From:	Jason Gorrie
То:	SWD Waste
Cc:	Justin G. Roessler
Subject:	Pasco County Class I Landfill - 2022 Remaining Useful Life Estimate
Date:	Thursday, March 2, 2023 7:32:15 AM
Attachments:	Class 1 Useful Life 2022 Annual Report.pdf

EXTERNAL MESSAGE

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From: Justin G. Roessler <jroessler@pascocountyfl.net>
Sent: Wednesday, March 1, 2023 5:32 PM
To: SWD_Waste <SWD_Waste@dep.state.fl.us>
Cc: Jason Gorrie <jason@jmg-eng.com>
Subject: Capacity Report

We are in the final stages of QC. We will have a signed and sealed deliverable tomorrow. Apologies for the delay.

Thanks, Justin



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Pasco County Utilities

Remaining Disposal Capacity and Site Life Calculations Pasco County Resource Recovery Facility

Reporting Year 2022

February 2023



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Prepared For:

Pasco County Public Infrastructure

Prepared By:

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Jason Gorrie, P.E. JMG Engineering, Inc. 3825 Henderson Blvd. Suite 604 Tampa, Florida 33629

3/1/2023

Date

1.0 Purpose of Report

Rule 62-701.500(13)(c) of the Florida Administrative Code (FAC) requires landfill owners and operators to annually prepare an estimate of the remaining life and capacity (in cubic yards) of the existing, constructed landfill and an annual estimate of the life and capacity of other permitted areas not yet constructed. For the purposes of this Report, the "existing, constructed landfill" is considered to be portions of the site designated as the Ash Monofill (consisting of cells A1, A2, A3, and A4 for combustion ash) and the Solid Waste Landfill (consisting of cells SW-1 and SW-2 for unprocessed municipal solid waste.) The remaining useful life of the Ash Monofill is presented in **Section 3.0**. The remaining useful life of the Solid Waste Landfill is presented in **Section 4.0**. Finally, the remaining useful life of future disposal cells permitted by Power Plant Siting Act Conditions of Certification PA 87-23C are presented in **Section 5**.

2.0 Assumptions Used in Report

- The primary disposal mechanism for municipal solid waste generated within Pasco County is the Pasco County Resource Recovery Facility. The Resource Recovery Facility is permitted to combust approximately 1,050 tons per day of municipal solid waste. Residue from the combustion of the municipal solid waste (hereinafter referred to as "ash") is disposed in those areas identified in **Figure 1** as "Ash Disposal Cells." As of the writing of this Report, disposal cells A-1, A-2, and A-3 are temporarily inactive and not receiving ash. While these cells are not currently receiving ash and are temporarily capped with a tarp to minimize leachate generation, they are still available for additional disposal in the future. Disposal cell A-4 is the currently active disposal cell for ash residue and receives all ash generated by the Resource Recovery Facility¹.
- The actual mass value of waste that can be processed by the Resource Recovery Facility is variable due to the heating value of the waste. Drier waste and waste containing larger amounts of plastics has a higher heating value, resulting in less mass throughput through the Resource Recovery Facility. Wetter waste and waste containing less plastics has a lower heating value, resulting in more mass throughput through the Resource Recovery Facility. The heating value of the waste (measured in British thermal units per pound of waste, or Btu/lb) has been observed to be gradually increasing over the course of several years, resulting in a slightly lower mass throughput capability of the Resource Recovery Facility. For purposes of this Report, it is assumed that the annual solid waste mass throughput capacity of the Resource Recovery Facility will remain at 1,050 tons per day for the foreseeable future. Assuming no changes in facility availability, the Resource Recovery Facility is capable of processing approximately 331,000 tons per years given the 1,050 tons per day design capacity, 90% availability and a standard higher heating value of 4,800 Btu per pound.

¹ The Florida Department of Environmental Protection has authorized Pasco County to beneficially utilize a significant portion of the ash generated by the Resource Recovery Facility. For purposes of this Report, it is conservatively assumed that <u>all</u> ash will be placed in the Ash Disposal Cells and not beneficially utilized. It should be noted that future beneficial reuse projects undertaken in accordance with the FDEP's approval could substantially reduce the amount of ash placed in the Ash Disposal Cells in future years.





- The quantity of ash generated by the combustion process at the Resource Recovery Facility is relatively consistent at 23% (by mass) of the municipal solid waste combusted. Previous studies by Covanta and others have demonstrated that the density of the ash is also relatively consistent over protracted periods at 2,200 pounds per cubic yard. Municipal solid waste that is bypassed from the Resource Recovery Facility and placed in the solid waste disposal cells is assumed to have a compacted density of approximately 1,100 pounds per cubic yard.
- It is widely recognized that the population of Pasco County is growing. Future waste generation rates were estimated in 2022 based in part on population projections generated by the University of Florida's Bureau of Economic and Business Research. These numbers are relied upon in this Report and presented in Table 1. (AECOM, 2022)
- The projections presented in this Report rely on multiple assumptions (such as population growth, WTE Facility combustion efficiency, landfill operation efficiency, planned future combustion capacity, etc.) The predicted dates are considered to be accurate to ± 3 years.

2.1 Permitted Disposal Capacity

Construction and operation of the disposal cells at the site is governed by Power Plant Siting Act Conditions of Certification PA87-23G. The permitted maximum elevation of the Ash Monofill is 122 feet NAVD88. Once the currently active cell (A4) reaches an elevation of 85 feet NAVD88, fill activities will shift to valley fills between Cells A1, A2, A3, and A4, as well as a vertical expansion for filling all four cells to a final elevation of 122 feet NAVD 88². Volume calculations utilizing Autodesk Civil 3D[®] indicate that the volume of airspace within the Ash Monofill at buildout is approximately 3.6 million cubic yards (**Attachment 1**)³.

The permitted maximum elevation of the Solid Waste Landfill is 121 feet NAVD88. Once the currently active cell (SW-2) reaches approximately 72 feet NAVD88, valley filling between SW-1 and SW-2 will commence along with vertical expansion as described in the approved Landfill Operations Plan. The fill sequencing and maximum permitted height result in an estimated total volume available for disposal of approximately 1.6 million cubic yards⁴.

3.0 Useful Remaining Life of Ash Monofill

As of February 2023, ash is being disposed in Subcell No. 6 (of six subcells). In order to estimate the current volume of waste in place within the Ash Monofill, D.C. Johnson Associates conducted a topographic survey on December 27, 2022. The elevation contours of the currently active A4 disposal cell are depicted at **Attachment 2**.

⁴ Refer to Application for Modification to Conditions of Certification dated February 6, 2019.



² For a detailed discussion of the fill sequence, refer to the approved Landfill Operations Plan found at Appendix I of PA87-23G.

³ Bottom liner elevations used in this calculation are considered to be rough estimates based on permit drawings.

Using the elevations reported on the topographic survey in conjunction with the estimated elevations of the liner system, it is possible to estimate the volume of ash in place in the Ash Monofill. Mathematically, the volume under a function is defined by the double integral:

$$\int_{x-min}^{x-max} \int_{y-min}^{y-max} f(x,y) dx \, dy$$

To determine the function f(x, y) defining the shape of the landfill surfaces, JMG Engineering relied upon the volume calculation algorithms of Autodesk Civil 3D[®]. The total volume of ash calculated to be currently in place in the Ash Monofill is approximately 1,891,000 cubic yards (see **Attachment 3**).

Given the permitted volumetric capacity of 3,600,000 cubic yards and subtracting the 1,891,000 cubic yards calculated from the 2022 survey to be currently in place, approximately 1,709,000 cubic yards of airspace remains available for disposal. Municipal waste combustor ash has an approximate density of 2,200 pounds per cubic yard. Using the assumed density, the 1,709,000 remaining cubic yards can accommodate approximately 1,879,900 tons of ash.

Table 1 below shows the projected ash generation rate as a function of anticipated Resource Recovery Facility capacity. Because the waste-to-energy facility is currently operating at its maximum capacity, no changes in the ash generation rate are expected in the immediate future. However, it is anticipated that a planned Facility expansion will be complete by the year 2027 and will result in an increased ash generation rate of approximately 87,000 additional cubic yards beginning in Calendar Year 2027. As shown in Table 1, this increased ash generation rate **will consume the remaining available airspace of the Ash Monofill by approximately 2039.** Beyond that time, Pasco County will need to construct and operate ash disposal cell A-5.

4.0 Useful Remaining Life of Solid Waste Landfill

The calculation procedures used to estimate the remaining useful life for disposal the Solid Waste Landfill are identical to those described above for the Ash Monfill. Utilizing the surveyed elevations provided by D.C. Johnson (see **Attachment 4**), the Autodesk Civil 3D[®] algorithms determined that the volume of solid waste present in the Solid Waste Landfill at the beginning of the fiscal year is approximately 845,874 cubic yards (see **Attachment 5**).

The new permitted volumetric capacity of SW-1/SW-2 is assumed to be 1.6 million cubic yards. Subtracting the 845,874 cubic yards calculated to be currently in place, approximately 754,126 cubic yards of airspace remains available for disposal.

The intent of the solid waste cells as stated in the original application for Power Plant Siting Certification is to accommodate solid waste deliveries in excess of the Resource Recovery Facility's capacity. As stated previously, the Resource Recovery Facility is operating at capacity. This necessitates periodic (and temporary) diversions during times when the Resource Recovery Facility must operate at reduced capacity to facilitate maintenance activities. The rate of waste placement in the Solid Waste Landfill is also heavily dependent upon year-to-year budget decisions about the amount of waste to haul out of County for disposal.



Table 1 below shows the projected waste diversion volume as a function of anticipated Resource Recovery Facility capacity and future population growth⁵. Using an assumed density of 1,100 pounds per cubic yard for municipal solid waste compacted in-place (USEPA, 2016), and further assuming that daily cover equivalent to 15% (by volume) per year will be utilized, it is estimated that remaining airspace will be consumed at the rate identified in Table 1. Accordingly, **the estimated remaining useful life of the Solid Waste Landfill (as currently designed and permitted) is at least 10 years using a combination of exporting waste out-of-county and disposal in the landfill⁶.**

5.0 Useful Remaining Life of Future Disposal Cells

As shown in Figure 1, several acres of permitted disposal space remain available for future use by the County. At present, liner and leachate collection systems have been constructed for the following disposal cells: SW-1, SW-2, A-1, A-2, A-3, and A-4. Because these lined cells are adjacent to each other, the fill sequence has been deigned and approved to maximize the airspace over existing lined areas by utilizing the interstitial space (or valley) between the existing cells, as described in the Landfill Operations Plan. Such a practice will delay the need for construction of additional liner and leachate collection systems until approximately 2040.

Finally, those cells identified in Figure 1 as SW-3, SW-4, SW-5, and SW-6 are sited and permitted as disposal areas but are yet to be constructed. Assuming that the ultimate capacity of these yet-to-be constructed cells will have an approximate capacity of 750,000 cubic yards each, an additional 3 million cubic yards of disposal volume for MSW remains available to Pasco County. This equates to in excess of 15 years of disposal capacity at the reasonably foreseeable MSW disposal rates anticipated in the future, as depicted in **Table 2**. Construction of additional waste combustion capacity will extend the useful life of the cells even further by allowing them to be used for ash placement.

⁶ Rapid population growth has necessitated increased reliance on out-of-county hauling. It is assumed that out-of-county hauling will continue to be heavily relied upon until the waste-to-energy expansion is completed in 2027.



⁵ The diversion rates listed in Table 1 are conservative. The actual diversion rate is expected to be less than that presented in Table 1 because the Resource Recovery Facility has demonstrated an ability to process waste in excess of the 331,000 tons per year.

Estimated Waste Generation Rates, Waste Disposal Rates, and Remaining Disposal Capacity

Table 1	
stimated Waste Generation Rates, Waste Disposal Rates, and Remaining Disposal Canad	citv

		Resourc	e Recovery I	Facility		Ash Monofil	I		S	olid Waste Lar	ndfill		Solid Waste of Co	Hauled Out- ounty
								Estimated Waste			Estimated Daily			
Fiscal Year		Estimated			Estimated Ash In		Estimated Remaining	In Place at	Estimated	Estimated	Cover	Estimated Remaining	Estimated	Estimated
(Oct - Sep)	Projected Total	Waste	Estimated As	h Generation	Place at Beginning	Estimated Waste	Disposal Capacity at	Beginning of Fiscal	Waste	Waste	Application	Disposal Capacity at	Waste	Waste
	Waste Received ¹	Processed ^{1a}	Ra	ite	of Fiscal Year	Placement Rate	End of Fiscal Year ³	Year ⁹	Placement Rate	Placement Rate	Rate	End of Fiscal Year ⁴	Transferred ⁷	Transferred
	(tons)	(tons)	(tons)	(yds ³) ⁵	(yds ³)	(yds ³)	(yds ³)	(yds ³)	(tons)	(yds ³) ⁶	(yds ³)	(yds ³)	(tons)	(yds ³) ²
2023	487,444	331,000	76,130	69,209	1,891,000	69,209	1,639,791	845,874	36,444	66,262	9,939	677,925	120,000	800,000
2024	497,079	331,000	76,130	69,209	1,960,209	69,209	1,570,582	922,075	10,306	18,738	2,811	656,376	120,000	800,000
2025	506,715	331,000	76,130	69,209	2,029,418	69,209	1,501,373	943,624	9,639	17,525	2,629	636,222	120,000	800,000
2026	514,698	331,000	76,130	69,209	2,098,627	69,209	1,432,164	963,778	63,698	115,814	17,372	503,036	120,000	800,000
2027	522,681	520,000	119,600	108,727	2,167,836	108,727	1,323,436	1,096,964	2,681	4,875	731	497,430	0	0
2028	530,664	520,000	119,600	108,727	2,276,564	108,727	1,214,709	1,102,570	10,664	19,389	2,908	475,132	0	0
2029	538,647	520,000	119,600	108,727	2,385,291	108,727	1,105,982	1,124,868	18,647	33,904	5,086	436,142	0	0
2030	546,631	520,000	119,600	108,727	2,494,018	108,727	997,255	1,163,858	26,631	48,419	7,263	380,460	0	0
2031	553,199	520,000	119,600	108,727	2,602,745	108,727	888,527	1,219,540	33,199	60,362	9,054	311,043	0	0
2032	559,768	520,000	119,600	108,727	2,711,473	108,727	779,800	1,288,957	39,768	72,305	10,846	227,892	0	0
2033	566,337	520,000	119,600	108,727	2,820,200	108,727	671,073	1,372,108	26,337	47,885	7,183	172,824	20,000	133,333
2034	572,905	520,000	119,600	108,727	2,928,927	108,727	562,345	1,427,176	32,905	59,828	8,974	104,022	20,000	133,333
2035	579,474	520,000	119,600	108,727	3,037,655	108,727	453,618	1,495,978	39,474	71,771	10,766	21,486	20,000	133,333
2036	584,986	520,000	119,600	108,727	3,146,382	108,727	344,891	\searrow	$>\!$	\searrow	\searrow	\wedge		
2037	590,498	520,000	119,600	108,727	3,255,109	108,727	236,164	\searrow	$>\!$	\searrow	\searrow	\searrow		
2038	596,009	520,000	119,600	108,727	3,363,836	108,727	127,436	\searrow	$>\!$	\searrow	\searrow	\searrow		
2039	601,521	520,000	119,600	108,727	3,472,564	108,727	18,709	\searrow	$>\!$	\searrow	\searrow	\wedge		
2040	607,033	520,000	119,600	108,727	\wedge	\langle	$\langle \rangle$	\searrow	$>\!$	\searrow	\searrow	\wedge		
2041	611,846	520,000	119,600	108,727	\searrow	\langle	\langle	\searrow	$>\!$	\searrow	\searrow	\sim		
2042	616,659	520,000	119,600	108,727	$>\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$	>	>	>	$>\!$	\geq	> <	$>\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!\!$		
2043	621,471	520,000	119,600	108,727	>>	\searrow	>	>>	$>\!$	\searrow	$>\!$	$>\!\!\!>\!\!\!<$		
-													-	

¹ Source: Pasco County Future Solid Waste Disposal Options Report, AECOM, 2022

^{1a} Source: Engineering Judgement based on past facility performance

² assume density of uncompacted mixed MSW to be 300 lbs/cu. yd

³ assume total capacity of Ash Monofill is 3,600,000 cu. yds.

⁴ assume total capacity of Solid Waste Landfill is 1,600,000 cu. yds.

⁵ assume density of ash to be 2,200 lbs/cu. yd.

⁶ assume density of compacted mixed MSW to be 1,100 lbs/cu. yd.

⁷ Assumes that favorable pricing will result in decision to haul out of county through 2026

	Projected Total			Estimated Daily	Estimated Remaining
	Waste	Estimated Waste	Estimated Waste	Cover Application	Disposal Capacity at
Year	Received ¹	Placement Rate ²	Placement Rate	Rate	End of Calendar Year
	(tons)	(tons)	(yds ³)	(yds ³) ³	(yds ³)
2036	585,000	65,000	92,857	9,286	2,897,857
2037	590,000	70,000	100,000	10,000	2,787,857
2038	596,000	76,000	108,571	10,857	2,668,429
2039	601,000	81,000	115,714	11,571	2,541,143
2040	607,000	87,000	124,286	12,429	2,404,429
2041	612,000	92,000	131,429	13,143	2,259,857
2042	617,000	97,000	138,571	13,857	2,107,429
2043	620,000	100,000	142,857	14,286	1,950,286
2044	625,000	105,000	150,000	15,000	1,785,286
2045	630,000	110,000	157,143	15,714	1,612,429
2046	635,000	115,000	164,286	16,429	1,431,714
2047	640,000	120,000	171,429	17,143	1,243,143
2048	645,000	125,000	178,571	17,857	1,046,714
2049	650,000	130,000	185,714	18,571	842,429
2050	655,000	135,000	192,857	19,286	630,286
2051	660,000	140,000	200,000	20,000	410,286

TABLE 2Future Solid Waste Cells SW-3, SW-4, SW-5, and SW-6

¹ Source: Pasco County Future Solid Waste Disposal Options Report, AECOM,222

² Projected Total Waste Delivered minus 520,000 tons processed in WTE Facility

³ Estimated at 10% of waste placement rate

References

AECOM. (2022). Pasco County Future Solid Waste Options Disposal Report.

USEPA. (2016). Volume to Weight Conversion Factors, Office of Resource Conservation and Recovery.

Attachments

- Attachment 1: Ash Monofill Available Volume Computation
- Attachment 2: A-4 Topographic Contours
- Attachment 3: Ash Monofill In-Place Volume Computation
- Attachment 4: Solid Waste Landfill Contours
- Attachment 5: Solid Waste Landfill In-Place Volume Computation



ATTACHMENT 1

Ash Monofill Available Volume Computation

Cut/Fill Report

Generated:	2023-02-24 09:16:44
By user:	JasonGorrie
Drawing:	D:\OneDrive - JMG Engineering\Pasco\ARCHIVE\Future Disposal Options\Landfill Depletion Model\D:\OneDrive - JMG Engineering\Pasco\ARCHIVE\Future Disposal Options\Landfill Depletion Model\Landfill Depletion Model.dwg

Volume Summary											
Name	Туре	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)				
A1 THROUGH A4 BUILDOUT VOLUME	full	1.000	1.000	2043148.74	0.00	<mark>3594481.98</mark>	3594481.98 <fill></fill>				

Totals				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	2043148.74	0.00	3594481.98	3594481.98 <fill></fill>

* Value adjusted by cut or fill factor other than 1.0

ATTACHMENT 2 A-4 Topographic Contours





• = $5/8^{\circ}$ CAPPED IRON ROD • = PK NAL & DISC • = VERTICAL CONTROL BENCHMARK $\chi^{4^{\circ}}$ = SPOT ELEVATION



ATTACHMENT 3 Ash Monofill In-Place Volume Computation

Cut/Fill Report

Generated:	2023-02-24 09:19:27
By user:	JasonGorrie
Drawing:	D:\OneDrive - JMG Engineering\Pasco\Compliance Assistance (2-23)\Landfill Useful Life\D:\OneDrive - JMG Engineering\Pasco\Compliance Assistance (2-23)\Landfill Useful Life\survey file - JMG working file.dwg

Volume Summary										
Name	Туре	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)			
2023 VOLUME IN PLACE	full	1.000	1.000	2181317.69	5754.37	1891008.29	1885253.91 <fill></fill>			

Totals				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	2181317.69	5754.37	1891008.29	1885253.91 <fill></fill>

 \ast Value adjusted by cut or fill factor other than 1.0

ATTACHMENT 4 Solid Waste Landfill Contours



ATTACHMENT 5

Solid Waste Landfill In-Place Volume Computation

Cut/Fill Report

Generated:	2023-02-24 12:09:38
By user:	JasonGorrie
Drawing:	D:\OneDrive - JMG Engineering\Pasco\Compliance Assistance (2-23)\Landfill Useful Life\D:\OneDrive - JMG Engineering\Pasco\Compliance Assistance (2-23)\Landfill Useful Life\survey file - JMG working file.dwg

Volume Summary										
Name	Туре	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)			
SOLID WASTE VOLUME	full	1.000	1.000	1092882.50	0.45	845874.28	845873.83 <fill></fill>			

Totals				
	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	1092882.50	0.45	845874.28	845873.83 <fill></fill>

* Value adjusted by cut or fill factor other than 1.0