek agreed to pay the Commission a host fee and security fee as defined in the Agreement. The following recap reflects the calculation for the period February 1, 2017 to February 28, 2017:

Host Fees (Greater of below) –	
Total Tip Fees Billed	\$299,867.36
Host Fee Percentage	<u>4.00%</u>
	<b>\$ 11,994.69</b>
Minimum Fee	<u>\$ 10,652.00</u>

Security Fees (Greater of below) –	
Total Tonnage Received	14,991.58
Rate per ton	\$ <u>1.00</u>
Total	\$ 14,991.58

Total Tip Fees Billed	\$299,867.36
Security Fee Percentage	<u>5.00%</u>
	<b>\$ 14,993.37</b>

Our checks in payment of the above fees have been remitted to the above address for the Commission. Should you have any questions or need additional information, please let me know.

Sincerely,

A handwritten signature in cursive script that reads "Andrew Kandy".

Andrew Kandy  
Vice President of Finance & Corporate Controller

DRAFT - FOR DISCUSSION PURPOSES ONLY

*Financial Statements*

LOUDON COUNTY SOLID WASTE  
DISPOSAL COMMISSION

Year Ended June 30, 2016



DRAFT - FOR DISCUSSION PURPOSES ONLY

*Financial Statements*

LOUDON COUNTY SOLID WASTE  
DISPOSAL COMMISSION

Year Ended June 30, 2016

DRAFT - FOR DISCUSSION PURPOSES ONLY

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INDEPENDENT ACCOUNTANTS' AUDIT REPORT

Board of Commissioners  
Loudon County Solid Waste Disposal Commission  
Loudon, Tennessee

**Report on the Financial Statements**

We have audited the accompanying financial statements of Loudon County Solid Waste Disposal Commission, which comprise the statement of net position as of June 30, 2016, and the related statement of revenue, expenses, and change in net position, and statement of cash flows for the year then ended, and the related notes to the financial statements.

***Management's Responsibility for the Financial Statements***

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

***Auditors' Responsibility***

Our responsibility is to express an opinion on the financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditors consider internal control relevant to the preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

## DRAFT - FOR DISCUSSION PURPOSES ONLY

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

### *Opinion*

In our opinion, the financial statements referred to in the first paragraph present fairly, in all material respects, the respective financial position of Loudon County Solid Waste Disposal Commission as of June 30, 2016, and the changes in its financial position and its cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

### *Other Matters*

#### *Required Supplementary Information*

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis on pages 4 to 6 be presented to supplement the financial statements. Such information, although not a part of the financial statements, is required by the Governmental Accounting Standards Board, who considers it to be an essential part of financial reporting for placing the financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the financial statements, and other knowledge we obtained during our audit of the financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

#### *Other Supplementary Information*

Our audit was conducted for the purpose of forming an opinion on the financial statements that collectively comprise Loudon County Solid Waste Disposal Commission's financial statements. The schedule of the board of commissioners is presented for the purpose of additional analysis and is not a required part of the financial statements.

The schedule of the board of commissioners has not been subjected to the auditing procedures applied in the audit of the financial statements and, accordingly, we do not express an opinion or provide any assurance on it.

**Other Reporting Required by *Government Auditing Standards***

In accordance with *Government Auditing Standards*, we have also issued our report dated February 2017, on our consideration of Loudon County Solid Waste Disposal Commission's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering Loudon County Solid Waste Disposal Commission's internal control over financial reporting and compliance.

*Mitchell Emert & Hill*

February 2017

**Loudon County Solid Waste Disposal Commission**  
**Management's Discussion and Analysis**  
**June 30, 2016**

**Introduction**

This discussion and analysis is intended to be an introduction to the financial statements and notes that follow this section and should be read in conjunction with them. The Loudon County Solid Waste Disposal Commission ("LCSWDC") is a governmental agency created by Loudon County, the City of Lenoir City and the City of Loudon to operate and manage the Matlock Bend Landfill in Loudon, Tennessee. The Commission also serves as the Municipal Solid Waste Region Board for the Loudon County Solid Waste Region under the Solid Waste Management Act of 1991.

**Financial Statement Review**

The financial statements herein are comprised of the statement of net position, the statement of revenue, expenses and changes in net position, the statement of cash flows and the accompanying notes to the financial statements.

*Financial Highlights as of June 30:*

The statement of net position presents information on all LCSWDC's assets and liabilities. Current assets as well as other assets and liabilities are reported in order of their liquidity. The table below presents the significant components of net position:

**Condensed statements of net position**

	2016	2015	2014	2013
<b>Assets:</b>				
Current and other	\$ 3,239,950	\$ 3,062,274	\$ 2,884,576	\$ 2,625,388
Capital assets	<u>1,438,032</u>	<u>1,440,399</u>	<u>1,447,070</u>	<u>1,453,741</u>
Total assets	<u>\$ 4,677,983</u>	<u>\$ 4,502,673</u>	<u>\$ 4,331,646</u>	<u>\$ 4,079,129</u>
<b>Liabilities:</b>				
Current	\$ 31,853	\$ 35,451	\$ 5,853	\$ 10,465
Long – term	<u>5,413,766</u>	<u>5,169,459</u>	<u>4,915,262</u>	<u>4,600,623</u>
Total liabilities	5,445,619	5,204,910	4,921,115	4,611,088
<b>Net position:</b>				
Investment in capital assets	1,438,032	1,440,399	1,447,070	1,453,741
Unrestricted (deficit)	<u>(2,205,669)</u>	<u>(2,142,636)</u>	<u>(2,036,539)</u>	<u>(1,985,700)</u>
Total net position	<u>(767,637)</u>	<u>(702,237)</u>	<u>(589,469)</u>	<u>(531,959)</u>
Total liabilities and net position	<u>\$ 4,677,983</u>	<u>\$ 4,502,673</u>	<u>\$ 4,331,646</u>	<u>\$ 4,079,129</u>

## DRAFT - FOR DISCUSSION PURPOSES ONLY

The statement of revenue, expenses and change in net position presents LCSWDC's results of operations. The table below is a condensed statement of revenue and expenses:

### Condensed statements of revenue, expenses and change in net position

	<u>2016</u>	<u>2015</u>	<u>2014</u>	<u>2013</u>
Operating revenue	\$ 300,566	\$ 286,067	\$ 384,602	\$ 414,611
Operating expenses	(377,854)	(398,008)	(448,870)	(615,441)
Depreciation and amortization	(2,367)	(6,671)	(6,671)	(5,901)
Net operating (loss)	(79,655)	(118,612)	(70,939)	(206,731)
Non-operating income	<u>14,255</u>	<u>5,844</u>	<u>13,390</u>	<u>15,278</u>
Change in net position	<u>\$ (65,400)</u>	<u>\$ (112,768)</u>	<u>\$ (57,549)</u>	<u>\$ (191,453)</u>

### Results of Operations

LCSWDC shows operating revenue of \$300,566, which represents an increase of \$14,499 above the previous year's operating revenue. At the same time, LCSWDC shows a decrease in operating expenses of \$20,154 over the previous year's operating expenses. LCSWDC shows a negative change in net position due in part to an increase in the utilized capacity of the landfill, which in turn required an increased adjustment to the estimated future liability for closure and post closure costs from the previous year. The increased utilization of the landfill during the year resulted in a \$244,307 increase to the estimated future liability for closure and post closure costs. This increase to the estimated future liability for closure and post closure costs decreased by \$9,890 from the previous year's increase in estimated costs. As of June 30, 2016, LCSWDC completed its ninth full year of operations under its 20-year operations contract that commenced on October 1, 2007 and provides for the turn-key operation of Matlock Bend Landfill by the operator instead of LCSWDC.

During the year ended June 30, 2016, LCSWDC received approximately 157,254 tons of waste into the Matlock Bend Landfill. Based on that volume, had LCSWDC charged an additional \$.72 per ton of waste received it would have resulted in a positive change in net position.

The statement of cash flows in the accompanying financial statements is presented using the direct method. This method outlines the sources and uses of cash as it relates to operating income. In addition, included in the statement of cash flows are classifications for non-capital related financing and investing activities.

## DRAFT - FOR DISCUSSION PURPOSES ONLY

LCSWDC shows operating expenses for legal services related to the investigation of the site conditions at the former Poplar Springs Landfill in the amount of \$68,250. The Poplar Springs Landfill was closed in 1987, prior to the formation of LCSWDC, and therefore, LCSWDC had no direct responsibility for the ongoing post closure care of the Poplar Springs Landfill. The legal fees related to the investigation of the former Poplar Springs Landfill site were incurred by LCSWDC's three governmental stakeholders which operated the former Poplar Springs Landfill. These legal fees were paid from LCSWDC's operating accounts solely because certain funds were deposited by the three governmental stakeholders into LCSWDC's operating accounts in 1993, in part to cover post closure care costs associated with the Poplar Springs Landfill.

### Capital Assets

Capital asset levels stayed the same from the prior year. LCSWDC did not purchase capital assets during the year ended June 30, 2016.

### Future Events

LCSWDC is engaged in discussions with the Matlock Bend landfill operator to modify the existing contract to address an anticipated shortfall of funds to cover the estimated future liability for closure and post closure costs.

### Request for Information

Questions concerning this report or other requests for additional information should be directed to Steve Field, Chairman at (865) 576-1057 or at his office located at 100 River Road, #106, Loudon, Tennessee 37774.

Respectfully submitted,

Steve Field,  
Chairman



DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**STATEMENT OF NET POSITION**

June 30, 2016

**ASSETS**

**CURRENT ASSETS**

Cash - operating		\$ 2,903,115
Cash - Poplar Springs Landfill		<u>311,543</u>
		3,214,658
Accounts receivable		24,728
Interest receivable		<u>564</u>

**TOTAL CURRENT ASSETS** 3,239,950

**CAPITAL ASSETS**

Land	\$ 1,410,852	
Landfill facilities	<u>125,016</u>	
	1,535,868	
Accumulated depreciation	<u>(97,835)</u>	<u>1,438,032</u>

**TOTAL ASSETS** \$ 4,677,983

**LIABILITIES AND NET POSITION**

**CURRENT LIABILITIES**

Accounts payable		\$ 31,853
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**LONG-TERM LIABILITIES**

Estimated closure/postclosure care cost		5,413,766
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**NET POSITION**

Investment in capital assets	\$ 1,438,032	
Unrestricted	<u>(2,205,669)</u>	<u>(767,637)</u>

**TOTAL LIABILITIES AND NET POSITION** \$ 4,677,983

See the accompanying notes to the financial statements.

DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**STATEMENT OF REVENUE, EXPENSES AND CHANGE IN NET POSITION**

Year Ended June 30, 2016

**OPERATING REVENUE**

Surcharge - host agency		\$ 133,165
Surcharge - closure/post closure security fees		<u>167,401</u>

**TOTAL OPERATING REVENUE** 300,566

**OPERATING EXPENSES**

Salaries and wages:		
Board of Commissioners compensation		3,800

Contracted services:

Legal services	\$ 28,301	
Legal services - Poplar Springs Landfill	68,250	
Accounting and auditing	<u>7,200</u>	103,751

Landfill operations:

Supplies and materials	49	
Closure and postclosure care	<u>244,307</u>	244,357

Other expenses:

Contributions to City of Loudon for debt service	15,000	
Insurance	4,746	
Trustee's commissions	3,105	
Advertising	1,908	
Travel	333	
Miscellaneous	<u>855</u>	25,947

Depreciation		<u>2,367</u>
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**TOTAL OPERATING EXPENSES** 380,221

**(LOSS) FROM OPERATIONS** (79,655)

DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**STATEMENT OF REVENUE, EXPENSES AND CHANGE IN NET POSITION**

(continued)

Year Ended June 30, 2016

**NONOPERATING REVENUE**

Interest

14,255

**CHANGE IN NET POSITION**

(65,400)

**NET POSITION AT THE BEGINNING OF THE YEAR**

(702,237)

**NET POSITION AT THE END OF THE YEAR**

\$ (767,637)

See the accompanying notes to the financial statements.

DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**STATEMENT OF CASH FLOWS**

Year Ended June 30, 2016

**CASH PROVIDED(USED) BY OPERATING ACTIVITIES**

Cash received from customers	\$ 303,518
Cash paid to employees	(3,800)
Cash paid to suppliers	<u>(133,345)</u>

**NET CASH PROVIDED BY OPERATING ACTIVITIES** 166,373

**CASH PROVIDED(USED) BY  
INVESTING ACTIVITIES**

Interest received	<u>14,255</u>
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**NET INCREASE IN CASH** 180,628

**CASH AT THE BEGINNING OF THE YEAR** 3,034,030

**CASH AT THE END OF THE YEAR** \$ 3,214,658

**RECONCILIATION OF (LOSS) FROM OPERATIONS  
TO NET CASH PROVIDED(USED)  
BY OPERATING ACTIVITIES**

(Loss) from operations	\$ (79,655)
Adjustments to reconcile (loss) from net cash provided by operating	
Depreciation	\$ 2,367
Decrease in:	
Accounts receivable	2,952
Increase(decrease) in:	
Accounts payable	(3,598)
Estimated closure/postclosure care cost	<u>244,307</u>

**NET CASH PROVIDED BY OPERATING ACTIVITIES** \$ 166,373

See the accompanying notes to the financial statements.

DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**

June 30, 2016

**NOTE A - DESCRIPTION OF ORGANIZATION**

Loudon County Solid Waste Disposal Commission (the Commission) has been delegated the authority and responsibility for operating the Matlock Bend landfill (the Landfill) under the Amended and Restated Loudon County Solid Waste Disposal Agreement dated March 1, 1993, as amended. This agreement was entered into pursuant to state laws requiring the creation of municipal solid waste regions. In addition to specific powers relative to the operation and management of the Landfill, the Commission is granted all the powers and duties of a municipal solid waste region board as set forth in T.C.A. §68-211-813, et seq.

The Commission's seven member board is appointed by the Loudon County mayor (5 members) and the mayors of City of Loudon, Tennessee (1 member) and Lenoir City, Tennessee (1 member).

The Commission has contracted with a company to operate the Landfill. The company is responsible for the operation of Phase II/IV of the Landfill and the closure and postclosure of Phases I and II/IV during the term of the contract, which expires on September 30, 2027. Phase I of the Landfill was closed during the year ended June 30, 1996 and closure was approved by the State of Tennessee Department of Environment and Conservation during fiscal year ended June 30, 1998. Phase III was never developed.

**NOTE B - SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES**

Basis of Accounting

The Commission's financial statements are reported using the economic resources measurement focus and the accrual basis of accounting. Accordingly, all assets and liabilities (whether current or noncurrent) are included in the statement of net position. The statement of revenue, expenses and change in net position presents increases (revenue) and decreases (expenses) in total net position. Under the accrual basis of accounting, revenue is recognized in the period in which it is earned while expenses are recognized in the period in which the liability is incurred.

The Commission recognizes revenue when it is earned and measurable, and expenses are recognized when the liability is incurred. Surcharge revenue and revenue for closure and postclosure security fees are classified as operating revenue. All other revenue is reported as nonoperating revenue. Operating expenses are those expenses that are essential to the primary operations. All other expenses are reported as nonoperating expenses.

DRAFT - FOR DISCUSSION PURPOSES ONLY  
LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**  
(continued)

June 30, 2016

The Commission prepares its financial statements in accordance with GASB Statement No. 34, *Basic Financial Statements-and Management's Discussion and Analysis-for State and Local Governments*. GASB Statement No. 34 establishes standards for external financial reporting for state and local governments and requires that resources be classified for accounting reporting purposes into the following three net position groups:

Investment in capital assets

This category includes capital assets, net of accumulated depreciation and outstanding principal balances of debt attributable to the acquisition, construction, or improvement of those assets. The Commission had no debt as of June 30, 2016. Investment in capital assets at June 30, 2016 has been calculated as follows:

Capital assets	\$ 1,535,868
Accumulated depreciation	<u>(97,836)</u>
	<u>\$ 1,438,032</u>

Restricted: This category includes net position whose use is subject to externally imposed stipulations that can be fulfilled by actions of the Commission pursuant to those stipulations or that expire by the passage of time. When both restricted and unrestricted resources are available for use, it is the Commission's policy to use restricted resources first, then unrestricted resources as needed. The Commission had no restricted net position as of June 30, 2016.

Unrestricted This category includes net position that is not subject to externally imposed stipulations and that do not meet the definition of "restricted" or "investment in capital assets". Unrestricted net position may be designated for specific purposes by action of management or the Board of Commissioners or may otherwise be limited by contractual agreements with outside parties. The Commission had a deficit of unrestricted, undesignated net position of \$2,205,669 as of June 30, 2016.

Accounts Receivable

Accounts receivable which are deemed uncollectible based upon a periodic review of the accounts are charged to revenue. At June 30, 2016 no allowance for uncollectible accounts was considered necessary.

DRAFT - FOR DISCUSSION PURPOSES ONLY  
LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**  
(continued)

June 30, 2016

**Property and Equipment**

Property and equipment is recorded at cost. Depreciation is computed using the straight-line method over the estimated useful lives, which range from five to thirty years. The Commission has not adopted a formal capitalization policy.

**NOTE C - CASH**

Cash represents money on deposit in various banks. The District considers all highly liquid investments with an original maturity date of three months or less when purchased to be cash equivalents.

State of Tennessee law authorizes the District to invest in obligations of the United States of America or its agencies, nonconvertible debt securities of certain federal agencies, other obligations guaranteed as to principal and interest by the United States of America or any of its agencies, secured certificates of deposit and other evidences of deposit in state and federal banks and savings and loan associations, and the Tennessee Department of Treasury Local Government Investment Pool (the LGIP). The LGIP contains investments in certificates of deposit, U.S. Treasury securities and repurchase agreements, backed by the U.S. Treasury securities. The Treasurer of the State of Tennessee administers the investment pool.

All deposits with financial institutions in excess of Federal Deposit Insurance Corporation (FDIC) limits are required to be secured by one of two methods. Excess funds can be deposited with a financial institution that participates in the State of Tennessee Bank Collateral Pool. For deposits with financial institutions that do not participate in the State of Tennessee Bank Collateral Pool, state statutes require that all deposits be collateralized with collateral whose market value is equal to 105 percent of the uninsured amount of the deposits.

The Commission's cash and investments at June 30, 2016 are held by the Loudon County Trustee in the Commission's name and are entirely insured through the Federal Deposit Insurance Corporation or the State of Tennessee Bank Collateral Pool.

Cash received by the Commission for closure and postclosure security fees was \$1,654,926 as of June 30, 2016. Management intends to use this cash to partially satisfy the closure/post-closure costs described in Note G.

DRAFT - FOR DISCUSSION PURPOSES ONLY  
LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**  
(continued)

June 30, 2016

**NOTE D - CAPITAL ASSETS**

Capital assets activity for the year ended June 30, 2016 was as follows:

	<u>Balance</u> <u>7/1/15</u>	<u>Additions</u>	<u>Retirements</u>	<u>Balance</u> <u>6/30/16</u>
<u>Capital assets not being depreciated</u>				
Land	\$ 1,410,852	\$ 0	\$ 0	\$ 1,410,852
<u>Capital assets being depreciated</u>				
Landfill facilities	125,016	0	0	125,016
<u>Accumulated depreciation</u>				
Landfill facilities	<u>(95,469)</u>	<u>(2,367)</u>	<u>0</u>	<u>(97,836)</u>
	<u>\$ 1,440,399</u>	<u>\$ (2,367)</u>	<u>\$ 0</u>	<u>\$ 1,438,032</u>

**NOTE E - RISK MANAGEMENT**

The Commission is exposed to various risks of loss related to torts; theft of, damage to, and destruction of assets; errors and omissions; injuries to employees; and natural disasters. The Landfill operator, on behalf of the Commission carries commercial insurance for various risks of loss, including general liability coverage. Settled claims resulting from these risks have not exceeded commercial insurance coverage in any of the past three fiscal years.



DRAFT - FOR DISCUSSION PURPOSES ONLY  
LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**

(continued)

June 30, 2016

**NOTE F - COMMITMENTS**

The Commission has completed nine full years of operations under its operations contract with its operator dated as of July 1, 2007, which provides for the turnkey operations of the Landfill by the Commission's existing operator, Santek Environmental, Inc. (Santek), commencing on October 1, 2007. The prior operations agreement dated April 5, 1994 was amended on June 19, 2007 to provide for the termination of that contract effective September 30, 2007. The current operations agreement provides for a twenty-year term ending on September 30, 2027. Under the previous contract, the Commission received all tipping fee revenue and contracted with Santek to operate the Landfill. In accordance with the current agreement, Santek receives all revenue for tipping fees, pays operating costs of the Landfill, and pays a host fee and closure/postclosure fees to the Commission.

**NOTE G - CLOSURE AND POSTCLOSURE CARE COST**

State and federal laws and regulations require a final cover to be placed on the Landfill site when it stops accepting waste and to perform certain maintenance and monitoring functions at the site for a minimum of thirty years after closure. Phase I of the Landfill was closed during the year ended June 30, 1996. However, state certification of closure was not approved until the year ended June 30, 1998.

Although closure and postclosure care costs will be paid only near or after the date that the Landfill stops accepting waste, the Commission reports a portion of these closure and postclosure care costs as an operating expense in each period based on Landfill capacity used as of the date of the statement of net position. Landfill facilities operation expense reported in the accompanying financial statements consists of \$244,307 for the current year increase in the estimated liability for closure and postclosure costs.

At June 30, 2016, the estimated liabilities for closure and postclosure care costs were as follows:

Phase I	\$ 539,796
Phase II/IV	<u>4,873,970</u>
	<u>\$ 5,413,766</u>

DRAFT - FOR DISCUSSION PURPOSES ONLY

LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**NOTES TO THE FINANCIAL STATEMENTS**

(continued)

June 30, 2016

The liabilities were estimated based on information provided by the State of Tennessee Department of Environment and Conservation when the corresponding cells of the Landfill were initially permitted. Closure and postclosure costs related to Phase I were recognized by the Commission in prior periods based on Landfill capacity as of the date of each statement of net position. The liability for Phase II/IV represents the estimated cumulative amount of closure and postclosure care costs reported to date based on the use of 65% of the estimated capacity of the Landfill for that phase. The Commission will recognize the remaining estimated cost of \$2,824,445 as the remaining permitted capacity of the Landfill is filled. These amounts are based on what it would cost to perform all closure and postclosure care in 2016. The Commission expects to close Phase II/IV of the Landfill in August of 2030 (assuming 80,000 tons of waste per year). The Commission is seeking a permit modification which would extend the life of the landfill and result in a new phase. Actual costs of closure and postclosure may vary based on inflation, deflation, technology, or applicable laws and regulations.

Loudon County, Tennessee (the County) has entered into a Contracts in Lieu of Performance Bond with the State of Tennessee Department of Environment and Conservation for Phase I (dated February 24, 1994) and for Phase II/IV (dated September 1, 1997), which are amended from time to time. In the event the County fails to perform closure and postclosure care requirements pursuant to all applicable laws, statutes, rules and regulations as such laws, rules, statutes and regulations may be amended, the contracts pledge future revenues of the County, disbursed from the State of Tennessee to the County, up to the amount of \$7,409,502 (covering all phases of the Landfill) as of June 30, 2016, for closure and postclosure care.

**NOTE H - CONTRIBUTIONS TO CITY OF LOUDON, TENNESSEE**

The Commission makes contributions of \$3,750 per quarter to City of Loudon, Tennessee to defray the cost associated with the retirement of debt incurred by City of Loudon, Tennessee to extend utility service lines to the Landfill. The timing of these payments vary so some years the total will not equal \$15,000. The loan payments commenced in March 2002 and are expected to end in February 2022.

DRAFT - FOR DISCUSSION PURPOSES ONLY

SUPPLEMENTARY INFORMATION

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LOUDON COUNTY SOLID WASTE DISPOSAL COMMISSION

**BOARD OF COMMISSIONERS**

June 30, 2016

Steve Field, Chairman  
John Watkins, Vice-Chairman  
Kelly Littleton-Brewster, Secretary/Treasurer  
Larry Jameson, Member  
Bruce Hamilton, Member  
Art Stewart, Member  
Robert Harrison, Member

See the accompanying independent accountants' audit report.

DRAFT - FOR DISCUSSION PURPOSES ONLY

INTERNAL CONTROL

AND

COMPLIANCE

INDEPENDENT ACCOUNTANTS' REPORT ON INTERNAL CONTROL  
OVER FINANCIAL REPORTING AND ON COMPLIANCE AND  
OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS  
PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

Board of Directors  
Loudon County Solid Waste Disposal Commission  
Loudon, Tennessee

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States of America, the financial statements of Loudon County Solid Waste Disposal Commission, which comprise the statement of net position as of June 30, 2016, and the related statements of revenue, expenses and change in net position, and cash flows for the year then ended and the related notes to the financial statements, and have issued our report thereon dated February 2017.

**Internal Control Over Financial Reporting**

In planning and performing our audit of the financial statements, we considered Loudon County Solid Waste Disposal Commission's internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing an opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of Loudon County Solid Waste Disposal Commission's internal control. Accordingly, we do not express an opinion on the effectiveness of Loudon County Solid Waste Disposal Commission's internal control.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent or detect and correct misstatements on a timely basis. A material weakness is a deficiency or combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of Loudon County Solid Waste Disposal Commission's financial statements will not be prevented or detected and corrected on a timely basis. A significant deficiency is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

**Compliance and Other Matters**

As part of obtaining reasonable assurance about whether Loudon County Solid Waste Disposal Commission's financial statements are free of material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

We noted certain other matters that we have reported to management of Loudon County Solid Waste Disposal Commission in a separate letter dated February 2017.

**Purpose of this Report**

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of Loudon County Solid Waste Disposal Commission's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering Loudon County Solid Waste Disposal Commission's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

A handwritten signature in black ink that reads "Mitchell Emert & Hill". The signature is written in a cursive, flowing style.

February 2017

Loudon County Trustee's proposal for investment of accrued funds in Treasury notes for the Solid Waste Disposal Commission:

912828P20	US	TREASURY	N/B	0.750	01/31/18	100.000	0.750
912828V56	US	TREASURY	N/B	1.125	01/31/19	99.880	1.187
912828W22	US	TREASURY	N/B	1.375	02/15/20	99.635	1.500

(Note: Current rates are reflected and the number in the far right is the yield to maturity)

It is suggested to invest \$500,000 in 1 year, \$500,000 in 2 years and \$1,000,000 in 3 years. The Treasury notes will be held in the account of Loudon County Solid Waste Disposal Commission at Raymond James. There is no fee for safekeeping services. Raymond James will be happy to provide GASB 72 and GASB 40 reports if the authority reports separately from the Trustee. There is no charge for this service either. *The prices and yields above are subject to change.*

The Fed Chairman Janet Yellen has said that rates will rise at the next Fed meeting which takes place on Mar 14th and 15th. The Trustee feels that the Commission should take advantage of the new rates after the Mar 14/15 meeting of the Fed by investing the proposed amounts in staggered Treasury notes once the rates are adjusted.





March 13, 2017

Loudon County Solid Waste Disposal Commission  
Loudon County Annex  
101 Mulberry Street, Suite 102  
Loudon, TN 37774

Gentlemen:

Quantum Environmental & Engineering Services, LLC (QE2) is pleased to submit our proposal to be considered for the review and analysis of a recent proposal from Santek Environmental for the Matlock Bend Landfill.

We provide our qualifications, a brief description of the proposed scope of work and an estimate number of hours with rates to complete the work. QE2 has vast experience in landfill design and operations. I have had the opportunity to teach as an Adjunct Professor in the University of Tennessee Civil and Environmental Engineering Graduate Program and share landfill design experiences for landfills much like yours for over 35 years now. Our company experience is strong, and is detailed within the Proposal.

Thank you for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read 'George J. Hyfantis, Jr.', written over a faint, illegible typed name.

George J. Hyfantis, Jr., Ph.D., P.E.  
President

# **QUALIFICATIONS**

**for Engineering and Financial Evaluation  
for Matlock Bend Landfill  
Loudon, TN**

**March 13, 2017**

**Prepared for:**

Loudon County Solid Waste Disposal Commission  
Loudon County Annex  
101 Mulberry Street  
Suite 102  
Loudon, Tennessee 37774

**Prepared by:**



Quantum Environmental & Engineering Services, LLC  
126 Dante Road  
Knoxville, Tennessee 37918  
865.689.1395  
Proposal 2017-024

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### Attachments

- Estimated Labor and Pricing
- Fee Schedule
- Resumes

## INTRODUCTION AND QE2 FIRM INFORMATION

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Quantum Environmental & Engineering Services, LLC (QE2) is honored to have been offered the opportunity to propose on the Loudon County Solid Waste Disposal Commission (LCSWDC) RFP to review and analyze the recent proposal from Santek Environmental (Santek) for the Matlock Bend Landfill. QE2 herein presents a Team approach to the review and analysis, bringing credentials and qualifications that are some of the most highly respected in the State of Tennessee. Having over 100 years combined experience designing and permitting; providing operations and financial surety projections; and assisting with closure and post-closure considerations of solid waste facilities across Tennessee and other states, our qualifications meet and exceed the requirements necessary to conduct the proposed review scope and approach. QE2 does not have any current or past work engagements with Santek.

### Contact Information

The contact for correspondence related to this proposal shall be the Company President:

George J. Hyfantis, Jr., Ph.D., P.E.  
President  
Quantum Environmental & Engineering Services, LLC  
126 Dante Road  
Knoxville, TN 37918  
Phone Number: (865) 689-1395  
Fax Number: (865) 689-6844  
GHyfantis@QE2LLC.com

The proposal is organized as follows:

- Section 1.0 is an introduction to the work and QE2's corporate history and background,
- Section 2.0 presents the approach to the review and a proposed scope of work
- Section 3.0 presents proposed costs and limitations
- Section 4.0 presents the QE2 Team, personnel qualifications and experience.

The proposal introduces a superb professional team with exhaustive experience conducting solid waste engineering and permitting and cradle-to-grave financial budgeting and forecasting services in the East Tennessee area. Highlights include:

- A highly qualified engineering Team with literally hundreds of years of combined technical experience in all facets of the solid waste industry led by Dr. George J. Hyfantis, P.E., one of the area's preeminent solid waste industry engineers
- Financial accounting/auditing review by Steve Jerman, CPA

- Regulatory compliance and post-closure financial review by Mr. Mike Apple, P.E., the former Director of the Tennessee Department of Environment and Conservation (TDEC) Division of Solid and Hazardous Waste Management (DSWM)
- Post-closure monitoring review by hydrogeologist, Mr. Matthew Teglas.
- Engineering review, Mr. Michael Hogan P.E., and
- An impressive corporate resume of solid waste design and related solid waste industry successes.

Our credentials, qualifications and corporate resume are excellent; and our commitment to the community and our industry make QE2 an excellent choice to review financial and operational considerations of the Matlock Bend Landfill.



#### **Firm Location, Size and Capabilities**

QE2 is an environmental services and civil engineering firm that focuses its efforts regionally, including all of Tennessee and contiguous states. QE2 employs a staff of 8 full-time and 5 part-time professional and technical experts in Knoxville and Nashville, Tennessee. Our in-house staff has all the training, certifications, and licenses to conduct the full range of Engineering and Financial review services required to fully assess operational and financial performance of the Matlock Bend Landfill. All work conducted under the current proposal will be administered from our corporate office, located at 126 Dante Road, Knoxville, Tennessee.

In business since 2003 as QE2, the group has been in continuous operation since 1989 formerly as a Division of a larger Knoxville-based environmental products and services firm. Principals of QE2 include George J. Hyfantis, P.E., Ph.D.; Steve Jerman, CPA (CFO). Efficient business practices have resulted in a lengthy operational period, strong credit and banking references. QE2 is routinely engaged in the following services:

#### **Civil Engineering**

- Solid waste facility design and operations
- Landfill closures and post-closure surety
- Wastewater treatment design
- Development support (finance and funding assistance)

## Environmental

- Solid waste and hazardous materials consulting, planning and design
- Environmental assessments of all types, including National Environmental Protection Act (NEPA) Environmental Assessments (EAs) and Environmental Impact Statements (EISs)
- Ecological and cultural/archeology surveys
- Environmental permitting of all types
- Wetlands, floodplain and stream biota delineation, relocation and mitigation
- Human health risk assessments
- Air, soil and water testing, assessment and remediation
- Mining permitting

## 1.0 PROJECT APPROACH AND SCOPE OF WORK

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The overall purpose of the Matlock Bend Landfill Review is to assess:

- 1) the financial viability of the Landfill based on the new proposal from Santek over the facility's operational life, including its closure and post-closure periods and operating contract
- 2) the Engineering design and operation of the landfill, including the proposed major permit modification
- 3) the proposed phased closure plan, including cost estimates
- 4) LCSWDC's recent financial statements and accounting records
- 5) closure and post-closure cost estimate
- 6) the model used by Santek to provide funding to LCSWDC to cover closure and post-closure costs
- 7) conduct a sensitivity analysis of income based on daily waste streams of 400 to 800 tons per day
- 8) revenue projections to LCSWDC based on proposed contract provisions and estimated tonnage
- 9) shortfall/surplus projections for estimated closure/post-closure costs at the termination of the contract
- 10) and to determine appropriate rate for compensation to LCSWDC in order to accumulate funds to meet closure/post-closure obligations.

QE2 understands that the Matlock Bend Landfill has served the Loudon County area since at least the late 1980's. The Landfill has been operated by Santek, headquartered in Cleveland, Tennessee, since 2007. The scope of services proposed to achieve the review and analysis objective is based on the requirements as expressed in the RFP and our understanding of the financial and operational considerations.

QE2 will prepare a report summarizing the finding of the financial and operational sustainability and recommendations.

## 2.0 PRICING AND LIMITATIONS

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Based on the proposed scope of work QE2 will perform the work on a time-and-materials basis. QE2 will invoice only for actual expenses and number of hours expended on the project and will not exceed the estimated budget of **\$40,600.00** without approval by LCSWDC. This agreement is subject to the terms and conditions set forth in the attached Fee Schedule with Terms and Conditions. QE2 reserves the right to revise its Fee Schedule every twelve months from the date of the AGREEMENT. Any additional services requested by LCSWDC will be based on the QE2 Schedule of Fees (revised July 2015). QE2 labor projections, pricing and Fee Schedule are attached.

## 3.0 QUALIFICATIONS AND EXPERIENCE

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### Proposed Project Staffing

Key QE2 staff responsible for the review project will include senior level accountant, engineer, geologist, solid waste, and construction quality assurance professionals, some of whom are leaders in the solid waste industry in Tennessee. The Project Organization is shown on Figure 1. The Figure identifies Dr. George J. Hyfantis, P.E. as Review Team Leader. Key discipline lead roles under Dr. Hyfantis will include:

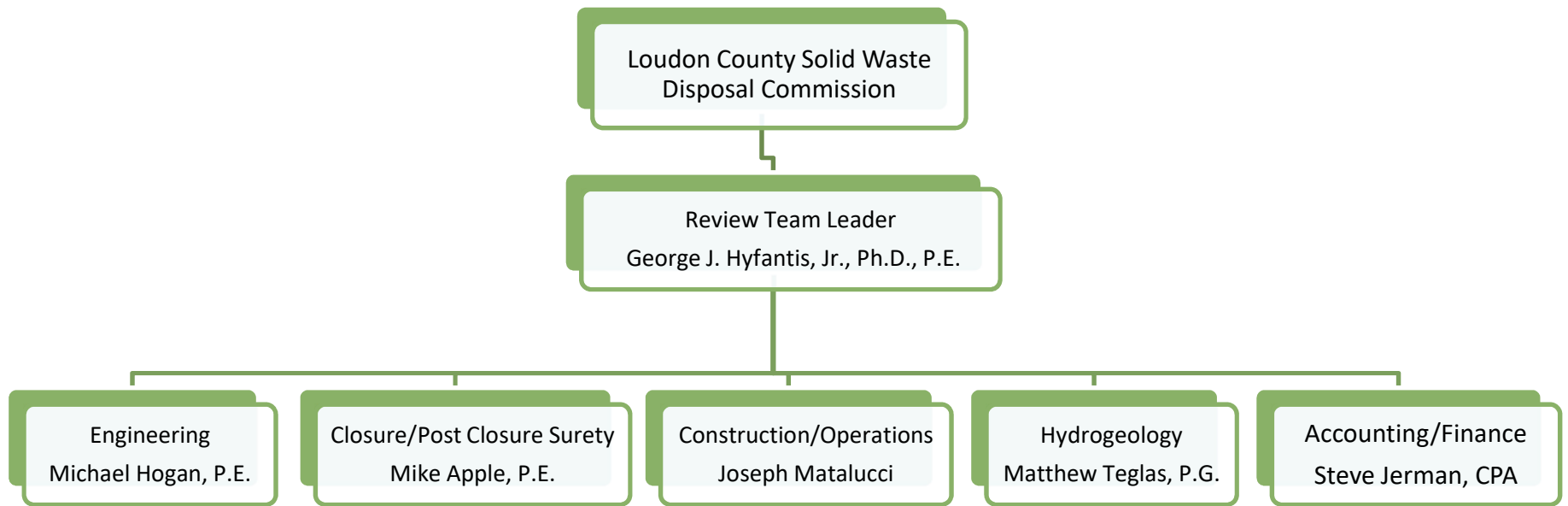
- Accounting/Finance                      Steve Jerman, CPA
- Senior Solid Waste Professional        Mike Apple, P.E.
- Engineering                                Michael Hogan P.E.
- Construction QA / Specifications        Joseph Matalucci
- Monitoring/Post-closure                 Matt Teglas, P.G.

Dr. Hyfantis will report and answer directly to LCSWDC for all aspects of the project including both technical and budgetary. Other key personnel will report directly to Dr. Hyfantis.

Corporate business and technical support will be available to LCSWDC through the Review Team Leader. Exemplary qualifications of the Team include: 1) affiliations and memberships with State policy and regulatory organizations; 2) certifications, licenses, and registrations in all necessary disciplines; and 3) professional resumes with relevant projects.



**Figure 1**  
**Review Team Organization**



## Affiliations

Regulatory and policy affiliations of some of QE2’s senior staff are summarized in Table 1. In addition, most of QE2 technical staff is affiliated with professional and technical organizations representative of the disciplines relevant to our work. These include engineering, public works, environmental, public health, industrial hygiene, and construction.

<b>Table 1. Summary of Affiliations</b>
<p><b>George J. Hyfantis, Jr., Ph.D., P.E., CHMM - President</b></p> <ul style="list-style-type: none"> <li>• Former TVA Solid Waste Manager</li> <li>• University of Tennessee, adjunct civil engineering faculty – Solid Waste Engineering, 1979 – present</li> <li>• Governor-appointed member Underground Storage Tank Board, 1989 – 2009</li> <li>• Governor-appointed member Solid Waste Disposal Control Board, 2010 - present</li> <li>• Board-elected Chairman for Underground Storage Tank Board, 1993 – 2003</li> <li>• Governor-appointed member Task Force for TDEC UST remediation programs reorganization, 2003 - present</li> <li>• Tennessee Chamber of Commerce and Industry, Chamber-appointed Hazardous Waste and Remediation Subcommittee for review of statutory and regulatory environmental policy, 1999 to present</li> </ul>
<p><b>Mike Apple – Sr. Solid Waste Professional</b></p> <ul style="list-style-type: none"> <li>• Over 30 years serving TDEC Division of Solid and Hazardous Waste Management in both technical, management and senior administrative capacities</li> <li>• Governor appointed Director of TDEC Division of Solid and Hazardous Waste Management from 1998 through 2012</li> <li>• Deputy Director of TDEC Division of Solid and Hazardous Waste Management from 1981 through 1998</li> <li>• Solid Waste Disposal Control Board Executive Secretary and Treasurer</li> <li>• Permit authority on all solid waste disposal permits in the State of Tennessee</li> </ul>
<p><b>Steve Jerman, CPA – CFO</b></p> <ul style="list-style-type: none"> <li>• Certified Public Accountant, Georgia</li> <li>• Member of Tennessee Society of Certified Public Accountants</li> <li>• Member of American Institute of Certified Public Accountants</li> </ul>

## Resumes

Resumes of QE2 key personnel are included. The resumes are organized that refer to those identified on Figure 1 – Project Organization. The resumes demonstrate the following:

- QE2 resources far exceed the demands of the project
- Each discipline anticipated during the implementation of the project is represented by a lead discipline role
- Review Team Leader, and lead discipline roles are each filled with environmental, engineering and financial professionals averaging approximately 20 years of experience
- An abundance of directly relevant, solid waste design, remedial investigation/feasibility study, RCRA experience is demonstrated by all key staff and roles

The Review Team Leader designated by QE2 is Dr. George J. Hyfantis, P.E. Dr. Hyfantis founded QE2 in 2003 after successful careers working for the Tennessee Valley Authority (TVA) and in the engineering and environmental consulting field both independently and for others. Dr. Hyfantis has over forty years of experience in solid waste design, budgetary considerations, permitting, construction and operations and closure, post-closure and remediation. An internationally recognized expert on the subject matter, Dr. Hyfantis teaches solid waste engineering at the University of Tennessee and serves by gubernatorial appointment to the State of Tennessee Underground Storage Tank and Solid Waste Disposal Control Board. As Regional Solid Waste Director for the TVA, Dr. Hyfantis managed oversight of TVA designed solid waste landfills throughout the Tennessee Valley. As an engineering consultant, Dr. Hyfantis has led the area in solid waste industry projects including facility siting, permitting, operations, emergency response, corrective action and facility closures.

In addition to his distinguished career in solid and hazardous waste consulting, Dr. Hyfantis leads public outreach programs for environmental permitting of all types including solid waste, air emissions, aquatic resource alterations permits (ARAP), TVA 26 (a), United States Corps of Engineers 404, and National Pollution Discharge Elimination System (NPDES) permits. This has resulted in an excellent resume of successful public notice and comment outcomes and negotiated settlements with community stakeholders where environmental permits are contested. His work across Tennessee has led to relationships of respect with regulators and service providers including Division of Solid Waste Management and Division of Superfund staff in both the Central and Environmental Field Offices.

A few recent examples of Dr. Hyfantis' projects include:

- Regulatory closure of the City of Knoxville, Old Rutledge Pike Landfill by permitting a Class III/IV facility expansion over the existing fill, demonstrating that leachate contaminants do not leave the facility and minimizing additional work to the existing cap.
- TDEC Solid Waste Part II Permit application – Roberta Landfill, Oneida County. The permit is currently pending final approval with the recent approval of the ARAP for stream relocation, which received high levels of scrutiny on account of the location in the Big South Fork Wild and Scenic River watershed.
- TDEC Solid Waste Part II Permit application – Coal Ash Mono-fill, Crab Orchard, Tennessee. The Class II Mono-fill was proposed as part of the reclamation strategy for a closing coal surface mine.
- Class III solid waste disposal facility expansion design for a local Yarnell Road C&D Landfill

- Landfill contaminant investigations, feasibility studies, risk assessments and cleanups for municipal, private and state managed locations across Tennessee.
- Design and construction QA/QC testing of the Meadow Branch Class I Landfill (formerly Mine Road Landfill) in Athens, TN.

Dr. Hyfantis has exceptionally strong solid waste facility design credentials (including cradle-to-grave financial and post-closure maintenance and planning) and has had a distinguished career as a leader in the solid waste engineering industry.

Dr. Hyfantis is supported by a Team of engineering and technical professionals who are likewise strong in their technical skill and career histories. Table 2 summarizes Key Personnel of the Team.

<b>Table 2</b>			
<b>Landfill Operations and Finance Review Team</b>			
<b>Personnel - Position</b>	<b>Project Role</b>	<b>Responsibilities</b>	<b>Credentials</b>
George J. Hyfantis, Jr., Ph.D., P.E. – QE2 President	Review Team Leader Chief Engineer	<ul style="list-style-type: none"> <li>• Review planning and roles distribution</li> <li>• Disposal design capacity and “burn rate” analysis</li> <li>• Landfill operations - review oversight</li> </ul>	<ul style="list-style-type: none"> <li>• Licensed Professional Engineer in Tennessee and two other states</li> <li>• Expertise developed over 40 years of experience in solid waste planning, design and operations</li> <li>• Governor-appointed member Underground Storage Tank and Solid Waste Disposal Control Board</li> <li>• University of Tennessee Adjunct Professor teaching Solid and Hazardous Waste one semester each year</li> <li>• Landfill finance and post-closure surety analysis</li> </ul>
Mike Apple, P.E. – Consulting/Senior Scientist	Regulatory / Closure Finance Review	<ul style="list-style-type: none"> <li>• Landfill operations - regulatory review</li> <li>• Post closure financial analysis</li> <li>• Operations review</li> </ul>	<ul style="list-style-type: none"> <li>• Over 40 years solid waste planning, design and operations experience</li> <li>• Governor-appointed Technical Director of TDEC Solid and Hazardous Waste Management Division for 40 years</li> <li>• University of Tennessee guest lecturer for Solid Waste Management instruction</li> <li>• Landfill finance and post-closure surety analysis</li> </ul>

Steve Jerman, C.P.A. – QE2 Principal / CFO	Auditor	<ul style="list-style-type: none"> <li>• Landfill operations - finance review</li> <li>• Post closure financial analysis oversight</li> </ul>	<ul style="list-style-type: none"> <li>• Over 25 years financial accounting/auditing, financial reporting and treasury management experience.</li> <li>• 15 years financial accounting and management in environmental services industry</li> </ul>
Joseph Matalucci, Geologist / Construction Manager	Construction QA/QC, Onsite operations	<ul style="list-style-type: none"> <li>• Daily site operations review</li> <li>• Grading, cover and placement review</li> <li>• Disposal quantities verification and documentation</li> <li>• Construction QA/QC review</li> </ul>	<ul style="list-style-type: none"> <li>• Trained Geologist</li> <li>• Over 25 years solid waste planning, design, permitting, operations and closure experience</li> <li>• Specifications, bidding and construction oversight</li> <li>• Soil and synthetic liner construction QA/QC</li> <li>• Grading and construction QA/QC</li> </ul>

QE2 personnel are excellent, highly-qualified and respected locally and regionally for their skills and capabilities. Resumes of Key Discipline personnel are attached.

### Relevant Landfill Design Experience

QE2’s corporate resume includes literally hundreds of Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) solid waste, hazardous materials consulting, and related services projects, some that are very closely aligned with the review requirements of the solicited scope of work.

QE2’s full-service civil and environmental engineering is particularly strong in solid waste planning, design, development, remediation, and engineering services. The QE2 team provides the qualifications and experience needed to form a cost-effective planning and implementation team for the Project. The information presented in Table 1 documents the experience of QE2 and our personnel in this area. Key aspects of this work history include effective financing and life-of-project financial projections, risk reduction through creative compliance, effective property re-use and value generation, identifying available funding sources, and administering solid waste development and remediation projects.

The select entries in Table 3 demonstrate that the QE2 team has been involved in a wide range of projects that have common elements with the work proposed for the Matlock Bend Landfill. Several of the projects demonstrate detailed technical expertise related to the very issues that

are pertinent to the subject landfill. These include a privately owned C&D facility in Knox County, the Roberta Landfill in Oneida County, the closed City of Knoxville facility on Rutledge Pike and a coal ash mono-fill development site in a closed coal surface mine. Issues common to the Loudon County Landfill Site include:

- Waste stream identification, quantification and future accounting projections
- Landfill capacity, phasing and capacity usage “burn rate”
- Maintenance, closure and post-closure surety and funding planning
- Public and resident concerns

**Table 3. Relevant Project Experience**

<b>Name, Location, and Key Personnel Assigned</b>	<b>Scope of Work Completed</b>
<p align="center"><b>Roberta Landfill Permitting</b>                      Oneida, TN                      George J. Hyfantis Jr., Ph.D., P.E.                      Joseph Matalucci                      Michael Hogan, P.E.                      Steve Jerman, CPA</p>	<p>QE2 conducted Part I/II permitting and design of a Class I solid waste disposal facility. In order to maximize disposal volume, financial considerations and land use objectives, QE2 proposed relocating a perennial stream resulting in a ARAP permit. Closure and post-closure requirements and surety sources were identified. Due to the location of the project in the Big South Fork Wild and Scenic River watershed, intense scrutiny was applied to the ARAP, especially by US Army Corps of Engineers and National Park Service reviewers. Public outreach was conducted and public meetings managed by QE2.</p>
<p align="center"><b>Coal Ash Mono-fill</b>                      Crab Orchard, TN                      George J. Hyfantis Jr., Ph.D., P.E.                      Joseph Matalucci                      Steve Jerman, CPA</p>	<p>QE2 conducted Part I/II permitting and design of a Class II coal ash mono-fill solid waste disposal facility. The proposed facility is designed in a former surface coal mine excavation, making effective reuse of the mined land. QE2 conducted hydrogeologic investigation and all Part I and II engineering and permitting activities including public outreach and meetings. Closure and post-closure requirements and surety sources were identified. The work was coordinated with both TDEC and the Department of Interior Office of Surface Mining. Permitting is pending resolution of EPA coal ash waste classification.</p>
<p align="center"><b>Hungary's Waste Management Plan</b>                      Country of Hungary                      George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p align="center">Developed industrial/solid waste management plan for the Country of Hungary, reviewed operations for municipal/hazardous waste landfill.</p>
<p align="center"><b>Mine Road (Meadow Branch Landfill)</b>                      McMinn County, Tennessee                      George J. Hyfantis Jr., Ph.D., P.E.                      Joseph Matalucci, P.G.</p>	<p>Provided design and permitting for the expansion of the Class I landfill, completed hydrogeological investigation and report and provided permitting for expansion of the Class III/IV Construction and Demolition landfill at same location.</p> <p>Expert witness in dispute between Operator and Owner, evaluated the initial design compared to final contours, determined history for volume vs. airspace calculations; redesigned cap to meet Subtitle D standards, designed leachate collection system.</p> <p>Performed topographic design survey, completed feasibility study and prepared design plans and operations manual for submittal to TDEC; completed permit application; designed associated methane venting system.</p>

**Table 3. Relevant Project Experience**

<b>Name, Location, and Key Personnel Assigned</b>	<b>Scope of Work Completed</b>
<p><b>Poplar View Landfill</b> Rutledge Pike Knoxville, Tennessee George J. Hyfantis Jr., Ph.D., P.E. Joseph Matalucci</p>	<p>Provided environmental assessment including leachate sampling and analysis, analysis of cap integrity, methane assessment; prepared preliminary design for upgrades to cap and methane venting, vegetating the Class I landfill cap and other existing problems, including preparing a cost estimate for the work; then coordinated with City officials, landowner, residents of trailer park atop the landfill, and owner of adjacent Class III/IV landfill to relocate the residences and expand the Class III/IV facility over the existing Class I landfill. Prepared hydrogeological report for proposed expansion. Closure, remediation and redevelopment cost estimates were devised for redevelopment and re-permitting opportunities consideration.</p>
<p><b>Yarnell Road Landfill</b> Joseph Matalucci</p>	<p>Completed hydrogeological investigation and report for Part II Permit application. Conducting on-going ground-water monitoring at site. Conducted investigations and reports to address past disposal of asphalt plant waste at site. Closure and post-closure financial considerations and surety sources assistance. QA/QC for construction of geologic buffer.</p>
<p>Over 30 Sanitary Landfills (Class I and Class II) in Tennessee, Kentucky, Alabama, Mississippi, and North Carolina George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Performed overall design, permitting, geologic and hydrogeologic studies, permitting and developing operational manuals; conducted construction monitoring and oversight; provided oversight of operations.</p>
<p>15 Sanitary Landfills in Tennessee, Kentucky, Alabama, Mississippi, and North Carolina George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Designed or evaluated existing methane recovery systems for adequacy and recommended improvements when necessary; provided design for improved systems.</p>
<p><b>Bumpass Cove Landfill</b> George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Public relations and technical advisor to TDEC and EPA</p>
<p><b>City of Chattanooga Landfill</b> George J. Hyfantis Jr., Ph.D., P.E.</p>	<p>Leachate Collection system troubleshooting and repair. Pumps maintenance.</p>
<p><b>Hollis Hodgson Landfill</b> (Private Industrial Landfill East TN) Matthew Teglas, P.G. George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Conducted a hydrogeologic investigation and environmental assessment of unauthorized industrial landfill in Level A safety clothing; conducted gas monitoring for methane and other gases (some hazardous air pollutants); developed proper closure compliance strategy and assisted the owner with entering the TDEC Division of Superfund's Voluntary Oversight and Assistance Program; conducted human and ecological risk assessment to determine what risks were present on various receptors; prepared plan for long term monitoring and case closure.</p>



**Table 3. Relevant Project Experience**

<b>Name, Location, and Key Personnel Assigned</b>	<b>Scope of Work Completed</b>
<p><b>Grainger County Landfill</b> Grainger County, Tennessee Joseph Matalucci George J. Hyfantis Jr., Ph.D., P.E. Steve Jerman, CPA</p>	<p>Provided environmental monitoring of groundwater; provided construction management during final stages of active life, and facilitated closure of the existing landfill; designed erosion control system and made surface water management plan to facilitate landfill closure. Prepared operations manual for submittal to TDEC upon closure. Closure plan included provisions for surety sources and capping the landfill and providing methane monitoring/recovery if needed.</p>
<p><b>Hollywood Dump</b> Memphis, Tennessee George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Limits of waste analysis, made design assessment and recommendations for closure of hazardous waste landfill.</p>
<p><b>Lancaster County Landfill</b> Lancaster, Pennsylvania George J. Hyfantis Jr., Ph.D., P.E.</p>	<p>Evaluated totally integrated waste management program (including incineration, collection, subtitle D requirements, and mining of old landfill for metals and degraded cover material); evaluated existing solid waste management program</p>
<p><b>Land Between the Lakes Landfill</b> Land Between the Lakes, Tennessee George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Designed, constructed and operated the municipal solid waste landfill.</p>
<p><b>Proposed Knox County Construction and Demolition Landfill</b> Solway, Tennessee George J. Hyfantis, Jr., Ph.D., P.E.</p>	<p>Phase I permitting evaluation, geologic reconnaissance.</p>
<p><b>Rhea County Landfill</b> Rhea County, Tennessee George J. Hyfantis Jr., Ph.D., P.E. Joseph Matalucci</p>	<p>Performed as-built topographic survey of existing landfill, completed life capacity evaluations for final closure, prepared minor permit modification with approval from TDEC; designed and performed construction contact management and administration for expansion and closure of the Subtitle D landfill; provided preliminary planning to revise and expand the existing Subtitle D Fill area; designed the methane/NMOC gas venting system; completed Title V air permit application, then successfully got the Title V requirements relaxed until the landfill is expanded.</p>

**Table 3. Relevant Project Experience**

<b>Name, Location, and Key Personnel Assigned</b>	<b>Scope of Work Completed</b>
<p><b>Scott County Landfill,</b> Scott County, Tennessee George J. Hyfantis, Jr., Ph.D., P.E. Joseph Matalucci</p>	<p>Assisted the East Tennessee Development District in evaluating the closure requirements and developing a closure plan for the Class I landfill; developed a cost estimate for closure and post-closure activities; also included conducting a preliminary engineering evaluation and reporting the results; privately provided consulting related to closing the landfill.</p> <p>Prepared final closure/post-closure design plans and prepared operations and maintenance manual for submittal to TDEC; closure plans included provisions for cap and cover and methane monitoring/recovery if needed.</p>
<p><b>Sullivan County Landfill</b> State of Tennessee George J. Hyfantis, Jr., Ph.D., P.E. Matthew Teglas, P.G.</p>	<p>We currently conduct semi-annual ground water sampling of all on-site and off-site monitoring wells; conduct semi-annual sampling of off-site springs and drinking water supply wells. Prepared a preliminary design and cost estimate to upgrade the cap and address leachate problems; prepared a scope of work and cost estimate to conduct a leachate pump test. Conducted turn-key design and construction services of site landfill cover grading and leachate collection system installation.</p>
<p><b>Tokheim Facility</b> State of Tennessee Matthew Teglas, P.G.</p>	<p>Conducted an off-site water well survey; sampled off-site water well</p>
<p><b>Skyline Drive Dump Site</b> State of Tennessee George J. Hyfantis Jr., Ph.D., P.E. Matthew Teglas, P.G.</p>	<p>Prepared a preliminary design to remediate surface water drainage from flowing through the former dump site; prepared a preliminary design for a soil cap; sampled on-soil and surface water.</p>
<p><b>Former Electro-Voice Site</b> State of Tennessee Matthew Teglas, P.G.</p>	<p>Provided technical assistance to the State of Tennessee by reviewing a Risk Assessment Report for the site.</p>
<p><b>Lenzing Fibers Landfill</b> State of Tennessee Matthew Teglas, P.G.</p>	<p>Prepared a topographic survey; conducting oversight of site maintenance. Future work includes implementation of final site closure/post closure plans on behalf of the State of Tennessee. Site closure activities will include leachate remediation, installation of a cap, and post closure monitoring.</p>
<p><b>Wheland Foundry</b> State of Tennessee Matthew Teglas, P.G.</p>	<p>Conducted post-closure site maintenance and ground water monitoring activities.</p>

**Table 3. Relevant Project Experience**

<b>Name, Location, and Key Personnel Assigned</b>	<b>Scope of Work Completed</b>
<b>Duromatic Landfill</b> State of Tennessee Matthew Teglas, P.G.	Conducted post-closure site maintenance and ground water monitoring activities.
<b>Union County Landfill</b> Union County, Tennessee Joseph Matalucci	Nearing the end of the life of the existing permitted Class I landfill, we monitored the final filling and all closure activities; designed and permitted major modification to add life to the old landfill through expansion; provided design and permitting for new Subtitle D landfill which will be placed adjacent to the old Class I landfill in the future.  Prepared final closure/post-closure design plans and operations manual for submittal to TDEC; closure plans included cap and cover design and provisions for methane monitoring/recovery if needed.
<b>Pactolus Landfill</b> Eastman Chemical, Kingsport, Tennessee Michael Hogan, P.E.	This was a special waste landfill expansion. Provided engineering consulting for design of additional cells and final cap drainage improvement plans.

One project in particular, the Old City of Knoxville Landfill at Rutledge Pike, highlights the potential for innovative approaches and QE2's ability to negotiate effective engineering, regulatory and business development solutions.

A broad range of RCRA projects conducted over a period of two decades in the East Tennessee area make QE2 and our staff a highly experienced team. That combined with a strategy of efficient, streamlined review and analysis objectives will advance the success of the project and LCSWDC long term objectives.

**ATTACHMENTS**

**Labor and Pricing**

**Fee Schedule**

**Resumes**

### Estimated Labor and Pricing

	Matlock Bend Landfill Review	CADD	Mike Hogan	John Sesera	Mike Apple	Matt Teglas	Steve Jerman	Joseph Matalucci	George J. Hyfantis	Clerk	Labor Revenue	Mileage/Other Expenses	TOTAL
<b>1.0</b>	<b>Financial/Operation/Engineering</b>												
1.1	Review project documents		24	24	24	6	24	24	24		\$17,724.00	\$2,676.00	\$19,359.00
1.2	Summarize findings		16	16	16	6	16	16	16		\$12,044.00	\$971.00	\$13,015.00
<b>2.0</b>	<b>Prepare Report</b>												
2.1	Prepare and review draft report with LCSWDC	4	8	8	8	6	8	8	8	4	\$6,856.00	\$70.00	\$6,926.00
2.2	Prepare and present final report						4	4		4	\$1,300.00	\$0.00	\$1,300.00
											<b>\$37,924.00</b>	<b>\$2,676.00</b>	<b>\$40,600.00</b>

**SCHEDULE OF FEES WITH TERMS AND CONDITIONS  
 QUANTUM ENVIRONMENTAL & ENGINEERING SERVICES, LLC**

**EFFECTIVE JULY 2015**

Quantum Environmental & Engineering Services, LLC (QE2) provides its clients with consulting services in environmental sciences and engineering. Compensation will be based on the following schedule of fees and charges or on a lump sum basis as stipulated in the executed *Task Authorization and Statement of Work*. All fees are quoted and payable in U.S. Dollars.

<b>Hourly Fees for Professional and Technical Staff</b>	<b>Rate/Hour</b>
1. President/Principal .....	
2. Program Manager.....	
3. Senior Engineer.....	
4. Engineer.....	
5. Senior Environmental Specialist .....	
6. Environmental Specialist .....	
7. Senior Geologist .....	
8. Geologist.....	
9. Certified Industrial Hygienist.....	
10. Industrial Hygienist.....	
11. Staff Professional III.....	
12. Staff Professional II.....	
13. Staff Professional I.....	
14. Contract Administrator.....	
15. CADD Designer.....	
16. CADD Operator .....	
17. Senior Technician .....	
18. Technician II.....	
19. Technician I.....	
20. Constr & Engr Inspector (CEI).....	
21. Construction Inspector II .....	
22. Construction Inspector I .....	
23. Administrative .....	

Expert witness testimony: twice the listed rate. Travel time will be charged at the regular hourly rates, not to exceed 8 hours per day. Rates charged to clients are those rates in effect at the time services are rendered. Client acknowledges that these rates are reviewed annually and may be adjusted accordingly.

**Project-related expenses are charged as follows:**

1. Travel-related expenses (hotels, meals, rental vehicles, parking, etc.): cost plus 20 percent.
2. Subcontractors (drilling, trenching, surveying, laboratory testing, etc.): cost plus 20 percent.
3. Out-of-pocket expenses for reprographics, aerial photos, publications, overnight shipping, project-expendable materials and supplies, etc.: cost plus 20 percent.

4. Printing and reproduction: \$0.10 per page (black & white), \$0.40 per page (color). Retrieval of records more than two years after project completion bear an additional charge of \$100.00 per request.
5. Mileage: \$0.70 per mile.
6. Rates for health/safety and field instrumentation equipment rental will be furnished upon request.

#### **Invoicing**

**Invoices will be issued monthly and are payable on receipt.** Any amounts not paid within 30 days of the invoice date will be charged a late fee of 1.5% per month (APR of 18.0%). Payment thereafter, to be applied first to accrued interest and then to the principal amount remaining unpaid. Client acknowledges and agrees to pay reasonable attorney's fees, legal fees, administrative and professional fees or other costs incurred in collecting any delinquent amount owed by the Client. Charges for special accounting and financial services, (e.g. invoice support documentation, task itemization budget reports, other financial reporting, etc.) will be charged at a rate of \$50.00/hour.

#### **Stoppage of Work**

QE2 reserves the right to stop work on this project in the event Invoices for work performed or materials used on this project are not paid within 60 days of the invoice date. QE2 will notify client in writing of the work stoppage. When QE2 stops work for non-payment of invoices, an additional 5% of the past due amount will be charged as a remobilization fee. All invoices and charges must be paid and the Client must be current before work is restarted.

#### **Limitation of Liability**

QE2 will not be liable for any loss, damage or liability arising out of the performance of its services beyond the lesser of the contract amount or \$25,000.

#### **Hazardous Substance or Pollution Liability**

Client acknowledges and agrees that the presence of hazardous substances or pollution at a site may further create risks and liabilities for which QE2 has no responsibility. Consequently, Client will:

- (a) disclose to QE2 the existence of all hazardous substances and pollution at or near the project site to the best of the Client's knowledge, records and investigation;
- (b) indemnify, hold harmless and defend QE2 from and against any and all claims, liability or damages, however caused, associated with the presence, discharge, release or escape of such pollution or hazardous substances (such indemnification includes reasonable attorney fees and any expense incurred by QE2 in defense of a claim);
- (c) acknowledge that QE2 has no responsibility as a generator, treater, storer, or disposer of hazardous or toxic substances found or identified at a site; and
- (d) consent to the immediate suspension of services if QE2 encounters hazardous materials or pollution beyond that originally represented by the Client.



## Resumes

**George J. Hyfantis, Jr., Ph.D., P.E., CHMM**  
**Quantum Environmental & Engineering Services, LLC**  
***Principal Manager - Engineer***

Years in Civil & Environmental Engineering 35  
 Years with Company (including predecessors) 25

**EDUCATION:**

Ph.D., Environmental Engineering, Vanderbilt University, Nashville, Tennessee, 1977  
 M.S., Radiation Chemistry, West Virginia University, Morgantown, West Virginia, 1973  
 B.S., Chemistry, Waynesburg, Pennsylvania, 1970

**REGISTRATIONS:**

Registered Professional Engineer Tennessee (14150)  
 Registered Professional Engineer North Carolina (9928)  
 Registered Professional Engineer Alabama (18620)  
 Certified Hazardous Materials Manager, Master Level  
 American Society of Civil Engineers  
 Advisory Board of Journal of Cleaner Production  
 Air and Waste Management Association  
 Institute of Hazardous Materials Managers

**EMPLOYMENT HISTORY:**

Quantum Environmental & Engineering Services, 2003 - present – President  
 Environmental Systems Corporation, 1986-2003 - Vice President  
 State of Tennessee, Department of Environmental and Conservation, UST Board, 1988-2010  
 State of Tennessee, Department of Environmental and Conservation, Solid Waste Disposal Control Board  
 2011-Present  
 University of Tennessee, Knoxville, Civil Engineering Department, 1979-Present - Adjunct Professor  
 University of Tennessee, Waste Management Research and Education Center, 1988-1994 - Senior Fellow  
 Waste Management Program, Tennessee Valley Authority (TVA), Office of Natural Resources and  
 Economic Development, 1983-1985 – Manager  
 Solid and Hazardous Waste Management Program Office of Natural Resources, TVA, 1977-1980 Program  
 Manager  
 Environmental Assessment and Compliance Staff, TVA, 1976-1977 Environmental Engineer

**RELEVANT EXPERIENCE:**

<b>RCRA Solid Waste Facility Experience</b>		
<b>Project Title</b>	<b>Scope</b>	<b>Role</b>
Roberta Landfill Class I Design and Permitting	Complete Class I, Part I/II permitting, ARAP, Public Outreach	Principle-in-Charge Lead Engineer
City of Knoxville, Rutledge Pike Class III design	Complete Class III, Part I/II permitting Post Closure Remediation	Principle-in-Charge Lead Engineer
Cumberland Coal	Class II Monofill for coal ash,	Principle-in-Charge

<b>RCRA Solid Waste Facility Experience</b>		
<b>Project Title</b>	<b>Scope</b>	<b>Role</b>
Ash Landfill	Part I/II permitting	Lead Engineer
Rhea County Landfill	Class I expansion design and permitting	Principle-in-Charge Lead Engineer
Mine Road Landfill	Class I expansion design and permitting	Principle-in-Charge Lead Engineer
Yarnell Road Landfill	Class III expansion design and permitting	Principle-in-Charge Lead Engineer
Memphis North Hollywood Dump Closure	Site Investigation/ Ground water Monitoring	Project Manager
Community Technical Assistance	Multiple (over 30) Landfill Designs and Closures	TVA Regional Solid Waste Manager
Oman / Eastern Europe / Thailand	Landfill Design, Operations and Closure	Cooperative Technical Assistance

Founder and President of QE2, Dr. Hyfantis has 35 years of experience in the emergency response, environmental remediation, indoor air quality and solid and hazardous waste management area. Dr. Hyfantis is a Certified Hazardous Materials Manager and is co-author of the Certified Hazardous Materials Manager's Manual (1987). His experience encompasses a wide range of environmental activities that have involved:

- RCRA Wastes
- Radon
- Indoor Air Quality
- CERCLA Response and Implementation
- Lead Contamination
- PCB Contamination
- Hazardous Materials Management
- Radioactive Wastes
- UST Remediation

Dr. Hyfantis has conducted extensive consulting services for State agencies, municipalities, and transit authorities, covering a broad variety of environmental concerns. Before founding QE2, he was president of International Waste Management Systems and was manager of the regional waste management program for the Tennessee Valley Authority. During his tenure with TVA Dr. Hyfantis was the Federal on-site coordinator for emergency responses.

Dr. Hyfantis is the principal, manager and engineer for QE2 and is responsible for the oversight of all staff, including assignment of staff to specific projects and overview of project managers and senior level staff. Dr. Hyfantis keeps abreast of federal regulations and, is keenly aware of State issues and situations.

**Johnie Michael Apple**  
**Quantum Environmental & Engineering Services, LLC**  
***Consultant – Senior Scientist***

**EDUCATION:**

B. S., Bachelor Degree in Civil Engineering, Vanderbilt University – 1964-1968

M. S., Master of Science Degree, Vanderbilt University – 1968-1970

**REGISTRATIONS:**

PE License Number (State of TN – 9238)

Licensed Land Surveyor – 1978

**EXPERIENCE:**

**Division of Solid Waste Management**

- Engineer 1 & 2 - 1970 -1974
- Engineer 3& 4 – 1974- 1978
- Engineer 5 &6- - 1978 – 1981
- Assistant Director 1981 – 1998
- Director 1998 - 2012

Mr. Apple has served the State of Tennessee in its solid waste management programs for over 40 years progressing through the ranks to his appointment by the Governor the Director position of Division of Solid Waste Management in 1998. Throughout his career Mr. Apple has worked in all facets of landfill development, permitting and operations including life-cycle budgetary planning and closure and post-closure surety requirements. He led the initial drafting of the solid and hazardous waste and Superfund rules for the State of Tennessee. He also worked with a team of planners to research, develop and propose financial instruments that now effectively serve as closure and post-closure surety mechanisms across the State. As Assistant Director and Director, Mr. Apple served as the liaison to the general public in permitting, enforcement and financial planning considerations of solid waste facility permitting and development.

**JOB RESPONSIBILITIES:**

- Engineer 1&2 Inspector and plan review of sanitary landfills being permitted
- Engineer 3&4 Lead engineer in landfill design and operation. Lead
- Engineer 5 & 6 Program manager over all engineering and field office staff
- Assistant Director Program Manager with emphasis on public relations and conflict resolution acting as Director in his absence. Liaison with regulated community and public in the permit process. Supervised the public participation staff.
- Director- Total program responsibility. Served as the legislative liaison and lobbyist for the Department. Coordinated all activities with Federal Environmental Protection Agency for the Division/Department relative to the Division of Solid/Hazardous Waste Management. Appointed/Served at the pleasure of the Governor.

**Steven F. Jerman, CPA**  
**Quantum Environmental & Engineering Service, LLC**  
***Principal and CFO***

**Education:**

B.S. Accounting, Clemson University, 1992  
Magna Cum Laude

**Registrations and Training:**

Certified Public Accountant, Georgia (#15579)  
Member, American Institute of Certified Public Accountants  
Member, Tennessee Society of Certified Public Accountants

**Professional Experience:**

Mr. Jerman has over 25 years of combined experience working in public accounting and various service-related industries, from multi-billion dollar corporations and emerging start-ups. He has several years of experience managing the financial and administrative functions of a business. Mr. Jerman's qualifications include treasury management, budgeting and forecasting, internal controls, financial reporting, managing the daily and month-end accounting functions, and mergers & acquisitions.

**Relevant Experience Includes:**

- **Auditing** – Examining financial statements, general ledgers and supporting documents to obtain reasonable assurance that the financial information is free of material misstatement.
- **Treasury Management:** Responsible for developing and maintaining relationships with financial institutions and other lenders. Actively manage cash flow for QE2 via forecasting and analysis of collections versus disbursements. Evaluate capital expenditure purchases and leasing options.
- **Financial Reporting:** Preparation and review of financial statements for internal management reporting purposes as well as external reporting requirements. Coordinate annual review of financial statements by external auditors.
- **Budgeting, Forecasting and Project Tracking:** Oversee development of QE2's annual operating and capital budgets. Perform analysis of actual financial results versus budget and evaluate variance contributors. Review project-level budgets prepared by managers and professional staff. Develop cost tracking tools and reports within MAS90 accounting system to monitor project performance against budget.
- **General Accounting:** Manage all tasks performed by QE2's finance/accounting department, including: month-end and year-end close processing; client invoicing, accounts receivable and collections; accounts payable and vendor management; fixed asset tracking, reporting and inventory; employee time and expense tracking and project posting.
- **Human Resources:** Coordinate payroll processing, management and related reporting. Responsible for benefits administration, including employee group health insurance and 401k

retirement plans. Monitor QE2's performance review process and employee development programs.

- **Thermography:** Perform roof and system surveys for commercial and public buildings. Identify correlation of infrared results to fungal growth occurrences.
- **Other Relevant Experience:** Includes internal controls (policy and procedure development, compliance with regulatory requirements, and process implementation, review and improvement of financial functions); mergers and acquisitions (financial due diligence, and purchase accounting/consolidations); insurance and risk management (evaluation and administration of QE2 insurance policies, credit analysis for all significant new clients).

**Employment History:**

***Quantum Environmental & Engineering Services, LLC (QE2)2003 - Present***

Principal & CFO

***QBG Thermo Imaging, 2001 – 2003***

Thermography Technician I

***U.S. Cellular Corporation, Knoxville Tennessee, 2002-2003***

Manager of Pricing & Rate Plan Development

***Globix Corporation, Atlanta Georgia, 1999-2001***

Director of Finance

***Cox Communications, Inc., Atlanta Georgia, 1995-1998***

Business Manager – Broadband Services

***Deloitte & Touche LLP, Atlanta Georgia, 1992-1995***

Senior Auditor

**Joseph L. Matalucci**  
**Quantum Environmental & Engineering Services, LLC**  
**Director of Construction Services**

Years in Environmental/Engineering Services 32  
 Years with Company 14

**EDUCATION:**

B.A., Geology, State University of New York at New Paltz, 1978  
 A.S., Physical Sciences, Orange County Community College, New York, 1976

**EMPLOYMENT HISTORY:**

Quantum Environmental & Engineering Services,	2003 – Present	Director of Construction Services
Environmental Systems Corporation	1998 – 2003	Construction Manager
Interstate Industrial Corporation	1995 – 1998	Geologist
United Enterprises	1994 – 1995	Partner
Virogroup - ETE Division	1990 – 1994	Sr. Geologist
Grossinger Development Corporation	1989 – 1990	Construction Manager
Phillips Engineering Construction Company	1984 – 1989	Corporate Officer/Project Manager
Wehran Engineering, PC	1978 – 1984	Staff Geologist

**REGISTRATIONS:**

Certified Troxler Laboratories Nuclear Soil Testing Equipment Operator  
 Site Safety Manager - New York City Dept. of Buildings  
 40-hour Hazardous Waste Training Program

**SPECIAL QUALIFICATIONS:**

Association of Groundwater Scientists and Engineers  
 American Association of Petroleum Geologists

**REVELANT EXPERIENCE:**

RCRA Solid Waste Facility Experience		
Project Title	Scope	Role
Roberta Landfill Class I Design and Permitting Oneida, TN	Complete Class I, Part I/II permitting, ARAP, Public Outreach	Project support/specifications
City of Knoxville, Rutledge Pike Class III design Knoxville, TN	Complete Class III, Part I/II permitting Post Closure Remediation	Project support/specifications
Cumberland Coal Ash Landfill Crab Orchard, TN	Class II Monofill for coal ash, Part I/II permitting	Project support
Rhea County Landfill Evensville, TN	Class I expansion design and permitting	Project support/specifications QA/QC Manager
Mine Road (Meadow Branch) Landfill, Athens, TN	Class I expansion design and permitting	Project support/specifications QA/QC Manager
Yarnell Road Landfill Knoxville, TN	Class III expansion design and permitting	Project support/specifications QA/QC Manager

<b>RCRA Solid Waste Facility Experience</b>		
<b>Project Title</b>	<b>Scope</b>	<b>Role</b>
Fresh Kills Landfill Section 2/8, Staten Island, NY	Final Cover & Landfill Gas Extraction	QA/QC Manager
Grainger County Landfill, Rutledge, TN	Final Cap Design and Construction	Oversight Manager
Laidlaw Environmental Services, Pinewood, SC	Hydrogeologic Investigation and Expansion Design	Geologist
Poplar View Landfill Knoxville, TN	Part 2 Application for Expansion	Oversight Manager

Mr. Matalucci has thirty-two years of varied experience in the areas of civil design support, geology and geologic investigations, ground-water monitoring, solid and hazardous waste landfill design, site remedial investigations, preparation of remedial plans, environmental site assessments, quality control and quality assurance for landfill liner construction, and construction management. He has a proficient knowledge of field techniques in geologic investigations as well as extensive field management of construction activities. Mr. Matalucci also coordinates the business development, staffing, budgeting, and scheduling for all construction services at QE2.



**Michael D. Hogan, P.E.**

**QUANTUM ENVIRONMENTAL & ENGINEERING SERVICES, LLC**

**Engineer**

Years in Civil and Environmental Services            9.5  
Years with Company    3.5

**EDUCATION:**

University of Tennessee, B.S. Civil and Environmental Engineering, 2007

**REGISTRATIONS:**

Professional Engineer: Tennessee (#115048), Texas (#118111), Georgia (#038726), Louisiana (#0039351) ,  
Kentucky (#31063)

**EMPLOYMENT HISTORY:**

Quantum Environmental & Engineering Services, LLC	2013 – Pres.	Civil Engineer
Barge Waggoner Sumner & Cannon, Inc.	2007 – 2013	Civil Engineer

**RELEVANT EXPERIENCE:**

Mr. Hogan is a registered Professional Engineer in Tennessee, Texas, Georgia, and Louisiana. He has served as the Past President of the American Society of Civil Engineers, Knoxville Branch. Mr. Hogan is an accomplished engineer with experience in civil engineering design and management, site development and re-development, and construction and environmental permitting for multi-family residential, parks and recreation, athletic, large commercial, transportation, industrial, institutional, and government facilities. Mr. Hogan has prepared due diligence reports and performed site selection studies for large commercial and industrial facilities. His development experience has also required preparation and submittal of site development plans to rezoning boards, planning commissions, and municipal engineering departments for approvals and site development and building permits. His engineering design experience includes layout of site features, utilities, and transportation facilities, preparing grading and drainage, erosion control, and demolition plans and specifications. In his time at QE2, he has also gained experience in environmental assessment and abatement of hazardous materials and practice in environmental compliance and monitoring for air, water, and waste operation permitting. He has also provided construction and demolition monitoring and oversight. Mr. Hogan has additional field experience in utility mapping, field surveying, and construction staking and layout.

**CERTIFICATIONS:**

- 3-Day Asbestos Inspector Training
- UST Sampling for Groundwater, Development/Decontamination and Soil Gas Survey
- OSHA 40 Hour HAZWOPER
- SITEOPS Certified Professional status
- TDEC Level I Training Course, Fundamentals of Erosion Prevention and Sediment Control
- TDEC Level II Training Course, Design Principals for Erosion Prevention and Sediment Control

**TRAINING:**

- Microstation, SITEOPS, AutoCAD, Microsoft Office Suite
- Field surveying experience with total station and scanners
- Submittals: Site Development Plans, Use on Review, Site Development and Building Permits, National Pollutant Discharge Elimination System (NPDES) Construction Permits, Aquatic Resource Alteration Permits (ARAP)
- Recent Coursework: Traffic Calming, Tennessee Transportation Assistance Program, 2012; Roundabout Design, Tennessee Transportation Assistance Program, 2012

**Matthew S. Teglas, P.G.**

**QUANTUM ENVIRONMENTAL & ENGINEERING SERVICES, LLC**

***Director of Environmental Services***

Years in Environmental Services            21  
Years with Company                            17.5

**EDUCATION:**

B.S., Geology, University of Tennessee Knoxville, 1996  
B.A., Environmental Studies, University of Tennessee Knoxville, 1996  
Geology Field Study, University of Memphis, 1996  
Sigma Gamma Epsilon Earth Science Honors Society

**REGISTRATIONS AND QUALIFICATIONS:**

Prof. Geologist: Tennessee (TN4202); Kentucky (KY2539); Alabama (AL1372); Georgia (PG002131)  
Phase I Environmental Site Assessor  
SPCC and Industrial SWPPP trainer  
Department of Justice NEPA training  
UST Compliance Inspector  
ISO 14001 and 9001 Auditing and Training procedure implementation  
40 Hour HAZWOPER Training  
30 Hour OSHA Construction Training  
DOT Hazmat Training  
8 Hour RCRA Training  
Confined Space Training  
Bloodborne Pathogens Training  
HAZCOM Training

**EMPLOYMENT HISTORY:**

Quantum Environmental & Engineering Services, LLC	1999 – Present	Senior Geologist/Director Env. Services
EnSafe, Nashville, TN	1997 – 1999	Staff Geologist
Philips Consumer Electronics	1993 – 1996	Environmental Intern

**RELEVANT EXPERIENCE:**

Mr. Teglas has over 20 years' experience in the environmental and engineering consulting industry. He is currently the Director of Environmental Services, overseeing the activities of staff environmental scientists and technicians. Mr. Teglas has conducted and managed numerous subsurface site investigations, Phase I and II Environmental Site Assessments, Voluntary Cleanup, Oversight and Assistance Program (VOAP) and Brownfield investigations, NEPA assistance, groundwater and soil remediation designs, UST removal, UST compliance inspections, hazardous materials assessments, and construction oversight. He has provided UST and subsurface contamination consulting for hazmat surveys and demolition projects.

Mr. Teglas has provided services for landfill projects ranging from hydrogeologic investigations for permits, leachate system design and installation oversight to monitoring and groundwater quality assessments. The projects were located in various geologic settings including known karst areas. Mr. Teglas is also the

project manager for all sites in the VOAP and Brownfield programs, including sites in Knoxville, Johnson City, and Chattanooga, Tennessee. Work on these sites has included development of Remedial Action Plans, groundwater use surveys, field reconnaissance, geologic mapping, monitoring well installation and sampling, dye-tracing studies, groundwater basin identification and flow evaluation, plus statistical analysis of analytical data.

Mr. Teglas is also the Project Manager of the Department of Energy (DOE) and Department of Defense (DOD) sites in Tennessee. DOE and DOD projects have included fuel center demolition and UST removal, petroleum hydrocarbon groundwater investigation, RCRA permitting, DNAPL groundwater remediation design and monitoring, landfill maintenance, and NPDES permitting. He also prepares Spill Prevention, Control, and Countermeasures (SPCC) plans and Industrial Storm Water Pollution Prevention plans (SWPPP) for private and government agencies. He also conducts SPCC, SWPPP, HAZCOM, and Bloodborne Pathogen training for clients.

13 March 2017

Loudon County Solid Waste Disposal Commission  
Loudon County Annex  
101 Mulberry Street, Suite 102  
Loudon, TN 37774

**Subject: Response to Request for Proposal  
Review and Analysis of Proposal by Santek Environmental Services  
to Modify Contract  
Matlock Bend Landfill, Loudon County, TN**

Dear Loudon County Solid Waste Disposal Commission:

## **INTRODUCTION**

Geosyntec Consultants (Geosyntec) is pleased to provide this response to the Request for Proposal (RFP) attached to the 20 February 2017 e-mail from Kevin G. Stevens, Esq., on behalf of the Loudon County Solid Waste Disposal Commission (LCSWDC). The RFP requests that a proposal be prepared to assess a recent proposal from Santek Environmental Services (Santek) to LCSWDC regarding the Matlock Bend Landfill (MBL). Specifically, the RFP indicates... *“LCSWDC is seeking an independent engineering and financial evaluation regarding Santek’s proposed payment of funds under the operating contract closure and post closure costs for the Landfill.”* The remainder of this document provides Geosyntec’s proposed strategy to respond to the items requested in the RFP and is organized to provide: (i) brief background; (ii) proposed strategy; (iii) anticipated budget and schedule; and (iv) closure.

## **BACKGROUND**

Geosyntec has had the pleasure of working either directly with or on behalf of the LCSWDC since 2004 on numerous issues related to Santek and the MBL. Examples of projects include: (i) Assessment of Landfill Operations; (ii) Current and Future Disposal Capacity Options; (iii) Assessment of Landfill Height Impacts on Disposal Capacity; (iv) Post-closure Care Cost Assessment; (v) Analysis and Recommendations regarding Landfill Slope Failure; and (vi) Development of Strategy for Accepting Sludge at Matlock Bend Landfill. Most of these projects were completed under contract between Geosyntec and LCSWDC. However, at the request of and in full cooperation with LCSWDC, some of this work was contracted directly between Geosyntec and Santek. Importantly, one of the projects completed for LCSWDC was dedicated to assessing

closure and post-closure care (C&PCC) costs for the MBL and the impact of the proposed security fee on these costs. Geosyntec believes that this experience is significant, as it serves as a baseline reference for the project identified in the RFP. Geosyntec proposes to build on this experience in responding to the RFP, and by doing so believes that it will provide significant value and efficiency to LCSWDC.

## **GEOSYNTEC'S PROPOSED STRATEGY**

As identified above, Geosyntec proposes to build on previous project experience to complete this assignment and to respond to the items identified in the RFP. Geosyntec notes that the RFP identified several items that are included in the Santek proposal and that require assessment in this current assignment. Geosyntec concurs with the LCSWDC that these items are critical to the requested independent assessment and provides the following observations and concurring comments regarding the specific items identified in the RFP that relate to information included in the Santek proposal:

- *Security fee increases to \$1.50 per ton:* Previous analysis by Geosyntec identified the sensitivity of the C&PCC funding to the selected security fee, as well as the total area of the MBL that requires LCSWDC funding for closure. To completely understand the sufficiency of the Santek-proposed security fee, it will be necessary understand the current funds available to LCSWDC for C&PCC costs and the amount of funds desired in the LCSWDC account at the conclusion of the Santek contract. This will obviously be a critical component of the proposed project and requires input from and collaboration with LCSWDC.
- *Operating contract will be extended for 5 years through 2032:* Geosyntec understands that this contract extension is intended to address: (i) projected shortfall in C&PCC funding under the current contract between LCSWDC and Santek; and (ii) concession to reduce the height of the MBL from the elevation currently considered in the pending landfill expansion application. This seems a potential win-win opportunity for LCSWDC and Santek; however, the details and obligations will be critically assessed as part of this project.
- *Santek will close approximately 32 acres of the Landfill during the contract term under a phased closure plan:* It is very encouraging to see that this is a component of the Santek proposal, as this was a critical omission/concern/misunderstanding of the previous contract

between Santek and LCSWDC. The location of the proposed closed areas and the amount of the MBL that has “achieved permitted capacity/elevation but has not yet been closed” is critically important to the assessment. As part of this assessment, it will likely be beneficial for a representative from LCSWDC (or Geosyntec) to communicate with the Central Office of the Tennessee Department of Environment and Conservation (TDEC) to confirm that the Santek closure strategy is consistent with TDEC’s guidelines regarding phased closure.

- *Santek will lower the maximum elevation of the Landfill from 1,125 to 1,093 ft.:* As referenced above, this represents a potential win-win concession. The reduced elevation and the proposed operations and closure phasing will be critically reviewed.
- *Santek will consume all constructed airspace during the term of the contract (although there may remain unconstructed permitted airspace at the conclusion of the contract term:* Upon first inspection, this proposed contract condition is of major concern to Geosyntec for two reasons. First, this means that a portion of the MBL will be closed under the financial responsibility of LCSWDC and therefore closure costs must be critically assessed; and (ii) at the completion of the new contract with Santek, there will be no constructed disposal capacity at MBL. Therefore, so that there is no disruption in disposal capacity at MBL, LCSWDC will potentially be faced with the logistical problems of retaining a contractor to construct permitted airspace while Santek is operating/closing portions of MBL. It will also be important to review the proposed contract terms to confirm the subtle (but significant) difference between: (i) a contract extension for five additional years, which is estimated to result in consumption of all constructed airspace; and (ii) a contract extension that results in consumption of all constructed airspace, which is estimated to be an additional five years.

Geosyntec’s proposed strategy for addressing this project will proceed in the following three phases:

- *Phase I – Initial Data Compilation and Contract Review:* Geosyntec will compile all available information to update previous records associated with C&PCC costs developed by Geosyntec and previously presented to LCSWDC. Geosyntec will also review Santek’s proposed expansion plans and proposed contract terms. In completing this phase, Geosyntec concurs that all nine tasks identified on page 2 of the RFP will be addressed and included.

- *Phase II – Meeting with LCSWDC and Santek:* Based on previous experience, Geosyntec sees significant value in convening a meeting between Santek, Geosyntec, LCSWDC, and Mr. Stevens to discuss the details of proposed contract and results from the Phase I activities.
- *Phase III – Preparation and Presentation of Assessment Report:* After Geosyntec’s assessment, a final report will be prepared and a summary presentation will be made to the entire LCSWDC. Geosyntec has found that these two presentation formats are efficient and helpful to all involved parties.

## **ANTICIPATED BUDGET AND SCHEDULE**

Because of his familiarity with LCSWDC records and his previous experience regarding the earlier projects and interactions with LCSWDC, Geosyntec believes that it will be most efficient to have Dr. Robert C. Bachus perform the major activities required for this project. Dr. Bachus is well known in the solid waste industry in Tennessee and has completed the previous LCSWDC projects identified above. A resume for Dr. Bachus is included as Attachment 1. Based on the scope of work identified above, Geosyntec estimates that the project will require less than 30 hours to complete and will commit to a not-to-exceed budget reflective of this level of effort. Geosyntec will only bill effort on a time and materials basis. Using the rate schedule attached to this proposal as Attachment 2, Geosyntec estimates and will commit to a not-to-exceed budget of \$7,200 for the project. It is estimated that project as identified in the RFP can be completed within approximately 5 weeks of receiving formal notice-to-proceed (NTP) from LCSWDC, assuming: (i) timely receipt of documents from LCSWDC and/or Santek; and (ii) timely scheduling of the proposed meeting between Santek, Geosyntec, LCSWDC, and Mr. Stevens.

Geosyntec maintains local offices in Knoxville and Chattanooga, TN. Dr. Bachus routinely operates from these offices. As has been the case for previous projects completed by Dr. Bachus for LCSWDC, all travel related to this proposed project (i.e., meetings with LCSWDC and Santek, presentation to LCSWDC, etc.) will be billed as “local” travel, recognizing the location of Geosyntec’s offices. As such, time and expenses related to travel on behalf of the project will not be billed to the project.

## **CLOSURE**

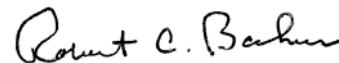
Geosyntec appreciates the opportunity to present this proposal and to again work with LCSWDC. As mentioned previously, Geosyntec’s previous work on projects related to MBL have been



contracted either directly with or on behalf of the LCSWDC. As requested in the RFP and as reported to LCSWDC in an earlier e-mail, Geosyntec personnel from its Chattanooga Office assisted Santek by preparing a Coal Combustion Residuals (CCR) Management Plan (Plan) for Santek's Rhea County facility in August/September 2015. The Plan was a requirement by the Tennessee Valley Authority (TVA) of potential vendors being considered for the off-site disposal of CCRs from TVA facilities. Ultimately, TVA opted to go another route for CCR disposition and the Plan was never implemented.

Upon review of this proposal and response to the RFP, should LCSWDC have any questions, please do not hesitate to contact Geosyntec.

Sincerely,



Robert C. Bachus, Ph.D., P.E., D.GE  
Senior Principal

Attachments: Attachment 1: Resume for Robert C. Bachus, Ph.D., P.E., D.GE  
Attachment 2: Proposed Rate Schedule

# ATTACHMENT 1

Resume for Robert C. Bachus,  
PH.D., P.E., D.GE

**ROBERT C. BACHUS, Ph.D., P.E., D.GE**

**geotechnical engineering  
waste management  
geosynthetics**

## **EDUCATION**

Stanford University: Ph.D., Geotechnical Engineering, 1982  
University of Illinois at Chicago Circle: M.S., Civil Engineering, 1975  
University of Illinois at Chicago Circle: B.S., Civil Engineering, 1974

## **PROFESSIONAL REGISTRATION**

Georgia Professional Engineer, PE029199	Arkansas Professional Engineer, No. 12271
Mississippi Professional Engineer, No. 17176	Pennsylvania Professional Engineer No. 074678
Kentucky Professional Engineer, No. 27789	Tennessee Professional Engineer, No. 113195
Alabama Professional Engineer, No. 31272	North Carolina Professional Engineer, No. 39996

## **PROFESSIONAL HISTORY**

Geosyntec Consultants, Atlanta, Georgia; Senior Principal, 2016 – date; Principal, 1994 - 2016; Associate, 1992 - 1994; Senior Project Manager, 1990 - 1992  
Georgia Institute of Technology, Atlanta, Georgia, Assistant Professor of Civil Engineering, 1983 - 1990, Instructor, 1979 - 1983  
Engineering Consulting Services provided to Soil Foundation Systems (Santa Clara, California), 1976 - 1979; Chattahoochee Geotechnical Consultants (Norcross, Georgia), 1979 - 1983.

## **REPRESENTATIVE EXPERIENCE**

### **Geotechnical Engineering**

Dr. Bachus has been the project manager and has provided technical oversight for a wide range of projects requiring geotechnical investigation and rehabilitation, site characterization, specialty geotechnical analysis, seismic design, geotechnical instrumentation, geotechnical testing, and general site civil design. He has more than 40 years' experience in geotechnical engineering, much of this related to the analysis of earth retaining structures, earth dams, slope stability and seepage, site characterization, forensic investigations, and soil property evaluation for a wide range of private and public-sector clients. Dr. Bachus has worked extensively on the design and performance of earth retaining structures, most notably mechanically stabilized earth (MSE) walls. This includes forensic investigation at seven project sites where MSE walls have not met performance requirements. He recently completed an assessment of the performance of a cofferdam in the Mississippi River for an interstate bridge seismic retrofit project. This work follows design of a temporary cofferdam and earth support system in Augusta, Georgia and temporary shoring downstream of an earth dam in Blue Ridge, Georgia. He has worked extensively within the transportation industry, most recently assisting in the training and transition to Load and Resistance Factor Design (LRFD) design methodologies and on technical issues related to excessive deformations for a 50-ft high embankment constructed over soft clay. Notable projects include the subsurface investigation, in-situ and laboratory testing, and slope stability analysis for dredge material contaminant dikes in Savannah, Georgia and Wilmington, Delaware and the technical oversight for the slope stability and performance assessment of compacted earth dams throughout Georgia and in Alabama. He has worked on gold mine tailings dams in South Dakota. Dr. Bachus has conducted and provided senior oversight and technical review for numerous

static and seismic slope stability analysis and designs across the country and recently completed the investigation, instrumentation, and rehabilitation of large landslides in Pittsburgh, Pennsylvania and Orange County, California. The landslide stabilization project included design and construction of an innovative short- and long-term stormwater management system and engineered wetland. He recently worked as a key member of the team that was assessing the seismic stability of a semi-hydraulic fill dam of the Blue Ridge Dam on behalf of the Tennessee Valley Authority (TVA) and participated in the failure mode assessment evaluation (FMEA) for a gold mine in Alaska. He worked on the failure of a fly ash dike failure in Harriman, Tennessee. Related to this latter effort, he recently completed a project under contract to the Electric Power Research Institute (EPRI) regarding the characterization and engineering performance of ponded fly ash from electric power utilities across the U.S. He provided senior review for annual dam inspections at fly ash retention embankments throughout the Midwestern U.S. for the American Electric Power (AEP) Company. He has extensive experience within the electric power generation, focusing on the characterization and beneficial use of coal combustion by-products (CCBs). He also participated on the forensic investigation team studying the failure of a large fly ash containment dike sited on a karst foundation in North Georgia and has investigated the cause and rehabilitation of Georgia Highway 53 after it was adversely impacted by the sinkhole activity that was activated by nearby mining activities. He recently worked on hydraulic barrier wall installations on large earth dams owned by the U.S. Army Corps of Engineers (USACE) in Kentucky, Tennessee, Ohio, and Florida. His experience includes foundation and waste settlement evaluation, soil liner material evaluation, and laboratory testing for the Department of Energy (DOE) Fernald Environmental Management Project (FEMP) in Fernald, Ohio and worked on the geotechnical site characterization for the DOE's Savannah River Site in Aiken, SC. He has worked on the assessment of the hydraulic performance of low permeability compacted clay liners (CCLs), geosynthetic clay liners (GCLs), and geomembrane liners (GMs) at several sites across the US, including the hazardous waste disposal site in Adams County, Colorado. Dr. Bachus has worked extensively in the area of soft soil engineering, including slope stability assessment and settlement. He recently completed projects regarding an assessment of the failure and reconstruction of an anchored bulkhead adjacent to the Port of Savannah, performance of a deep excavation in Savannah, an anchored bulkhead in North Carolina, foundations for a ten-story building in North Carolina, and pavements/walls for two projects in Florida. He directed the innovative slope stability assessment and erosion protection of a riverbank embankment subject to undermining erosion in Oklahoma City, Oklahoma and adjacent to a fly ash pond in Macon, Georgia.

Dr. Bachus has also worked on commercial, industrial, and residential development projects where foundation problems developed. Specific projects included a forensic investigation in a housing development where excessive structural distress developed and gas migration occurred soon after construction was completed, design of underpinning and excavation protocols for structural foundations at an industrial development constructed over decomposing organic materials, and assessment of micropile foundations to mitigate settlements for a ten-story student dormitory.

He is nationally-recognized for his expertise in the areas of in situ testing, laboratory testing, site characterization, soil stabilization, instrumentation, and data management and visualization. He was responsible for technical oversight of Geosyntec's Geomechanics and Environmental Laboratory and the Soil-Geosynthetics Interaction Laboratory in Atlanta, Georgia. The laboratories specialized in conventional and specialized geotechnical testing, soil/geosynthetic interaction testing, and geo-environmental and solid waste testing. Dr. Bachus has devoted a considerable effort in developing and utilizing in situ testing equipment and analytical techniques for interpreting in situ test results. These efforts were largely directed towards the self-boring and pre-bored pressuremeter, but also include the piezoelectric cone penetrometer and the flat plate dilatometer. For the past 20 years, Dr. Bachus has worked extensively in the site characterization of sites underlain by soft soils, loose sands, stiff glacial till, and karst. He worked extensively on the geotechnical investigation for a Salt Waste Processing Facility at the Department of Energy (DOE) Savannah River Site in Aiken, South Carolina, where it is critical to

assess the engineering characteristics of a soft soil layer attributed to the weathering a limestone at a depth of nearly 100 feet. He has worked with the Federal Aviation Administration (FAA) regarding a guidance tower in northwestern Florida whose stability had been compromised by the karst foundation conditions and well as anchored towers in North Carolina and self-supporting towers in Florida damaged by a hurricane. He provided independent review of a large scale load test of the London Avenue Canal in New Orleans, on behalf of the USACE and worked with the New Orleans Levee District and USACE on assessing performance of the repaired portion of the levee along the 17<sup>th</sup> Street Canal. He worked as a member of the review team to evaluate the safe water elevation of the London Avenue, 17<sup>th</sup> Street, and Orleans Canals in New Orleans. He recently completed work on the design and construction of hydraulic barriers that include deep soil-mixed panels and grouting solutions for USACE projects at the Herbert Hoover Dike (Florida), Wolf Creek Dam (Kentucky), Chickamauga Lock and Dam (Tennessee). He is currently working on the stabilization of Center Hill Dam (Tennessee). He worked on the slurry stabilization, management, and disposal strategies for excavated cuttings from stabilization activities at the USACE's Wolf Creek Dam in Jamestown, Kentucky and Center Hill Dam in Silver Point, TN. Deep soil mixing is being used at the Plant Vogtle Nuclear Station on Georgia under the direction of Dr. Bachus.

For the past ten years, he has been extensively involved in the development and implementation of geotechnical data management systems, starting with an innovative project for the Maryland State Highway Administration (MSHA) regarding the Woodrow Wilson Bridge reconstruction and currently is the chairman of the Technical Advisory Board for the Geo-Institute of ASCE regarding the development and implementation of a standardized geotechnical management systems referenced as Data Interchange for Geotechnical and Geoenvironmental Specialists (DIGGS) that can be used by highway agencies and other geotechnical asset owners across the U.S. He has developed data management and visualization strategies for geotechnical projects on behalf of the Georgia Department of Transportation (GDOT) and has developed workshops for the transportation industry related to geotechnical data management practices. He worked as part of the instrumentation and information management team to develop an Underground Construction Information Management System (UCIMS) for the Crossrail project in London, UK, where the focus is not only on instrumentation, but innovative techniques for data visualization. Techniques developed by Geosyntec under the direction of Dr. Bachus for Herbert Hoover Dike, Wolf Creek Dam and Center Hill Dam have been adopted by USACE for several recent USACE projects.

Dr. Bachus taught in the geotechnical engineering program for eleven years at the Georgia Institute of Technology. He was primarily responsible for teaching graduate courses dealing with the engineering properties and physico-chemical properties of soils, clay mineralogy, and field testing techniques, seepage and slope stability, rock mechanics, soil construction, geosynthetics engineering, and soil/site improvement techniques in addition to undergraduate courses in soil mechanics and foundation engineering. One of his notable research projects was in collaboration with Southern Company Services in the southeastern US and EPRI regarding the beneficial reuse of coal combustion residual (CCR) materials, focusing on high-volume highway transportation applications. This project included three full-scale highway construction projects focused on the use of fly ash and bottom ash. While at Georgia Tech, Dr. Bachus worked on research projects with Georgia Kaolin Company in Sandersville, Georgia regarding slope stabilization and reclamation of excavated mines and the characterization of soft mine spoils. He was recognized with four outstanding teaching awards from the American Society of Civil Engineers (ASCE) Student Chapter and a similar award from the Student Government Association. Dr. Bachus organized and prepared lectures for several continuing education short courses, technical seminars, and invited lectures. He currently teaches university extension courses for the Florida Department of Environmental Protection (FDEP), University of Florida and the University of Wisconsin on the design, testing, and performance of low permeability clay and geosynthetic liners and slope stability analysis techniques. He has prepared and delivered a course on

behalf of the TVA and USACE related to seepage, piping, and drainage control design methodologies. Dr. Bachus has authored or co-authored more than 200 technical papers and reports. He was co-editor of the ASTM publication STP 1084, *Deep Foundation Improvements: Design, Construction and Testing*. He recently co-authored several state-of-the-practice design guidelines titled *Geotechnical Engineering Circulars* under contract to the FHWA and is currently a certified lead instructor for the FHWA-sponsored *Soils and Foundations Workshop* and a certified instructor for the FHWA workshop titled *LRFD for Highway Bridge Substructures and Earth Retaining Structures*. Dr. Bachus recently prepared course materials and taught the course titled *Seepage and Piping Design* on behalf of USACE, which includes modules on risk assessment and numerical modeling.

### **Waste Management**

For the past 26 years, Dr. Bachus has worked on the siting, design, permitting, construction and closure of municipal and hazardous waste landfills throughout the United States. He has led the permitting and design efforts for waste facilities in Georgia, Indiana, Florida, Tennessee, Arkansas, Mississippi, and Illinois, and has participated on and provided senior technical oversight for landfill projects in Pennsylvania, New York, California, Ohio, Lisboa, Portugal, and Salinas, Puerto Rico. His work includes specialized analyses for waste facilities constructed in areas underlain by karst geologic features, construction over soft foundations, design of landfill bioreactors, and innovative concepts for vertical expansion over solid waste, including the use of mechanically stabilized earth retaining structures to enhance landfill capacity. The results of these analyses have been used to assess the impact on the performance of composite-lined landfills. Dr. Bachus has been invited to meet with state regulatory agency personnel across the country and present these design and analysis methodologies and technical approaches. He was a member of the Technical Advisory Group (TAG) for the Florida Department of Environmental Protection (FDEP), an advisory group charged with providing guidance to the agency regarding the development of specific investigation and design guidelines for landfill construction in karst terrain.

Dr. Bachus has extensive experience in the subsurface investigation and geotechnical analysis and design for a wide range of geological settings, including soft foundation conditions and in karst areas. The soft foundation activities include soft soils and industrial by-product materials. With regards to industrial by-products, Dr. Bachus has been involved for more than 25 years on characterization, testing, design, construction, basin closure, and beneficial reuse projects involving coal combustion by-products, rock quarry pond screenings, kaolin mine spoils, ammonia soda ash, and sludges from drilling muds and from rayon fiber production. His work in karst areas has included hydrogeologic studies regarding preferential pathways for ground-water and gas migration, engineering solutions to permit construction over karst features, and assessment of sinkhole hazards related to land development restrictions. This work involved large projects in Georgia, Alabama, Tennessee, and Florida. Most notable are projects in northwest Georgia related to the siting of ash and gypsum disposal ponds, a gypsum disposal facility located in karst and a closed CERCLA site in Idaho containing soluble gypsum, and six sites located across Tennessee for the development of municipal solid waste disposal facilities. His expertise related to karst characterization and development was recognized recently by the invitation to deliver the keynote lecture at the 10<sup>th</sup> International Karst Conference, in 2005. Dr. Bachus has directed the design of several landfill gas recovery systems which included site redevelopment and the beneficial end use of the collected gas. He co-authored a design guidance manual related to the leachate distribution and gas collection in bioreactor landfills. He has worked on the design of leachate treatment systems at sites characterized by abnormally high levels of ammonia in the leachate. He has taught university extension courses related to landfill design and construction of clay and geosynthetic liner systems for the past 15 years and developed /taught courses regarding the slope stability and settlement assessment at solid waste facilities and on the design and operation of landfill gas and leachate recovery systems. He currently teaches courses on landfill design as an Adjunct Professor at the Georgia Institute of Technology.



Dr. Bachus has conducted analyses for the vertical and lateral expansions of solid waste landfills, the design of cover systems for steep sideslopes, and the forensic assessment of landfill slope failures. Regarding this latter topic, Dr. Bachus has worked on the analysis of failures at several landfills including: Hughes Road (aka Rumpke) Landfill (Ohio), Doña Juana Landfill (Bogotá, Columbia), Bierloas Landfill (Lisboa, Portugal), Chilton County Landfill (Alabama), Chastang Landfill (Alabama), Carleton Farms Landfill (Michigan), Vandale Superfund Site (Ohio), Matlock Bend Landfill (Tennessee), and Pine Ridge Landfill (Georgia). In addition, he has worked on numerous failure assessments regarding cover system instability at numerous facilities across the country. He was a key member of Geosyntec's project team for the Operation Industries Inc. (OII) hazardous waste landfill and was responsible for the design and construction of the specialized testing equipment, as well as the technical oversight of the testing of waste from OII. He is currently leading the static and seismic stability assessment of the BKK hazardous waste landfill in Southern California. He has worked extensively on the testing of solid waste, including large-scale field assessment of waste settlement. He has been working on the design of final cover systems which support beneficial end-use plans and innovative leachate recirculation and gas recovery plans. He has been active in the design, operation, and compliance monitoring of landfill gas collection and control systems. Dr. Bachus' activities have included work for both private and public sector clients, including Browning-Ferris Industries; Allied Waste, Waste Management; Republic Waste, Chambers Development Company; USA Waste Services; Metro Dade County, Florida; Town of Babylon, New York and Town of Huntington, New York. Dr. Bachus has also worked on several remediation design projects, primarily on aspects related to low-pH and chromium impacted sites, slurry wall containment, leachate evaporation, and soil/waste stabilization and compatibility testing. He provides oversight and guidance for RCRA Facility Investigations (RFIs) and Corrective Measures Studies (CMSs) for NASA at the Kennedy Space Center, Florida.

### **Geosynthetics**

Dr. Bachus was responsible for technical oversight of Geosyntec Consultants' Materials Testing Laboratory (MTL) in Boca Raton, Florida. This laboratory was the preeminent geosynthetics testing geosynthetic laboratory in the United States for nearly 15 years, providing comprehensive geosynthetic testing. Dr. Bachus has overseen large testing programs at the MTL for evaluating the compatibility of geosynthetic liner system components in contact with leachate from DOE's LLRW site in Fernald, Ohio, and the U.S. Army's Rocky Mountain Arsenal site in Commerce City, Colorado.

For the past 25 years, Dr. Bachus has been active in design projects using geosynthetic and in research projects focused on geosynthetic product development and innovative use of geosynthetics. This research focused on construction survivability of geotextiles, compression creep performance of drainage composites, effects of boundary conditions on geocomposite transmissivity, hydraulic conductivity ratio testing of geotextiles, performance of reinforced soils at high strain rates, stabilization of embankments constructed over soft subgrades, hydraulic and chemical transmission measurements through geomembranes, clogging and blinding characteristics of geotextiles, and strength and compatibility testing of geosynthetic clay liners. Many of the forensic investigations at landfill sites have involved assessing the interface strength and the potential impacts on the hydraulic integrity to the landfill lining system.

Dr. Bachus has also been an instructor for the Federal Highway Administration (FHWA)-sponsored course on design using geosynthetics and has co-authored design guidance documents focusing on filtration design using geotextiles and drainage design of composite drainage systems, including *The GSE Drainage Design Manual*, which was received International Geosynthetics Society (IGS) Award at the 8th International Conference on Geosynthetics in Yokohama, Japan in 2006. He recently delivered the keynote lecture on geosynthetics in mining applications at the Geosynthetic Mining Solution 2014 conference in Vancouver, Canada.

## **AFFILIATIONS**

International Geotextile Society

North American Geosynthetics Society

American Society for Testing and Materials

American Society of Civil Engineers Geo-Institute - Soils and Rock Properties Committee

International Society of Soil Mechanics and Foundation Engineering

Transportation Research Board (Soil Properties, Earthworks, and Instrumentation Committees)

Technical Affiliate, Association of Drilled Shaft Contractors

Technical Affiliate, Pile Driving Contractors Association (Education Committee)

United States Society on Dams – Materials for Embankment Dams Committee



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- 75-2 Bachus, R.C., "*Review of Filter Design Criteria for Clay*", Stanford University Research Report submitted to Dr. J.L. Sherard, Dec 1975.
- 76-1 Clough, G.W. and Bachus, R.C., "*An Evaluation of the Technical Feasibility of a Slurry Trench Cut-Off for the Excavation for the Tensas-Cocodrie Pumping Plant and Review of Slurry Trench Specifications*", report submitted to Vicksburg district, U.S. Army Corps of Engineers, 1976.
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- 80-1 Sitar, N., Bachus, R.C., and Clough, G.W., "*Behavior of Weakly Cemented Soil Slopes under Static and Seismic Loading Conditions*", Report No. 44, The John A. Blume Earthquake Engineering Center, Stanford University, June 1980.
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- 82-1 Clough, G.W. and Bachus, R.C., "*An Investigation of Sampling Disturbance in Weakly Cemented Sand*", Engineering Foundation Conference on Updating Subsurface Sampling and In-Situ Testing, Santa Barbara, CA, Jan 1982.
- 82-2 Bachus, R.C. and Mitchell, J.K., "*In-Situ Soil Testing - Part A - Session Reporters Summary*", Engineering Foundation Conference on Updating Subsurface Sampling and In-Situ Testing, Santa Barbara, CA, Jan 1982.
- 82-3 Barksdale, R.D., Bachus, R.C., and Calnan, M.B., "*Settlements of a Tower on Residual Soil*", Proceedings, ASCE Specialty Conference on Engineering and Construction in Tropical Residual Soils, Honolulu, HI, Jan 1982.
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- 84-2 Bachus, R.C. and Barksdale, R.D., "*Vertical and Lateral Behavior of Model Stone Columns*", Proceedings, International Conference on In-Situ Soil and Rock Reinforcement, Paris, Oct 1984.
- 85-1 Pohland, F.G. and Bachus, R.C., "*Critical Review and Summary of Analytical Methods for the Determination of the Hydraulic Integrity of Synthetic Liners*", Final Report, Cooperative Agreement No. CR810807, U.S. Environmental Protection Agency, Hazardous Waste Research Laboratory, Cincinnati, OH, Apr 1985.
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- 88-2 Mayne, P. and Bachus, R.C., "*Profiling OCR in Clays by Piezocone Soundings*", 1st International Symposium on Penetration Testing (ISOPT1), Mar 1988.
- 88-3 Briaud, J.L. and Bachus, R.C., "*Full Displacement and Driven Pressuremeter Testing of Soils*", Specialty Session, 1st International Symposium on Penetration Testing (ISOPT1), Mar 1988.
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- 89-7 Bachus, R.C., "*Physical and Engineering Properties of Coal Ash*", Design and Construction Applications Using Ash: A Technical Workshop, Atlanta, Georgia, Nov 1989.
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# ATTACHMENT 2

## Proposed Rate Schedule



## GEOSYNTEC CONSULTANTS 2016 RATE SCHEDULE

Staff Professional  
Senior Staff Professional  
Professional  
Project Professional  
Senior Professional  
Principal  
Senior Principal

Engineering Technician I  
Engineering Technician II  
Senior Engineering Technician I  
Senior Engineering Technician II  
Site Manager I  
Site Manager II  
Construction Manager I  
Construction Manager II

Designer  
Senior Drafter/Senior CADD Operator  
Drafter/CADD Operator/Artist  
Project Administrator  
Clerical

Direct Expenses  
Subcontract Services  
Technology/Communications Fee  
Specialized Computer Applications (per hour)  
Personal Automobile (per mile)  
Photocopies (per page)



Rates are provided on a confidential basis and are client and project specific.  
Unless otherwise agreed, rates will be adjusted annually based on a minimum of the Produce Price Index  
for Engineering Services.

Rates for field equipment, health and safety equipment, and graphical supplies presented upon request.

March 13, 2017

Mr. Steve Fields  
Loudon County Solid Waste Disposal Commission  
101 Mulberry Street, Suite 102  
Loudon, TN 37774

Re: Analysis of Santek's Operational Proposal  
Comm. No. 1500.278

Dear Mr. Fields:

We appreciate the opportunity to provide professional consulting services for the review and analysis of the proposal from Santek Environmental in regards to modifying present operating contract for the Matlock Bend Landfill in Loudon, TN. This letter describes the terms to provide services to you, and the expectation regarding compensation of services. Please be assured that we will do our utmost to service you professionally and efficiently. If at any time, you have any questions or concerns, please contact us at once.

## **DESCRIPTION OF SERVICES**

We propose to provide professional services necessary to deliver closure/post-closure costing information to the Loudon County Solid Waste Disposal Commission (LCSWDC) so the proposed contract modification from Santek Environmental can be evaluated and determine if it is agreeable to the satisfaction of the county.

In performing this analysis, MBI will consider the following matters as they relate to the future closure/post closure operation of the landfill:

1. Assess the pertinent items of the proposed modifications to Santek's contract.
2. Review Santek's existing design drawings and calculations for the landfill.
3. Examine the proposed design modifications to the Landfill.
4. Review Santek's existing proposed phased closure plan.
5. Examine LCSWDC's current financial status on elements relating to the closure/post closure funds.
6. Review Santek's closure/post-closure costs estimates.
7. Assess Santek's model to provide funding to LCSWDC to cover closure/post-closure costs.
8. Based on various projected tonnages entering the landfill, provide revenue projections and identify surpluses/deficits as the contract expires.
9. Based on the closure/post closure cost, provided by Santek, provide suggested collection rates to offset financial requirements of the landfill.

MBI will utilize financial spreadsheets to run the various tonnage and life cycle situations and provide suitable financial data and use graphs and charts to better demonstrate the scenarios. All the engineering design, operational expenses, closure and post closure cost will be provided by Santek. MBI will not be developing any cost information only provide engineering and financial assessment of the information provided under various tonnage and term scenarios.

The deliverables will be a report stating the objectives, base information, description and results in summary format. Additional information such as charts and graphs will be provided for clarification and presentation material.

Below is the listed of personnel to be utilized for this job and their anticipated hours:

### **Engineering and Financial Evaluation**

**Chattanooga**  
University Tower  
651 E. Fourth Street, Suite 500  
Chattanooga, TN 37403

**Knoxville**  
299 N. Weisgarber Road  
Knoxville, TN 37919

**Florida**  
100 Colonial Center Parkway, Suite 230  
Lake Mary, FL 32746  
Architecture: AA26000828  
Interiors: IB26000665



<u>PERSONNEL</u>	<u>RATE</u>	<u>Estimated Hours</u>
Administrative Assistant / Accounting		8
Engineering CAD Technician		8
Engineering Technician/Designer		40
Project Manager		40
Principal		20
Senior Principal	5	

The work will be billed on an hourly basis.

**ADDITIONAL SERVICES:** Additional services shall consist of all services not included in the Basic Services as set forth above. No work will be performed beyond the services noted above without an expressed written agreement between Michael Brady Inc., (MBI) and LCSWDC.

Fees for Additional Services shall either be a lump sum quoted in advance of the work performed or the product of the hours worked for the type of services performed multiplied by the hourly rates for the professionals and staff performing the work. These rates are subject to change as we adjust our hourly rates periodically to reflect the advancing experience, capabilities and seniority of our professionals and staff, as well as general economic factors.

Our hourly rates by staff and additional services are attached as Exhibit A.

**MISCELLANEOUS:** This Letter of Engagement, along with the Terms and Conditions of Agreement are part of one and the same document hereinafter referred to as "Agreement" which is a contract. This Agreement constitutes the entire understanding between all parties regarding our engagement for engineering services. This Agreement may not be modified except by a further written agreement signed by each party. If you have any questions concerning the terms of this Agreement, please contact the undersigned. By executing this Agreement, you acknowledge the Terms and Conditions of Agreement as part of this contract, and that you have read carefully and understand all its terms. This Agreement is valid for a period of 60 days from the date of this letter. If not executed within the 60 day period MBI reserves the right to modify the terms and/or rescind this offer.

By utilizing our services, you acknowledge and accept the terms and conditions set forth in this letter. However, we require confirmation of acceptance by executing all copies of this Agreement and returning all documents to Beth Ann Carter, Office Administrator, Michael Brady Inc., 299 N. Weisgarber Road, Knoxville, Tennessee 37919-4013. If you have questions, please contact David Matlock.

Sincerely,  
Michael Brady Inc.



David J. Matlock, P.E.  
Principal

Loudon County Solid Waste Disposal Commission.

\_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(Print Authorized Signature)

\_\_\_\_\_  
(Title of Person Authorized to Sign)

ACCEPTED AND AGREED TO THIS

\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_



## Terms and Conditions of Agreement

Project #: 1700.027

1. **Authorization to Proceed and Standard of Care:** Execution of this agreement by Client will be authorization of Michael Brady Inc., hereinafter referred to as “**MBI**”, to proceed with the work, unless otherwise stated in this agreement. **MBI** shall exercise that degree of care, skill and diligence in rendering all of its services under this Agreement in accordance with that prevailing among a design firm when performing services for projects similar to the Project in the jurisdiction where the project is located (the “Professional Standard”). **MBI** makes no warranty in this Agreement, express or implied, other than to comply with the Professional Standard in providing services Pursuant to this Agreement.
2. **Payment to MBI:** Unless we agree to other arrangements, we will present to you, after the first of each month, a statement for the services rendered and costs incurred during the prior month and/or which remain unpaid. All invoices are due and payable upon receipt. After Forty-Five (45) days, a carrying charge of one percent (1%) per month may be imposed on any unpaid billings. We accept personal checks and credit cards (Visa, MasterCard, Discover or American Express). If full or satisfactory payment is not made within Forty-Five (45) days from the date of the invoice, work on this Project may be stopped at the discretion of **MBI** without penalty from the Owner. If legal action is required in order to collect moneys due to **MBI**, the Client shall be liable for any attorneys’ fees and costs incurred in such action in addition to the fees and termination expenses. Said legal action shall take place in Tennessee – **MBI**’s principle place of business – which shall also determine applicable law. Terms regarding the entitlement success and value added portion of **MBI**’s fee, when applicable, shall survive the termination of this agreement. **All payments shall be sent to: Michael Brady Inc., 299 N. Weisgarber Road, Knoxville, TN 37919. Correspondence concerning any invoice shall be sent to 299 N. Weisgarber Road, Knoxville, TN 37919, or by email to: [accounting@mbiarch.com](mailto:accounting@mbiarch.com) , or by calling 865-584-0999.**
3. **Reimbursable Expenses:** Reimbursable expenses are in addition to compensation for **MBI**’s services and include expenses incurred by **MBI** and **MBI**’s Consultants directly related to the Project, including, but not limited to: (1) transportation in connection with the project, authorized out-of-town travel and subsistence, electronic communications, reproductions, plots, postage, handling, delivery of instruments of service to the extent not included in Basic Services or Letter of Engagement, rendering, models and mock ups requested by the Owner; (2) Client approved project specific insurance or the expense of additional insurance coverage or limits requested by the Client in excess of that normally carried by **MBI** and **MBI**’s Consultants. In addition to the direct costs, twenty percent (20%) will be added for cost of funds, handling and overhead (multiple for reimbursable expenses: 1.2).
4. **MBI Consultants:** For changes in the services and/or additional service of **MBI** Consultants, compensation shall be computed as a multiple of 1.2 times the amounts billed to **MBI** for such services.
5. **Ownership and Reuse of Documents:** Ownership of any documents prepared by us remains with us. By signing this agreement, you also give us authorization to use any rendering, photographs drawing we produce of the project for our marketing under this. The design documents developed under this Agreement (contract documents) are instruments of **MBI**’s services and **MBI** retains an ownership interest in the documents. The contract documents are subject to re-use fees if used for other projects. The re-use of these contract documents for other projects can be negotiated upon written notification from the Client of its re-use intent. Should **MBI** not be retained to provide site adaptation and revision services of the documents for other developments, the Client shall compensate **MBI** for such re-use fees negotiated with **MBI** and will execute in favor of **MBI** a complete release of liability and indemnity agreement for such proposed re-use. Nothing in this provision shall prohibit the Client from using or modifying the design documents as desired for this Project. To the extent **MBI** is not retained in regards to subsequent modifications to the design documents for this Project, Client agrees to hold **MBI** harmless for any damages, direct or indirect, that may arise as a result of subsequent modifications. Any unauthorized use of the documents shall be at the Owner’s sole risk and without liability to **MBI** or its Consultants.  
Prior to the exchange of electronic information between the parties, the Client and **MBI** shall by separate agreement set forth the specific conditions governing the exchange and format of such electronic data, including any special limitations or licenses not otherwise provided in this Agreement.
6. **Suspension of Services:** In the event of a suspension of services caused by the Owner, **MBI** shall have no liability to the Client for delay or damage caused the Client because of such suspension of services. Before resuming services, **MBI** shall be paid all sums due prior to suspension and any expenses incurred in the interruption and resumption of services including entitlement success and value added fees, when applicable. **MBI**’s fees for the remaining services and the time schedules shall be equitably adjusted.
7. **Termination:** You may terminate our services at any time. Subject to fulfilling our contractual and/or professional responsibilities, we reserve the right to withdraw from a project at any time. Notice of termination of services must be in writing and provided to the other party no later than 30 days prior to the termination of services. Additionally, if the Client does not make timely payments to **MBI** or otherwise perform in accordance with this Agreement, such failure shall be considered cause for termination or, at **MBI**’s option, cause for suspension of performance of services under this Agreement. In the event of termination of the Agreement, **MBI** shall be compensated for services performed prior to termination, together with Reimbursable Expenses then due. Terms regarding the entitlement success and value added portion of **MBI**’s fee, when applicable, shall survive the termination of this agreement.
8. **Indemnification:** Both **MBI** and the Client mutually agree to indemnify and hold each other harmless from any damages and losses arising from their own negligent acts, errors, or omissions in their performance of the services under this Agreement, to the extent that each party is responsible for such damages and losses on a comparative basis of fault.
9. **Stepped Dispute Resolution:** In the event of a dispute arising out of or relating to this Agreement or the services to be rendered hereunder, the Client and **MBI** agree to attempt to resolve such disputes in the following manner:  
First, the parties agree to attempt to resolve such disputes through direct negotiations between the appropriate representatives of each party.  
Second, In the event the parties have failed to resolve any dispute arising out of or relating to this Agreement promptly, the parties shall endeavor to settle the dispute by mediation in accordance with the then appropriate prevailing rules and procedures of the American Arbitration Association pertaining to the mediation of business, commercial or construction disputes. The parties by unanimous agreement may choose to adopt rules adopted by the Supreme Court and Legislature of the State of Tennessee. The parties shall share the mediator’s fees and any filing fees equally. Mediation shall be a condition proceeding to any arbitration, legal or equitable proceedings.  
Third, if the dispute or any issues remain unresolved after the above steps, the parties agree to attempt resolution by submitting the matter to a court of competent jurisdiction.  
Should it become necessary for **MBI** to engage legal counsel to enforce any of the provisions of this contract, you agree to reimburse **MBI** for all its reasonable fees, costs and expenses, mediator’s fees, arbitrator’s fees, administrative fees, travel expenses, attorney’s fees and other necessary costs that may be incurred and expended in connection therewith.
10. **Limitation of Liability.** In order for the Client to receive the benefits of a fee which includes a lesser allowance for risk funding, the Client agrees to limit **MBI**’s liability for any cause or combination of causes arising from **MBI**’s or **MBI**’s Consultants’ professional acts, errors or omissions, such that the total aggregate liability of **MBI** shall not exceed five (5) times **MBI**’s fees paid for the services rendered on this project, or \$50,000 whichever is greater, not including reimbursable expenses, **MBI**’s Consultants’ fees or value added and entitlement success fees where applicable. The Client further agrees that no shareholder, officer, director, partner, principal or employee of **MBI** shall be personally liable under any provisions of this agreement for any causes of action arising out of or related to the professional services provided in connection with the Project. The limitations of liabilities contained herein will survive the termination of this agreement.
11. **Waiver of Consequential Damages:** A breach of this agreement may cause both parties to experience damages that are indirectly related to the breach or that were not foreseeable by either party at the time this agreement was entered into. Such damages are called consequential damages and may include, but are not limited to, loss of use and loss of profit. Neither party shall be liable to the other for any consequential damages incurred by either party due to the fault of the other, regardless of the nature of this fault.

- 12. **Governing Law:** This contract shall be interpreted and governed by the laws of the State of Tennessee without giving effect to the principles of Conflicts of Laws.
- 13. **Interpretation, Titles and Severability:** The paragraph titles used in this agreement and within the Terms and Conditions of Agreement are for general reference only and are not part of the Agreement between the parties. As used herein, the term "MBI" includes or refers to Michael Brady Inc., when applicable. The term "MBI Consultant" refers to those consultants that contract directly with MBI. The invalidity or unenforceability of any provision of this Agreement shall not affect the validity or enforceability of any other provision of this Agreement, which shall remain in full force and effect.
- 14. **No Third Party Beneficiaries:** Nothing contained in this Agreement shall create a contractual relationship with or a cause of action in favor of a third party against either the Client or MBI and there are no third party beneficiaries to this Agreement.
- 15. **Accessibility:** The Client acknowledges that the requirements of the Americans with Disabilities Act (ADA), Fair Housing Act (FHA) and other federal, state and local accessibility laws, rules, codes, ordinances and regulations will be subject to various and possibly contradictory interpretations. MBI, therefore, will use its reasonable professional efforts and judgment to interpret applicable accessibility requirements in effect as of the date of the execution of this Agreement to the extent those statutes apply to the Project. MBI, however, cannot and does not warrant or guarantee that the Client's Project will comply with all possible interpretations of the accessibility requirements and/or the requirements of other federal, state and local laws, rules, codes, ordinances and regulations as they apply to the Project, and MBI shall, accordingly, not have any liability to the Client in connection with same.
- 16. **Betterment:** If, due to MBI's omission, a required item or component of the Project is omitted from MBI's construction documents, MBI shall not be responsible for paying the cost required to add such item or component to the extent that such item or component would have been required and included in the original construction documents. In no event will MBI be responsible for any cost or expense that provides betterment or upgrades or enhances the value of the Project.
- 17. **Code Compliance:** MBI shall put forth reasonable professional efforts to comply with applicable laws, codes and regulations in effect as of the date of the execution of this Agreement. Design changes made necessary by newly enacted laws, codes and regulations after this date shall entitle MBI to a reasonable adjustment in the schedule and additional compensation in accordance with the Additional Services provisions of this Agreement.
- 18. **Construction Administration:** If contracted, MBI shall perform Construction Administration as set forth in the basic scope of services or as set forth in additional services agreements. Construction Administration is defined as a process in which MBI 1) becomes generally familiar with and keeps the Client informed about the progress and quality of the portion of construction completed ("work"), 2) endeavors to guard the Client against defects and deficiencies in the work, and 3) determines in general if the work is being performed in a manner indicating that the work, when fully completed, will be in substantial accordance with the Contract Documents. However, MBI shall not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the work. MBI shall not have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work. MBI shall not be responsible for the Contractor's failure to perform the work in accordance with the requirements of the contract documents.

- 19. **Certifications:** Please be aware that if you do not request construction administration services we cannot provide any bank, building code official or other requested certifications regarding the construction. We can only certify our portion of the work unless we are requested by you with specific instruction to observe work designed by others prior to the work beginning.
- 20. **No Assignment:** This agreement and any work to be performed by MBI may not be assigned to any party without the express, written permission of a Vice President, President or Chief Executive Officer of MBI.

Client Name: \_\_\_\_\_

Signature: \_\_\_\_\_

(Client Print Name & Title)

Date: \_\_\_\_\_

Michael Brady Inc.

By: David Matzocci

DAVID MATZOCCI, PRINCIPAL  
(MBI Print Name and Title)

Date: 13-MAR-2017

## 2017 Hourly Rates by Staff Type

### Michael Brady Inc.

- Administrative Assistant / Accounting
- Architect / Engineer – Registered
- Architect / Engineer – Intern
- Architect / Engineer – Registered II
- CAD Technician
- CAD Technician Designer
- Senior Principal
- Principal / Surveyor
- Interior Designer
- Project Manager
- Principal
- Project Manager
- Senior Principal



# David Matlock, PE

PRINCIPAL, CIVIL ENGINEER

## EDUCATION

University of Tennessee,  
Bachelor of Science in Civil  
Engineering, 1985

## REGISTRATION

Professional Engineer: AL, AR,  
KY, LA, SC, TN, TX

David is a Principal and Civil Engineer for Michael Brady Inc. He has a wealth of experience spanning more than 24 years in engineering related projects in government and energy, among other industries. A large portion of his experience includes work performed on projects for the Department of Defense and the Department of Energy. Involvement has been with initial conception through production of construction documents and construction monitoring. Responsibilities have included site layout, roadway design, utility design (water and sewer), hydraulic analysis, grading, drainage, erosion control, hydrology, and preparing specifications.

**Heraeus Metals Expansion** – Wartburg, Tennessee

\* Denotes projects worked on  
independently from MBI

**Lenoir City Utilities Board Administration  
Building** – Lenoir City, TN

**Chase Environmental Office** – Lenoir City, TN

**Emory Valley Center** – Oak Ridge, TN

**Mahle Engine Components** – Morristown, TN

**Yamaha Storage Facility** – Vonore, TN

**Colgate Palmolive Wastewater Treatment  
Facility** – Morristown, TN

**Sanders Medical Building** – Knoxville, TN

**ORNL Tennessee Office Building** - Oak Ridge, TN\*

**Knoxville News Sentinel Site Development** – Knoxville, TN\*

**Department of Energy (DOE), Shaw AREVA MOX Services, LLC Mixed Oxide Fuel  
Fabrication Facility** - Aiken, SC\*

**B&W Pantex Protected Area Chilled Water Loop** - Amarillo, TX\*

**MOTIVA Enterprises, LLC. Nashville Terminal CEP Tank** - Nashville, TN\*

**Alcoa Inc. 300-acre Site Development** - Berkeley County, SC\*

**Mascot Sanitary Sewer Improvements** - Mascot, TN\*

**Trico Steel Company, LLC. 700-acre Greenfield Site Development** - Decatur, AL\*



# Louis Cortina, PE

PRESIDENT, CIVIL ENGINEER

## EDUCATION

University of Tennessee,  
Bachelor of Science in Civil  
Engineering, 1981

University of Tennessee, 30  
semester hours of graduate  
engineering and business  
courses, 1981-1998

Louis is President of Michael Brady Inc. and has been with the company for 21 years. He has over 35 years of experience in government, military, industrial, commercial and institutional projects. Louis also serves as an expert witness and conducts property condition surveys for various types of facilities and sites. He is responsible for all phases of administration and project management along with civil and structural design. Project Management responsibilities include business development, contract negotiations, construction administration, budgets, civil-structural design and quality control.

## REGISTRATION

Registered Professional  
Engineer: CA; LA, NB, WA, AL,  
AZ, AR, CO, CT, FL, GA, ID, IN,  
IA, KY, ME, MD, MA, MI, MN,  
MS, MO, NH, NJ, NM, NY, NC,  
ND, OH, OK, PA, SC, SD, TN,  
TX, UT, VA, WV, WI

**City of Knoxville Compactor #1 and #2 Replacement** – Knoxville

**Upgrades to City of Knoxville Solid Waste Facility** – Knoxville  
*Canopies, Water Quality Unit, and Storm Drainage Improvements*

**Anderson County Solid Waste Facility** – Clinton

**30-acre Isaiah's Landing Commercial Retail Site** – Knoxville

*Mass grading, cut & fill calculations, storm sewer, erosion control, landscaping, estimating, construction administration*

**32-acre Merchants Road Retail Site** – Knoxville

*Mass grading, cut & fill calculations, balancing earthwork, storm, water quality permitting, estimating, design, and construction administration*

**South Ponte Industrial Park(s)** – Virginia, Alabama, North Carolina

*100 plus acres industrial sites. Mass grading, cut & fill balance, erosion control, water quality permitting, storm drainage, landscaping, design, estimating, and construction administration*

## PROFESSIONAL AFFILIATIONS

American Institute of Steel  
American Society of Civil  
Engineers

Steel Framing Alliance

National Council of Structural  
Engineers Association (NCSEA)

ISA Mechanical and Structural  
Committee



# Alicia McAuley

SENIOR PROJECT COORDINATOR | MBI

## EDUCATION

East Tennessee State University, Bachelor of Science in Industrial Engineering Technology, 2006

## CERTIFICATIONS

TDEC Level I & II

Alicia is a senior civil engineering project coordinator for MBI and has a broad range of responsibilities including site development, permitting documents, civil design plans, site layouts, stormwater and water quality design calculations, submittal documents, and as-builts. Since joining MBI in 2007, she has coordinated projects with a variety of firms, organizations, and institutions, including the Tennessee Department of Environment and Conservation, TVA, Corps of Engineers, Tennessee Department of Transportation and numerous local jurisdictions. As Project Coordinator, Alicia's duties include: prepare civil engineering proposals and contracts; perform due diligence research; develop preliminary site design layouts; assemble permitting documentation; coordinate with state and local review agencies; compile stormwater and water quality design calculations for engineers' review; submit site related design plans and calculations for state and local approval; process review comments and final permit release for start of construction; provide general construction administration; coordinate easement documentation, plat submittals, covenant documents, and bond forms; complete as-built design calculations and submittals for approval through local jurisdictions and finalize project completion and closeout documents.

**Anderson County Solid Waste Convenience Center** – Clinton, TN

**Heraeus Metal Processing Expansion** – Wartburg

**Lenoir City Utilities Board Headquarters & Event Center** – Lenoir City

**Diocese of Knoxville Waterline Extension** – Knoxville

**Center for Advanced Manufacturing & Business Innovation** – McMinn County

**Anderson County Jail Expansion** – Clinton

**Campbell County Justice Center** – Campbell County

**I-75 Commerce Park** – Knox County

**Sale Creek Fire Station** – Hamilton County

**University of Tennessee Electrical Distribution System Upgrade** – Knoxville

**Mahle Engine Components** – Morristown

**Yamaha Storage Facility** – Vonore

**Colgate Palmolive Wastewater Treatment Facility** – Morristown

**Sanders Medical Building** – Knoxville

**AES Seal** – Rockford

## Transforming Landfills Into Resources

Posted By [David C. Richardson](#) On February 15, 2017 @ 3:15 pm In [Supplement](#) | [No Comments](#)

A landfill can be like a baby: It is helpless to care for itself; while it's growing, it eats all day; at night when resting, it must be protected from the elements; and it belches constantly. If you're lucky, it won't stir up much fuss. If you're not lucky, the neighbors can become quite annoyed.

Landfills can grow to tremendous size; Puente Hills landfill (now retired) outside Los Angeles—once the largest landfill in the US—grew in 60 years to a 500-foot-tall mountain of trash on a 1,300-acre site. Sadly, for every landfill, the day also comes when it too must be retired and put to rest permanently. While it may sound a little strange, in its afterlife, a landfill can become an even more complex creature than during its heyday. It continues to belch; it continues to require protection from the elements such as rain, wind, and foraging creatures; and the environment around it must be shielded from effluents leaching out from below. Ultimately, a retired landfill will require ongoing care for up to 100 years or more.

A former landfill can be a nuisance or a treasure. It can reflect a troubled past or help light the way to a brilliant future. The difference between a pleasant productive life and afterlife, and a problem child with an unpleasant legacy can lie on the fabric of the thinnest of films.

FREE Infographic on Landfill Management: 6 Tips for Excellence in Landfill Operations. [Covering publicity, education, engineering, long-term planning, and landfill gas waste-to-energy](#) <sup>[1]</sup>. Download it now!

### Garbage and Resources at River Birch

The goal of landfill operations is to make sure that what goes into a landfill stays in the landfill. However, innovative landfill operators have begun to realize there are two kinds of things in a landfill: garbage and resources. The objective is to control the former and to access, manage, and in some cases, profitably harvest the latter. The challenge is to do so at a reasonable cost with minimal disturbance to neighbors and the surrounding environment. Vic Culpepper sought to achieve such results in harvesting the landfill-generated gas at the River Birch landfill just outside of New Orleans, LA.

Federal regulations for landfills under Subtitle D require that waste in a landfill be covered at the end of each day. Protecting the landfill every evening from precipitation, controlling gases produced by decaying organics, and discouraging foraging by fauna including troublesome birds and vermin are major responsibilities for landfill operators. According to Culpepper, technical director of River Birch landfill, one of the most labor-intensive and costly tasks in landfill management is making sure the garbage gets tucked in safely every evening.

Add [MSW Management Weekly](#) <sup>[2]</sup> to your Newsletter Preferences and keep up with the latest articles on municipal solid waste management: landfill disposal, recycling, waste collection, waste collection containers and vehicles, waste to energy, and waste vehicle safety.

Initially, says Culpepper, daily cover operations at River Birch landfill followed EPA's guideline of applying 6 inches of soil over the entire working surface of the active face at the close of each operational day.

But there were problems with this approach for River Birch, he says. "It was extremely difficult for us, especially with the type of clay in our area. A lot of times you had to apply more than six inches—more like a foot—to get adequate cover." Culpepper also tried using a spray-applied cover material, which, he notes, "worked moderately well, but was expensive and difficult to put down to ensure adequate cover."

River Birch's operators continued looking at different options to fulfill the mandated daily cover requirement. In the search, says Culpepper, the important criteria for selecting a daily cover system for included cost efficiency and simply "how well it covers." In addition, he says, it was important to find a technology that would conserve airspace to maximize the volume of permitted space available for trash. He wanted a thin material to avoid sacrificing 6 inches to a foot of airspace just to deploy cover material every evening.

The operators of River Birch landfill had built up a revenue stream harvesting methane gas, generated by decaying garbage, and selling it on the fuel market. Therefore, says Culpepper, the landfill would require a daily cover method that would facilitate the "trash-to-trash contact" needed to support the biological breakdown processes responsible for generating the raw landfill gas resource.

Culpepper opted for EPI Environmental Products' Enviro Cover System. The system consists of the Enviro Cover—a nonreusable polyethylene film developed to meet requirements for alternative daily covers—along with the Enviro Cover Deployer, a versatile and efficient applicator for placement of the cover. A third element is the method of application, which provides ballast and seal at panel overlaps to create a continuous impermeable barrier between the waste and the surrounding environment.

Culpepper explains that the Enviro Cover System is simple to deploy using the Enviro Cover Deployer, which spools the cellophane-like cover over the treatment area in continuous sheets. As it proceeds over the treatment area, the vehicular-mounted system lays down an anchoring ballast of sand or soil along the overlapped edges of each sheet, significantly reducing the time it takes to complete daily coverage of the landfill's working surface compared to traditional daily covers.

"Where it used to take three-and-a-half hours to cover the area with clay and about three hours to cover with the spray-applied cover, it takes about an hour with the Enviro Cover System—with only one person and one machine," he notes.



[3]

Credit: EPI Environmental Products



[4]

Credit: EPI Environmental Products

In contrast, he says, using a clay cover, "you'd have to have dump trucks and bulldozers and all the people to drive them."

Culpepper describes the streamlined workflow: toward the end of the workday, as crews begin laying down the Enviro Cover, they leave a small portion of the landfill open for late-arriving loads. "Then, once you're closed, go ahead and close that area out as well."

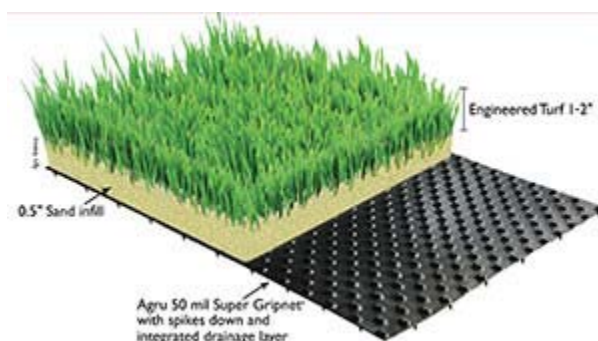
Considering the random constituents of trash, Culpepper says that sharp-edged objects might occasionally punch through the thin-ply Enviro Cover, but that, nonetheless, no surface preparation is needed before applying the cover.

Occasional punctures, he says, are "not an issue. Overall, the amount of complete coverage you get and the shedding of rain from your garbage minimizing your leachate intrusion is still greater, we think, than most other technologies."

Along with ease of application, Culpepper says the advantages to using an alternative daily cover, such as Enviro Cover, includes its more predictable material cost control and reduced labor costs compared to soil covers. It also enables quick and dirty trash-to-trash contact when the next day's load comes in.

"All we have to do is drive on top of it the next day and shred it under the truck tires, so we get garbage-to-garbage contact" with trash arriving on subsequent days, says Culpepper.

Culpepper says the smooth learning curve for the crews operating the Enviro Cover System makes the solution very accessible. "You can get a good operator performing this with a week or less of training."



[5]

Credit: Agru America

Deploying innovative operational controls, including "a good gas collection system to pull the gas out of the landfill, good intermediate cover" for dormant sections of the landfill, and the Enviro Cover as an alternative daily cover for the active faces, has helped control odors and maintain River Birch's standing as a good neighbor, says Culpepper. "I don't know why more landfills don't use it," he adds.

### Shining the Light on a Retired Landfill

It is not often that people talk about the convenience of living close to a landfill, but one of the prime functions of any municipality is sanitation, and having some sort of waste disposal facility within convenient reach of homes, businesses, and institutions is part of what makes life in urban districts viable. The Hartford, CT, landfill wasn't just convenient to neighboring homes and businesses—it was actually within the city of Hartford.

The landfill began accepting trash as far back as 1940. Initially, trash delivered to the site was burned in the open. Incinerators were later constructed, but residents complained about the soot and ash, prompting an end to incineration and implementation of an urban landfill that, by the turn of the century, had approached its full capacity. With expansion of the site under consideration, the neighboring communities voiced their objections, and in 2008, the landfill received its final delivery. Changing times have brought new technologies since then, and

today, the former Hartford landfill has worked its way into a secure future delivering clean energy, with a major helping hand from erosion control technology.

Of the 96-acre Hartford landfill site, 66 acres were capped in the traditional manner. According to Chris Eichelberger, vice president of technical marketing for Agru America, this traditional Subtitle D landfill capping method uses a 40-mil geomembrane with a geosynthetic drainage layer.

"Typically, two to three feet of soil is placed above that, with vegetation such as grass planted on top of that," says Eichelberger.

It sounds simple, but he notes, "If you are the owner of a landfill and don't have the volume of soil onsite to build up the erosion protective layer, there can be a big logistic and financial challenge of finding that soil and trucking it in."

In addition, he says, owners face the challenge of not only constructing the slopes from the imported soil, but also planting them with sufficient vegetation to prevent erosion and financially addressing the challenge of ongoing maintenance to those plantings—a responsibility that could trail off into the next century. Such maintenance issues can include providing irrigation, applying fertilizers, and mowing, which can itself be a daunting task on landfill slopes often engineered to a 3:1 ratio.

Agru America's Closure Turf can provide an alternative to these obligations. Eichelberger says the technology was developed by a group of civil engineers with a background in solid waste management to address some of the tough issues in landfill closure and post-closure activities.

The technology utilizes Agru America's geomembrane product with an engineered synthetic turf from Watershed Geosynthetics on top to form the patented system called Closure Turf. The company now has 30 million square feet of Closure Turf installed at more than 25 project sites. Eichelberger says landfill facilities that employ Closure Turf can expect a 90% reduction in post-closure care and maintenance needs.

### **Making Lemonade From Lemon Peels**

In 2008, after close to 70 years of receiving trash from 70 municipalities in Connecticut, Hartford landfill shut its gates to dumping operations for good. David Bodendorf—senior environmental engineer for the Materials Innovation and Recycling Authority (MIRA), the agency that took responsibility for the closed landfill—says installation of the final landfill cap over the entire 96 acres of the working face and slopes was planned and organized around a phased timetable.

"It was a matter of logistics," he says. "The north and west faces were closer to neighbors, so we wanted to cap them first."

The south side of the site, fronting the Connecticut River and inaccessible to the public, had a lesser impact on neighboring communities and was scheduled for capping in the later stages of closure. By 2013, with the north and west faces capped and three-quarters of the working surface permanently closed in the traditional manner, what remained was a 35-acre lemon on the south side of the landfill. Bodendorf says MIRA got a brilliant idea: What could be better for a lemon than sunshine? As an alternative to the customary fate of retired landfills as fallow land, the final 35-acre capping and closure installation would embrace the power of the sun and come into a new life as a solar photovoltaic (PV) energy-generation facility.

Noting advances in solar technology and the availability of government incentives for clean energy initiatives, says Bodendorf, "We saw the possibility of doing something other than the traditional capping and closure."

In 2013, MIRA began accepting bids for an alternative landfill capping technology appropriate for housing a 6-acre, 1-MW solar generation facility. "We wanted to look at more than one technology so prices would come in as competitively as possible," says Bodendorf.

MIRA "was aware of at least two capping technologies" that could render the site suitable for use as a solar power plant. As they had anticipated, two firms responded, offering differing solutions.

One bidder envisioned a thermoplastic olefin (TPO) exposed membrane deployed over the final 35-acre parcel of the landfill. The proposal specified anchor trenches to hold the membrane in place on the face and slopes. The design envisioned chemically welding a thin-film PV solar material on top of this capping installation as the solar collector.

The competing proposal hinged on the application of the Closure Turf system, a permeable synthetic turf carpet placed over Agru America's Super Gripnet geomembrane to serve as a platform for an array of ballasted trestle-mounted solar panels.

The Closure Turf synthetic turf protects the underlying geomembrane from ultraviolet (UV) and puncture degradation and allows stormwater to infiltrate through the woven geotextile to either a swale, or drainage downchute, or sub-drain piping. A half-inch nominal thickness of sand spread over and between the tufts of synthetic turf strands adds holding power through the force of gravity while protecting the synthetic turf carpet from UV degradation and puncture damage from above.

Comparing the two technologies, says Bodendorf, he imagined a worst-case scenario in which a final cover material might be degraded. "What if the turf carpet was degraded by the sun and starts blowing away in 10 years—what do we do?"

He could see some potential shortcomings in using a TPO exposed membrane as a final landfill cap. "It's a smooth-faced product."

Lacking the textured facing of Agru America's Super Gripnet to provide the friction to hold a layer of soil on its top, the TPO would not have frictional characteristics to allow the application of a remedial soil cover on a side slope to fix things, feared Bodendorf. "If you did see it start to degrade, and you said, 'Oh, my god, we've got to cover this up with something,' you couldn't just throw soil on top of it and walk away," he says.

Envisioning this same worst-case outcome, Bodendorf believed the Closure Turf solution would fare much better if the top layer were somehow to degrade. "We'd be left with the Super Gripnet polyethylene that is chemically the same as what we've already got on the site. In the worst case, we'll just put a bunch of dirt over the site, then we'd have a cap that's a normal membrane cap."

### **Sweeping Erosion Away**

To achieve installation, after the initial grading to meet subgrade, sand was placed as a cushion layer also serving as a gas vent layer on top of the subgrade. Installers pulled the Super Gripnet out at a rate of about an acre and a half per day "when the weather cooperated," says Bodendorf. Immediately over the Super Gripnet, they deployed the synthetic turf product. As soon as practical after that, they placed the sand infill by broadcast spreading, booming, and high-speed conveyor to spread the sand up the slopes.

"It's amazing how easily the Closure Turf can be slid over the membrane, but once it is in place with the sand infill down, it doesn't slide any further down the hill. When you're walking on it, it doesn't feel like it's sliding down the hill; you can even drive on it," says Bodendorf.

At the edges, the geomembrane was welded to the adjacent previously installed membrane, to interface with the existing linear low-density polyethylene product called MicroSpike that had been installed on other sections of the landfill. Clean stone filling in the grade between the depth of soil on the old cap and the synthetic turf anchors ties in the new Closure Turf installation to the existing sections of capping.

Although Bodendorf says it took "some effort with broadcast spreaders and high-speed conveyors to cast the sand onto the steeper slopes" and some manpower using brooms to get the sand between the tufts of synthetic grass, the installation went off without a hitch, sidestepping the problems that can arise using traditional capping techniques. "We used traditional caps on 66 acres, and ultimately, it worked out fine, but in each of the preceding phases, we did have times when it rained pretty heavily before the grass started growing, and the contractor lost a lot of soil. When they lose soil, they are losing time and money; the relationship gets strained because they are not as profitable as they would have been if the weather had cooperated. With Closure Turf you take that risk away, or at least minimize it."

With soil requirements for a traditional cap ranging 18–24 inches, "you might require 100,000 cubic yards of soil cover," says Bodendorf. "But the half-inch-thick layer of sand over the 35 acres translates into a couple of thousand cubic yards of material, so it's only 2% of the material that would have to be employed with a traditional cap."

He adds, "With Closure Turf, once you've got your membrane layer installed, the risk of erosion is really eliminated compared to the traditional cap."

Although he concedes he didn't run a cost comparison between the Closure Turf system and a traditional cap, Bodendorf notes, "With a traditional cap, so much of the cost of the project is wrapped up in the procurement and placement of the soil. In some cases, there may not be a nearby low-cost source of soil."

With the alternative membrane cap there is less budgetary uncertainty. "You know about how much the membrane will cost; you know what it will take to install it—how much manpower and about how long it will take," he says. "It's probably pretty easy to price for a contractor, but soil can be a lot harder to price."

With the capping installation complete, MIRA installed the solar panels, and the former Hartford landfill now sells enough power to the grid to electrify 1,000 homes. MIRA is also in the process of establishing a connection to provide power for a Hartford Public Works facility. Bodendorf says the solar array sitting on top of the cap "certainly doesn't hurt" the cap's functionality, adding that, because the turf surrounding the panels is synthetic.

"We don't have to worry about overgrown vegetation ever shading the panels."

He says the Closure Turf blends aesthetically with the rest of the restored site, consisting of meadows with "diverse populations of birds, deer, and nesting bald eagles nearby."

In addition to winning a Solid Waste Association of North America (SWANA) Excellence award, the project has gotten great response from the community, and MIRA has led more than a dozen delegations onsite tours.

Bodendorf notes, "People have known the area in the past as a source of odors and nuisance birds, but now they

are impressed when they ride to the top of the slope and see the skyline and the turf and the solar installation.  
We're convinced we made the right decision." **MSW**

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Article printed from Forester Network: <http://foresternetwork.com>

URL to article: <http://foresternetwork.com/msw-management-magazine/supplement/transforming-landfills-into-resources-3/>

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[1] Covering publicity, education, engineering, long-term planning, and landfill gas waste-to-energy:  
<http://foresternetwork.com/free-reports/landfill-management-6-tips-for-excellence-in-landfill-operations/>

[2] *MSW Management Weekly*: <http://foresternetwork.com/account/>

[3] Image: <http://foresternetwork.com/wp-content/uploads/ms-37-1.jpg>

[4] Image: <http://foresternetwork.com/wp-content/uploads/ms-37-2.jpg>

[5] Image: [http://foresternetwork.com/wp-content/uploads/ms1703\\_381.jpg](http://foresternetwork.com/wp-content/uploads/ms1703_381.jpg)

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On August 29, 2016, USEPA updated regulations concerning design, operations, and monitoring requirements for landfill gas (LFG) systems at municipal solid waste (MSW) landfills. The updated regulations are contained in the New Source Performance Standards (NSPS) Subpart XXX of 40 CFR Part 60 and pertains to LFG systems at new MSW landfills and landfills for which construction, reconstruction, or modification commenced after July 17, 2014. Subpart Cf of 40 CFR Part 60 pertains to LFG systems that were constructed or modified prior to July 17, 2014; Subpart Cf will essentially replace Subpart WWW. Modification here is "an increase in the permitted volume design capacity of the landfill by either lateral or vertical expansion."

A landfill that is currently subject to NSPS WWW and has not permitted a new vertical or horizontal expansion after July 17, 2014, is not yet subject to NSPS XXX. Keep in mind that operational or structural changes made to comply with NSPS WWW are not considered to be construction, reconstruction, or modification. The effective date of Subpart XXX was October 28, 2016. Subpart Cf will be implemented by delegated states through implementation plans. States have nine months to prepare the plan, and EPA has four months to review the plan.

FREE Infographic on Landfill Management: 6 Tips for Excellence in Landfill Operations. [Covering publicity, education, engineering, long-term planning, and landfill gas waste-to-energy](#) <sup>[1]</sup>. Download it now!

Methane is the second most prevalent greenhouse gas emitted by human activities in the United States, and nearly 20% of those emissions come from landfills. EPA estimates that more than 1,000 active landfills will be subject to the new guidelines. Through the new emission and NSPS guidelines, EPA concluded that a well-designed and well-operated LFG collection and control system is the best way for controlling LFG emissions.

The newly promulgated Subparts Cf and XXX made changes in four areas of compliance. The most noticeable change is the decrease in the non-methane organic compounds (NMOC) threshold at which the installation of a gas collection and control system (GCCS) is required. The previous threshold of 50 Mg per year NMOC has been reduced to 34 Mg per year. This could potentially mean many more landfills will be required to install a GCCS where they previously would not have been. Along with this change in the NMOC threshold there is now a Tier 4 procedure that can be utilized to determine if a GCCS must be installed.

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The second area that the new regulations have changed concerns the monthly wellfield monitoring. The well compliance parameters have been modified so that now only deviations from the temperature and pressure standards could be considered an exceedance. The wellfield operation must still monitor oxygen; however, there is no longer a compliance limit. Actions taken in response to an exceedance are still similar; but, if the exceedance cannot be resolved within 15 days, a root cause analysis must be conducted, and the issue resolved within 60 days. If this isn't possible, then a corrective action analysis and implementation schedule must be developed and submitted within 75 days to have the exceedance corrected within 120 days.



[2]

Credit: Golder Associates  
An LFG well



[4]

Credit: Photo Courtesy of GSE

The third change involves how various permit required documentation is submitted to EPA. Some testing reports and leachate circulation reports, for instance, will need to be submitted through EPA's CEDRI/CDX online website. Also, GCCS design plans must be updated and submitted to the regulatory agency within 90 days of expanding to an area not previously covered by the design plan or when installing a portion of the system not consistent with a previous design plan.

The fourth area of change is the one we are interested in exploring further in this article. The new regulations require affected facilities to monitor all penetrations of the landfill cover, including intermediate soil cover areas, during the quarterly surface scan. There is also a new requirement to note the latitude and longitude of each exceedance with an accuracy of 4 meters and out to five decimal places.

Outlined below are issues and potential mitigation efforts

monitoring and reporting exceedances at landfill cover systems surface penetrations. Cover penetrations such as LFG wells, LFG vacuum risers, condensate sumps, air/force main isolations loops, etc., require monitoring, and could lead to an increase of exceedances. (Items such as survey stakes, fencing or litter fencing, flags, signs, trees, and utility poles do not require monitoring.)

While cover penetration monitoring is specifically identified in Subpart XXX, we believe EPA's intent is to require penetration monitoring of LFG systems at landfills regulated under Subpart WWW. Therefore, exceedances, both in general cover and at penetrations, should be included in semi-annual compliance reports for all landfills with regulated LFG systems.

The addition of penetration monitoring to compliance reports may significantly increase environmental liability exposure to landfill operators unless proper planning and installation of appropriate controls are implemented. Any site may have a limited number of exceedances during routine cover surface emission monitoring, the number of exceedances may increase significantly during monitoring of surface penetrations—especially in landfill areas with intermediate cover.

Exceedances may be affected by construction practices (e.g., backfill methods and soil types used during LFG construction activities; LFG well tuning (e.g., reduction of LFG well vacuum to limit oxygen intrusion); and climactic conditions (e.g., desiccation cracking of clay soils during dry periods).

To limit penetration exceedances in areas where a gas collection is required to be in place, changes to standard LFG construction procedures may be required. For example, backfill around penetrations may require placement and compaction in moisture-conditioned lifts, as opposed to conventional dozer pushing and tracking. Emphasis on compaction of soils around penetrations (e.g., hand compaction with tampers) or installation of impermeable seals at the penetration (e.g., bentonite seals) may be required to control exceedances. Other methods to reduce exceedances include installation of additional soil cover at the penetration. If clay soils are present at the penetrations, hydration of the soils tends to seal cracks and limit exceedances.

While relatively passive improvements may work in the short-term, climatic conditions could adversely impact the effectiveness of these measures. As indicated above, weather conditions may cause these impenetrable seals to crack, potentially negating their intended performance and requiring the landfill operator to periodically monitor the integrity of these types of remedies.

A more effective and long-term method of controlling penetration exceedances is the installation of pipe boots and skirts. Boot/skirt installations can be implemented using a combination of prefabricated and field fabricated boot/skirts.

For a typical LFG well/vacuum riser pipe, oversized skirts can be fabricated with boots for both the LFG well, and the LFG well vacuum source (riser). The distance between the boots can be established so that excess skirts can be folded accordion style, with the boots being pulled over existing LFG wells and vacuum pipes.

Afterwards, clamps can be installed at each pipe/pipe-boot location, and the skirt covered with soil to hold it in place. LLDPE geomembrane, as typically used in final cover system construction, is an appropriate material for skirts due to its relative flexibility. Skirt materials will need be of suitable thickness to avoid damage due to underlying materials or placement of cover soils over the skirt. These skirts may be temporarily removed and reinstalled when LFG gas wells are raised as required by additional waste placement in an area.

Field fabricated boot/skirts can also be installed at condensate sumps, air/force main isolation loops, valves, LFG wells with couplings, etc. Coordinating prefabricated boot/skirt installation such that a sufficient quantity of these can be installed at one time, should lessen the impact of equipment rentals and/or mobilization costs associated with use of subcontractors.

In addition to reducing exceedances at the penetration, boots/skirts inhibit oxygen intrusion allowing the vacuum within the LFG system to be increased. Increasing the vacuum, the volume of LFG available for beneficial use is increased, gas emissions through the cover are decreased, and odor issues likely decrease. Other considerations could be to redesign gas extraction well systems that minimize the actual number of surface penetrations. Some potential considerations may be for the designer to develop a manifold system of subsurface extraction wells that break the surface or cap through one oversized penetration. Of course, in designing this type of system, the operator has to weigh the added maintenance costs against the monitoring effort using the older designs.

The addition of cover penetrations to monitoring requirements by USEPA can pose significant compliance issues for landfill operators. Landfill operators need to become more creative with their designs and consider compliance



[5]

Credit: Golder Associates  
Gas plant



impacts resulting from surface penetration monitoring. Thinking outside the box can minimize exposure and provide appropriate controls. **MSW**

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## Structural Integrity That Lasts

Posted By [Don Talend](#) On February 15, 2017 @ 3:14 pm In [Supplement](#) | [No Comments](#)

Capping and closing a municipal solid waste (MSW) landfill can be a civil engineering challenge. The goal is to eliminate any need for further erosion control work onsite to ensure that the landfill keeps its structural integrity. True, landfill owners are required to adhere to EPA's post-closure rules as defined by Subtitle D of the Resource Conservation and Recovery Act, which include maintenance of the leachate collection system, groundwater monitoring system, methane gas monitoring system—and, germane to erosion control activities, the final cover system. But having more structural work done after a landfill has been capped and closed can be costly and can damage the owner's reputation.

This article includes an example of a project in which a landfill was capped to prevent outflow of leachate and sediment to groundwater sources. It also includes an example of a capacity improvement project, i.e., expansion of an existing landfill. Finally, it includes a section on designing and constructing the drainage system, which is a critical aspect of capped landfill design.

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### Protecting Groundwater in Florida

One of the biggest concerns with closing and capping landfills is keeping stormwater runoff from commingling with leachate within the landfill and contaminating nearby groundwater. In some cases, previously capped landfills need remediation to ensure that this problem does not continue to occur.

The 25-acre Saufley Field construction and demolition (C&D) landfill in Pensacola, FL, is one such case. The site was abandoned by its previous owner in 2008. Prior to the abandonment of the facility, the Florida Department of Environmental Protection (FDEP) documented numerous compliance issues since the site was permitted in 1990. The most severe noncompliance issues included operation of the facility at elevations approximately 40 feet higher than the permitted design height and the presence of hydrogen sulfide emissions. In fact, the air pollution associated with the operations of the facility became so extreme in 2007 that the Florida Department of Health issued a report declaring a public health warning with regard to elevated levels of hydrogen sulfide around the facility that were affecting the local community.



[2]

The 25-acre Saufley Field C&D landfill was capped using a "soilless" system.

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Additionally, the stormwater management design of the facility allowed both sediment and leachate to be released offsite, discharging into neighboring stormwater systems maintained and operated by Escambia County. Last but not least, groundwater contamination was recorded with elevated levels of aluminum, arsenic, and manganese, which also resulted in significant fines and violations.

FDEP and Escambia County leadership quickly realized that while this site remained open, it posed a threat to the environment and the health of the citizens surrounding the facility. The only answer to the problem was to close the facility, which in itself posed several significant challenges. Funds were not available to construct a closure, and the closure plan would involve significant site improvements to address the noncompliance issues. After evaluating other traditional soil cover systems in 2012, both FDEP and Escambia County selected the ClosureTurf system based on several criteria.

The system was determined to be the most economical approach to performing a closure. The "soilless" technology reduced the need for natural resources, i.e., soil for constructing the system. It would offer superior protection against erosion along slopes and in down chutes and perimeter conveyance channels. The system promised to reduce infiltration of stormwater into the waste, minimizing impacts to groundwater quality. The remediated site would also have enhanced emission control. And the system would reduce sediment loadings of stormwater runoff to the surrounding watershed.

ClosureTurf is a patented three-component system consisting of Agru America Super Gripnet geomembrane, an engineered synthetic turf layer, and a specified infill, usually ASTM C-33 sand or Hydrobinder, a cementitiously bound infill for concentrated hydraulic flow areas. The impermeable, highly transmissive structured Super Gripnet geomembrane reportedly provides the highest interface friction values on the market. The engineered synthetic turf—consisting of ultraviolet-resistant, HDPE grass fibers—is designed to provide the natural look and feel of grass, while protecting the geomembrane from extreme weather conditions and trafficking stresses over the long-term. The specified infill component is placed between the blades of the engineered synthetic turf and allows the system to sustain vehicle loading while also providing additional protection from weathering.

During construction, advantages included a reduced need for soil because the system uses a tufted geosynthetic erosion layer, i.e., engineered synthetic turf, and typically installs at least 40% faster than traditional vegetative cover systems. Over the long-term post-closure period and beyond, surface water rapidly drains off and is not restricted by the hydraulic conductivity of the cover drainage system, reducing cap infiltration and minimizing the impermeable layer hydraulic head and subsequent waste infiltration. The system is designed to be a virtually maintenance-free cover system, and its dust-inhibitive design eliminates the need for watering. Finally, the system is engineered with increased geotechnical factors of safety so it provides increased protection from sloughing and veneer failures.

The geosynthetic erosion layer concept used on the project yielded significant savings by eliminating the need for large amounts of soil that otherwise would be used to cover the geomembrane. The design also promises stability and resilience during severe weather events. The ClosureTurf maintained the landfill's structural integrity during a historic flash flood event in April 2014. The system performed despite rainfall levels of 5.68 inches in a single hour and between 22 to 26 inches of rain over a 24-hour period. According to the National Oceanic and Atmospheric Administration (NOAA), it was the highest calendar day total dating to 1879. The NOAA HDSC Precipitation Frequency Map indicates that it was a 1-in-200-year to 1-in-500-year single hourly amount, and the 24-hour rainfall total was a 1-in-50-, to 1-in-100-year event.

The system is also designed for functional longevity and significantly low long-term care costs. Most importantly, the system is expected to virtually eliminate any stormwater infiltration into the C&D landfill and resulting leachate outflows.



[4]

View of relatively clean stormwater runoff in a sediment pond at the Saufley Field landfill

#### **Supporting the Capacity Improvement Segment**

A segment of the landfill construction market for which soil stability is critical is capacity improvement, or expansion. John Bolton, business director for Tensar Engineered Structures, says this segment is growing as landfill airspace is increasingly at a premium, which drives tipping fees higher. Permitting new cells can be challenging because protecting groundwater is so important and applicable regulations are very tight and well defined, he adds. This is why so many landfill owners seek to maximize the capacity of an existing landfill within its permitted footprint.

An additional factor driving expansion issues now, says Bolton, is the fact that some municipal landfills are taking coal ash, which is taking up more capacity. Ash used to be stored onsite at coal plants, but large energy producers that operate older coal-fired power plants are under new regulations to dispose of that byproduct in a different way to protect groundwater.

"They're having to find new ways to dispose of their coal ash, and landfill disposal is one alternative," says Bolton. "It's a new wastestream that did not traditionally go into landfills; their capacity is being taken up by new waste that didn't exist for landfills before."

Tensar developed its ADD3 Capacity Improvement Systems to provide lateral and vertical stabilization to perimeter structures of landfills that increase their capacity. "The overall objective of the stabilization of any cell is to protect the lining system," says Bolton. "We design these structures with geosynthetic materials—primarily geogrids—and the system is designed to support the landfill cell so that the integrity of the liner is not compromised."

The ADD3 system consists of four components, explains Bolton. First is the conceptual scoping out of the project. Tensar evaluates several aspects of the project, such as property lines, cell dimensions, and topography.

The second component is the design. Tensar looks at factors such as the loading conditions, the height of the landfill, and the strength of the subsurface strata beneath the landfill to develop design that meets the given design criteria.

The third part is the materials that go into the structure: primary HDPE geogrid, erosion control products, and welded wire forms or concrete block at the face of the mechanically stabilized earth (MSE) structure. These

structures reconfigure the outboard slopes of perimeter berms to maximize the inboard airspace of the landfill cells.

And, the fourth component is onsite assistance that Tensar provides the contractor during construction. Tensar representatives attend preconstruction meetings and make site visits to ensure that contractors install the ADD3 structures as efficiently as possible and to clarify any issues relating to the site plan.

Bolton reports that, as capacity improvement becomes more common, many landfill owners are open to the concept but need help from a third party to design an expanded structure that maintains structural integrity. "Landfill owners attempt to maximize what they get out of each cell and to go steeper or near-vertical with perimeter structures," he notes. "Key drivers include the challenge of permitting a new cell, coupled with the difficulty of maximizing the airspace out of a given permitted landfill footprint. In places where you see the end coming soon for the cell and tipping fees are higher, you're going to think of new ways to get more out of what you have."

### **Pennsylvania Landfill Expanded Ahead of Schedule**

An ADD3 system MSE berm was used to increase the capacity of Cumberland County, PA's MSW landfill back in 2008. Plans to expand the landfill were submitted by the owner-operator, Interstate Waste Services, in August 2005 and by the Pennsylvania Department of Environmental Protection in December 2007. Hershey, PA-based environmental and geotechnical engineers ARM Group Inc., with assistance from Tensar International, developed the project design, as well as all permit and construction documents.

The design included a vertical expansion area over an existing landfill area and a lateral expansion area. ARM Group designed an MSE berm to optimize the volume and permitted the rechanneling of two streams to make the project feasible. The engineer had previously specified an MSE berm for a Chester County, PA, landfill expansion in 2004–2005.

The project was submitted for bid in January 2008 and awarded to Pavex Inc. of Camp Hill, PA. Pavex provided all earthwork services within the berm footprint. Elverson, PA-based Pickering Valley Landscape Inc. was subcontracted to install the Tensar products. The project was the second MSE berm installation for Miguel Servin, a project foreman for Pickering Valley who had also worked on the Chester County facility. Servin and a crew of nine built two MSE berms on the Cumberland County site, steepening the existing slopes with welded wire forms, reinforcing them with Tensar geogrids, and topping them with erosion control mats from North American Green, a sister company to Tensar.

The crew installed nearly 46,500 square yards of Tensar uniaxial (UX) geogrid and 21,800 square yards of Tensar biaxial (BX) geogrid in the process of constructing the berms over three months. One berm measured 1,100 feet long and had a maximum height of 58 feet, and the other measured 305 feet long and peaked at 19.5 feet tall.

"The project went great," says Robbie Sochovka, Interstate Waste Services' capital projects manager. "The technology demonstrates how we can help save valuable airspace. We're very pleased with the product and engineering design."

Sochovka projects an additional 20 years of service for the landfill. The Tensar MSE berm was a first for Les Stotler, Pavex's project superintendent and 30-year veteran of the site development industry.

"The walls are beautiful," he says. "And, they were completed ahead of construction schedule."

### **Designing for Release of Water**

When it comes to protecting the structural integrity of landfills, it's important to approach the tremendous power of water flow with a jujitsu-like mentality: leverage the momentum of the "attacker" to advantage, rather than try to resist the momentum. Steven Mayes, P.E., senior technical manager for North America at GSE Environmental, notes how critical it is to provide a release mechanism for runoff seepage water through a capped landfill. Not doing so may result in soil sloughing—saturated soil loses its cohesion and falls down slopes in large sheets. Landfill sloughing has two causes: sediment buildup in swales, which timely maintenance prevents; and under-designed landfill cap drainage system capacity.



[5]

The 25-acre Saufley Field C&D landfill was capped using a "soilless" system.

Regarding the latter, Mayes refers to a New Jersey landfill that underwent significant sloughing due to clogged geocomposite material that prevented the inflow of runoff and seepage water into a perforated drainage pipe at the bottom of the slope. The landfill was referenced in a Geosynthetic Institute (GSI) report by Bob and George Koerner titled "On the Need for Water Release from Drainage Composites at the Toe of Slope."



In this case, the clogged geocomposite material increased pore pressure and, ultimately, caused the soil to begin sliding down the slope, notes Mayes. "For everything associated with a landfill, the cap is the most visible to the public, and the public generally doesn't want a landfill in its backyard," he says. "So, if you think about the most scrutinized part of your design, that very well could be it."

While the geocomposite material on the New Jersey landfill was indeed clogged, the bigger contributing factor was the manner in which the geocomposite drainage layer was terminated at the perforated drainage pipe. For terminating the geocomposite drainage layer, Mayes points out the importance of rapid and free water release from the geocomposite drainage layer into the drainage collection system, such that buildup of hydrostatic pressure within the geocomposite drainage layer and the buildup of pore pressures within the cover soil are avoided.

Due to the under design of the landfill cap drainage layer capacity, water saturated the soil, causing increased pore pressures up to some undetermined elevation of the landfill slope. The resulting sloughing eventually caused large cracks in the soil, consequently causing a snowball effect by letting in even more runoff water, and eventually leading to a veneer stability failure of the landfill cap.

### Unit Gradient Method

In Mayes' professional opinion, landfill capping drainage system design should be based on the Unit Gradient Method. The most common design methodology, it assumes that cover soil is saturated, so the maximum flow velocity equals the permeability of the cover soil. (This calculator can be found online, at [www.landfilldesign.com/calculators.html](http://www.landfilldesign.com/calculators.html)).

"The Unit Gradient Method is the most straightforward," states Mayes. "You're using the worst-case design scenario and designing around that; not all engineers take that approach, though."

Another method—Hydrologic Evaluation of Landfill Performance—is not appropriate for landfill capping drainage design, according to GSE Environmental, because it uses the daily average rainfall in the water balance calculation, which does not simulate the worst-case condition.

The Unit Gradient Method gives engineers a great deal of latitude to design for site-specific water infiltration rates with reduction factors and safety factors.

Reduction factors include, but are not limited to:

- $L_h$ : Drainage pipe spacing or length of slope measured horizontally; the spacing between lateral pipes in swales
- $k_{veg}$ : Permeability of the vegetative supporting soil, as measured by length/time; typically 1.05 or 1.1
- $i$ : Hydraulic gradient;  $i = \sin(\beta)$ , where  $\beta$  is the slope, typically 3:1 (gradient = 32%)

Safety factors include, but are not limited to:

- $F_{sd}$ : Overall factor of safety for drainage 2.0–10.0, typically 2.0
- $RF_{in}$ : Intrusion Reduction Factor; adjusts for effects on infiltration rate due to variables such as the choice of geocomposite material; range = 1.0–1.2; engineers might opt for a slightly higher value to allow for short-term impacts on the infiltration rate under a 100-hour transmissivity test.
- $RF_{cr}$ : Creep Reduction Factor
- $RF_{cc}$ : Chemical Clogging Reduction Factor, 1.0–1.2

GSI has a standard guide, GC-8 (Geocomposite 8), "Determination of the Allowable Flow Rate of a Drainage Geocomposite," for which reduction factors to include based on the anticipated flow rate. According to Mayes, these factors can address uncertainty that may exist in translating the 100-hour transmissivity laboratory test results to field performance. Sometimes, though, engineers don't use the Unit Gradient Method—or, if they do, they do not utilize appropriate reduction factors, says Mayes. He adds that this may have been the case on the New Jersey landfill.

### Selecting Geocomposite Material

Mayes says that, in addition to the reduction and safety factors cited above, it's important for engineers to take into consideration loads on the soil when selecting geocomposite material. For example, the load on soil above geocomposite material should not exceed the geocomposite material's compressive strength. For instance, if the compressive strength of a geocomposite is 10,000 pounds per square foot, add in a minimum  $F_{sd}$  of 2.0, and the load should not exceed 5,000 psf.

"Generally, when you're trying to decide what type of geocomposite to specify, you have two considerations initially," he says. "You're always looking at its flow capacity, but you're also considering the structural design of the geonet material itself because it has to accommodate any structural loading, and that's not something all design engineers consider."

Besides structural loading, Mayes says that engineers may need to account for live loading from construction equipment such as bulldozers. **MSW**