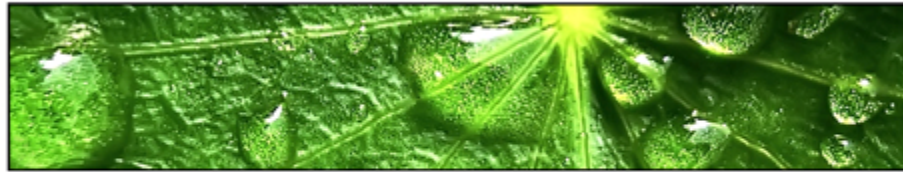


The Greening of a PRP Lead Site In Central Florida

INTERNATIONAL CONFERENCE · JUNE 15-17, 2010



GREEN REMEDIATION
ENVIRONMENT - ENERGY - ECONOMICS

www.wrscompass.com



University of Massachusetts

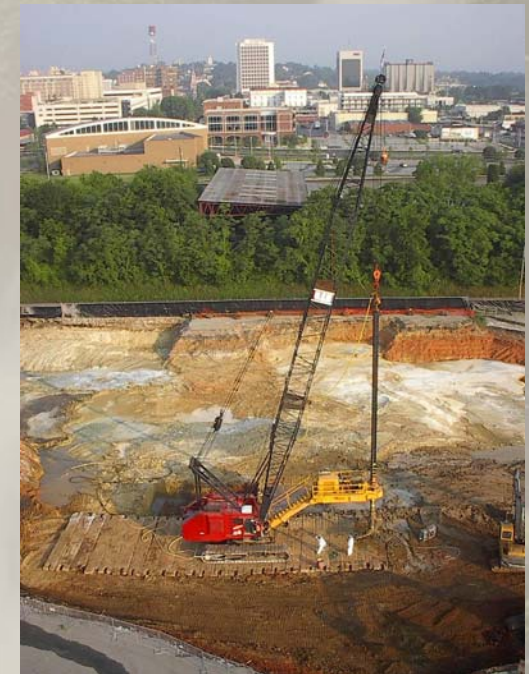
Amherst, Ma

Introduction



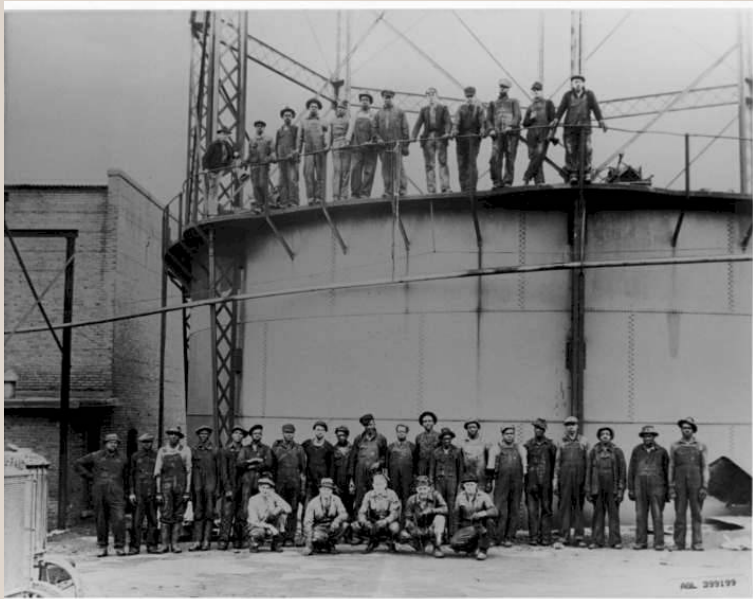
- History of MGPs
- Site Description and History
- Scope of Work

- Sustainability Goals
- Sustainability Results (to date)



History of MGPs

- The processing of coal, coke, or oil to produce gas for towns is referred to as manufactured gas; therefore, the sites that produced this town gas were referred to as Manufactured Gas Plant sites or MGP sites.



- The history of the MGP process dates back to the late 17th and early 18th centuries.

History of MGPs

- The improved processes produced residuals, including tars, liquors, sludges, and other chemical compounds which we clean-up today.
- Beginning in 1930, natural gas distributed via extensive pipeline and distribution systems and made available across the country.



Augusta Gas Oil Plant Site - 1959

History of MGPs

- As a result, MGPs around the country were phased out. This shift in the utility industry triggered the demolition and/or selling of most MGP properties, while others were converted and dedicated to the transmission of natural gas
- Which leads us here today



History of MGP

- There are some 3,000 legacy MGP sites in the country



- 70 in Massachusetts alone
- One in Amherst



Site History

- The **MGP** plant operated from the 1880's until the 1950's
- The plant expanded until the late 1920's
- The plant consisted of two gas producers, one purifier, two de-emulsifiers, a 200,000-cubic foot low pressure holder, and a 42,000-cf relief gas holder



Site History

- Operations ceased in 1953
 - In 1963 there is a propane distribution facility on site.
- All major structures removed sans one gas holder



- 1990 FDEP investigates the site to assess the potential for environmental impacts
- 2009 remediation begins

Scope of Work

- In-situ stabilize 90,000 cubic yards of soil and sediment
- Removal of 24,000 tons of contaminated soils
- Remove, replace and reroute utilities



Scope of Work

- Dewater excavation
- Design and install 3,000 feet of stream bypass'
- Install 1,100 feet of culvert
- Capping
- Rehabilitate and armor 900 feet of stream bed



Technologies



June 18, 2010

www.

Technologies

- Hog and haul
- Thermal treatment
- *In situ* mixing



- Pump and treat
- No action

EPA

Green Remediation

- Minimize Total Energy Use and maximize Use of Renewable Energy
- Minimize Air Pollutants and Green House Gases
- Minimize Water Use and Impacts to Water Resources
- Reduce, Reuse, and Recycle Materials and waste
- Protect Land and Ecosystems

Green Remediation

- Why?
 - Because we were asked to do it
- When?
 - At final remedial design
- What?
 - We analyzed the major design elements where we could affect change
 - Set up tracking for fuel, equipment and materials
 - Substitute for dewatering
 - Material substitution slag in lieu of cement

Green Remediation

- What it is not:
 - Did not compare the foot print of different technologies

Green Remediation at Site

- Minimize Energy Use
 - Use of B20 diesel with ULSD
 - Use gravity diversions rather pump-a-rounds
- Minimize Air Pollutants and GHG Emissions
 - Use of Tier 2 and Tier 3 Equipment
 - Use of foam suppressants
- Minimize Water Use
 - Use of collected site water

Green Remediation at Site

- Reduce, Reuse, Recycle
 - Recycling of Trees
 - Reuse of Site Water
 - Use of recycle concrete for rip-rap
 - Send off concrete for recycling
- Protect land and Ecosystems

Sustainability Goals

Draft Sustainability Goals Former Manufactured Gas Plant Secret Place, Florida

	Estimated Quantities	Implmentation on site	Environemental Impact	Status	Cost Impact
Recycling					
Concrete	200 tons	Feasible	Less material in Landfill	Researching	uknown
Steel	50 tons	Feasible	Less material in Landfill	Researching	cost reduction
Water	7,000,000 gallons	Feasible	Reduction in city water used and reduction of water to be treated.	Researching	cost reduction
Idling Policy					
Implement	NA	Feasible	smaller CO2 foot print	Completed	
Tiered Equipment					
Tier II	based on availability	Feasible	smaller NMHC,SO2, Nox, and part. foot print	awaiting availability from vendor	minimal
Tier III	based on availability	Feasible	smaller NMHC,SO2, Nox, and part. foot print	awaiting availability from vendor	minimal
Tier IV	based on availability	Feasible	smaller NMHC,SO2, Nox, and part. foot print	awaiting availability from vendor	minimal
Low Sulfur Fuel					
	127.829 gallons				
	based on availability	Feasible	less particulate and SO2 emissions	located; negotiaitng Price	modest
Bio-diesel					
	127,829 gallons				
B 2.5	Based on Availability	Feasible	smaller CO2 foot print; less use of foreign oil	Located; negotiating Price, final selection	modest
B 5.0	Based on Availability	Feasible	smaller CO2 foot print; less use of foreign oil	Located; negotiating Price, final selection	modest
B 10	Based on Availability	Feasible	smaller CO2 foot print; less use of foreign oil	Located; negotiating Price, final selection	modest
B20	Based on Availability	Feasible	smaller CO2 foot print; less use of foreign oil	Located; negotiating Price, final selection	modest

Sustainability Goals (continued)

Draft Sustainability Goals Former Manufactured Gas Plant Secret Palce, Florida

	Estimated Quantities	Implmentation on site	Environemental Impact	Status	Cost Impact
Product Substitution					
Slag vs. Cement	12,000 tons	Feasible	using waste product; smaller CO2 foot print	Awaiting Results of Pilot Study	minimal
Recycled Concrete vs Imported Rip Rap		Feasible	using waste product; smaller CO2 foot print	Determining emission reductions	Cost Reduction
Office Space					
Used existing office space	N/A	Feasible	Reduction in transportation CO2 emissions	Determining emission reductions	cost reduction
Stream Restortion					
Brownfield Development					

Major Materials

	Estimate	To Date	Delta
ISS QTY	91,500cy	92,000 cy	500
Cement Usage (tons)	12%-12,939	2%-3,628	(9,311)
Slag Usage (tons)	0%	6%-9,908	9,908
Diesel (gallons)	127,800	0	(127,800)
B20 Diesel (gallons)	0	32,900	32,900
Concrete Recycle (tons)	0	229	229
Recycle Trees (tons)	0	2,620	2,620
Rip-Rap (tons)	2,761	0	(2,761)
Recycled Rip-Rap (tons)	0	827	827
Water Usage	7,100,000	2,292,000	(4,808,000)

Major Materials CO2 Foot Print

	Estimate	Tons CO2	To Date	Tons CO2	Totals
ISS QTY	91,500cy	--	92,000 cy	--	
Cement Usage (tons)	12%-12,939	12,939	2%-3,628	3,628	(9,311)
Slag Usage (tons)	0%	0	6%-9,908	209	209
Diesel (gallons)	127,800	1,477	0	0	(1,477)
B20 Diesel (gallons)	0	0	32,900	304	304
Gasoline	19,629	190	NR	190	190
Concrete Recycle (tons)	0	0	229	229	229
Recycle Trees (tons)	0	0	2,620	712	712
Rip-Rap (tons)	2,761	64	0	0	64
Recycled Rip-Rap (tons)	0		827	19	19
Water Usage (gallons)	7,100,000	733	2,292,000	220	(513)
		15,403		5,511	(9,574)

Cement vs. Slag

Water Recycling and Reduction

Bio-Diesel And Reduction

CO₂ Equivalency

4,440 homes

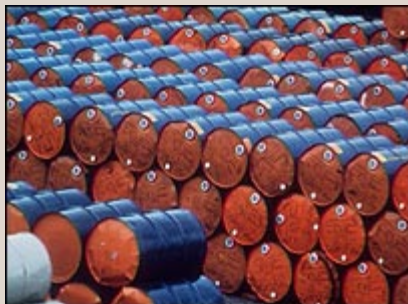


1,648 cars

7,500 head
(breathing only)



20,000 barrels



45 coal cars



Equipment Input

Equipment Call-out	Engine Model/Equipment Make	Equipment Type	Engine Type	kw	hp	Equip. Hp	Equip. Hp	Equip. Model Year	Sulfur Content (ppm)	Fuel (gal/hr)	Hours	Fuel Consumption (gallons)
Chipper	Vermeer Chipper	Logging Equipment Shredders > 6 HP	Cat c16 Tier 2	469	630	<750	750	1999	500	29	206	5,974
Crane	Cat 330w/shear	Construction Equipment Cranes	CumminsNTA 855	253	340	<600	600	1997	500	15	1,925	28,875
Drill Platform	Haines Plat4m	Construction Equipment Bore/Drill Rigs	Cat c9 ATAAC	238	320	<300	300	1999	500	4	1,925	7,700
8,000# Forklift	Skytrack 8042	Construction Equipment Rough Terrain Forklifts	Cummins4BT3.9	184	247	<300	300	1999	500	4	4	16
Compactor	Skytrack?	Construction Equipment Rollers	Cat c6	114	153	<100	100	1999	500	4	666	2,664
Dump Truck	Cat D6	Construction Equipment Dumpers/Tenders	3126BT	86	115	<100	100	1999	500	5.5	1,488	8,184
Dozer	Cat 563 Compactor	Construction Equipment Crawler Dozer		86	115	<100	100	1999	500	4.5	1,649	7,421
Loader	Skid Steers	Construction Equipment Rubber Tire Loaders		56	75	<100	100	1997	500	5.5	3,168	17,424
Sweeper	Skid Steers	Industrial Equipment Sweepers/Scrubbers		56	75	<100	100	2005	500	1	1,700	1,700
Water Truck	2,000 Water Truck	Construction Equipment Off-highway Trucks		112	150	<175	175	1996	500	5.5	1,700	9,350
Pumps	Godwin Pump Misc	Light Commercial Pumps	3126BT	86	115	<175	175	1997	500	1	8,044	8,044
Pressure Washer	Misc.	Light Commercial Pressure Washers		4	5	<11	11	1998	500	1	151	151
Excavator	Cat 330	Construction Equipment Excavators	Cat c9 ATAAC	184	247	<300	300	2008	500	8.75	2,958	25,883
EXC. w/shear	Cat 330w/shear	Construction Equipment Excavators	Cat c9 ATAAC	184	247	<300	300	2007	500	8.75	240	2,100
EXC. w/grapple	Cat 330w/grapple	Construction Equipment Excavators	Cat c9 ATAAC	184	247	<300	300	2006	500	8.75	250	2,188
EXC. w/grapple	Cat 330w/grapple	Construction Equipment Excavators	Cat c9 ATAAC	184	247	<300	300	2005	500	8.75	80	700

Total

26,154 128,373

Equipment Emissions

Output T1 (g/hp-hr)

Engine Model/Equipment Make	Equip. Hp	Equip. Model Year	HC g/hp-hr	VMHC+Nox g/hp-hr	CO g/hp-hr	Nox g/hp-hr	PM10 g/hp-hr	SPM _{adj} g/hp-hr	PM10 _(ADJ) g/hp-hr	CO2 g/hp-hr	S02 g/hp-hr	Tier
Vermeer Chipper	630	1999	0.1553	5.6980	2.0534	5.5452	0.2848	0.0733	0.2115	530.5478	0.1626	T1
Cat 330w/shear	340	1999	0.2083	6.3344	1.4103	6.1294	0.2759	0.0733	0.2026	530.3788	0.1625	T1
Haines Plat4m	320	1999	0.3137	5.9491	0.7832	5.6404	0.3084	0.0733	0.2351	530.0423	0.1624	T1
Skytrack 8042	247	1999	0.3347	5.7447	1.2500	5.4154	0.4451	0.0733	0.3718	529.9756	0.1624	T1
Skytrack?	153	1999	0.5682	6.0129	4.0055	5.4538	0.8726	0.0815	0.7911	588.5569	0.1803	T1
Cat D6	115	1999	1.2058	7.3866	6.2514	6.2001	1.0553	0.0815	0.9738	586.5229	0.1797	T1
Cat 563 Compactor	115	1999	0.5730	6.0489	4.0950	5.4850	0.9400	0.0815	0.8585	588.5416	0.1803	T1
Skid Steers	75	1999	0.5720	6.0414	4.0764	5.4785	0.9260	0.0815	0.8445	588.5448	0.1803	T1
Skid Steers	75	1999	0.1864	3.1969	2.5663	3.0135	0.3798	0.0815	0.2982	589.7749	0.1807	T1
2,000 Water Truck	150	1999	0.3925	6.1302	1.7150	5.7440	0.8172	0.0733	0.7439	529.7911	0.1623	T1
Godwin Pump Misc	115	1999	0.3443	6.0566	0.9090	5.7178	0.3438	0.0733	0.2705	529.9449	0.1624	T1
Misc.	5	1999	0.7710	6.0260	4.2370	5.2674	0.5107	0.0815	0.4292	587.9099	0.1801	T1
Cat 330	247	1999	0.1942	2.7969	1.1914	2.6057	0.2493	0.0733	0.1760	530.4236	0.1625	T1
Cat 330w/shear	247	1999	0.1949	2.8004	1.2152	2.6086	0.2637	0.0733	0.1904	530.4213	0.1625	T1
Cat 330w/grapple	247	1999	0.1957	2.8040	1.2390	2.6115	0.2781	0.0733	0.2048	530.4190	0.1625	T1
Cat 330w/grapple	247	1999	0.1964	2.8076	1.2629	2.6144	0.2925	0.0733	0.2192	530.4167	0.1625	T1

Equipment Emissions Output T1 (lb/job)

Engine Model/Equipment Make	Equip. Hp	Equip. Model Year	Actual Equipment Emissions									Tier
			HC	VMHC+Nox	CO	Nox	PM10	SPM _{adj}	PM10 _(ADJ)	CO2	SO2	
			lb/job	lb/job	lb/job	lb/job	lb/job	lb/job	lb/job	lb/job	lb/job	
Vermeer Chipper	630	1999	53	1,941	699	1,889	97	24.97	72	180,709	55	T1
Cat 330w/shear	340	1997	530	16,129	3,591	15,607	702	186.68	516	1,350,501	414	T1
Haines Plat4m	320	1999	399	7,574	997	7,181	393	93.34	299	674,822	207	T1
Skytrack 8042	247	1999	1	15	3	14	1	0.19	1	1,402	0	T1
Skytrack?	153	1999	83	883	588	801	128	11.97	116	86,415	26	T1
Cat D6	115	1999	396	2,423	2,051	2,034	346	26.74	319	192,404	59	T1
Cat 563 Compactor	115	1999	208	2,199	1,489	1,994	342	29.63	312	213,956	66	T1
Skid Steers	75	1997	399	4,219	2,847	3,826	647	56.93	590	411,047	126	T1
Skid Steers	75	2005	70	1,198	962	1,129	142	30.55	112	221,036	68	T1
2,000 Water Truck	150	1996	257	4,021	1,125	3,767	536	48.09	488	347,471	106	T1
Godwin Pump Misc	115	1997	1,068	18,796	2,821	17,745	1,067	227.53	839	1,644,628	504	T1
Misc.	5	1998	3	22	16	19	2	0.30	2	2,153	1	T1
Cat 330	247	2008	380	5,472	2,331	5,098	488	143.43	344	1,037,694	318	T1
Cat 330w/shear	247	2007	31	445	193	414	42	11.64	30	84,194	26	T1
Cat 330w/grapple	247	2006	32	464	205	432	46	12.12	34	87,702	27	T1
Cat 330w/grapple	247	2005	10	149	67	138	15	3.88	12	28,064	9	T1

Equipment Emissions

Output T0 (lb/job) base

Engine		Equip. Model Year	T0 Based Equipment Emissions									
Model/Equipment Make	Equip. Hp		HC lb/job	NMHC+Nox lb/job	CO lb/job	Nox lb/job	PM10 lb/job	SPM _{adj} lb/job	PM10 _(ADJ) lb/job	CO2 lb/job	S02 lb/job	Tier
Vermeer Chipper	630	1999	244	2,959	1,436	2,719	177	29.43	148	180,098	55	T0
Cat 330w/shear	340	1997	1,786	23,438	7,726	21,681	1,347	220.00	1,127	1,346,496	413	T0
Haines Plat4m	320	1999	885	11,661	3,738	10,790	626	110.00	516	673,274	206	T0
Skytrack 8042	247	1999	2	23	13	22	2	0.23	2	1,399	0	T0
Skytrack?	153	1999	160	1,144	937	987	196	14.10	181	86,170	26	T0
Cat D6	115	1999	753	3,248	3,095	2,507	528	31.51	497	191,263	59	T0
Cat 563 Compactor	115	1999	401	2,852	2,409	2,457	522	34.92	487	213,341	65	T0
Skid Steers	75	1997	762	5,444	4,459	4,694	931	67.09	864	409,890	126	T0
Skid Steers	75	2005	393	3,049	1,607	2,663	429	36.00	393	220,006	67	T0
2,000 Water Truck	150	1996	519	6,018	3,853	5,507	674	56.67	618	346,638	106	T0
Godwin Pump Misc	115	1997	2,151	28,378	9,012	26,261	1,489	268.14	1,220	1,641,176	503	T0
Misc.	5	1998	6	42	19	37	4	0.35	4	2,144	1	T0
Cat 330	247	2008	1,497	17,615	10,352	16,142	1,662	169.03	1,493	1,034,132	317	T0
Cat 330w/shear	247	2007	121	1,429	840	1,310	135	13.71	121	83,905	26	T0
Cat 330w/grapple	247	2006	126	1,489	875	1,364	140	14.29	126	87,401	27	T0
Cat 330w/grapple	247	2005	40	476	280	437	45	4.57	40	27,968	9	T0

Equipment Emissions Reductions

Delta (lb/job)

Engine		Equip. Model Year	Project Equipment Emissions Delta									Tier
Model/Equipment Make	Equip. Hp		HC lb/job	NMHC+Nox lb/job	CO lb/job	Nox lb/job	PM10 lb/job	SPM _{adj} lb/job	PM10 _(ADJ) lb/job	CO2 lb/job	S02 lb/job	
Vermeer Chipper	630	1999	192	1,019	737	830	80	4	76	611	0	T1T0
Cat 330w/shear	340	1997	1,256	7,309	4,135	6,073	645	33	612	4,005	-1	T1T0
Haines Plat4m	320	1999	486	4,087	2,741	3,609	233	17	217	1,549	0	T1T0
Skytrack 8042	247	1999	1	8	9	7	1	0	1	3	0	T1T0
Skytrack?	153	1999	77	262	349	186	67	2	65	245	0	T1T0
Cat D6	115	1999	358	825	1,044	473	182	5	177	1,142	0	T1T0
Cat 563 Compactor	115	1999	193	653	920	463	180	5	175	615	0	T1T0
Skid Steers	75	1997	363	1,225	1,612	868	284	10	274	1,157	0	T1T0
Skid Steers	75	2005	323	1,851	645	1,533	287	5	281	1,030	0	T1T0
2,000 Water Truck	150	1996	261	1,997	2,728	1,740	138	9	130	833	0	T1T0
Godwin Pump Misc	115	1997	1,082	9,582	6,191	8,517	422	41	381	3,453	-1	T1T0
Misc.	5	1998	3	20	4	18	2	0	2	9	0	T1T0
Cat 330	247	2008	1,117	12,143	8,021	11,044	1,174	26	1,149	3,562	-1	T1T0
Cat 330w/shear	247	2007	90	985	647	896	93	2	91	289	0	T1T0
Cat 330w/grapple	247	2006	94	1,025	670	932	94	2	92	300	0	T1T0
Cat 330w/grapple	247	2005	30	328	213	298	29	1	29	96	0	T1T0

Equipment Emission Reductions

%

Model/Equipment	Equip. Make	Equip. Hp	Equip. Model Year	Percentage Equipment Emissions Reductions								Tier
				HC	NMHC+Nox	CO	Nox	PM10	SPM _{adj}	PM10 _(ADJ)	CO2	
Vermeer C	630	1999	78.4%	34.4%	51.3%	30.5%	45.3%	15.1%	51.3%	-0.3%	-0.3%	T1T0
Cat 330w/s	340	1997	70.3%	31.2%	53.5%	28.0%	47.9%	15.1%	54.3%	-0.3%	-0.3%	T1T0
Haines Pla	320	1999	54.9%	35.0%	73.3%	33.4%	37.3%	15.1%	42.0%	-0.2%	-0.2%	T1T0
Skytrack 8	247	1999	55.1%	35.2%	74.1%	33.4%	37.3%	15.1%	40.4%	-0.2%	-0.3%	T1T0
Skytrack?	153	1999	47.9%	22.9%	37.3%	18.9%	34.5%	15.1%	36.0%	-0.3%	-0.3%	T1T0
Cat D6	115	1999	47.5%	25.4%	33.7%	18.9%	34.5%	15.1%	35.7%	-0.6%	-0.6%	T1T0
Cat 563 Cc	115	1999	48.1%	22.9%	38.2%	18.9%	34.5%	15.1%	35.9%	-0.3%	-0.3%	T1T0
Skid Steer	75	1997	47.6%	22.5%	36.2%	18.5%	30.5%	15.1%	31.7%	-0.3%	-0.3%	T1T0
Skid Steer	75	2005	82.2%	60.7%	40.2%	57.6%	66.8%	15.1%	71.5%	-0.5%	-0.5%	T1T0
2,000 Wat	150	1996	50.4%	33.2%	70.8%	31.6%	20.5%	15.1%	21.0%	-0.2%	-0.2%	T1T0
Godwin Pu	115	1997	50.3%	33.8%	68.7%	32.4%	28.3%	15.1%	31.2%	-0.2%	-0.2%	T1T0
Misc.	5	1998	49.3%	47.9%	19.4%	47.7%	54.8%	15.1%	58.5%	-0.4%	-0.4%	T1T0
Cat 330	247	2008	74.6%	68.9%	77.5%	68.4%	70.7%	15.1%	76.9%	-0.3%	-0.4%	T1T0
Cat 330w/s	247	2007	74.5%	68.9%	77.0%	68.4%	69.0%	15.1%	75.1%	-0.3%	-0.4%	T1T0
Cat 330w/c	247	2006	74.4%	68.9%	76.6%	68.4%	67.3%	15.1%	73.2%	-0.3%	-0.4%	T1T0
Cat 330w/c	247	2005	74.3%	68.8%	76.1%	68.3%	65.6%	15.1%	71.3%	-0.3%	-0.4%	T1T0

Side Notes

- Recycling done by city
- Solar backup for the perimeter monitors
- Stabilized culvert alignment vs. dewatering
- 2,244 cy stabilized
- 202 tons cement / 202 tons CO₂ vs. 220 MW/hr/145 tons CO₂(does not include delays) vs 220 tons CO₂ using a diesel engine
- Anticipated flow rate from dewatering activities +5,000 gpm for minimum of 30 days

cleanNgreen Measurements

- Project-level Carbon Footprint Calculation
- Methodology and emission. factors developed from publicly available resources:



WRS COMPASS

Project Information:

Project Name: _____
 Project Address: _____
 Brief Scope of Work: Maryland
 Thermal Treatment

Summary of Estimated Project Emissions:

Direct On-Site Emissions	
Stationary Combustion	
Mobile Sources	
Indirect Emissions	
Water Usage / Landfilled Materials / Other Wastes	5,915 CO ₂ -e (metric tons)
Purchased and Consumed Electricity	2,212 CO ₂ -e (metric tons)
Purchased and Transported Materials	
Other Emissions	
Equipment Mobilization and Demobilization	2 CO ₂ -e (metric tons)
Employee Travel and Lodging	4 CO ₂ -e (metric tons)
Corporate Overhead Emissions	1,097 CO ₂ -e (metric tons)
Biomass Emissions from Stationary Sources	47.2 CO ₂ -e (metric tons)
Biomass Emissions from Mobile Sources	50.2 CO ₂ -e (metric tons)
	0.0 CO ₂ -e (metric tons)
	0.0 CO ₂ -e (metric tons)
Total Estimated Project Emissions	
Total GHG Emissions (not including Other Emissions)	9,230 CO ₂ -e (metric tons)
Total Other Emissions	158 CO ₂ -e (metric tons)
Grand Total - "As Bid" Project Carbon Footprint	9,388 CO₂-e (metric tons)
Emissions AVOIDED by not sending to landfill:	23,678 CO ₂ -e (m.t.)

Lessons Learned

- Do not under estimate the time involved
- Easiest way to mine data is through the accounting software. Make sure you have the appropriate cost codes.
- Some items to be tracked
 - Fuel
 - Equipment (owned and rental)
 - Materials
 - Transportation
- Always know that you can revise the numbers with better data
- Green remediation is not “no remediation”

Lessons Learned (continued)

- Develop a library of emissions factors. There is no one clearing house of information. Document your sources.
- Finding the emissions factors you need might not be available.
- Try to set up data bases with usage parameters that align with published emissions factors.
- Don't expect others to be as enthusiastic as you in counting green house gases.
- On the remediation side, companies have not yet begun to incorporate sustainability goals in contracts.
- Multi-disciplinary nature of work
- Expect and deal with frustration
- Don't get overwhelmed by the numbers

Questions?

