

Gary C. Jarvis
Chairman



Joseph J. Solomon
Mayor

Earl W. Bond
Interim Executive Director

Warwick Sewer Authority
125 Arthur W. Devine Boulevard
Warwick, RI 02886
Voice: (401) 739-4949 • Fax: (401) 739-1414

WARWICK SEWER AUTHORITY
Quarterly Report to City Council
November 4, 2020

WSA Budget

See attached MUNIS budget report for Fiscal Year 2021 to date as of September 30th, 2020.

In summary:

Expenditures	Budget	Actual	% Expended
Personnel Services	3,760,502.40	741,960.89	19.73%
Commodities	2,030,813.00	233,878.97	11.52%
Services	2,338,055.60	234,935.37	10.05%
Other	15,500.00	3,585.00	23.13%
Debt Service	11,485,578.00	10,494,911.26	91.37%
Capital Expenditures	350,000.00	-	0.00%
Total Expenditures	19,980,449.00	11,709,271.49	58.60%

Revenues	Budget	Actual	% Expended
Usage & Service	(15,234,113.00)	(3,879,822.74)	25.47%
Sewer Assessment	(3,788,275.00)	(626,284.15)	16.53%
Other Revenues	(958,061.00)	(172,490.49)	18.00%
Total Revenues	(19,980,449.00)	(4,678,597.38)	23.42%

Revenues now include sewer assessment collections to date. Although these revenues are currently under budget, with the billing cycles being October and April, we fully expect these to be on target by year-end.

Please note that debt service payments are made twice a year (September and April) with the most substantial principal payments due in September. All other expenditure categories are under their respective budgets at this time.

Major WSA Board Actions in Last Quarter

July, the Board approved the following expenditures:

- Approval of Oakland Beach Force main Repair:\$23,346.37- Line Item (80-370)- Remaining in FY20- \$50,294.16

August, the Board approved the following expenditures:

- Approval of Magnesium Hydroxide: Amrex Chemical -\$47,000.00, Bid #2021-091 Line Item (80-247)- Remaining \$85,581.00
- Approval of Inlet Grit Conveyor: \$49,376.00 - Line Item (80-799)- Remaining \$328,250.00
- Approval of Engineering design and land surveying to replace the Oakland Beach For Main-\$26,500.00 Line Item (80-392)- remaining \$120,000.00

September, the Board approved the following expenditures:

- Approval of DEM required Climate Resiliency Plan for Warwick Sewer Authority:\$74,989.00 -Line Item (80-392)- Remaining \$93,500.00

Treatment Facility & Collection System Operations and Maintenance (O&M)

Over the last quarter, daily flows to the treatment facility have averaged 4.4 million gallons per day (facility design capacity is 7.7 MGD). Average monthly discharges for all pollutants complied with permit limits, including better than 99% removal efficiency for some conventional pollutants such as suspended solids and biological oxygen demand.

Sewer Extension Planning & Construction (projects included in \$33 million bond authorization)

Northwest Gorton Pond (Contract 88) – The project is currently on hold.

Bayside (Contract 86B) – Nothing to Report.

Airport and Oakland Beach Interceptor Rehabilitation Project (Contract 95) –

- In Design Phase
- Soil Borings Complete

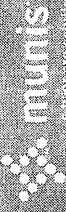


CITY OF WARWICK, RI
YEAR-TO-DATE BUDGET REPORT

10/21/2020 10:09
jason.parmelee

FOR 2021 03

ACCOUNTS FOR: 200 ENTERPRISE FUND	ORIGINAL APPROP	TRANSFERS/ ADJUSTMTS	REVISED BUDGET	YTD ACTUAL	ENCUMBRANCES	AVAILABLE BUDGET	PCT USED
80 SEWER DEPARTMENT							
80 100 SICK TIME & OTHER LEAVE	0	0	0	13,709.45	.00	-13,709.45	100.0%*
80 101 SALARIES - MUNICIPAL	2,504,956	0	2,504,956	430,612.57	.00	2,074,343.43	17.2%
80 106 OVERTIME - MUNICIPAL	80,000	0	80,000	22,394.96	.00	57,605.04	28.0%
80 107 OVERTIME - STORM/SNOW	10,000	0	10,000	.00	.00	10,000.00	.0%
80 108 EASEMENT - OT	15,000	0	15,000	.00	.00	15,000.00	.0%
80 154 FRINGE BENEFITS	1,150,546	0	1,150,546	275,243.91	.00	875,302.49	23.9%
80 201 OFFICE SUPPLIES & EQUIPM	7,500	0	7,500	955.59	383.20	6,161.21	17.9%
80 202 PRINT, BIND, & REPRODUCT	19,250	0	19,250	597.18	3,402.82	15,250.00	20.8%
80 203 ADVERTISING	1,900	0	1,900	.00	.00	1,900.00	.0%
80 204 DUES & SUBSCRIPTIONS	580	0	580	.00	.00	580.00	.0%
80 205 POSTAGE	37,433	0	37,433	784.25	8,339.92	28,308.83	24.4%
80 210 LABORATORY SUPPLIES	25,200	0	25,200	1,885.70	2,427.42	20,886.88	17.1%
80 220 FUEL	8,000	0	8,000	822.15	5,177.85	2,000.00	75.0%
80 221 DIESEL FUEL	26,000	0	26,000	2,154.19	15,845.81	8,000.00	69.2%
80 222 NATURAL GAS	51,500	0	51,500	2,427.48	.00	49,072.52	4.7%
80 231 SUPPLIES-COMPUTER	817,000	-50,000	767,000	74,983.59	.00	692,016.41	9.8%
80 234 SUPPLIES-SAFETY EQUIPMEN	3,400	0	3,400	.00	1,548.96	1,851.04	45.6%
80 243 CHEMICALS-POLYMER	4,000	0	4,000	909.74	.00	3,090.26	22.7%
80 244 CHEMICAL ROOT CONTROL	125,000	0	125,000	17,135.00	96,965.00	10,900.00	91.3%
80 245 CHEMICALS-CHLORINE	25,000	0	25,000	.00	.00	25,000.00	.0%
80 246 CHEMICALS-DECHLOR	65,000	0	65,000	9,999.60	55,000.40	.00	100.0%
80 247 CHEMICALS-ODOR CONTROL	31,500	0	31,500	5,410.22	26,089.78	.00	100.0%
80 248 CHEMICALS-ALUM	177,000	0	177,000	10,215.15	128,704.45	38,080.40	78.5%
80 249 CHEMICALS-CAUSTIC	115,000	0	115,000	35,207.46	79,792.54	.00	100.0%
80 260 CLOTHING	262,000	0	262,000	42,783.96	219,216.04	.00	100.0%
80 261 CLOTHING ALLOWANCE	900	0	900	.00	.00	900.00	.0%
80 262 BYPASS PUMPING	10,200	784	10,984	1,169.40	4,115.00	5,700.00	48.1%
80 281 MAINTENANCE MATERIALS	30,000	0	30,000	.00	.00	30,000.00	.0%
80 285 SMALL TOOLS	125,000	5,144	130,144	21,568.46	31,103.56	77,471.93	40.5%
80 286 DEDUCT METERS	3,000	0	3,000	.00	.00	3,000.00	.0%
80 296 GRINDER PUMPS	25,000	0	25,000	2,069.10	512.00	22,418.90	10.3%
80 299 BASEMENT COMMODITIES	13,950	50,000	63,950	1,737.00	54,750.00	7,463.00	88.3%
80 300 TRAINING & EDUCATION	20,500	0	20,500	1,063.75	.00	19,436.25	5.2%
80 303 TELEPHONE	750	0	750	.00	.00	750.00	.0%
80 304 WATER USAGE	5,340	0	5,340	247.50	280.00	4,812.50	9.9%
80 313 EQUIPMENT REPAIR	18,000	1,001	19,001	3,047.27	1,000.72	14,952.73	21.3%
80 323 TAX SALE	10,720	0	10,720	1,905.83	.00	8,814.17	17.8%
80 325 INSURANCE	80,000	3,219	83,219	15,773.61	27,794.88	39,650.51	52.4%
	125,000	0	125,000	.00	.00	125,000.00	.0%
	278,228	0	278,228	38,939.52	.00	239,288.88	14.0%



3
P. G. Y. T. D. B. U. D.

CITY OF WARWICK, RI
YEAR-TO-DATE BUDGET REPORT

10/21/2020 10:09
jason.parmelee

FOR 2021 03

	ORIGINAL APPROP	TRANSFERS/ ADJUSTMTS	REVISED BUDGET	YTD ACTUAL	ENCUMBRANCES	AVAILABLE BUDGET	PCT USED
GRAND TOTAL	0	71,484	71,484	7,030,674.11	1,954,682.68	-8,913,873.03	*****%

** END OF REPORT - Generated by Jason Parmelee **

Warwick Sewer Authority
Purchase Authorization / Confirmation Memo

To: Patrice Peshka, Purchasing Agent
From: Earl Bond, Maintenance Work Coordinator
Date: July 17, 2020
Re: Emergency Repair of the Oakland Beach Force main

On 6/9/2020, the Warwick Sewer Authority (WSA) was notified that there was what appeared to be sewerage coming out of the ground near 222 Suburban Parkway. The WSA mobilized and arrived on the scene within 15 minutes. Ammonia testing of the water was performed and confirmed that it was sewerage. The WSA immediately began to vacuum and contain the flow. D' Ambra Construction was notified to repair excavate and repair the line section.

D' Ambra excavated to the pipe line section and it was determined that the failure was a direct result of a joint collar failure between line sections. The repair took several hours to perform as the force main required to be back drained to relieve pressure to allow for a repair. D'Ambra removed the joint collar and installed a repair band collar. Once the repair was complete, the trench was backfilled and once settled, paved.

The WSA is asking for the Board to approve the cost of the repair in the amount of \$ 23,346.37 to D'Ambra construction. This will be funded out of our line item Construction Services # 80-370 in FY 20.

Approval:



WSA Board of Directors

8/14/2020
Date

Consent:



Joseph Solomon, Mayor

8/14/2020
Date

Cc: Dana DiScullo, WSA Superintendent



D'AMBRA

CONSTRUCTION CO., INC., 80 Centre of New England Boulevard, Coventry, RI 02816
"An Equal Opportunity Employer"

Invoice

35456

Phone 401-737-1300
Fax 401-732-4725
www.d-ambra.com

SOLD TO: Warwick Sewer Authority 125 Arthur W. Devine Boulevard Warwick, RI 02886 Attention: Earl W. Bond	Invoice Date:		June 30, 2020	
	Customer P.O. No. or Reference:			
	D'AMBRA Job Number	3000	Taxable	<input type="checkbox"/>
	Terms:		Non Taxable	<input type="checkbox"/>

Net

Emergency response to broken 12" Diameter Sewer Force Main at 222 Suburban Parkway. Final cleanup and asphalt paving.

TOTAL AMOUNT DUE \$23,346.37

Sales Acct. No.		

A LATE PAYMENT CHARGE OF 1% PER MONTH (12% PER ANNUM) SHALL BE CHARGED AND PAID ON ALL UNPAID BALANCES FROM THE DUE DATE TO THE DATE WE RECEIVE PAYMENT.

Wanda Construction Co., Inc.

PROJECT: WSA Suburban Parkway
CONTRACT No:
LOCATION: 222 Suburban Parkway
DESCRIPTION: 12' P.D. Repair

Week Ending: 06/13/80

DRWG :
SUMMARY: EXTRA WORK

LABOR		
HEALTH & WELFARE	5,319.86	
SUB-TOTAL LABOR	<u>5,319.86</u>	
PROFIT ON LABOR, HEALTH & WELFARE (25%)	1,329.96	
INSURANCE ON LABOR ONLY (7.5%)	1,769.79	
PROFIT ON INSURANCE (5%)	486.97	
WORKMENS COMPENSATION INSURANCE (2.05%)	24.42	
CR&P ON WC INSURANCE (5%)	178.72	
TOTAL COST FOR LABOR	<u>14.50</u>	81,409.86
MATERIAL		
PROFIT ALLOWED FOR MATERIAL (15%)	4,266.21	
TOTAL COST FOR MATERIAL	<u>659.93</u>	4,926.14
EQUIPMENT		
PROFIT ALLOWED FOR EQUIPMENT (15%)	\$,436.52	
TOTAL COST FOR EQUIPMENT	<u>818.38</u>	4,179.88
SUB-CONTRACTOR		
PROFIT ALLOWED FOR SUBCONTRACTOR (5%)	869.00	
TOTAL SUB-CONTRACTOR	<u>43.45</u>	912.45
SUBTOTAL LABOR, MATERIAL, EQUIP., SUBS.		<u>23,382.75</u>
LIABILITY INSURANCE (2.575%)	69.02	
6% ON ABOVE	3.69	
INSURANCE TOTAL	<u>3.69</u>	68.03
TOTAL COST		<u>TOTAL: \$23,345.37</u>

BREAKDOWN OF INSURANCE PERCENTAGE:

WORKMENS COMPENSATION	0.07
LIABILITY INSURANCE	
F.I.C.A.	0.02
R.I. UNEMPLOYMENT	
FEDERAL UNEMPLOYMENT	
TOTAL INSURANCE ON LABOR	

THIS HEREBY CERTIFIES THAT THE ABOVE CHARGES FOR
LABOR AND MATERIALS ARE BILLED AT ACTUAL COST TO
THE UNDERSIGNED.

PROJECT: WEA Suburban Parkway
 CONTRACT No:
 LOCATION: 222 Suburban Parkway
 DESCRIPTION: 12" P.C. Pipe

Week Ending: 04/12/20

BRWG:

LABOR Name	LABOR Classification	04/02/20		04/12/20		Total Hours	Labor Rate	Labor Total	Overages Rate	Overages Total
		Tues	Wed	Wed	Mon					
Isela Pardo	Gen. Foreman	0.00		2.00	1.00	3.00	42.50	127.50	23.00	261.00
Celestino Viteriano	Foreman	0.00		0.00		1.00	34.00	34.00	23.00	309.00
Pablo Guad	Laborer	0.00		0.00		16.00	32.00	512.00	23.00	309.00
Guillermo Gonzalez	Operator	0.00		0.00		16.00	35.70	571.20	26.15	418.00
Osorio Hernandez	Driver	0.00			2.00	2.00	18.00	37.00	27.00	279.00
Anthony Gomez	Laborer (part cut)			4.00		4.00	32.00	128.00	23.00	95.00
Fedro Alvarez	Foreman				0.00	0.00	4.00	34.00	23.00	95.00
Hylo Grandy	Laborer				0.00	0.00	4.00	32.00	23.00	95.00
John Costa	Laborer				0.00	0.00	4.00	32.00	23.00	95.00
Jordan Pardo	Laborer				0.00	0.00	4.00	32.00	23.00	95.00
Dan Diaz	Laborer				0.00	0.00	4.00	32.00	23.00	95.00
Russel Peterson	Operator				0.00	0.00	4.00	35.70	26.15	104.00
TOTAL:								\$3,392.00	26.15	\$2,307.20

EQUIPMENT Description	04/02/20		04/12/20		Total Hours	Rate	Total
	Tues	Wed	Wed	Mon			
John Deere 410 Backhoe	0.00		0.00		23.00	43.04	1,000.32
Cat 316 Rubber Tired Excavator	2.00				2.00	111.20	222.38
Lowbed & Trailer	4.00				4.00	98.41	393.64
Strike Body Truck	2.00		0.00		2.00	22.00	22.00
Strike Body Truck	15.00		4.00	4.00	23.00	22.00	\$25.00
10 Wheel Dump	16.00			2.00	17.00	95.31	1,637.27
F 150 Pile Up	15.00		2.00		17.00	N/C	0.00
Asphalt Saw			4.00		4.00	22.50	90.00
Paver (P-14)				4.00	4.00	257.10	1,028.40
Roller (VR-14)				4.00	4.00	89.73	322.92
							0.00
							0.00
							0.00
TOTAL:							\$3,486.52

MATERIAL		04/02/20		04/12/20		Total Quantity	Cost	Total
		Tues	Wed	Wed	Mon			
30# Stone	Tons	33.00				33.00	13.00	443.00
3/4 Process Gravel	Tons	23.00				23.00	11.00	254.00
						0.00		0.00
Worwick W/awater 12" Wrap Around	sq.	1.00				1.00	433.00	433.00
Asphalt Binder	Tons			32.14		32.14	63.00	2,091.00
Asphalt Surface	Tons					12.14	12.14	70.00
Peak	Gal.					6.00	0.00	12.75
						0.00		0.00
						0.00		0.00
						0.00		0.00
						0.00		0.00
TOTAL:							\$4,266.21	

Invoice No. 194071



WARWICK WATERWORKS CO.
62 WINDING AVENUE
WARWICK, RI 02806

Page	Date Printed	Invoice No.
1	7/02/20	194071 00

To Reorder Contact Us At
Phone No. : (401) 732-5151
Fax No. : (401) 732-5212 DSG 01

Bill To

D'AMBRA CONST
80 CENTRE OF NEW ENGLAND BLVD
COVENTRY, RI 02816-6063

Ship To

CONTRACT EE

CONTRACT EE WARWICK

Customer Invoice 00002-001025	Customer Purchase Order	Customer 019-JAMES ELLONS	Web Site Steel	Ship Via	Date Shipped 7/02/20
----------------------------------	-------------------------	------------------------------	-------------------	----------	-------------------------

*** WE KNOW YOU HAVE MANY CHOICES TO BUY FROM - THANK YOU FOR CHOOSING US ***

Units Ordered	U/M	Item Description	Units Shipped	B/C	Price	Per	Discount	Extended	Tax
1	EA	102-1320-18 12X18 CLAMP CPLG.	1		485.0000		.00	485.00	N

Check out our web site at: www.warwickwinwater.com

Terms: Monthly Service Chargeback to Applied to Past Due Accounts.
NET 90 DAYS

Pay full balance by 9/29/20

Tax Area ID: RI - 400930100	Net Sales	485.00
State Tax 3 .000	Freight	.00
Local Tax 0 .000	State Tax	.00
	Local Tax	.00
	Invoice Amount	485.00



When you provide a check as payment, you authorize us either to use information from your check to make a one-time electronic fund transfer from your account or to process the payment as a check transaction. For inquiries please call (401) 732-5151.
 *You agree that the sale of these products/services is subject to all of our standard terms and conditions of sale located at www.winsupplyinc.com/cecollo.

D'AMBRA CONSTRUCTION CO. INC.
DAILY TIME AND MATERIAL WORK SHEET
(EXTRA WORK CLAIM)

JOB Name WSA

JOB Numbr: 3000

DATE: 6-09 to 6-10-2020

DESCRIPTION OF WORK PERFORMED: Emergency 12" Forcemain Repair at 220 Suburban Parkway
 called in at 5pm ended at 8am following day
 Excavated, located 12 AC FMI, hit unmarked water service ,creating an unsanitary condition to the domestic water supply
 Had first get the watermain repaired before any possible cross contamination could occur
 Cut out 12" AC collar installed a ss wrap around and secured the site, then had to replace the water service
 from the curb stop to the corp

Back filled and cleaned up

LABOR

FULL NAME	CLASSIFICATION	REG HRS	O/T HRS
Justin Paulo	Supervisor	8	7
Gelsomino Vizzaccaro	Forman	8	7
Fausto Succi	Laborer	8	7
Eurico Cordeiro	Operator	8	7
Dennis Demascio	Driver	8	7
Adalberto Lourenco	Forman		2
Michael Larsorsa	Operator		2
Carlos Pimental	lowbed driver		4

EQUIPMENT

DESCRIPTION	EQUIPMENT NO.	HOURS
Cat 316 Excavator		2
Stakebody Truck(P-160)	160	2
JD 410 BH	58	15
Dump Truck	71	15
Tagalong Trailer		15
lowbed& tractor		4
Stakebody (P-154)	154	15
Pick-up	51	15
light plant		12
electric pumps(2") 2ea		10ea

MATERIALS FURNISHED/SUBCONTRACTORS

SUPPLIER	DESCRIPTION	QUANTITY	UNIT
D'Ambra	3/4 " stone(1.5 loads)	33	tons
	3/4" process gravel	23	tons
WWW	12" Wrap Around	1	ea

SIGNATURE of RECEIPT ONLY: _____

D'AMBRA CONSTRUCTION CO. INC.
DAILY TIME AND MATERIAL WORK SHEET
(EXTRA WORK CLAIM)

JOB Name WSA

JOB Numbr: 3000

DATE: 6/17/2020

DESCRIPTION OF WORK PERFORMED: Binder paving of the emergency 12" Forcemain Repair at 220 Suburban Parkway

Saw cut the edges grade and pave in kind(5")

Installed the Binder only (3"-4") left low to install top

LABOR

FULL NAME	CLASSIFICATION	REG HRS	O/T HRS
Justin Paulo	Supervisor	2	
Gelsomino Vizzaccaro	Forman	8	
Fausto Succi	Laborer	8	
Eurico Cordeiro	Operator	8	
Anthony Grasso	Saw-Cutter(laborer)	4	

EQUIPMENT

DESCRIPTION	EQUIPMENT NO.	HOURS
Stakebody Truck(P-154)	154	8
JD 410 BH	58	8
Rental Dump Truck(Raposa Trucking)		8
Tagalong Trailer		8
Roller	VR-20	
E-51 Pick-up Truck	E-51	2
Walk Behind Saw		4
Stakebody Truck(P-165)	165	4

MATERIALS FURNISHED/SUBCONTRACTORS

SUPPLIER	DESCRIPTION	QUANTITY	UNIT
D'Ambra	Asphalt 12.5(29136);(29142)	32.14	tons

SIGNATURE OF RECEIPT ONLY: _____

D'AMBRA CONSTRUCTION CO. INC.
DAILY TIME AND MATERIAL WORK SHEET
(EXTRA WORK CLAIM)

JOB Name WSA

JOB Numbr: 3030

DATE: 6/22/2020

DESCRIPTION OF WORK PERFORMED: Top paving of the emergency 12" Forcemain Repair at 220 Suburban Parkway

Clean-up edges, tac edges and install top layer of asphalt

LABOR

FULL NAME	CLASSIFICATION	REG HRS	O/T HRS
Justin Paulo	Supervisor	1	
Pedro Albermaz	Forman	4	
Kyle Grundy	Laborer	4	
John Costa	Laborer	4	
Jordan Ferreira	Laborer	4	
Dan Baez	Laborer	4	
Russell Peterson	Operator	4	

EQUIPMENT

DESCRIPTION	EQUIPMENT NO.	HOURS
Stakebody Truck		4
Paver	P-14	4
Roller	VR-17	4

MATERIALS FURNISHED/SUBCONTRACTORS

SUPPLIER	DESCRIPTION	QUANTITY	UNIT
D'Ambra	Asphalt 9.5(29297)	12.14	tons
	tac	5	gal

SIGNATURE OF RECEIPT ONLY: _____

Adjustments for P-154 in Trucks

June 2, 2016

On-Highway Light Duty Trucks
Miscellaneous Models

Size Class:
Net Hp 300 HP & Over

Configuration for On-Highway Light Duty Trucks

Power Mode	Diesel	Horsepower	340
Cab Type	Conventional	Axle Configuration	4X2
Ton Rating	1	Horsepower	340.0

Blue Book Rates

** FHWA Rate is equal to the monthly ownership cost divided by 176 plus the hourly estimated operating cost.

	Ownership Costs				Estimated Operating Costs Hourly	FHWA Rate** Hourly
	Monthly	Weekly	Daily	Hourly		
Published Rates	\$665.00	\$240.00	\$80.00	\$9.00	\$17.85	\$22.76
Adjustments						
Region (Rhode Island: 103.8%)	\$32.67	\$8.12	\$2.26	\$0.34		
Model Year (2012: 97.6%)	(\$21.55)	(\$5.39)	(\$1.49)	(\$0.22)		
Ownership (100%)	-	-	-	-		
Operating (100%)	-	-	-	-		
Total:	\$676.32	\$243.14	\$80.70	\$9.12	\$17.85	\$22.83

Rate Element Allocation

Element	Percentage	Value
Depreciation (ownership)	56%	\$484.40 / mo
Overhaul (ownership)	27%	\$233.55 / mo
CFC (ownership)	7%	\$60.55 / mo
Indirect (ownership)	10%	\$86.50 / mo
Fuel (operating) @ \$3.46	75%	\$14.12 / hr

Revised Date: 2nd Half 2015

Equipment ID	Equipment Type	Size Class	Manufacturer	Model	Year	Serial Number	Configuration/Notes	Adjusted Monthly Company Cost	Heavy Operating Cost	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate	Rate
P-23	On-Highway Light Duty Truck	3000 LB	International	4300	2016	1000	Ado Configuration 02, Cab, 4x4, 2.5L Diesel, Power Windows, Power Mirrors, Power Locking, 100000 Miles	317.19	317.19	58.65	210-01-01	18.75	18.75	18.75	18.75	18.75	18.75	18.75
V2-16	On-Highway Truck Tractor	6000 GVW	International	6300	2013	1000	Ado Configuration 02, Cab, 4x4, 6.0L Diesel, Power Windows, Power Mirrors, Power Locking, 100000 Miles	322.00	322.00	64.01	210-01-01	18.75	18.75	18.75	18.75	18.75	18.75	18.75
V2-16	On-Highway Truck Tractor	6000 GVW	International	6300	2013	1000	Ado Configuration 02, Cab, 4x4, 6.0L Diesel, Power Windows, Power Mirrors, Power Locking, 100000 Miles	322.00	322.00	64.01	210-01-01	18.75	18.75	18.75	18.75	18.75	18.75	18.75
V2-16	On-Highway Truck Tractor	6000 GVW	International	6300	2013	1000	Ado Configuration 02, Cab, 4x4, 6.0L Diesel, Power Windows, Power Mirrors, Power Locking, 100000 Miles	322.00	322.00	64.01	210-01-01	18.75	18.75	18.75	18.75	18.75	18.75	18.75
V2-16	On-Highway Truck Tractor	6000 GVW	International	6300	2013	1000	Ado Configuration 02, Cab, 4x4, 6.0L Diesel, Power Windows, Power Mirrors, Power Locking, 100000 Miles	322.00	322.00	64.01	210-01-01	18.75	18.75	18.75	18.75	18.75	18.75	18.75

These are the most accurate rates for the selected Revision Category. However, due to more frequent online updates, these rates may not match Rental Rate Base East. Visit the Cost Recovery Product Guide on our Risk page for more information.

The equipment represented in this report has been exclusively prepared for ERIN SWEET (erinsweet@andria.com)

LOW RISK
 TRACTOR 77.25
 TRAILER 27.16
 98.41

www.equipmentwatch.com

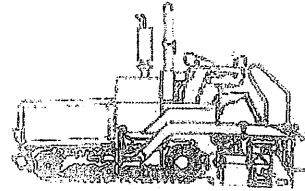
All prices shown in US dollars (\$)

Adjustments for PL-014 in All Saved Models

June 26, 2020

Caterpillar AP355F
 Greater Material Asphalt Pavers

Base Class:
 \$3,620 - \$4,600 lbs
 Weight:
 MA



Configuration for AP355F

Power Mode: Diesel Spread Model: SEBS V

Blue Book Rates

** FWWA Rate is equal to the monthly ownership cost divided by 176 plus the hourly estimated operating cost.

	Ownership Costs				Estimated Operating Costs Hourly USD \$103.03	FWWA Rate** Hourly USD \$257.10
	Monthly	Weekly	Daily	Hourly		
Published Rates	USD \$20,163.00	USD \$7,359.00	USD \$1,839.00	USD \$275.00		
Adjustments						
Region (Rhode Island; 165.2%)	USD \$1,331.02	USD \$391.10	USD \$26.42	USD \$14.30		
Model Year (2017: 89.4%)	(USD \$165.26)	(USD \$46.27)	(USD \$11.53)	(USD \$1.74)		
Adjusted Hourly Ownership Cost (36%)	(USD \$275.01)	(USD \$76.69)	(USD \$19.16)	(USD \$2.93)		
Hourly Operating Cost (100%)						
Total:	USD \$27,107.53	USD \$7,369.24	USD \$1,830.85	USD \$284.00	USD \$103.03	USD \$257.10

Non-Active Use Rates

	Hourly
Standby Rate	USD \$31.01
Idling Rate	USD \$175.89

Rate Element Allocation

Element	Percentage	Value
Depreciation (ownership)	26%	USD \$7,331.63/mo
Overhaul (ownership)	63%	USD \$16,711.00/mo
CFC (ownership)	6%	USD \$1,571.10/mo
Indirect (ownership)	6%	USD \$1,571.10/mo
Fuel (operating) @ USD 3.07	21%	USD \$21.68/hr

Revised Date: 1st half 2020

These are the most accurate rates for the selected Revision Date(s). However, due to more frequent online updates, these rates may not match Rental Rate Blue Book Print. Visit the Cost Recovery Product Guide on our Help page for more information.

The equipment represented in this report has been exclusively prepared for ERIN SWEET (esweet@d-ambra.com)

www.equipmentwatch.com

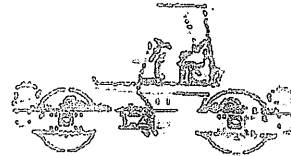
All prices shown in US\$

Adjustments for VR-14 in All Saved Models

June 25, 2010

Caterpillar CB-64 MW
Tandem Vibratory Compactors

Size Class:
6.6 - 11.2 MTons
Weight:
26290 MT



Configuration for CB-64 MW

Drum Width 70.0 in Net Horsepower 120.0 hp
Power Mode Diesel

Blue Book Rates

Non-current (i.e. archived) rates: Jul 1, 2014 - Jun 30, 2015

** FHWA Rate is equal to the monthly ownership cost divided by 176 plus the hourly estimated operating cost.

	Ownership Costs				Estimated Operating Costs Hourly	FHWA Rate** Hourly
	Monthly	Weekly	Daily	Hourly		
Published Rates	\$9,209.00	\$2,316.00	\$620.00	\$67.00	\$33.15	\$80.00
Adjustments						
Region (Rhode Island; 104.4%)	\$363.44	\$101.66	\$25.62	\$3.00		
Model Year (2012: 97.1%)	(\$260.00)	(\$70.00)	(\$17.64)	(\$2.63)		
Adjusted Hourly Ownership Cost (100%)	-	-	-	-		
Hourly Operating Cost (100%)						
Total:	\$9,373.56	\$2,343.77	\$607.06	\$69.16	\$33.15	\$90.73

Non-Active Use Rates

Standby Rate \$20.46 Hourly
Idling Rate \$50.62 Hourly

Rate Element Allocation

Element	Percentage	Value
Depreciation (ownership)	36%	\$2,478.00/mo
Overhaul (ownership)	67%	\$4,708.20/mo
CFC (ownership)	4%	\$330.40/mo
Indirect (ownership)	9%	\$743.40/mo
Fuel (operating) @ 0	36%	\$11.04/hr

Revised Date: 2nd half 2014

These are the most accurate rates for the selected Revision Date(s). However, due to more frequent online updates, these rates may not match Rental Rate Blue Book Print. Visit the Cost Recovery Product Guide on our Help page for more information.

The equipment represented in this report has been exclusively prepared for ERIN SWEET (esweet@d-ambra.com)

EquipmentWatch.

www.equipmentwatch.com

All prices shown in US\$

Rental Rate Blue Book®

June 25, 2019

Deere 410L

Tractor-Loader-Balances

Size Class:
15' to Under 16'
Weight:
feet



Configuration for 410L

Power Mode Diesel

Blue Book Rates

** FHWA Rate is equal to the monthly ownership cost divided by 176 plus the hourly estimated operating cost.

	Ownership Costs				Estimated Operating Costs Hourly	FHWA Rate** Hourly
	Monthly	Weekly	Daily	Hourly		
Published Rates	\$5,305.00	\$1,465.00	\$370.00	\$56.00	\$13.40	\$43.64
Adjustments						
Region (Rhode Island: 102.1%)	\$111.40	\$31.10	\$7.77	\$1.16		
Model Year (2017: 99.9%)	(\$6.42)	(\$1.62)	(\$0.39)	(\$0.03)		
Adjusted Hourly Ownership Cost (99%)	(\$64.11)	(\$15.16)	(\$3.77)	(\$0.67)		
Hourly Operating Cost (100%)						
Total:	\$6,363.00	\$1,460.62	\$373.02	\$66.96	\$13.40	\$43.64

Non-Active Use Rates

	Hourly
Standby Rate	\$16.13
Idling Rate	\$30.44

Rate Element Allocation

Element	Percentage	Value
Depreciation (ownership)	33%	\$1,750.65/mo
Overhaul (ownership)	47%	\$2,493.35/mo
CFC (ownership)	11%	\$693.55/mo
Indirect (ownership)	9%	\$477.45/mo

Fuel cost data is not available for these rates.

Revised Date: 1st half 2019

These are the most accurate rates for the selected Revision Date(s). However, due to more frequent online updates, these rates may not match Rental Rate Blue Book Print. Visit the Cost Recovery Product Guide on our Help page for more information.

The equipment represented in this report has been exclusively prepared for ERIN SWEET (esweet@d-ambra.com)

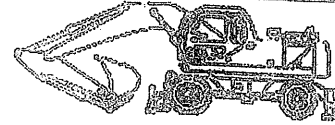
www.equipmentwatch.com

All prices shown in US\$

Adjustments for BH-053 in All Saved Models

May 3, 2019

Caterpillar M316D (disc. 2014)
Wheel Mounted Hydraulic Excavators



Size Class:
17.1 - 20.0 MTenc
Weight:
32550 MT

Configuration for M316D (disc. 2014)

Bucket Capacity - Heaped	0.8	Net Horsepower	159.0
Operating Weight	17.6	Power Mode	Elect

Blue Book Rates

** FHWA Rate is equal to the monthly ownership cost divided by 176 plus the hourly estimated operating cost.

Published Rates	Ownership Costs				Estimated Operating Costs Hourly	FHWA Rate** Hourly
	Monthly	Weekly	Daily	Hourly		
Published Rates	\$10,420.00	\$2,835.00	\$735.00	\$110.00	\$51.05	\$110.65
Adjustments						
Region (Rhode Island: 104.1%)	\$430.00	\$120.50	\$30.14	\$4.51		
Model Year (2010: 28.07%)	(\$210.43)	(\$59.56)	(\$14.74)	(\$2.21)		
Adjusted Hourly Ownership Cost (88%)	(\$107.10)	(\$29.53)	(\$7.50)	(\$1.12)		
Hourly Operating Cost (100%)						
Total:	\$10,662.53	\$2,896.48	\$742.26	\$111.18	\$51.05	\$111.29

Non-Active Use Rates

	Hourly
Standby Rate	\$34.94
Idling Rate	\$70.67

Rate Element Allocation

Element	Percentage	Value
Depreciation (ownership)	41%	\$4,360.90/mo
Overhaul (ownership)	43%	\$4,510.70/mo
CFC (ownership)	9%	\$944.10/mo
Indirect (ownership)	7%	\$734.20/mo
Fuel (operating) @ 3.27	38%	\$19.63/hr

Revised Date: 1st half 2019

These are the most accurate rates for the selected Revision Date(s). However, due to more frequent online updates, these rates may not match Rental Rate Blue Book Print. Visit the Cost Recovery Product Guide on our Help page for more information.

The equipment represented in this report has been exclusively prepared for ERIN SWEET (esweet@d-ambra.com)

Warwick Sewer Authority
Purchase Authorization / Confirmation Memo

To: Patrice Peshka, Purchasing Agent
From: Earl Bond CAPM, PMP, Executive Director
Date: August 07, 2020
Re: Award of Bid # 2021 - 091 Magnesium Hydroxide

The Warwick Sewer Authority (WSA) has been working to address odor and corrosion issues primarily resulting from Hydrogen Sulfide (H₂S) in the Cedar Swamp neighborhood and in and around the major interceptor pump station. The metrics of success are based on low gaseous H₂S readings at or below 10 ppm in the station wet well as well as odor complaints from residents.

In order to mitigate H₂S in a waste stream, the soluble form of H₂S needs to remain bound in the wastewater. One of the ways this is accomplished is to raise the PH of the wastewater to 8.3 or higher. Once this threshold has been reached, soluble H₂S remains bound to the waste stream and not released as a gaseous form thus reducing odors and corrosion.

The WSA recently conducted a short term pilot of magnesium hydroxide at another pump station. The initial results were successful in reducing H₂S in the gaseous form. Our pilot was performed to determine if this product would be effective in the Cedar Swamp sewer shed as well as other areas of the city to control corrosion and odors.

The WSA advertised for public bid for this product and three bids were received. The companies that provided a bid for the product is:

1. G & G Enterprises of KS, LLC
2. Fusion Environmental Solutions
3. Amrex Chemical Co. Inc.

A bid tabulation was developed to compare the submitted bids. One Company Fusion Environmental Solutions did not meet the advertised bid requirements and was disqualified. Out of the remaining two, Amrex Chemical Co. Inc. provided the lowest bid price for a delivered product. We are recommending to the WSA Board to award Bid # 2021 - 091 to Amrex for the delivered price of \$4.75 per gallon with an estimated total cost of product for the year at \$ 47,000.00. This will be funded out of our chemical line item 80 - 247.

Approval:



WSA Board of Directors

8/28/2020

Date

Consent:



Joseph Solomon, Mayor

9/04/2020

Date

Cc: Dana DiScullo, WSA Superintendent

Patricia A. Peshka
Purchasing Agent



Joseph J. Solomon
Mayor

City of Warwick
Purchasing Division
3275 Post Road
Warwick, Rhode Island 02886
Tel (401) 738-2013
Fax (401) 737-2364

The following notice is to appear on the City of Warwick's website Thursday, July 9, 2020.
The website address is <http://www.warwickri.gov/bids>.

**CITY OF WARWICK
BIDS REQUESTED FOR**

Bid2021-091 Wastewater Treatment Chemicals Magnesium Hydroxide

Specifications are available in the Purchasing Division, Warwick City Hall, Monday through Friday, 8:30 AM until 4:30 PM on or after Thursday, July 9, 2020.

Sealed bids will be received by the Purchasing Division, Warwick City Hall, 3275 Post Road, Warwick, Rhode Island 02886 up until 11:00 AM, Tuesday, July 21, 2020. The bids will be opened publicly commencing at 11:00 AM on the same day in the Lower Level Conference Room, Warwick City Hall. *Please note due to COVID-19 only one (1) person from each company may attend the bid opening. Employees and visitors must adhere to social distance guidelines. All visitors are advised to wear masks or face coverings at all times.*

Awards will be made on the basis of the lowest evaluated or responsive bid price.
Please note that no bids can be accepted via email or fax.

The City of Warwick, in addition to soliciting bids in response to this bid, may consult, consider, and make an award for any and all open bid offers for a comparable unit as sought herein at the following websites:

RI State MPA: <https://www.ridop.ri.gov/contract-portal/>

NASPO: <https://www.naspo.org/>

NJPA (National Joint Powers Alliance): <https://www.njpacoop.org/cooperative-purchasing>

MHEC (Massachusetts Higher Education Consortium): <https://www.mhec.net/>

Individuals requesting interpreter services for the hearing impaired must notify the Purchasing Division at 401-738-2013 at least 48 hours in advance of the bid opening date.

Original Signature on File

Patricia A. Peshka
Purchasing Agent

PLEASE COMPLETE THIS PAGE & SUBMIT WITH YOUR BID

Acknowledgement of Addendum (if applicable)

Addendum Number Signature of Bidder

COMPANY NAME: Amrex Chemical Co., Inc.

COMPANY ADDRESS: 117 E. Frederick Street

COMPANY ADDRESS: Binghamton, New York 13904

BIDDER'S SIGNATURE: 

BIDDER'S NAME (PRINT): William F. Rexer Jr.

TITLE: President TEL. NO.: 607-772-8784

EMAIL ADDRESS: info@amrexchemical.com *

*Please include your email address. Future bids will be emailed, unless otherwise noted.

II. AWARD AND CONTRACT:

The CITY OF WARWICK, acting as duly authorized through its Purchasing Agent/Finance Director/Mayor, accepts the above bid and hereby enters into a contract with the above party to pay the bid price upon completion of the project or receipt of the goods unless another payment schedule is contained in the specifications. All terms of the specifications, both substantive and procedural, are made terms of this contract.

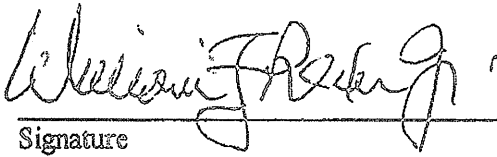
DATE: Bid2021-091 Purchasing Agent

PLEASE COMPLETE THIS PAGE & SUBMIT WITH YOUR BID

CERTIFICATION & WARRANT FORM*

This form must be completed and submitted with sealed bid.
Failure to do so will result in automatic rejection.

Any and all bids shall contain a certification and warrant that they comply with all relevant and pertinent statutes, laws, ordinances and regulations, in particular, but not limited to Chapter 16- Conflicts of Interest, of the Code of Ordinances of the City of Warwick. Any proven violation of this warranty and representation by a bidder at the time of the bid or during the course of the contract, included, but not limited to negligent acts, either directly or indirectly through agents and/or sub-contractors, shall render the bidder's contract terminated and the bidder shall be required to reimburse the City for any and all costs incurred by the City, including reasonable attorney fees, to prosecute and/or enforce this provision.



Signature

7/17/20

Date

Amrex Chemical Co., Inc.

Company Name

117 E. Frederick Street

Address

Binghamton, New York 13904

Address

*This form cannot be altered in any way

CITY OF WARWICK
NOTICE TO BIDDERS

Bid2021-091 Wastewater Treatment Chemicals Magnesium Hydroxide

If you received this document from our homepage or from a source other than the City of Warwick Purchasing Division, please check with our office prior to submitting your bid to ensure that you have a complete package. The Purchasing Division cannot be responsible to provide addenda if we do not have you on record as a plan holder.

Bids received prior to the time of the opening will be securely kept, unopened. No responsibility will be attached to an officer or person for the premature opening of a bid not properly addressed and identified. No bids will be accepted via facsimile or email.

The opening of bids will be in the order established by the posted agenda and the agenda will continue uninterrupted until completion.

Once an item has been reached and any bids on that item has been opened, no other bids on that item will be accepted and any such bid will be deemed late.

The contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap for any position for which the employee or applicant is qualified and that in the event of non-compliance the City may declare the contractor in breach and take any necessary legal recourse including termination or cancellation of the contract.

A bidder filing a bid thereby certifies that no officer, agent, or employee of the City has a pecuniary interest in the bid or has participated in contract negotiations on the part of the City, that the bid is made in good faith without fraud, collusion, or connection of any kind with any other bidder for the same call for bids, and that the bidder is competing solely in his own behalf without connection with, or obligation to, any undisclosed person or firm.

All bids should be submitted with one (1) original and one (1) copy in a sealed envelope, which should read: *YOUR COMPANY NAME* plainly marked on the exterior of the envelope as well as "Bid2021-091 Wastewater Treatment Chemicals Magnesium Hydroxide."

All proposals submitted become the property of the City and will not be returned. If the company intends to submit confidential or proprietary information as part of the proposal, any limits on the use or distribution of that material should be clearly delineated in writing. This information should be submitted in a sealed envelope, clearly labeled confidential and where it should be submitted in the response. Please be advised of the Freedom of Information Act as it may pertain to your submittal.

Should you have any questions, please contact Earl Bond Executive Director, Warwick Sewer Authority, 125 Arthur Devine Blvd., Warwick, RI at 401-468-4721.

All bids should be written in ink or typed. If there is a correction with whiteout, the bidder must initial the change.

Negligence on the part of the bidder in preparing the bid confers no rights for the withdrawal of the bid after it is open.

Any deviation from the specifications must be noted in writing and attached as part of the bid proposal. The bidder must indicate the item or part with the deviation and indicate how the bid will deviate from specifications.

The IRS Form W-9 available on www.warwickri.gov should be completed and submitted with the bid if the bidder falls under IRS requirements to file this form.

The successful bidder must provide the City of Warwick with an original Certificate of Insurance for General & Automobile Liability in a minimum amount of \$2 million. The certificate of insurance must name the City of Warwick as the additional insured and so stated on the certificate with the bid name and bid number. It is the vendor's responsibility to provide the City of Warwick with an updated certificate of insurance upon expiration of the original certificate.

For a bid to be awarded to a corporation, limited liability company or other legal entity, prior to commencing work under the awarded bid, that corporation, company or legal entity may be required to provide to the Purchasing Agent a Certificate of Good Standing dated no more than thirty (30) days prior to the date upon which the bid approval was made.

The successful bidder will provide said Certificate of Insurance and Certificate of Good Standing within ten (10) calendar days after notification or the City reserves the right to rescind said award.

Prices to be held firm (1) one year from date of award. Term contracts may be extended for two (1) one year terms upon mutual agreement unless otherwise stated.

The contractor must carry sufficient liability insurance and agree to indemnify the city against all claims of any nature, which might arise as a result of his operations or conduct of work.

The City is exempt from the payment of the Rhode Island Sales Tax under the 1956 General Laws of the State of Rhode Island, 44-18-30, Paragraph I, as amended.

The Purchasing Agent reserves the right to reject any and all bids, to waive any minor deviations or informalities in the bids received, and to accept the bid deemed most favorable to the interest of the City.

The successful bidder must comply with all Rhode Island Laws applicable the public works projects, including, but not limited to provisions of Chapter 13 of Title 37 of the

Rhode Island General Laws, pertaining to prevailing wage rates, and all other applicable local, state and federal laws.

The City reserves the right to terminate the contract or any part of the contract in the best interests of the City, upon 30-day notice to the contractor. The City will incur no liability for materials or services not yet ordered if it terminates in the best interests of the City. If the City terminates in the interests of the City after an order for materials or services have been placed, the contractor will be entitled to compensation upon submission of invoices

and proper proof of claim, in that proportion which its services and products were satisfactorily rendered or provided, as well as expenses necessarily incurred in the performance of work up to time of termination.

No extra charges for delivery, handling or other services will be honored. All claims for damage in transit will be the responsibility of the successful bidder. Deliveries must be made during normal working hours unless otherwise agreed upon.

All costs directly or indirectly related to the preparation of a response to this solicitation, or any presentation or communication to supplement and/or clarify any response to this solicitation which may be required or requested by the City of Warwick will be the sole responsibility of and will be borne by the respondent.

If the respondent is awarded a contract in accordance with this solicitation and the respondents bid or response and if the respondent fails or refuses to satisfy fully all of the respondents obligations thereunder, the City of Warwick will be entitled to recover from the respondent any losses, damages or costs incurred by the City as a result of such failure or refusal.

The City reserves the right to award in part or full and to increase or decrease quantities in the best interest of the City.

Any quantity reference in the bid specifications are estimates only, and do not represent a commitment on the part of the City of Warwick to any level of billing activity. It is understood and agreed that the agreement will cover the actual quantities ordered during the contract period.

The City reserves the right to rescind award for non-compliance to bid specifications.

The successful bidder must adhere to all City, State and Federal Laws, where applicable.

SUPPLEMENT TO BID SPECIFICATIONS

1. The Warwick Sewer Authority plans to purchase Magnesium Hydroxide for Warwick Sewer Authority as indicated in the attached specifications.

Bidder is not to separate the supplement from the bid but must return same as complete. Bid is not to include any taxes, from which the City of Warwick is exempt by State law.

2. **BID:** Sealed bids shall be received by the Purchasing Division on the form attached in a sealed envelope marked "Bid2021-091 Wastewater Treatment Chemicals Magnesium Hydroxide".
3. **BID QUALIFICATIONS:** Each bidder shall present evidence that they are normally engaged in the purveying of this type of material, supplies or equipment. The bidder should be thoroughly familiar with the contents of the notice before submitting a bid. The bidder automatically acknowledges and accepts all the provisions, conditions and specifications of this notice; no bid shall be considered from bidders who are unable to show that they are normally engaged in purveying of the type of material, supplies or equipment bid on.
4. **DELIVERY:** Material shall be delivered for operation as required by the specifications. If the vendor fails to deliver materials as required in the time indicated, or subsequently agreed to, a credit may be taken in the bid price of 1/10 of 1% per day at the discretion of the Purchasing Agent for the City of Warwick. Off-loading of any chemical shall be prohibited until a Warwick Sewer Authority employee has signed off and accepted said delivery.
5. **ACCEPTANCE OF REJECTION:** The City of Warwick – WSA reserves the right to reject any or all bids, to accept any bid or to waive any informality in the bid as deemed advisable in the best interest of the City.
6. **PAYMENT:** The City agrees to pay for the material within thirty (30) days after acceptance. Acceptance means 100% delivery of satisfactory merchandise to comply with our specifications.
7. **TESTS:** Before approval, the Superintendent shall have the right to inspect and test the materials furnished in accordance with this notice. All chemical deliveries shall be accompanied by a certificate of analysis.

Bid of Amrex Chemical Co. (hereinafter called "bidder" organized and existing under the laws of the State of doing business as (Hereinafter called "Owner").

The bidder, in compliance with the invitation for bids for the supply of Magnesium Hydroxide agrees to have examined the specifications with relating documents and the site of the proposed delivery. The bidder shall be familiar with all of the conditions surrounding the project, hereby proposes to furnish all materials and supplies in accordance with the Contract Documents, at time set forth therein, and at prices stated below. These prices are to cover all expenses incurred in furnishing and delivering material in accordance with the Contract Documents, of which this bid is a part.

TECHNICAL SPECIFICATIONS

I. Introduction:

The Warwick Sewer Authority (WSA) is seeking bids for the supply of an additive chemical to Waste Water Treatment System to control odor, reduce corrosion, reduce collection system gas binding, and help maintain minimum alkalinity levels for the nitrification process and control of fats oil and grease ("FOG").

The WSA has conducted a trial to test the effectiveness of THIOGUARD brand (magnesium hydroxide slurry) and has determined that it is beneficial and desirable to add a precision metered flow of THIOGUARD brand (magnesium hydroxide slurry) at various WSA remote pump stations during certain periods throughout the year.

Brand names and/or descriptions used in these specifications are to acquaint bidders with the types of goods and supplies desired and will be used as a standard by which goods and supplies offered as equivalent will be evaluated.

Variations between the goods and supplies described and the goods and supplies offered are to be fully identified and described by the bidder on a separate sheet and submitted with the bid proposal form. Vendor literature WILL NOT suffice in explaining exceptions to these specifications. In the absence of any exceptions by the bidder, it will be presumed and required that the goods and supplies as described in the bid specification be provided or performed.

It is the responsibility of the bidder to document and/or demonstrate the equivalency of the goods and supplies offered. The WSA shall be the sole arbiter in determining the equivalency of the goods and supplies.

- Delivery of THIOGUARD brand (Magnesium Hydroxide) or equivalent via 275 gallon totes to 125 Arthur Devine Blvd. Warwick, RI 02888. Pricing on the chemical shall be for one year with an option for two- (1) one year extensions.
- WSA proposes to use this chemical additive during the months of May through October of each year. This contract does not guarantee any specific amount will be purchased.

III. Chemical Specifications:

Aqueous Suspension of TECHNICAL GRADE magnesium hydroxide slurry derived from calcined magnesium oxide for Waste Water Treatment Plants.

1) SCOPE

- a. Wastewater treatment is performed in a sensitive biological environment wherein operation is performed at near-neutral or slightly alkaline conditions, requiring the highest reactive technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide available, to provide active buffering at an optimal operational pH.
- b. Lower reactive grades of Magnesium Hydroxide Slurry are incapable of sufficiently neutralizing the acid generated in these environments and will pass through the system unused causing settling and damage in sensitive mechanical processes.
- c. The specific application of technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide within neutral pH for use to treat municipal wastewater must be manufactured to exacting particle size, specific surface area and particle size distribution to provide the highest reactivity and proper stability for transportation, pumping and handling.
- d. This specification establishes the minimum requirements for a one-year supply agreement with options for two one-year extensions for the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide. This product is used to control odor, reduce corrosion, and reduce collection system gas binding and to help maintain minimum alkalinity levels for the nitrification process. This specification establishes the minimum requirements for a one-year supply agreement with options for two one-year extensions and includes following sections on Scope and Classification, Applicable Specifications, Material and Contractor Requirements, Delivery Requirements, and Invoicing Requirements.

III. Environmental and Safety:

The Contractor shall be responsible for complying with all Federal and State of Rhode Island standards, including but not limited to, regulations and laws concerning this type of service, including EPA standards. This also includes the City of Warwick ordinances and regulations.

IV.

Material Specifications and Contractor Requirements:

a. **Material Specifications:** The Contractor shall at a minimum meet the following specifications in the table directly below as well as the Technical Requirements in section b. below. The Contractor shall provide with the bid submittal written specifications for the product bid that meet the minimum specifications listed in the Table 1A. below:

Table 1A:

	Typical	Maximum	Minimum
Slurry Basis			
Mg(OH) ₂ contained lb/gal	7.7	8	6.5
Dry Solids Basis			
MgO, wt%	93		92
CaO, wt%	2.0	4.0	
SiO ₂ , wt%	0.5	2.0	
Fe ₂ O ₃ , wt%	0.50	0.80	
Median Particle Size, Micron	6.0	10.0	
Specific Surface Area, m ² /g	16.0	25.0	12.0
Lbs Alkalinity/Gallon	13.34	14	12.5
Caustic Magnesia Activity/Sec	75	140	
% Passing 325 Mesh Sieve	99.8	100	99.0
Stabilized Residual Test, Grams*	15.0	25.0	
NaOH 50% Solution Equivalent	1 lb Equivalent to .73 lb Mg(OH) ₂ 60%		
Mg(OH) ₂ 60% Solution Equivalent	100% Equivalent to 137% NaOH 50%		
CaCO ₃ Equivalent	1 lb Equivalent to .59 lb Mg(OH) ₂		
Mg(OH) ₂ 60% Solution Equivalent	100% Equivalent to 170% CaCO ₃		
Physical Properties:			
Density, lbs/gal	12.9		12.5
Solids, Weight Percent %	60	62	59
Viscosity, cps*	150	300	100
*TP-112 14 Hour Stability Residual Test			
*Brookfield RVT Viscometer #3 spindle @ 100 rpm, 60 seconds at 70°F			
Certifications:			
NSF International Certifies that Thioguard conforms to the requirements of NSF/ANSI Standard 60 - Drinking Water Treatment Chemicals - Health Effects			

b. To be considered, the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide must also meet the following specifications, which shall be confirmed by a written analysis. Bid submittal will not be considered complete without requested documentation. If documentation is not provided at time of bid submittal, the bid will be disqualified. The following specifications and verifications must be provided with the bid submittal:

- i. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide must be produced and derived from highly reactive calcined magnesium oxide utilizing a wet milling process for consistent product sizing, uniformity, reactivity and highest purity. This requirement is utilized to provide consistent performance, better dispersion and suspension stability. Proof of origination of the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall require the contractor to provide a written description of the method confirming how the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- ii. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide must be produced and derived from highly reactive calcined magnesium oxide that originates and is manufactured in the United States. Proof of origination of the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall require the contractor to provide the written street address, town, state, zip code, contact name and contact name telephone number at the manufacturing location address with the bid submittal.
- iii. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall be NSF International Certified conforming to the requirements of NSF/ANSI Standard 60 – Drinking Water Treatment Chemicals – Health Effects. Contractor shall confirm this requirement by providing NSF/ANSI Standard 60 – Drinking Water Treatment Chemicals – Health Effects with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- iv. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a minimum Mg (OH)₂ dry weight percent purity of 92.0% or greater to insure high grade consistency, sufficient surface area and reactivity within the municipal wastewater. Contractor shall confirm this requirement by providing written analysis performed by certified 3rd party laboratory with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- v. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a minimum 6.5 pounds per gallon of a minimum 92.0% Mg (OH)₂ dry weight percent purity to insure minimum reactive solids content per gallon, consistent sufficient surface area and reactivity within the municipal wastewater. Contractor shall confirm this requirement by providing written analysis performed by

certified 3rd party laboratory with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.

- vi. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a median particle size no greater than 10.0 microns in order to insure sufficient surface area and reactivity within the municipal wastewater. Contractor shall confirm this requirement by providing written analysis performed by certified 3rd party laboratory with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- vii. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a specific surface area, m^2/g of no less than 12.0 square meters per gram in order to insure sufficient surface area and reactivity within the municipal wastewater. Contractor shall confirm this requirement by providing written analysis performed by certified 3rd party laboratory with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- viii. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a Caustic Magnesia Activity/Sec no greater than 140 seconds in order to insure sufficient surface area and reactivity within the municipal treatment plant. Contractor shall confirm this requirement by providing written analysis with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- ix. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall have a Stabilized Residual Test result in grams of less than or equal to 25 grams to prevent feed tank handling and wastewater treatment plant problems associated with instability of low grade magnesium hydroxide slurry produced from uncalcined brucite, uncalcined dolomite, dolime, brucitic marble, or any caustic-enhanced or lime-enhanced versions of the former. Contractor shall confirm this requirement by providing written analysis with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.
- x. The technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide shall be capable of cost effectively providing non-carbonate alkalinity for biological treatment plant processes. The percent by weight of the Contractor's magnesium hydroxide slurry shall not exceed 4.0% by weight of CaO. This requirement is to prevent water softening and to prevent the precipitation of magnesium and calcium that results in sludge production,

calcium scaling and reduced reactivity / reduced alkalinity. Contractor shall confirm this requirement by providing written analysis performed by certified 3rd party laboratory with the bid submittal. Failure to supply the requested items listed above with the bid submittal will disqualify the bidder from consideration.

V. Contractor Requirements:

The Contractor shall provide the following information as part of their bid package response. The bid package will not be considered complete without all of the following information submitted as part of the package. Bid packages that do not contain all of the requested items listed below will be disqualified from consideration. The bidder is required to provide:

- a. Magnesium hydroxide slurry produced or derived from uncalcined brucite, uncalcined dolomite, dolime, brucitic marble, or any caustic-enhanced or lime/calcium carbonate-enhanced versions of the former are not compliant with this bid and will not be accepted.
- b. The Contractor's technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide manufacturing location shall have a minimum inventory of 40,000-gallons at all times to ensure adequate supply in case of weather related / force majeure events that impede transportation and delivery. The Contractor must supply with the bid submittal a current picture of the minimum 40,000-gallon inventory, the location address, the contact name and the contact telephone number.
- c. The Contractor must supply with the bid submittal a current and valid Material Safety Data Sheet ("MSDS") for the technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide. The MSDS must include a CAS number for the product.
- d. The Contractor must submit a written company background/history and qualifications with the bid submittal.
- e. The Contractor must submit with the bid submittal a minimum of four (4) municipal wastewater references to whom they currently supply technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide including:
 - i. Name and address of the facility;
 - ii. Contact person;
 - iii. Contact phone number; and
 - iv. Current application of product
- f. The Contractor shall submit a written report with the bid submittal that details how the technical grade magnesium hydroxide slurry derived from highly reactive calcined

magnesium oxide provides non-carbonate alkalinity in a municipal wastewater treatment plant. This report shall document measureable results obtained through the use of technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide.

g. The Contractor shall contact the Contract Manager after award of contract to schedule a meeting. The purpose of this meeting will be to establish and mutually agree upon a schedule and coordination of the contract with plant operations.

VI. Delivery Requirements:

a. The Plant Superintendent or his Designee will place orders by phone/fax/email, on an "as needed" basis.

b. All shipments shall be accompanied by a certified weight certificate, Certificate of Analysis and MSDS.

c. Delivery hours shall be specified by the WSA

d. The Contractor shall be responsible for cleanup of any spillage or leakage during transportation or on the plant site due to defective pumping/unloading or negligence of the driver.

e. Delivery Locations:

- i. Warwick Sewer Authority
- ii. Contact Person: Dana DiScuillo
- iii. Office: (4 0 1) -468-4714
- iii. Email: Dana.a.Discuillo@warwickri.com

f. The WSA reserves the right to request additional technical grade magnesium hydroxide slurry derived from highly reactive calcined magnesium oxide feed locations as necessary.

VII. Invoicing Requirements:

Invoices shall be submitted to the Warwick Sewer Authority, 125 Arthur Devine Blvd. Warwick, Rhode Island 02888 within 5 business days after delivery of product and shall include, but is not limited to, the following:

- a. Contractor's name, on a professionally pre-printed numbered invoice;
- b. Contractor's address and phone number;
- c. WSA's contract number/purchase order number;
- d. Date of delivery;
- e. Location of delivery;
- f. Itemized description and pricing;
- g. Signed Chemical Delivery form for each delivery; and
- h. Copy of transportation invoice.

CITY OF WARWICK

BID AND CONTRACT FORM

TITLE OF SPECIFICATION: Bid2021-091 Wastewater Treatment Chemicals
Magnesium Hydroxide

I. BID:

WHEREAS, the CITY OF WARWICK has duly asked for bids for performance of services and/or supply of goods in accordance with the above-indicated specifications.

The person or entity does irrevocably offer to perform the services and/or furnish the goods in accordance with the specifications, which are hereby incorporated by reference in exchange for the bid price below;

This offer will remain open and irrevocable until the CITY OF WARWICK has accepted this bid or another bid on the specifications or abandoned the project.

The bidder agrees that acceptance by the CITY OF WARWICK will transform the bid into a contract. This bid and contract will be secured by Bonds, if required by the specifications.

Pricing as Follows

Continued next page

PLEASE COMPLETE THIS PAGE & SUBMIT WITH YOUR BID

(PRICING SHEET MAY NOT BE CONFIDENTIAL)

BID FORM

THE UNDERSIGNED, HAVING READ THE ADVERTISEMENT, NOTICE TO BIDDERS, GENERAL INFORMATION FOR BIDDERS, CONTRACT AND ALL OTHER BID SPECIFICATIONS, WILL COMPLY WITH ALL OF THE TERMS, COVENANTS AND AGREEMENTS SET FORTH THEREIN IF AWARDED A CONTRACT. FOR THE AMOUNT(S) SET FORTH BELOW, THE UNDERSIGNED WILL EXECUTE A CONTRACT WITH THE WARWICK SEWER AUTHORITY IN ACCORDANCE WITH THE TERMS AND CONDITIONS SET FORTH IN THE BID SPECIFICATIONS AND CONTRACT AND WILL DELIVER THE REQUIRED GOODS AND/OR SERVICES.

BIDDER NAME: Amrex Chemical Co., Inc.

ITEM #	ITEM DESCRIPTION	BID PRICE PER ITEM
1	One-year contract for Furnishing & Delivery of Thioguard Magnesium Hydroxide Slurry (or equivalent)	<p>\$ <u>4.75</u> per gallon delivered</p> <p>Four Dollars Seventy-five cents per gallon</p> <p>Write in Bid Price in Words (in dollars per gallon)</p>
2	First Option Year for Furnishing & Delivery of Thioguard Magnesium Hydroxide Slurry (or equivalent)	<p>\$ <u>5.10</u> per gallon delivered</p> <p>Five Dollars and ten cents per gallon</p> <p>Write in Bid Price in Words (in dollars per gallon)</p>
3	First Option Year for Furnishing & Delivery of Thioguard Magnesium Hydroxide Slurry (or equivalent)	<p>\$ <u>5.45</u> per gallon delivered <i>WFA</i></p> <p>Five Dollars and Forty-five cents per gallon <i>WFA</i></p> <p>Write in Bid Price in Words (in dollars per gallon)</p>

PLEASE COMPLETE THIS PAGE & SUBMIT WITH YOUR BID

(PRICING SHEET MAY NOT BE CONFIDENTIAL)

Name of Firm or Individual: Amrex Chemical Co., Inc.

Street Address: 117 E. Frederick Street

City, State, Zip Code: Ringhamton, New York 13904

Telephone Number: (607)772-8784

Fax Number: (607)772-8786

Email: info@amrexchemical.com

EIN 16-1186992

William J. Lopez
President

The undersigned bidder hereby agrees that if this bid is accepted by the Warwick Sewer Authority and the undersigned fails to execute and deliver the contract and all other documents required by the bid specifications within the time periods set forth in the bidding documents and bid specifications then the undersigned shall be deemed to have abandoned the contract and thereupon the bid and its acceptance shall be null and void.

The undersigned bidder acknowledges and agrees that said bidder has received, read, understood and shall comply with all of the provisions of the contract and bid specifications.



2x Raw Material Silos

**3x 15000 T finished
goods/aging tanks
ASPERS, PA**

Premier Chemicals

Municipal User Verification References

	Name	Application	Name/Address/Phone	Tank Size, gal	MGD
1.	Mt Airy WWTP, MD	WWTP alkalinity supplementation and collection system odor control	Terry Driver 7245 Ridge Road, Mt Airy, MD 21771 301-829-2674	2500	1.2 MGD
2.	Stafford County, VA Aquia and Little Falls WWTP	Alkalinity supplementation and odor control. Switched from Univar magnesia and lime slurries.	Ed Hayner Coal Landing, VA 22193 540-658-4826	6000/2500	14.25 MGD
3.	Kent County, DE	Odor control for three regions	Dave Whitney 139 Milford Neck Rd, Milford, DE 19963 302-335-6000 x-222	2500	6.8 MGD
4.	Gwinnett County, VA	Odor control 15 miles from plant, pebble lime slaker shut down	Christen Smeby Hazen & Sawyer Atlanta, GA 404-459-6363	6000 (x3)	9 MGD

AMREX CHEMICAL CO., INC.

117 E. Frederick St

P.O. Box 642

Binghamton, NY 13902



SAFETY DATA SHEET

Issue Date 01-July-2018

Revision Date 01-July-2018

Version 3

IDENTIFICATION OF THE SUBSTANCE, PREPARATION AND OF THE COMPANY UNDERTAKING

Product Identifier

Product Name THIOGUARD®

Other means of identification

Product Code THIOGUARD®

Synonyms Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)₂

Recommended use of the chemical and restrictions on use

Recommended Use Waste water treatment, Hydrogen sulfide control.

Uses advised against No information available

Details of the supplier of the safety data sheet

Manufacturer Address

Premier Magnesia, LLC, 1275 Drummers Lane, Suite 102, Wayne, PA 19087

Emergency telephone number

Company Phone Number 610-828-8929

24 Hour Emergency Phone Number Chemtrec 1-800-424-9300

Emergency Telephone Chemtrec 1-800-424-9300

HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status

Not hazardous in normal industrial use. Dust from dried product slurry is classified as a "nuisance particulate, not otherwise regulated" as specified by ACGIH and OSHA.

Not a dangerous substance or mixture according to the Globally Harmonized System (GHS)

Label elements

Emergency Overview

White to off-white aqueous slurry. Not a fire or spill hazard. Low toxicity. Dust is classified as a "nuisance particulate not otherwise regulated". Do not store in drums or tanks constructed of aluminum! See section 7.

Appearance Slurry

Physical state Liquid

Odor Odorless

Particulate may cause eye irritation

Low toxicity by skin contact

An unlikely route of exposure. If ingested in sufficient quantity may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting and diarrhea.

Hazards not otherwise classified (HNOC)

Other information

IDENTIFICATION INFORMATION ON INHERENT RISKS

Common name Magnesium Hydroxide CAS# 1309-42-8.
Synonyms Magnesium Hydroxide, Mag Hydroxide, Hydrated Magnesia, Mg(OH)₂

Formula #1	Chemical Name	CAS No.	Weight-%	Trade Secret
	Water	7732-18-8	39-47	
	Magnesium Hydroxide	1309-42-8	53-61	

IDENTIFICATION INFORMATION ON INHERENT RISKSFirst aid measures

Eye contact Rinse thoroughly with plenty of water, also under the eyelids. If eye irritation persists: Get medical advice/attention.

Skin Contact Wash skin with soap and water.

Inhalation Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Ingestion Ingestion is an unlikely route of exposure. If ingested in sufficient quantity and victim is conscious, give 1-2 glasses of water or milk. Never give anything by mouth to an unconscious person. Leave decision to induce vomiting to qualified medical personnel, since particles may be aspirated into the lungs. Seek immediate medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

IDENTIFICATION INFORMATION ON INHERENT RISKSSuitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Firefighters should wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing when appropriate.

Unsuitable extinguishing media Caution: Use of water spray when fighting fire may be inefficient.

Specific hazards arising from the chemical

No information available.

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

IDENTIFICATION INFORMATION ON INHERENT RISKSPersonal precautions, protective equipment and emergency procedures

Personal precautions Ensure adequate ventilation, especially in confined areas.

Environmental precautions

Environmental precautions See Section 12 for additional ecological information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so

Methods for cleaning up Carefully clean up and place material into a suitable container, being careful to avoid creating excessive dust from dried product. If conditions warrant, clean up personnel should wear approved respiratory protection, gloves and goggles to prevent irritation from contact and/or inhalation.

PHYSICAL AND CHEMICAL PROPERTIES

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions Do not allow product to freeze. Do not store in drums or tanks constructed of aluminum.

Incompatible materials Maleic anhydride; Aluminum metal in contact with product may produce hydrogen.

ENVIRONMENTAL PROTECTION AND PERSONAL PROTECTION

Control parameters

Exposure Guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls Provide sufficient ventilation, in both volume and air flow patterns to control mist/dust concentrations below allowable exposure limits.

Individual protection measures, such as personal protective equipment

Eyeface protection The use of eye protection is recommended.

Skin and body protection The use of eye protection, gloves and long sleeve clothing is recommended.

Respiratory protection Provide workers with NIOSH approved respirators in accordance with requirements of 29 CFR 1910. 134 for level of exposure incurred.

General Hygiene Considerations Avoid contact with eyes, skin and clothing. After handling this product, wash hands before eating or drinking.

PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Liquid	Odor	Odorless
Appearance	Slurry	Odor threshold	No information available
Color	White to off-white		

Property	Values	Remarks - Method
pH	10-11	
Melting point/freezing point	2100 °C >3800 °F	
Boiling point / boiling range	Loses free water at 100 °C	
		;Chemically combined water at 350°C
Flash point	No information available	
Evaporation rate	Same as water	
Flammability (solid, gas)	No information available	
Flammability Limit In Air		
Upper flammability limit:	No information available	
Lower flammability limit:	No information available	
Vapor pressure	No information available	
Vapor density	No information available	
Specific Gravity	1.45	
Water solubility	No information available	Aqueous Slurry
Solubility in other solvents	No information available	
Partition coefficient	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

Other Information

Softening point	No information available
Molecular weight	No information available
VOC Content (%)	No information available
Density	No information available
Bulk density	12.71-13.19 lb/gal

PHYSICAL AND CHEMICAL INFORMATION

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions.

Possibility of Hazardous Reactions
None under normal processing.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid
Extremes of temperature and direct sunlight.

Incompatible materials
Maleic anhydride; Aluminum metal in contact with product may produce hydrogen.

Hazardous Decomposition Products
Heat and steam.

TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information Product does not present an acute toxicity hazard based on known or supplied information

Inhalation No data available.
 Eye contact No data available.
 Skin Contact No data available.
 Ingestion No data available.

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Water	> 80 mL/kg (Rat)	-	-
7732-18-5 Magnesium Hydroxide 1309-42-8	= 8500 mg/kg (Rat)	-	-

Information on toxicological effects

Symptoms No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation May cause eye irritation.
 Sensitization No information available.
 Germ cell mutagenicity No information available.
 Carcinogenicity No information available.
 Reproductive toxicity No information available.
 STOT - single exposure No information available.
 STOT - repeated exposure No information available.
 Aspiration hazard No information available.

Numerical measures of toxicity - Product Information



Ecotoxicity

No data available on any adverse effects of this material on the environment

Persistence and degradability

No information available.

Bioaccumulation

No information available.

Other adverse effects

No information available



Waste treatment methods

Disposal of wastes

This produce does not exhibit any characteristics of a hazardous waste. The product is suitable for landfill disposal once the free water component is evaporated or absorbed by a suitable absorbent (earth). Follow all applicable federal, state and local regulations for safe disposal.

Re-used/contaminated packaging

Do not reuse container.

THOOGUARD®

TRANSPORTATION INFORMATION

Note: WARNING! Premier Magnesia, LLC prohibits this product from transportation or storage in tanks constructed of aluminum! See section 10.

DOT: Not regulated by DOT as a hazardous material. No hazard class, label or placard required, no UN or NA number assigned.

ENVIRONMENTAL INFORMATION

International Inventories

TSCA	Complies
DSL/NDL	Complies
EINECS/ELINCS	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend:

- TSCA - United States Toxic Substances Control Act Section 6(b) Inventory
- DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List
- EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
- ENCS - Japan Existing and New Chemical Substances
- IECSC - China Inventory of Existing Chemical Substances
- KECL - Korean Existing and Evaluated Chemical Substances
- PICCS - Philippines Inventory of Chemicals and Chemical Substances
- AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals This product does not contain chemicals known to the state of California to cause birth defects or other reproductive harm.

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Water 7732-18-5			X

U.S. EPA Label Information

EPA Pesticide Registration Number Not Applicable

HAZARD INFORMATION

<u>NFPA</u>	Health hazards 0	Flammability 0	Instability 0	Physical and Chemical Properties -
<u>HMS</u>	Health hazards 0	Flammability 0	Physical hazards 0	Personal protection X

Revision Date 01-July-2019
 Revision Note
 No information available

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

NSF Certificate

&

Third Party Lab Data



OFFICIAL LISTING

NSF International Certifies that the products appearing on this listing conform to the requirements of NSF/ANSI Standard 60 - Drinking Water Treatment Chemicals - Health Effects

This is the Official Listing recorded on July 20, 2017.

Premier Magnesia, LLC
75 Giles Place
Waynesville, NC 28786
828-452-4784

Facility: Aopems, PA

Chemical/
Trade Designation

Function

Max Use

Magnesium Hydroxide
Aquamag MW63

Precipitation Agent
pH Adjustment

300 mg/L

Magox 93 HRNW
Nutri-Mg ++

pH Adjustment
Precipitation Agent

300 mg/L

TG 325 OX
Thioguard

pH Adjustment
Precipitation Agent
pH Adjustment

300 mg/L
300 mg/L

Facility: Gabbe, NV

Chemical/
Trade Designation

Function

Max Use

Magnesium Hydroxide
Aquamag

Precipitation Agent
pH Adjustment

300 mg/L

AquamagNW

Precipitation Agent
pH Adjustment

300 mg/L

AquamagNW 633

Precipitation Agent
pH Adjustment

300 mg/L

Magox 93 HRNW
Nutri-Mg+

pH Adjustment
Precipitation Agent

300 mg/L

300 mg/L

Nutri-Mg++

pH Adjustment
Precipitation Agent

300 mg/L

TG 325 OX
Thioguard

pH Adjustment
Precipitation Agent

300 mg/L

300 mg/L

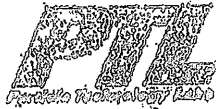
Thioguard 633

pH Adjustment
Precipitation Agent

300 mg/L

pH Adjustment

Note: Additions shall not be made to this document without prior evaluation and acceptance by NSF International.
1 of 1



PREMIER MAGNESIA

TriStar II 3020 3.02

TriStar II 3020 Version 3.02
Serial # 626 Unit 1 Port 2

Page 1

File name: 3680843E
Chemist: JF
Submitter: Particle Technology Lab
File: R:\TriStar II 3020\wiaso2\tdabin\36808-43\3680843E.SMP

Started: 4/10/2017 3:41:58 PM	Analyte Adsorptive: N2
Completed: 4/10/2017 4:47:48 PM	Analyte Bath Temp: 77.350 K
Report Time: 4/11/2017 8:12:01 AM	Thermal Correction: No
Sample Mass: 1.0398 g	Warm Free Space: 14.8665 cm ³ Measured
Cold Free Space: 46.7382 cm ³	Equilibration Interval: 20 s
Low Pressure Decc: None	Sample Density: 1.000 g/cm ³
Automatic Decc: No	

Comments: Magnesium Hydroxide ThioGuard-T-636217 Project #36808-43 PTL ID: 234618-43

Summary Report

Surface Area

Single point surface area at P/P₀ = 0.100146146: 14.7768 m²/g

JF, JF, JF
0 0 0 0 0 0



Beckman Coulter LS Particle Size Analyzer

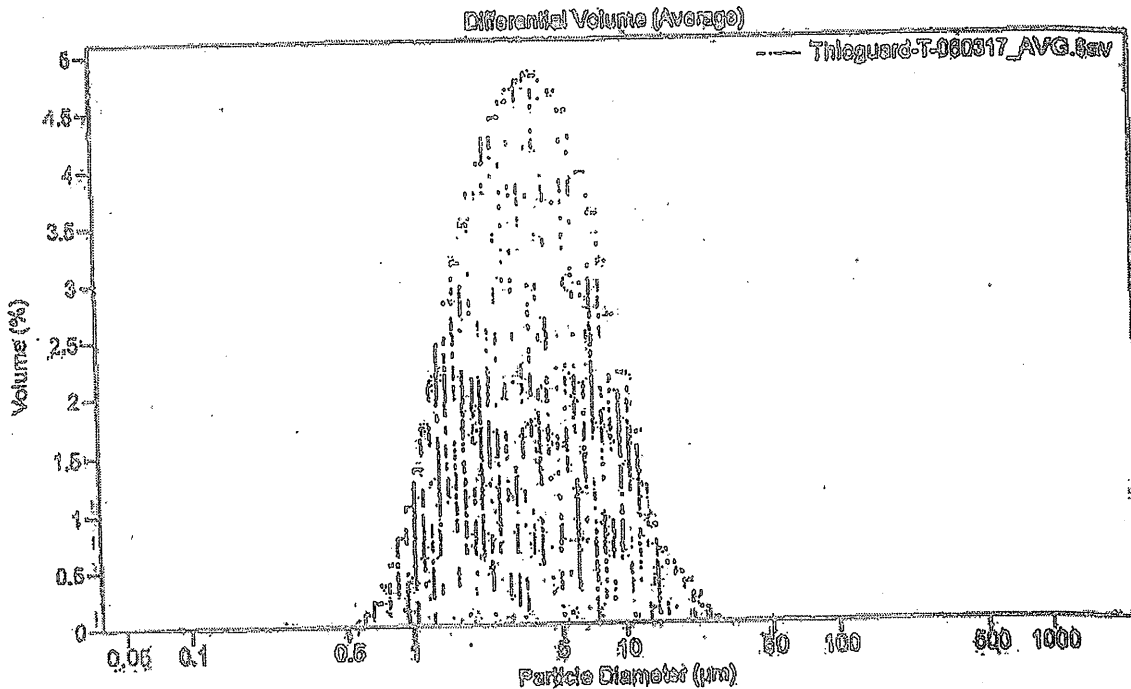
Particle Technology Labs

File name: RALS 1932030039-13\Thioguand-T-080317_AVG.sav
 Thioguand-T-080317_AVG.sav
 File ID: Thioguand-T-080317
 Sample ID: Magnesium Hydroxide
 Comment 1: PREMIER MAGNEBIA Channel: AA
 Comment 2: Particle Technology Labs Channel: Non-aqueous PTL ID: 287670-48
 Optical model: Powder3.r780d PIDS Included

Volume Statistics (Geometric) Thioguand-T-080317_AVG.sav

Calculations from 0.040 µm to 2000 µm

Volume:	100%	S.D.:	2.010
Mean:	3.769 µm	Variance:	4.041
Median:	3.819 µm	Skewness:	-0.017 Lar skewed
Mean/Median ratio:	0.987	Kurtosis:	-0.494 Platykurtic
Mode:	4.443 µm		
d10:	1.481 µm	d50:	3.810 µm
		d90:	8.272 µm



MAGNEBIA-66-24
 Je 2017-07-03



103 Commerce Street
P.O. Box 370
Wayneville, NC 27886
Phone: 919-652-4701

Caustic Magnesia Activity Results

Sample ID	Method	Repeat	State	Sample Amount Used	Date (YYYY)
Thloguard-T-062316	TP-TG 227	126 s	as received	4.88 mL	7/05/17

Report Number: 07240



Report Date: 2017-03-10

Laboratory Report

Report prepared for:
John Ladd
Pramler Magnaste LLC
102 Commodore Street
Waynesville, NC 28786
Phone: 828-462-4784 ext. 31
Email: ladd@pramchemical.com

Report prepared by:
Michelle Smith

Purchase Order:
PO 17033

For further assistance, contact:
Michelle Smith
Technical Manager
PO Box 81610
Knoxville, TN 37628-1610
(865) 536-1886 ext. 1628
michelle@pramchemical.com

Sample: Thiloguard-S-030317	Received: 2017-03-28
Lab ID: 2017-D-8942	

Analytic Method	Result	Units	Sample Amount Used	Date (Time)
40: Alkalinity as CaCO ₃ Equiv Client Method (See Note)	12.02 lbs equivalent CaCO ₃ /gal	As Received	Direct	2017-04-10

4.

For Alkalinity as CaCO₃ Equivalent, testing was performed by Method TP-76239, Rev. 1, "Calculation of Thiloguard Alkalinity Expressed as lb/gallon Calcium Carbonate Equivalent"

Copyright 2017 Calbraith Laboratories, Inc.

Reported results are only applicable to the item tested.

This report shall not be reproduced, except in full, without the written approval of the laboratory.

Report Number: 07216



Report Date: 2017-04-06

Laboratory Report

Report prepared for:
Josh Ladd
Purifier Magnesia LLC
102 Commerce Street
Waynesville, NC 28786
Phone: 828-452-4784 ext. 31
Email: jlad@purifiermagnesia.com

Report prepared by:
Michelle Smith

Purchase Order:
PO 17088

For further assistance, contact:
Michelle Smith
Technical Manager
PO Box 61610
Knoxville, TN 37629-1010
(865) 840-1338 ext. 1028
michelle.smith@galbraith.com

Sample: Thloguard-C-030717
Lab ID: 2017-L-0940
Received: 2017-03-28

Analytic Method	Result	Units	Sample Amount Used	Date (Time)
101: Density				
ASTM D1476	12.68	lb/gallon (US)	42.89473 g	2017-04-06
ASTM D1476	12.68	lb/gallon (US)	41.26816 g	2017-04-06

WASHINGTON MILLS

June 28, 2017

Josh Ladet
Premier Magnesia LLC
102 Commerce St.
Waynesville, NC 28786

Subject: Misc. Samples from Premier Magnesia
Thioguard-G-050117
Customer Order Number: PO 17127
WMEM Laboratory Number: 171376

Following is our analysis of this material (metal oxides are reported on a calcined basis):

% Loss/Gain	31.82	
	Loss	
	1000° C	1 Hour
% Na2O	< 0.01	
" Al2O3	0.07	
" SiO2	0.14	
" K2O	< 0.01	
" CaO	0.59	
" TiO2	0.04	
" Cr2O3	< 0.01	
" MnO	0.02	
" Fe2O3	0.24	
" P2O5	< 0.01	
" ZrO2	< 0.01	
" MgO	96.89	

Thank you for the opportunity to perform this analysis.
Please contact me at 800-828-1666 (x6774) with any questions regarding this report.

John Fomanko
Manager, Laboratory Services
(716) 278-8774
jfomanko@washingtomills.com

Report Number: 87240



Report Date: 2017-04-10

Laboratory Report

Report prepared for:
 Josh Ledet
 Premier Magnesia LLC
 102 Commerce Street
 Waynesville, NC 28786
 Phone: 828-482-4704 ext. 31
 Email: ledet@galbraithchemical.com

Report prepared by:
 Melissa Smith

Purchase Order:
 PO 17090

For further assistance, contact:
 Melissa Smith
 Technical Manager
 PO Box 51610
 Knoxville, TN 37950-1010
 (615) 546-4296 ext. 1022
melissasmith@galbraith.com

Sample: Thloguard-C-030717	Received: 2017-03-28
Lab ID: 2017-D-8940	

Analytic Method	Result	Units	Sample Amount Used	Date (Time)
Q90: Stone Analysis (wash to 6) % passing - 100 mesh min				
ASTM C136	100.00 %	As Received	10.04005 g	2017-04-06

Report Number: 417248



Board Drive, Smith, GA 31406

Laboratory Report

Report prepared for:
Josh Ladd
Premier Magnetics LLC
102 Camperus Street
Waynesville, NC 28786
Phone: 828-452-4784 ext. 31
Email: laddj@indiachemical.com

Report prepared by:
Michelle Smith

Purchase Order:
PO 17156

For further assistance, contact:
Michelle Smith
Technical Manager
PO Box 61010
Knoxville, TN 37901-1010
(865) 546-1985 ext. 1020
michelle@indiachemical.com

Sample: Thioguard-C-030717	Received: 2017-03-28
Lab ID: 2017-D-0940	

Analytical Method	Result	Back	Sample Amount Used	Date (Time)
40% Percent Solids Content (o Client Method (Spectro)	60.85 %	As Received	Direct	2017-04-10

6.

For Percent Solids Content (Calculation), testing was performed by Method TP-T0220, Rev. 1, "Measurement of Thioguard % Solids Content"



100 Commerce Street
P.O. Box 376
Waynesville, NC 28786
Phone 828-433-1764

Stabilized Residual Test, Grams per 14 Hours

Sample ID	Method	Result	State	Sample Amount Used	Date (Time)
Thloguard-C	TP-TG 112	1.13 g	as received	250 mL	7/18/17



Report Number: 63938

Report Date: 2016-03-17

Laboratory Report

Report prepared for:
Josh Liles
Premier Magnolia
102 Commerce Street
Waynesville, NC 28788
Phone: 620-452-4784 ext. 31

Email: jliles@calbraath.com

Report prepared by:
Schvorer Foster

Purchase Order:
PO 16164

For further assistance, contact:
Schvorer Foster
Technical Manager
PO Box 51010
Knoxville, TN 37630-1010
(423) 546-1896
pat@calbraath.com

Sample: Thioguard-C-030716		Received: 2016-03-17		
Lab ID: 2016-B-3928				
Analytic Method	Result	Units	Sample Amount Used	Date (Time)
110: Wapely, Brookfield @LI Procedure 0-137	272.0	CPM	Direct	2016-03-23



AMREX CHEMICAL CO., INC.

117 E. Frederick St.

P.O. Box 642

Binghamton, NY 13902

Thioguard® Magnesia

Proactive Municipal Wastewater Management

Premier Chemicals Co.

7251 Engle Road

Suite 415

Middleburg Heights

OH 44130

Tel: (440) 234-4600

Fax: (440) 234-5772

www.premierchemicals.com

In general, treatment plants and collection systems operate better with wastewater that has proper, stable pH, with lower acidity and higher alkalinity. Thioguard TST is a simple, safe and cost effective strategy that extends the life of wastewater infrastructure while improving the overall economics of collection and treatment.

Milk of Magnesia, $(Mg(OH)_2)$, is a viscous, mildly alkaline mixture widely known for medicinal use. Thioguard is industrial grade milk of magnesia developed and adapted for use in municipal wastewater collection and treatment. Chemically magnesium hydroxide $(Mg(OH)_2)$ provides a freely moving slow release source of non-carbonate alkalinity. It is easy to handle and adds no sodium or TDS pass-through. Alkalinity contributes to the properties of wastewater, many of which positively affect the physical, biological and chemical processes required for better wastewater transport and treatment. Thioguard also provides Mg^{2+} , an important micronutrient necessary for improved flocculation, clarification and biologic treatment.

Thioguard can be applied locally, or as a comprehensive strategy to improve the overall operational performance of an entire system. No other chemical strategy is as safe and as cost effective for municipal wastewater systems.

The following pages provide information regarding modes of action and measurable process benefits. Depending upon the collection system configuration and treatment process Thioguard can:

- Substantially Extend The Useful Life Of The Collection System
- Reduce Chemical Consumption (10-25%) \$5,000 to 15,000/yr/mgd
- Reduce Hydrogen Sulfide Gas Evolution by 95%
- Reduce or eliminate FOG (fats, oils and grease)
- Improve Safety and Eliminate Chemical Spill Concerns
- Reduce Energy Consumption (15-50%) \$7,500 to 50,000/yr/mgd
- Reduce Bio-Solids Output (5-15%) \$1,000 to 5,000/yr/mgd
- Increase Treatment Capacity (10-50%) \$5 to \$10 per gallon

Background

Wastewater has changed. Since the enactment of the Clean Water Act in 1972, more centralized treatment, longer retention times, low flow plumbing fixtures, higher influent BOD, the shift from phosphate to sulfur based detergents and elimination of heavy metal industrial discharges, all contribute to rapid depletion of dissolved oxygen. These factors have changed over the last 30 years and they result in less control of biologic oxidation during transport and treatment.

In addition to treating stronger more septic influent, treatment plants today are required to comply with more stringent discharge requirements, including tighter control over variables such as pH, alkalinity, turbidity, nitrogen, phosphorus, pathogens and residual chlorine. These effects, combined with the impact of aging infrastructure have caused a marked increase in total expenditures for wastewater treatment. Together with new regulatory requirements such as Capacity, Management, Operations and Maintenance (CMOM), there is a compelling case to add Thioguard magnesium hydroxide to the collection system.

In 2000 the EPA estimated 8 percent of U.S. wastewater collection systems were already in poor condition or worse. By 2016 the EPA projects more than 50% of the country's 600,000 miles of sewers will be in poor, very poor or inoperable condition.

Properties of Magnesia

Magnesia is most commonly known as a remedy for acid stomach. Taken internally, milk of magnesia serves as an acid acceptor and gently neutralizes acids and acid gasses at moderate pH.

It is common for wastewater professionals and consulting engineers to be unfamiliar with the properties and overall benefits of magnesia addition. The technology has been developed only within the last ten years. For this reason, a discussion on the properties of magnesia is in order.

Before considering what Thioguard does or how it works, it is helpful to better understand the chemical and physical properties of magnesium hydroxide. In the U.S., magnesium hydroxide has been in production since at least 1874. However, it has only recently become competitively priced and widely available for municipal application. Because of its effectiveness, relative cost and environmentally friendly properties, it is an ideal choice for today's wastewater professionals.

Magnesium is a divalent cation. That is, it carries a charge of plus two. Calcium and Magnesium are divalent, whereas Sodium and Potassium are monovalent (carry a single charge). Commercially practical bases for large-scale application usually include caustic soda and lime. However, pound for pound or gallon for gallon, magnesium hydroxide provides more alkalinity at lower pH.

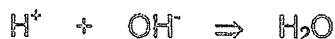
The solubility of magnesium hydroxide is much lower than either caustic or lime and its reactive pH is only 9.0. In practical terms this means magnesium hydroxide will buffer and control pH in the range of 8.5 to 9.0. For municipal wastewater this is an ideal pH to control hydrogen sulfide evolution. Over-addition with magnesium hydroxide will not drive the pH higher, an important consideration for safe system-wide application.

Property	50% NaOH	30% Ca(OH) ₂	58% Mg(OH) ₂
%Hydroxide	42.5	45.9	58.3
Solubility in Water g/100 ml	42	0.185	0.0009
Reactive pH	14	12.5	9.0
Freezing Point °F	61	32	32
Weight Equivalency	1.37	1.27	1

For neutralization three elements are worth commercial consideration; sodium, calcium and magnesium. Sodium is widely used and recognized in the forms of caustic soda (NaOH), and soda ash (Na₂CO₃). Calcium is also widely applied as quick lime (CaO), calcium hydroxide (Ca(OH)₂), and calcium carbonate or limestone (CaCO₃). Magnesia is available as MgO or more commonly as magnesium hydroxide slurry.

Element	Atomic Number	Atomic Weight
Na, Sodium	11	22.98
Mg, Magnesium	12	24.31
Ca, Calcium	20	40.08

Acid neutralization occurs when hydrogen ions are combined with hydroxyl ions:



Comparing the most common base reagent choices, magnesium hydroxide provides the lowest atomic mass per hydroxyl ion provided to the wastewater:

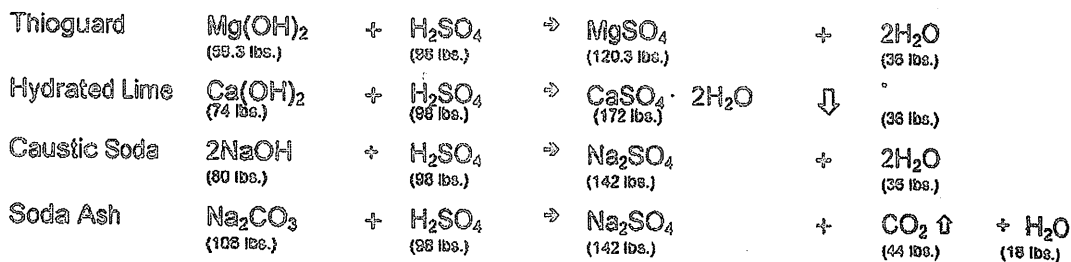
$$\begin{aligned} \text{NaOH} &= 22.98 + 16 + 1 = && 39.98 \text{ units per hydroxyl ion} \\ \text{Ca(OH)}_2 &= (40.08 + 34)/2 = && 37.04 \text{ units per hydroxyl ion} \\ \text{Mg(OH)}_2 &= (24.31 + 34)/2 = && 29.15 \text{ units per hydroxyl ion} \end{aligned}$$

For this reason magnesium hydroxide provides more neutralizing power per ton than the other alkali choices. More importantly for practical wastewater applications, reaction rates are slower and pH is more easily controlled within the ideal range to prevent sulfide formation and evolution.

Handbooks of wastewater practice have long recognized pH control as a means to mitigate sulfide odors. However, the relative high solubility of lime and caustic soda present difficulty controlling pH over wide flow rates and retention times. Lime readily carbonates and the byproduct of lime reactions results in scale and large volumes of sludge. Each pound-mole of lime yields 172 pounds of sludge. Stated another way, for every ton of lime added, 2.32 tons of sulfate reaction byproducts are produced. When the water content and carbonate reaction is taken into account, lime addition yields over 5 tons of sludge for every ton added. This contributes to scale and solids accumulation in the collection system as well as added biosolids disposal costs.

For this reason lime is a very poor choice for addition to the collection system. Most handbooks of practice recognize this shortcoming and recommend lime be restricted for use principally to the back end of the plant for sludge stabilization.

Neutralization of one mole (98 lbs.) of 100% Sulfuric Acid yields:



* CaSO_4 precipitates as sludge.

Thioguard in Municipal Wastewater

Addition of Thioguard to municipal wastewater collection systems is a proactive, rather than reactive, executive level strategy. It provides a wide range of tangible, measurable benefits from extended infrastructure life, to improvements in safety, odors, treatment quality and treatment costs. The sum of these benefits far offset the costs of implementing Thioguard addition. Fiscal benefits vary with each municipality, and they are system specific. However, from experience quantified cost:benefit is in the range of 1:5, to as much as 1:11.

<u>Process/Problem</u>	<u>Impact</u>	<u>Mode of Action</u>
Collection:		
Grease	Reduce/Eliminate	pH/Saponification
Odor	Reduce/Eliminate	pH, Adsorption/Absorption
Safety	Improve	Non-Haz, Remove H ₂ S Gas
Hydrogen Sulfide	Reduce/Eliminate	pH, Sulfide Association
Corrosion	Reduce/Eliminate	H ₂ S Control
Collection Methane	Reduce/Eliminate	pH
Treatment:		
Grease	Reduce/Eliminate	pH/Saponification
Odor	Reduce/Eliminate	pH, Adsorption/Absorption
Safety	Improve	Non-Haz, Remove H ₂ S Gas
Hydrogen Sulfide	Reduce/Eliminate	pH, Sulfide Association
Corrosion	Reduce/Eliminate	H ₂ S Control
Settling	Improve	M/D Ratio
BOD ₅	Reduce	Floc/M/D/Settling
Heavy Metals	Reduce	pH, Precipitation
Polymer Use	Reduce	Floc/M/D/Settling
Flocculation	Improve	Mg ²⁺ Micronutrient
Filamentous	Reduce	Mg ²⁺ Micronutrient
Energy Costs	Reduce	Catalysis/Bio-enhancement
SVI	Improve	Floc/M/D/Settling
RAS	Improve	SVI
TSS	Reduce	M/D Ratio, Ad/Ab
VSS	Reduce	Bio-enhancement
Digester Gas	Improve	pH, Bio-enhancement
Biosolids Quality	Improve	Mg ²⁺ Addition
SAR	Improve	Mg ²⁺ Addition

Magnesium hydroxide is a finely divided slurry. Concentrations typically added to wastewater range from about 10 ppm for weak wastewater to 100 ppm for strongly septic wastewater. This depends on acidity, conductivity, desired benefits and alkalinity requirements.

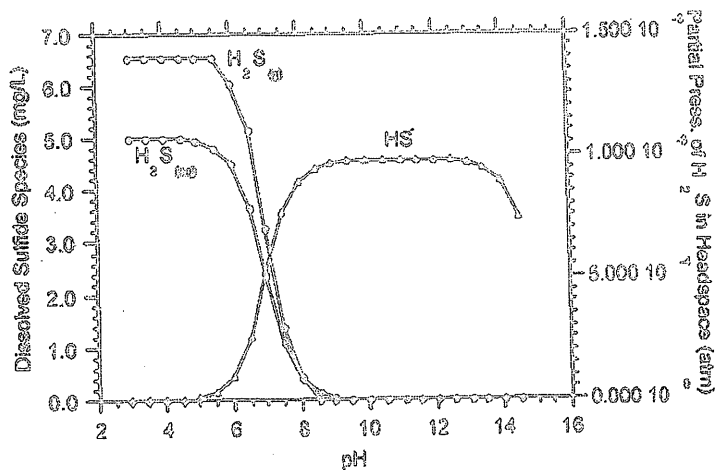
Hydrogen sulfide is produced under anaerobic conditions in the collection system. Sulfate-reducing bacteria (SRB) utilize SO_4^{2-} as an electron acceptor producing sulfide. Within the normal pH range for most municipal wastewaters, sulfide will partition to dissolved H_2S and HS^- . Dissolved H_2S gas escapes to the headspace of the collection system. H_2S in the headspace can then be oxidized to sulfuric acid by *Thiobacillus* bacteria. Acid produced by these bacteria attacks pipe surfaces leading to corrosion (ASCE, 1989). Also, hydrogen sulfide can escape to the environment causing nuisance odors, or in extreme cases, severe health problems.

A number of different methods are commonly applied to reduce hydrogen sulfide gas in wastewater collections systems. Examples include shock dosing with NaOH to kill microorganisms; acid/iron addition to precipitate sulfide from wastewater; oxidation of sulfides with chlorine, hydrogen peroxide, potassium permanganate or oxygen, spraying of pipe crowns with magnesium hydroxide slurries; nitrate addition intended to promote biologic nitrate reduction over sulfate reduction, or combinations of these techniques.

From the acid/base chemistry of sulfide species, pH control of the wastewater is among the most effective methods to reduce the release of hydrogen sulfide gas. For example, raising the pH of the wastewater will shift the sulfide species from H_2S to HS^- , thereby decreasing the concentration of aqueous phase H_2S .

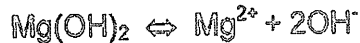
According to Henry's Law, reducing dissolved or aqueous H_2S results in a direct decrease in the equilibrium concentration of $\text{H}_2\text{S}_{(g)}$ in the atmosphere. The results of equilibrium calculations based on acid dissociation constants and Henry's Law for sulfide species are shown below. As can be seen, the $\text{H}_2\text{S}_{(g)}$ concentration in the headspace is a function of pH. Hydrogen sulfide in the headspace is greatest below a pH of approximately 5.0. As pH is increased, $\text{H}_2\text{S}_{(g)}$ in the headspace decreases rapidly. From this analysis, it is clear an increase in wastewater pH reduces the amount of $\text{H}_2\text{S}_{(g)}$ released to the headspace of the collection system. This directly decreases odor and corrosion.

Since wastewater pH is typically near 7.0, any increase in pH reduces $\text{H}_2\text{S}_{(g)}$ concentrations. Henry's Law predicts raising pH to approximately 9.0 virtually eliminates all headspace hydrogen sulfide. (Note: field data from lines using magnesium hydroxide reveals headspace hydrogen sulfide reduction in excess of that predicted by Henry's Law. This is caused by non-solution phase, surface reactions with unsolubilized magnesia particles.)



Sulfide speciation diagram for closed system at equilibrium with 5 mg/L total sulfide dissolved in water at equilibrium at 25 °C.

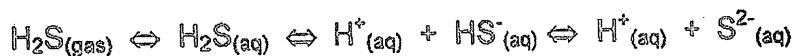
Although Thioguard relies in part on Henry's Law to reduce headspace hydrogen sulfide, there are three principal mechanisms that contribute to the reduction of headspace hydrogen sulfide. First, as outlined previously, Thioguard is an alkaline material. When added to wastewater it raises pH via the slow controlled release of hydroxyl (OH⁻) ions:



At a pH of 7.0, approximately 50% of the sulfides are present as dissolved hydrogen sulfide gas and the other 50% present as hydrosulfide, HS⁻ (or bisulfide) ion.

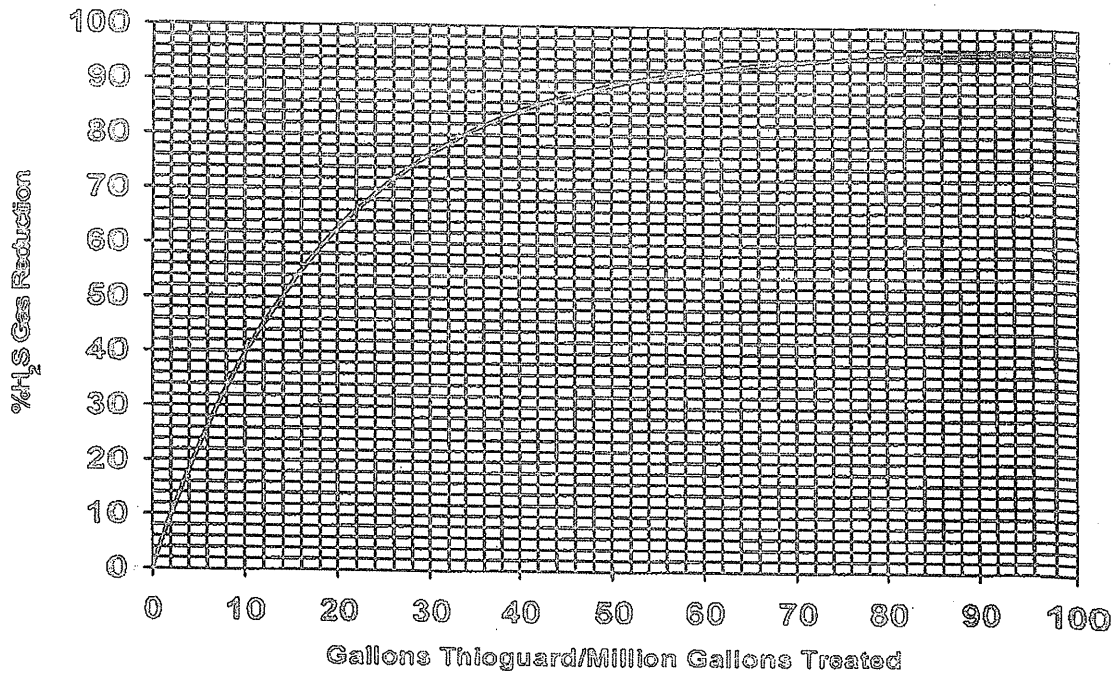
As wastewater pH rises slightly, equilibrium shifts rapidly to the right. This dramatically increases the solubility of hydrogen sulfide and favors formation of bisulfide ion. Bisulfide ion, unlike hydrogen sulfide, cannot escape from solution to the atmosphere and cause odor and corrosion. Sulfide ion S²⁻ can be ignored in most wastewater systems, as its occurrence is not significant until about pH 12.0. This mechanism of sulfide control can be simulated with other bases such as lime or caustic soda. However these chemicals pose safety, controls and sludge issues that limit their use and make them impractical for system wide application.

Thioguard typically achieves a 95% reduction in hydrogen sulfide gas emission in high sulfide systems. By raising wastewater pH speciation of dissolved sulfides is also altered:



Lower pH \rightleftharpoons higher pH

Raising pH decreases hydrogen sulfide emission from wastewater. Field data yields the following dose relationship:



Since Thioguard effectively converts dissolved hydrogen sulfide gas to bisulfide (HS^-), sulfide is converted to a form that cannot escape into the gas phase, i.e. the headspace, and cause odors and corrosion.

Magnesium ion, generated from the dissociation of magnesium hydroxide (Thioguard) in solution, is also known to associate or bind with dissolved sulfide. Mg^{2+} . Similar to ferrous and ferric, magnesium is cationic and reacts directly with sulfides. This reaction is favored because magnesium hydroxide adsorbs sulfide directly from solution onto its surface. As hydroxide is liberated and magnesium ion becomes available, loosely bound magnesium polysulfides form. Polysulfides are known to form under these conditions at the hydroxide particle interface. This results in the formation of species that do not readily dissociate to hydrogen sulfide in the absence of strongly acidic conditions.

Similar to, but lighter than more soluble iron sulfide, these complexes do not settle in the collection system. Importantly, laboratory and field tests show these compounds are stable in municipal wastewater and do not breakdown to release hydrogen sulfide when downstream dilution subsequently decreases pH to near 7. This is an important mechanism for large collection systems.

Magnesium ion (Mg^{2+}), also catalyzes the oxidation of dissolved sulfides and improves biologic oxygen uptake. For sulfide oxidation, the products of oxidation are believed to be sulfite (SO_3^{2-}) and sulfate (SO_4^{2-}). The rate of sulfide oxidation is increased on the order of 2-3 times in the presence of magnesium ion. This coupled with higher pH yields sulfide oxidation rates that are 5 to 6 times. Thioguard therefore creates two conditions in the wastewater stream that result in dissolved sulfides undergoing an enhanced rate of oxidation under aerobic conditions. Accordingly, sulfide arriving at the treatment plant is quickly oxidized upon aeration. Systems treated with Thioguard experience enhanced oxygen uptake with a corresponding reduction in O_2 requirements. Energy savings in the range of 15% to 50% have been documented and is believed to result from the combination of magnesium catalysis and improved microbial activity.

The third mechanism by which Thioguard reduces hydrogen sulfide gas is its direct impact on the biofilm or slime layer. Raising wastewater pH retards sulfate reducing bacterial (SRB) activity in the slime layer. SRB present in the slime layer are responsible for reduction of sulfate to sulfide. The optimal pH range for SRB is near 7. Thioguard produces a pH environment that is sub-optimal for SRB, thus decreasing their sulfide generating ability. Consequently, continuous addition of Thioguard to wastewater results in less sulfate reduction.

In long sewers with high retention times and converging flows, this is an important property for Thioguard treatment. That is, addition of Thioguard to flows that will ultimately converge with wastewater not treated with Thioguard produces pH of 9 and higher in the upper reaches. This deactivates sulfate-reducing bacteria and little or no sulfide is generated in that part of the system. When used in this manner, Thioguard is capable of not only suppressing headspace hydrogen sulfide in sulfide laden lines, it can eliminate the initial reduction of sulfate to sulfide and lessen the amount of biologically produced sulfide.

Methane Formation in the Collection System

The biological generation of methane (methanogenesis) is an anaerobic process that is carried out by methanogenic bacteria. This generally takes place in sediment that has built up in the collection system, as this is conducive to forming anaerobic conditions. Most methanogens function in a pH range of 6.7-7.4, but optimally at 7.0-7.2. The continuous addition of Thioguard to a collection system results in localized high pH, typically around pH 8.5. This higher pH is outside the optimal pH range for methanogenic bacteria enzyme activity and consequently results in their deactivation, along with a subsequent decrease in methane formation.

Waste Water Treatment Plant Benefits

Aerobic Processes

Aerobic processes have been employed by municipal and industrial wastewater treatment systems for the removal of organics, the biological conversion of ammonia to nitrates, reduction of sludge mass and volume, and reduction of pathogenic organisms. Aerobic digestion consists of two steps; direct oxidation of biodegradable matter, and subsequent oxidation of microbial cellular material.



If the digestion process is provided with sufficient oxygen and detention time, or a separate nitrification system is utilized, ammonia will nitrify and form nitrates. The nitrification process may result in a decrease of both pH and alkalinity as a result of acid generation during the process:



This reaction results in the consumption of about 7.1mg alkalinity per each mg $\text{NH}_4^+\text{-N}$ oxidized. Influent treated with Thioguard from the collection system arrives at the digester very near the optimum pH for bacterial growth in both aerobic and anaerobic processes. If the wastewater does not have sufficient alkalinity to compensate for losses in the nitrification reaction, it will result in a pH drop and could, if the pH drops too low, result in bacterial deactivation.

Addition of magnesium hydroxide improves oxygen uptake.

Digester Performance

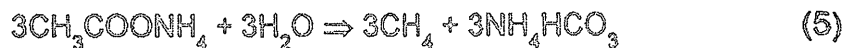
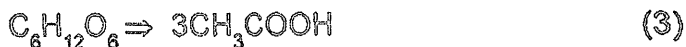
The addition of Thioguard in the collection system also has significant benefits down stream in the treatment plant. The increase in influent alkalinity and Mg^{2+} ion concentration benefits clarification, and both aerobic and anaerobic digestion processes. Anaerobic digestion is typically speeded up in the presence of magnesium hydroxide. Reductions in TSS, VSS, TCOD and SCOD as well as phosphorus removal from anaerobic supernatant are also achievable. An increase in bio-gas production is also typically seen, which is an indication of improved digester performance. It is thought that this occurs because the Mg^{2+} ion has a stimulatory effect on anaerobic bacteria as well as being an essential micronutrient.

Wastewater treatment processes generally consume a large amount of alkalinity. The increase in alkalinity afforded by treatment with Thioguard benefits both aerobic and anaerobic digestion as well as nitrification by producing a greater buffering capacity, thus helping to stabilize the system at the optimal pH of 7.0

and preventing rapid changes in pH. Enhanced primary and secondary clarification as well as better de-watering of anaerobic digester sludge is also typically seen due to the magnesium ion forming a cationic bridge between biopolymers, thus enhancing flocculation and settling. Enhanced primary clarification means that there will be less organic load going to the aerobic digesters, which should result in a reduction in aeration requirements.

Anaerobic Digestion

Anaerobic digestion is the solubilization and reduction of complex organic substances by microorganisms in the absence of oxygen. The products of digestion are methane, carbon dioxide, trace gases and stabilized biosolids. The microbial population responsible for this conversion can be divided into three groups: solubilization, acid formation and methane formation (methanogens). Proteins, lipids, carbohydrates and complex organics are solubilized by hydrolysis. These products are converted into short-chain organic acids, such as, acetic, propionic and lactic. These acids are then converted into methane and carbon dioxide. The acid forming bacteria are tolerant to environmental changes such as pH and temperature. In contrast, the methane forming bacteria are intolerant to environmental changes.



Equation 3 represents acid formation. The acid is then neutralized, equation 4, by bicarbonate present in the system. The buffer consumed in equation 4 is then regenerated in the methane-forming step. There is therefore an equilibrium between buffer formation and consumption. The optimum pH range for methanogens is also 6.5 to 7.5. In a digester upset, net consumption of buffer occurs and the process is in danger of pH failure. When this happens an external source of alkalinity must be added. Magnesium hydroxide can be added to the digester to neutralize any excess acid not consumed by the methanogens. Magnesium hydroxide when used in anaerobic digesters will have all the benefits apparent in aerobic processes.

Should Hazardous Materials Be Added To Municipal Wastewater Collection Systems?

According to the Federal Motor Carrier Safety Administration hazardous materials (HM) truck incidents cost society nearly \$1.2 billion every year. On average there are 15,000 HM truck incidents annually.



Today publicly operated sewers are regularly treated with hazardous chemicals for odor and corrosion control. These chemicals are often stored in residential areas for direct addition to the sewers. Millions of pounds of dangerous chemicals such as potassium permanganate, hydrogen peroxide, sodium hydroxide, sodium hypochlorite, chlorine, nitrates and ferric chloride are routinely transported through city streets for this purpose.

This activity is currently unregulated and poses a serious and unnecessary risk to the public for several reasons. First, the inherent risk of transporting and handling millions of pounds of hazardous chemicals through city streets. Second is the danger to the public from storage of these chemicals in unmanned, often unsecured rural and residential areas. Third, easy access for vandals or terrorists to obtain large quantities of hazardous chemicals. These chemicals can be used directly or further processed for bomb making, poisonous gas production or tainting potable water supplies.

Since non-hazardous chemical alternatives are available, use of hazardous chemicals for sewer odor control should be prohibited in the interest of public safety.

Here are the most commonly used chemicals added to sewers for odor and corrosion control.

POTASSIUM PERMANGANATE - KMnO_4

Hazardous - Yes

Danger! Strong oxidizer. Contact with other material may cause fire. Corrosive. Causes burns to any area of contact. Harmful if swallowed or inhaled.

HYDROGEN PEROXIDE - H_2O_2

Hazardous - Yes

Danger! Strong oxidizer. Contact with other material may cause a fire. Harmful if inhaled. Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns.

FERRIC CHLORIDE – FeCl₃

Hazardous - Yes

Danger! Corrosive. Causes burns to any area of contact. Harmful if swallowed or inhaled. Affects the liver.

FERROUS CHLORIDE – FeCl₂

Hazardous - Yes

Caution! May cause irritation. May be harmful if swallowed.

FERROUS SULFATE – FeSO₄

Hazardous - Yes

WARNING! Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects the liver.

SODIUM HYPOCHLORITE - NaClO

Hazardous - Yes

WARNING! Harmful if swallowed or inhaled. Causes irritation to eyes and respiratory tract. Causes substantial but temporary eye injury.

CALCIUM NITRATE - Ca(NO₃)₂ 4H₂O

Hazardous - Yes

Danger! Strong oxidizer. Contact with other material may cause fire. Causes irritation to skin, eyes and respiratory tract. Harmful if swallowed or inhaled.

CHLORINE – Cl₂

Hazardous - Yes

WARNING! HIGHLY TOXIC. CORROSIVE. May be fatal if inhaled. Strong oxidizer. Most combustibles will burn in chlorine as they do in oxygen.

SODIUM HYDROXIDE - NaOH

Hazardous - Yes

POISON! DANGER! CORROSIVE. May be fatal if swallowed. Harmful if inhaled. Causes burns to any area of contact. Reacts with water, acids and other materials.

Common Odor Treatment Chemicals

The problems of odor and corrosion are not new to wastewater. Biofilm sulfate reduction to sulfide is well researched and a host of chemical options have been available for years. Thioguard however is the first non-hazardous total system treatment that addresses odor, corrosion, grease, and wastewater treatability.

For purposes of comparison the following present's information about various other chemicals which are commonly used for municipal wastewater odor and corrosion control.

IRON SALTS – FeCl_2 , FeCl_3 , FeSO_4 - Hazardous

Iron salts is the name loosely given to an entire class of solutions containing iron in either the ferric (Fe^{+++}) or ferrous (Fe^{++}) form. In years past this was a very popular and widely used odor control chemical. The primary sources of iron salts are waste pickle liquor from the steel manufacturing and fabrication industry and by-products of the titanium mining industry. Various iron compounds can also be commercially produced from scrap or waste iron sources and waste acid, however, these sources cannot normally compete with the low cost of the recycled waste and by-product sources. Domestic reductions in steel making capacity limit the amount of by-product iron salts available today.

- Most iron salts are RCRA hazardous substances. If the pH of iron solutions is less than 2.0 they are considered "characteristically hazardous" based upon pH. As such, they have strict handling and storage requirements and are regulated. Spent pickle liquor, on the other hand, is a "listed" RCRA Hazardous waste (K-062), which causes it to be even more strictly regulated.
- Since pickle liquor usually contains a very high iron concentration, an exception to RCRA regulations has been made which allows the use of spent pickle liquors as substitutes for commercially available solutions if they can serve the same purpose. This was done in an effort to avoid wasting otherwise usable hazardous substances. In this case however, close attention should be paid to the heavy metals concentrations and routine analysis is recommended.
- **Stoichiometric chemistry:** Chemical usage increases with increasing sulfide concentration. Massive overdosing is required for adequate sulfide control in municipal wastewater collection systems.
- Iron salts are acid solutions. Addition to sulfide containing wastewater reduces alkalinity and lowers wastewater pH. Low pH quickly liberates hydrogen sulfide near the addition point. Municipalities adding iron salts to

force mains routinely see accelerated corrosion near the point of addition. Chloride and sulfate anions liberated by dissociation also contribute to downstream corrosion.

- o Depending upon the mass of sulfide being removed using iron salts, the sludge production from iron salts can be significant. Essentially all iron sulfide sludge must be removed from the collection system or at the treatment plant as waste sludge. These costs must be factored into the overall cost of iron salt addition.
- o Depending upon the particular iron salt being used (ferric or ferrous), the amount of soluble iron available for sulfide reaction may vary. Iron salts (particularly ferric salts) will dissociate from their carrier ion (chloride or sulfate, typically) and associate with OH⁻ ions to form ferrous hydroxide (Fe(OH)₂). When iron hydroxides are formed, the iron associated with them is not readily available for reaction with sulfide and simply contributes to sludge.

CAUSTIC SODA (NaOH) - Hazardous

Caustic Soda, (NaOH) widely known as Drano[®], is a highly soluble hazardous chemical that delivers one OH⁻ ion for every Na⁺ ion (monovalent). Thioguard (Mg(OH)₂), "Milk of Magnesia" is a slightly soluble non-hazardous chemical that delivers two OH⁻ ions for every Mg⁺⁺ ion (divalent). Caustic soda freezes near 60 degrees Fahrenheit. Thioguard freezes at 32° F.

The practice of slug dosing with caustic soda is effective in temporarily removing and deactivating the biofilm responsible for sulfate reduction. However, this strategy has serious safety and treatment drawbacks. Transporting tankers of highly caustic NaOH through city streets and dumping them into the sewers is inherently dangerous, environmentally questionable and potentially upsetting for the treatment plant biology.

Continuous addition of caustic soda for wastewater pH control is not generally practiced in collection systems.

Exceeding pH 9.0 causes several problems. (i.e. irreversible carbonate precipitation and sludge generation, ammonia gas evolution, WWTP process upsets and excess chemical expense). Tests performed at our laboratories and independently confirmed at Bucknell University and in field trials show Thioguard can effectively control H₂S at pH below 9.0, for long periods of time. (Subsequent field tests show it can be effective for retention times measured in days downstream from the addition point). Untreated septic municipal wastewater titrated to pH 8.5 - 9.0 with caustic shows rapid pH decay. Caustic is effective for only about 1 to 1½ hours downstream without dilution from side flows.

At pH near 8.5 Thioguard suppresses H₂S evolution and can maintain low or even zero head space hydrogen sulfide. Since Thioguard is only slightly soluble, surface chemistry not available with caustic, prevents evolution of H₂S at solution pH between 8.0 and 8.5 rather than 9.0.

Caustic and Thioguard are both sources of alkalinity, but because caustic's solubility is 370,000 ppm compared with 17 ppm for Thioguard, caustic reacts instantly and is quickly spent. For both chemicals, in most situations the mass of sulfide to be controlled is practically independent of pH. Table 1 presents the general limits of solubility of sulfide in water at varying wastewater pH values.

TABLE 1

Sulfide (HS) Solubility in Water as a Function of pH
At Equilibrium at 25° C

Wastewater pH (s.u.)	Sulfide Solubility (mg/l)
6	3,840
7	7,270
7.5	15,400
8	41,800
8.5	124,000
9	390,000
10	(infinite)

NITRATE Ca(NO₃)₂ - Na(NO₃) - Hazardous when dry

Calcium nitrate is a fertilizer sold commercially on the commodities market as "CN-9". For application in municipal odor control, hydrated calcium nitrate is patented and marketed by US Filter/Davis under the trade name Bioxide®. Calcium nitrate is a by-product from the mining of certain ores. Ores contained in calcium carbonate mineral deposits are extracted by dissolving the ore in nitric acid.

- o Stoichiometric chemistry –Nitrate chemical requirements change with fluctuating sulfide concentration. This creates a moving target causing constant over and/or under dosing.
- o Potential carry over of nitrate to the treatment plant. Nitrate can cause sludge bulking and increase energy requirements for denitrification. Nitrates upset the Bardenpho process (biological phosphorous removal).
- o Nitrate provides nitrate oxygen intended to prevent sulfate reducing bacteria from producing dissolved sulfides. When nitrate addition is discontinued, the rate of sulfide production has been observed to increase dramatically over untreated baseline data.

- Nitrate has a short half-life in sewers, many addition locations are required to achieve adequate system wide control.
- Nitrates rely on a strategy of "feeding" the biofilm with nitrate in order to prevent biological sulfate reduction. While this strategy can lower or even eliminate sulfate reduction, it also promotes growth of the biofilm. For previously untreated lines, nitrate addition requirements often increase until the biofilm becomes hydraulically unstable. Therefore, initial field-testing can yield inaccurate long term chemical requirements.
- Nitrates are marketed at "safe" for individuals handling them as well as for the environment. Biological reaction chemistry is purported to be direct reduction to nitrogen from nitrate. However, considerable data exists in the agricultural industry indicating that nitrate is not completely converted to nitrogen in a mixed biota. Tests done using nitrate for wastewater sulfide mitigation have measured large amounts of N_2O , a powerful hazardous greenhouse gas. This calls into question the its relative safety and overall impact on the environment.
- Because nitrate "feeds" bacteria, it will cause the uptake of organic carbon that would not ordinarily be removed until it reaches the treatment plant. This also has the negative effect of producing an odorous film often referred to as the Bioxide Mat. Cities with experience using nitrates often report increased formation of putrefied scum. This layer contributes to grease buildup and non-sulfide odor.

HYDROGEN PEROXIDE H_2O_2 - Hazardous

Hydrogen peroxide is effective in oxidizing sulfide to sulfate in local regions within the collection system. It has poor downstream control beyond 45 minutes from the ejection point and is completely ineffective after 2 hours.

H_2O_2 is a strong oxidizer and should not be used in unmanned locations. Special safety handling including protective clothing, face shields must be worn during bulk storage loading, and repair and maintenance. Spontaneous combustion is also a serious safety issue when using hydrogen peroxide.

HYDROGEN PEROXIDE - H_2O_2

Hazardous - Yes

Danger! Strong oxidizer. Contact with other material may cause a fire. Harmful if inhaled. Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns.

Summary

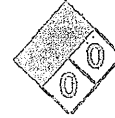
Thioguard magnesia safely reduces odors, removes grease, prevents SSO's, and significantly extends the useful life of sewers and treatment plants. It is beneficial to virtually all biological wastewater treatment processes and improves coagulation and flocculation, sedimentation, filtration, oxidation/disinfection, fixed film and suspended growth biological processes, aerobic and anaerobic digestion as well as biosolids quality.

There is no other commercially available chemical or biological alternative that safely and economically offers such a broad range of benefits to municipal wastewater collection, treatment and biosolids disposal.

While relatively new, Thioguard is well researched and has been demonstrated in many field applications over the past 5 years. It is now in use at dozens of cities across the U.S.

For more information visit our website at www.premierchemicals.com or contact us directly at 800-227-4287.

Thioguard® is a registered trademark of Premier Chemicals
Application of magnesia to municipal wastewater collection systems is protected in the U.S. and Canada by one or more of the following patents:
5,718,944 Corrosion Protection In Concrete Sanitary Sewers
5,834,075 Corrosion Protection In Concrete Sanitary Sewers
5,833,864 Method For The Reduction And Control Of The Release Of Gas And Odors From Sewage and Wastewater
5,834,075 Corrosion Protection In Concrete Sanitary Sewers
6,056,997 Corrosion Protection In Concrete Sanitary Sewers



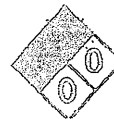
AMREX CHEMICAL CO., INC.
117 E. Frederick St.
P.O. Box 842
Binghamton, NY 13902

Product Data Bulletin
THIOGUARD®
Technical Grade Magnesium
Hydroxide Slurry

THIOGUARD® is a proven highest quality technical grade product available that is manufactured through a proprietary process for conditioning in municipal water and wastewater treatment. THIOGUARD® has the following qualities:

- THIOGUARD® is a highly reactive technical-grade magnesium hydroxide slurry that is produced and derived from highly reactive magnesium chloride brine.
- THIOGUARD® is sourced in the USA and processed in the USA exclusively by Premier Magnesia, LLC. 100% Made in the USA.
- THIOGUARD® has the highest available surface area and reactivity as a result of Premier's proprietary manufacturing process.
- Wastewater treatment is performed in a sensitive biological environment wherein operation is performed at near-neutral or slightly alkaline conditions, requiring the highest reactive grade magnesium hydroxide available.
- Lower reactive grades are incapable of sufficiently neutralizing the acid generated in these environments and will pass through the system unused.
- Thioguard is manufactured to exacting particle size, specific surface area and particle size distribution to provide the highest reactivity and proper stability for transportation, pumping and handling. This provides consistent performance, better dispersion and suspension stability that is critical to collection system and treatment plant operation while reducing acute in-plant sludge generation associated with lime and lower grade brucite magnesium hydroxides.
- THIOGUARD® is a patented application for the effective reduction of municipal wastewater odor and corrosion due to hydrogen sulfide gas.
- THIOGUARD® will also aid in solids settling by supplying a non-carbonate/lime divalent cationic magnesium ion that enhances bioflocculation formation.
- THIOGUARD® supplies a non-carbonate divalent cationic magnesium ion that enhances bioflocculation formation that improves de-watering resulting in higher percentage biosolids/filter-cake that reduces disposal costs.
- Premier offers distribution terminals throughout the USA.

PREMIER



THIOGUARD® Specifications:

	Typical	Maximum	Minimum
Slurry Basis:			
Mg(OH) ₂ contained lb/gal	7.7	8.0	7.0
Dry Solids Basis:			
Mg(OH) ₂ , wt%	98.8		98.5
CaO, wt%	0.6	0.8	
SiO ₂ , wt%	.20	.35	
Fe ₂ O ₃ , wt%	.10	.21	
Median Particle Size, Micron	3.0	5.0	1.0
Specific Surface Area, m ² /g	10	20	9
Acres/Gallon	3.21	3.5	3.0
Lbs. Alkalinity/Gallon	13.0	14.0	11.0
Caustic Magnesia Activity/Sec ²	250	350	
% Passing 325 Mesh Sieve	99.6	100	99.0
Timed Liquid/Solid Settometer Test, Colloidal Suspension mL/48 hours	248.0	240.0	250.0
Stablized Residual Test, Grams ⁺	1.0	4.0	
Caustic Soda (NaOH) Equivalent	1 lb Equivalent to .73 lb Mg(OH) ₂		
Soda Ash (Na ₂ CO ₃) Equivalent	1 lb Equivalent to .55 lb Mg(OH) ₂		
Physical Properties:			
Density, lbs./gal.	12.8	13.1	12.2
Solids, Weight Percent %	56	62	55
Viscosity, cps ⁺	150	400	100
Certifications:			
ISO 9001:2008 – ANSI/ISO/ASQ Q9001-2008 Certified Distribution, Sales, and Manufacture of periclase and technical grades of magnesium oxide and hydroxide products.			

Packaging and Storage:

THIOGUARD® is shipped in bulk tank trucks and can be easily pumped and stored in steel, fiberglass or polypropylene tanks.

THIOGUARD® is a registered trademark of Premier Magnesia, LLC
 Visit our Web Site www.THIOGUARD.com / www.PREMIERMAGNESIA.com





Executive Summary:

Premier Magnesia, LLC is a global market leader in magnesia-based products and solutions for dozens of applications ranging from agricultural to industrial and environmental markets. We are one of the world's principal manufacturers and suppliers of high purity calcined magnesium oxide and magnesium hydroxide products. For over 50 years, the Company and its predecessors have owned and operated a magnesia mine and processing plant located in Gabbs, Nevada that will continue to offer the only domestically-mined source of magnesia ore in the United States well into the future.

Our Giles Chemical Division is the largest producer of magnesium sulfate, commonly known as Epsom Salt, in North America. Premier Magnesia and Giles Chemical are your essential magnesia mineral source, assuring consistent quality, technical expertise, and long term reliable supply.

Considerable research and development capital has been, is currently and will be invested into our current brands, products and services. Over \$100 million in mine development, processing and research has been invested over the past 20 years to assure our clients have the best performing and most cost efficient technical grade magnesium oxide, magnesium hydroxide and magnesium sulfate available in the US. Premier Magnesia, LLC retains ownership and thus offers complete control of production from our secure US raw material source to formulated client solutions create the highest quality and most trusted products and brands.

Our USA-made products are proven in a range of industries and applications from agriculture to environmental, to industry and manufacturing. Our goal is to help our clients maximize their performance quality, mitigate risks, sustain resources, and comply with regulatory requirements. Our brands include Amphomag®, AquaMag®, EnviroBlend®, Giles®, Magox®, Thioguard®, Thioguard® Omega-S, Nutri-Mg++®, TG 325 OX®, Magriculture®, PREVent-C® and PREMAG Cements.



Mission Statement:

- To own and maintain USA-based production from mineral to final product; ensuring reliability of supply, quality control, and cost-effectiveness.
- To set a standard-of-excellence in client experience through our responsiveness, technical expertise, and innovative solutions.
- To be advocates for magnesia as a natural mineral that is safe, reliable, and adds value to numerous product applications in multiple industries.

Magnesia-based product chemistries are Generally-Recognized-As-Safe (GRAS) and non-hazardous, offering environmentally responsible solutions to complex problems.

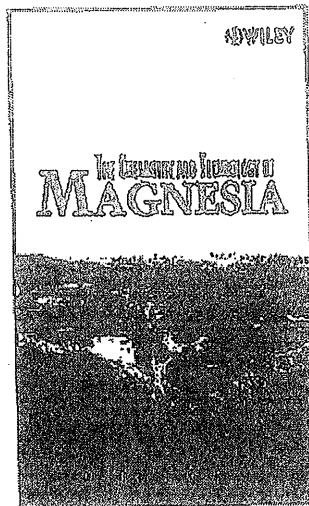


Some Historical Facts About the Mineral Magnesium:

- In 1808, Sir Humphrey Davy first isolated several of the alkaline earth metals, naming them after their oxides as barium, strontium, calcium, and magnesium. Davy derived the term "magnesium" from the common name for magnesium oxide: magnesia.
- Magnesium is the 8th most abundant compound in the earth's crust, and the 11th most abundant element in the human body.
- Magnesia is considered a "universal neutralizer", which makes it ideal for applications where pH control is essential for safety and treatment, such as in environmental, industrial, and spill response applications.
- Magnesium oxide is an essential nutrient in many animal feeds for providing mineral nutrition for digestive health and well-being.
- Discovered in Epsom, England, magnesium sulfate heptahydrate (aka Epsom Salt) has been used as a therapeutic / soaking treatment for aching muscles and joints for over 300 years.



We Wrote the Book on Magnesia:



"The Chemistry and Technology of Magnesia" by Dr. Mark A. Shand, Director of Product Development and Process Technology

A Complete Guide to Magnesia - From Mining to End Use

MARK A. SHAND is the Director of Product Development and Process Technology for Premier Magnesia LLC, where he is responsible for the research and development of magnesia chemicals. He has technical experience with dispersion technologies, industrial and municipal applications, and production of magnesia and oxide products. Mark is also a member of the American Chemical Society.

09/20/2020 10:37 Premier Magnesia, LLC

FMPT-077-73M

P.004P008

PREMIER

MAGNESIA, LLC

Non-Negotiable Bill of Lading

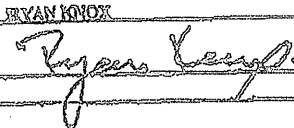
BL NO. AP10095
 ORDER# G01210005
 PO# 363153
 DATE: 3/20/2020

RECEIVED subject to the "COMMON CARRIER RATE AGREEMENT" or the CONTRACT between the Shipper and Carrier in which the date of shipment, the property described below, is apparent and order, except to note (terms and conditions of package insurance), unless, otherwise, and defined as shown below. This Bill of Lading is not subject to any tariffs or classification whether individually determined or filed with any federal or state regulatory agency, except as specifically agreed to in writing by the Shipper and the Carrier.

FROM: PREMIER MAGNESIA LLC 1306 CENTER MILLS ROAD ASPERS, PA 17304	CONSIGNEE: COUNTY OF STAFFORD 110 Mitchell Scott Lane Little Falls, VA
BILL TO: PREMIER MAGNESIA, LLC ADDRESS: PO BOX 370 WAYNESVILLE, NC 28788	CARRIER: KARL SIVERD ROUTE: TRUCK/TRAILER# 62

No. Pkgs.	Q	Description of Article, Packages, Markings, Exceptions	Weight	Rate #	Freight <input checked="" type="checkbox"/> Prepaid Charges <input type="checkbox"/> Collect
TL		THIOGUARD® / AQUAMAG® MAGNESIUM HYDROXIDE IN WATER NMFC 40000 CLASS 65 Finished Goods Tank # 2 ---2000GA ONLY BERDINE AS, DPL	@ 74,202 T 36,500 N 38,702		Subject to Article 7 of the Terms and Conditions of Carriage if the shipment is as is delivered to the consignee without change in its condition, the carrier shall sign the following contract: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges. Premier Magnesia (Signature) C.O.D. amount \$ Mark C.O.D. amount tax Carrier C.O.D. fee to be paid by Shipper/Consignee

Rate is individually determined and NOT subject to filed tariffs unless stated in Common Carrier Rate Agreement.

Shipper's Certification (if any required) RYAN KNOX _____ Shipper  Title & Date tendered _____ AM/PM Carrier's liability for loss or damage unless otherwise agreed to in Common Carrier Rate Agreement, or stated below. The record or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$ _____ per piece. _____ Shipper _____	OPTIONAL, or ON BROKER MOVEMENTS: Carrier hereby designates (broker) as its agent for the collection of freight charges. When paid to broker, Carrier agrees not to hold shipper or consignee liable for said charges. Accepted in good order and condition, unless otherwise stated herein, pieces Exception: _____ Carrier _____ (Signature) Title & Date tendered _____ AM/PM
--	--



Certificate of Analysis

Batch/Lot #: Tank #2 3/20/20

	Actual
% Solids	<u>59.89</u>
Density (lbs/gal)	<u>12.89</u>
Viscosity (cp)	<u>180</u>

Signature:



June 26th, 2020

RE: Supply Capacity/Storage and Organizational Chart

To Whom It May Concern,

The Magnesium Hydroxide Slurry, Thioguard, being offered within this bid, originates from Premier Magnesia's Slurry facility in Aspers, PA (Asper's Plant). The Asper's Plant is a state of the art Slurrying facility. In order to supply the capacity required by our current and future clients, Premier has placed four finished goods tanks capable of holding up to 9 full truckloads of material in each tank. Based on our quality process, we require material to "cool" for 24 hrs following production to ensure the quality of material. Even with the quality controls we have instituted, Premier, on a typical day, have 3 full finished goods tanks of material (27 truckloads of material). At this point in time, Premier Magnesia's Aspers Plant has all the necessary capacity to handle all our current and future clients.

Beyond this singular plant, Premier Magnesia's has multiple production facilities capable of supplying the same or comparable material. Attached to this letter is a map of all production facilities within the US.

Below you will find the contact information for the individuals responsible for handling your account

For Sales related question, please contact:

Andrew Rupprecht
NE Regional Salesman, Thioguard
1735 East Carson Street, #371
Pittsburgh, PA 15203-1700
Cell: 610-585-4162

For orders, please contact



117 E. FREDERICK STREET
P.O. BOX 642
BINGHAMTON, N.Y. 13902
PHONE (607) 772-8784
FAX (607) 772-8786

Premier Magnesia LLC
1275 Drummers Lane, Suite 102
Wayne, PA 15087
Office: (610) 868.8060





For questions related to contracts or awards, please contact myself from my information listed at the bottom of this letter.

Respectfully,

A handwritten signature in cursive script, appearing to read "Charles H. Gehret III", written over a horizontal line.

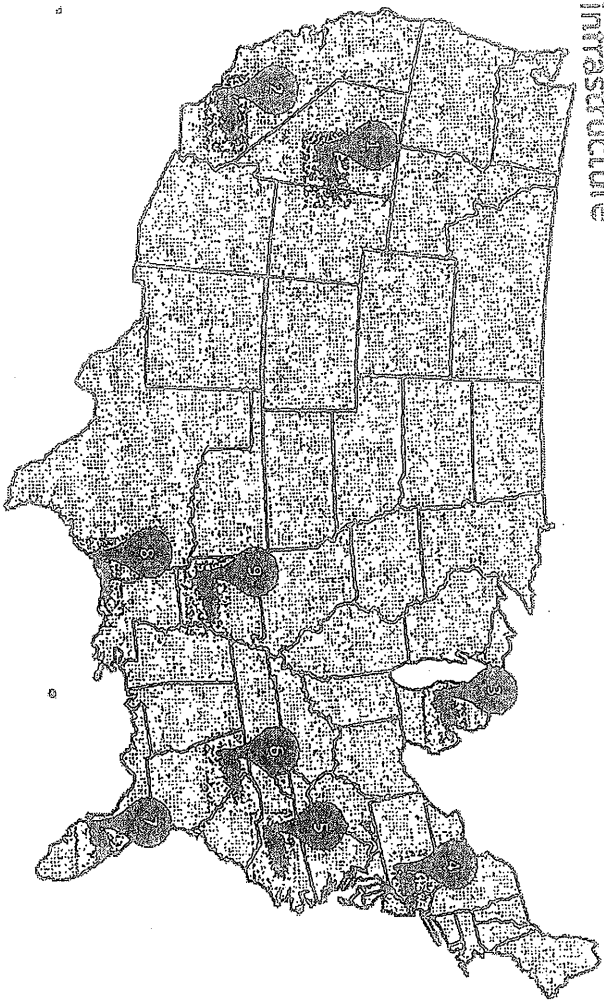
Charles H. Gehret III
Contract Administrator
Premier Magnesia, LLC

Premier Magnesia LLC
2275 Drummers Lane, Suite 102
Wayne, PA 19087
Office: (610) 868.8060





Thioguard® production facilities able to supply City of Atlanta through current Premier Magnesia vertical supply chain infrastructure



Thioguard® production facilities

1. Gabbs, NV
2. Santa Fe Springs, CA
3. Manistee, MI
4. Aspers, PA
5. Charlotte, NC
6. Atlanta, GA
7. Tampa, FL
8. Houston, TX
9. El Dorado, AR

THIOGUARD®
TST·OMEGA·OX

A Portfolio of Technologies from
PREMIER
MAGNESIA, LLC


nutri-mg®
High Purity Magnesium Oxide
Manufacturing OX • Nutri-Mg OX

Warwick Sewer Authority
Purchase Authorization / Confirmation Memo

To: Patricia Peshka, Purchasing Agent

From: Earl Bond, Executive Director

Date: 7/30/2020

Re: Inlet Grit Screw Conveyor

The Warwick Sewer Authority (WSA) operations process produces "grit" which consists of heavy solids and needs to be removed from the waste stream. This begins in the Inlet building utilizing a centrifugal force paddle mixer to separate the grit from the process fluid. This grit is then pumped to a grit concentrator that again uses centrifugal force to remove the water from the grit and it is finally dispensed into the grit conveyor. This equipment was installed during the Plant upgrade that occurred in 2002 and puts this equipment at 18 years old. The conveyor has a useful life 12 - 15 years which it is well past. The unit is rotting away and will fail soon.

The conveyor and concentrator equipment was engineered as part of the upgrade and cannot be substituted with any other due to space and plumbing restrictions. The WSA contacted the sole source vendor of this equipment Smith & Loveless, to provide a quote for a new Grit concentrator and Conveyor. The quote for the conveyor was \$45,257.00 and the Concentrator \$4,376.00 for a total cost including shipping of \$ 49,633.00. Installation will be performed by others.

The WSA staff is recommending to the Board of Directors that you approve the purchase of this critical process related equipment in the amount of \$ 49,376.00 which will be funded out of line item 80-799. Lead time for delivery is estimated at 12 - 14 weeks.

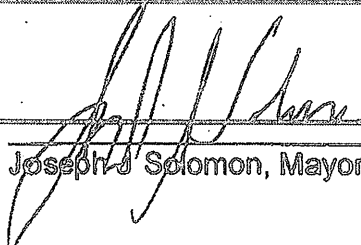
Approval:



Gary Jarvis, WSA Chairman

8/28/2020
Date of Approval

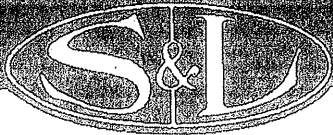
Consent:



Joseph J. Solomon, Mayor

8/10/2020
Date of Approval

cc: Dana DiScuillo, Superintendent



AFTERMARKET

Smith & Loveless, Inc.

SALES AGREEMENT

Date: July 30, 2020
Project: Warwick, RI
Inq #: RR-20904
Rev.
Existing S&L SN: 03-01805

Customer Contact: Ear Bond - Warwick Sewer Authority, WWTP
Customer Phone: 401-787-5304
Customer Email: earl.w.bond@warwickri.com

Your local Smith & Loveless Representative Contact Information:

Sales Person & Contact Phone: Thomas Valorose (401) 330-0995
Representative Company: Russell Resources
Representative Email: tvalorose@r-r-inc.com

Scope of Equipment: One (1) Model 15 SMITH & LOVELESS® PISTA® GRIT SCREW CONVEYOR™ constructed of carbon steel, including the screw and concentrator mounting bracket.

- Motor to be *explosion-proof* 1 HP, 1200 RPM, 3/60/460 volt with shaft mounted helical gear reducer.
- Screw diameter: 9", Screw length: 15'
- Anti-friction bearings at the outlet end and greaseable bronze bushing at the inlet end.
- Covers over the hopper and trough openings shall be provided.
- Does not include controls.

Price (includes freight): \$45,257

Scope of Equipment: One (1) 250 GPM NI-Hard PISTA® GRIT CONCENTRATOR™ P/N: 67C174-300

Price (includes freight): \$4,376

-MORE-

14040 Santa Fe Trail Drive. Lenexa, KS 66215
P: 913.888.5201 F: 913.748.0106
www.smithandloveless.com



AFTERMARKET

Smith & Loveless, Inc.

Page: 2 of 2
Inq: RR-20904
Rev.
SN: 03-01805
Location: Warwick, RI

SHIPMENT: Manufacturing completion is Estimated at 10-12 Weeks from approved submittals.
FUEL SURCHARGE: Any fuel surcharge assessed to Smith & Loveless, Inc. Shall be passed on at cost to customer. This fuel surcharge was not included in our quote and will be in addition to the contract amount.
INSTALLATION: Smith & Loveless is supplying the aforementioned items. Owner is responsible for installation, including all inspections and/or code compliance of the installation.
FREIGHT: F.O.B. Origin.
PAYMENT: All purchase orders must be made out to Smith & Loveless, Inc. Payment is 100% prior to shipment via check or, with continuing credit approval, 100% the earlier of net 30 days from date of shipment or at time of start up (if S&L start up is included in our quote).
TERMS: Smith & Loveless' quotation and standard terms and conditions applies to this order and no terms set forth in buyers purchase order, acknowledgment letter or verbal communication shall control Unless approved in writing by the S&L Contract Department. In the event of any inconsistency between S&L's terms and conditions and buyers purchase order, S&L's terms and conditions shall govern.
TIME FRAME: Quote is good for 90 days.
EQUIPMENT: If the equipment Smith & Loveless is providing is associated with the retrofit or modification of existing equipment, field adjustments to the existing and/or new equipment may be required for correct installation. Such adjustments may include, but are not limited to, piping modifications, grouting, shimming, control panel or electrical changes, etc. Smith & Loveless is relying on information provided by the customer, the installing contractor, or others with regard to the measurement, model or part numbers, drawings, and descriptions of existing equipment in the design and manufacturing of the new equipment for this project. As a result, Smith & Loveless shall not be responsible for any problems or difficulties encountered when fitting up new equipment with existing equipment.

Agreed to this ___ day of ___, 202_ Lenexa, KS. Agreed to this ___ day of ___, 202_ at

BUYER

SMITH & LOVELESS, INC.

By: _____
PRINT NAME

By: _____
AUTHORIZED SIGNATURE

AUTHORIZED SIGNATURE

ADDRESS

CITY, STATE, ZIP

PHONE

Is this purchase tax exempt? ___ Yes ___ No
If YES, attach Sales Tax Exemption Certificate. Failure to provide tax exempt certificate prior to shipment will result in Buyer being responsible for all applicable taxes.

14040 Santa Fe Trail Drive. Lenexa, KS 66215
P: 913.888.5201 F: 913.748.0106
www.smithandloveless.com

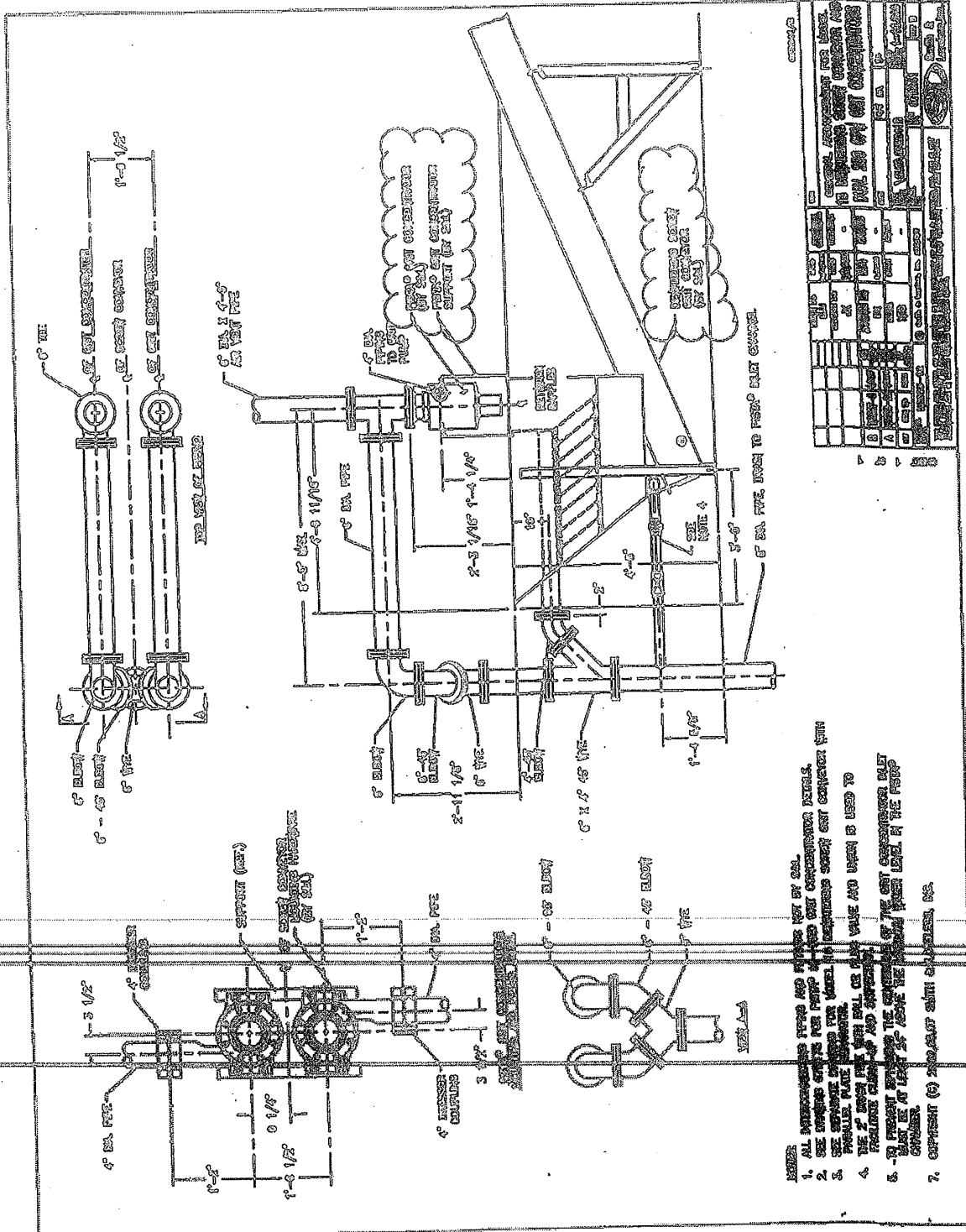
ENGINEERING DATA



Smith &
Loveless, Inc. ©

14040 West Santa Fe Trail Drive
Lenexa, Kansas 66215-1204

PISTA® Grit Screw Conveyor
Model 15 & PISTA® Dual
250 GPM Grit Concentrator
Arrangement Drawing 67B241
November, 2007
Page N15



- NOTES:
1. ALL DIMENSIONS ARE IN INCHES UNLESS NOTED OTHERWISE.
 2. SEE DRAWING 67B240 FOR PUMP AND CONCENTRATOR DETAILS.
 3. SEE DRAWING 67B242 FOR CONCENTRATOR AND CONVEYOR PARTS LIST.
 4. THE 1/2\"/>

NO.	DESCRIPTION	QTY	UNIT	REMARKS
1	SHAFT 4\"/>			

Warwick Sewer Authority
Purchase Authorization / Confirmation Memo

To: Patrice Peshka, Purchasing Agent
From: Earl Bond CAPM, PMP, Executive Director
Date: July 30, 2020
Re: Engineering Design and Land Surveying to Replace the Oakland Beach Force main.

On 6/9/2020, the Warwick Sewer Authority (WSA) was notified that there was what appeared to be sewerage coming out of the ground near 222 Suburban Parkway. The WSA was able to contain the break and perform repairs to mitigate any environmental noncompliance. This is the second failure of this force main and due to the age and material of the pipe as well as the proximity to Narragansett Bay, this force main requires review for replacement.

This main was originally installed in 1978 and we believe may be constructed of Asbestos Concrete or PCCP with a diameter of 12". The force main is approx. 8600 linear feet long and its endpoint is the Oakland Beach Interceptor.

The WSA recently contacted Garofalo & Associates to provide an engineering proposal for review and design for the replacement of the Force main. Their proposal includes Data Collection, Field Surveying and Mapping, Preliminary design study, Final design (based on one bid contract).

We are recommending to the Board of Directors that they approve Garofalo & Associates to provide engineering services in the amount of \$26,500.00 to be funded out of line item 80-392.

Approval:



WSA Board of Directors

8/28/2020

Date

Consent:



Joseph Solomon, Mayor

9/04/2020

Date

Cc: Dana DiScullo, WSA Superintendent



Garofalo & Associates, Inc.
 Consulting Engineers
 Surveyors ♦ Land Planners

July 10, 2020

Mr. Earl Bond
 Acting Executive Director
 WARWICK SEWER AUTHORITY
 125 Arthur W. Devine Boulevard
 Warwick, RI 02886

RE: *Replacement Design of The Oakland Beach Force Main
 Suburban Parkway to Albart Street
 Warwick, Rhode Island*

Dear Mr. Bond:

Garofalo & Associates, Inc. (Garofalo) is pleased to submit our Proposal for Engineering Design and Land Surveying for the Replacement of the Oakland Beach Force Main as requested by the Warwick Sewer Authority.

As you and the Authority know, *Garofalo* is a full-service engineering company that offers a wide variety of in-house technical skills that enables our firm to provide clients the efficiency of working with a single firm from initial planning through the construction phases of a project.

Our firm's professional staff includes Civil, Environmental, Transportation, Bridge, Structural Engineers, CADD Draftsmen, Planners and Land Surveyors. Among the major professional services offered by our firm are water and wastewater facilities planning and engineering, highway and roadway design, site planning and engineering, bridge design, traffic and highway engineering, cost estimating, land surveying, as well as construction inspection and administration.

Garofalo has worked on numerous similar projects throughout the State. More specifically we have provide both Design and Construction Administration Services for several projects four the Authority, in such neighborhoods as North Hoxie, West Natick, East Natick, Cedar Swamp, Northwest Gorton Pond and Sandy Lane. Accordingly, we have a proven approach for successfully completing sanitary sewer projects for the Authority and other communities and are very familiar with the Design issue within the City that we may encounter during the Design and Construction of this Force Main Replacement.

Based upon our understanding of this project *Garofalo* has assembled a Professional Team of Qualified Personnel Lead under the direction of Senior Project Manager Samuel Hemenway, PE and Project Engineer Ryan Stevens, PE to complete this project within the time frame that will be required by the Authority. The following Scope of Services is presented herein along with our Manhour Estimates and our Proposed Fees for Year Review.

Sincerely,
Garofalo & Associates, Inc.

[Handwritten Signature]
 Steven B. Garofalo, PE
 President
 SBG:kar

<i>Warwick Sewer Authority Authorization Signature:</i>	

<i>Name & Title</i>	

<i>Date</i>	





REPLACEMENT DESIGN OF THE OAKLAND BEACH SEWER FORCE MAIN

PROJECT UNDERSTANDING:

It is our understanding that the purpose of this project is to replace or restore the existing 12-inch Force Main from its Pump Station located at the intersection of Suburban Parkway and Sea View Drive to its tie into the Oakland Beach interceptor at Albert Drive. The length of this force main is approximately 8600 linear feet and traverses the following streets

- Suburban Parkway 920'
- Oakland Beach Avenue 3200'
- Pinchurst Avenue 550'
- Horse Neck Road, and 2400'
- West Shore Road (RI Rte 117) 1530'

As part of the City's Proposal request for this Sewer Force Main *Garofalo* will initially provide an Engineering Design Study, then ultimately prepare Preliminary and Final Design Plans, specification for Bidding, and a Construction Cost estimate. We will also provide Construction Administration and Inspection Services (if requested by the Authority) during the Construction Phase of the project.

Approach

Garofalo will assign this project to its Highway/Infrastructure Division. This Division is staffed with a highly qualified team of civil engineers and technicians. *Garofalo*'s project team will draw upon its vast experience to develop the sanitary sewer design for this project. The study and design portion of the work will meet the required goals and provide the Warwick Sewer Authority with a cost effective, constructible solution. The design approach proposed for this project will consist of, but not be limited to the following items:

1. Field review of the project area and meet with the Authority to discuss sewer routing options and design issues (i.e. wetlands and easements).
2. Provide survey and mapping for the preferred street location and develop base plans that will include base physical features, pavement widths, centerline grades, elevations, utility locations, and provide soil borings to determine depth to ledge, presents of groundwater and soil type.
- ~~3. During the data collection and field survey phase, prepare a draft Preliminary Design Study Report to be submitted to the Authority for review and comments, that will include, the proposed force main routing alternatives, location of easements (if required) and need for Rhode Island Department of Environmental Management (RIDEM), Coastal Resources Management Council (CRMC) and the Rhode Island Department of Transportation (RIDOT) permits.~~
4. Meet with the Sewer Authority to discuss their comments. *Garofalo* will then revise the Preliminary Design Study Report and resubmit to the Authority for final approval.





5. Upon acceptance of the Preliminary Design Study Reports, prepare the Final Design Plans. The plans will be developed using 2012 aerial photography from Col-East at a scale of 1 inch = 40 feet and be drafted on 24-inch x 36-inch plans using AutoCAD Civil 3D Version 2018. The plans will also include a centerline profile of the existing roadway grades at a scale of 1 inch = 40 feet horizontal and 1 inch = 4 feet vertical to show the proposed sewer design. The final design will include the new sewer design as well as any pavement/sidewalk restoration requested by the City.
6. Provide contract specifications and preliminary cost estimates based on the unit prices and quantities laid out by the design plans.
7. Submit draft plans and specifications with unit prices/quantities to the City for approval. Upon completion of the City's review, develop the Final Plans and Specifications for bidding.
8. Assist the Warwick Sewer Authority during the bidding phase.
9. Provide construction administration and resident inspection services if requested.
10. Other work items that may be included under this project, but are unknown at this time are: soil borings, RIDEM Wetland, CRMC Assent & RIDOT Utility permits and property easements. If these work items are needed, they will be added by supplemental agreement, once the Preliminary Design Study has been completed and approved by the Authority.

SCOPE OF SERVICES:

Task 1 - Data Collection, Field Surveys & Mapping

Garofalo will conduct all survey work with our experienced in-house survey staff. We plan to utilize the services of Col-East as a sub-consultant to provide aerial photogrammetric mapping using existing 2012 photography. The mapping will be compiled at a scale of 1 inch = 40 feet with 2-foot contour intervals and provided in a digital format compatible with AutoCAD Civil 3D Version 2018.

We will conduct a field survey to obtain photo control for the mapping and to provide supplemental information such as field edits, spot grades and obtain existing sewer/drain inverts. As part of the proposed work under this task, Garofalo will provide the following survey services as part of our data collection:

- Locate the roadway right of way lines and show property lines by occupation.
- ~~Locate existing easements and utilities within easement area.~~
- Locate home and building structures.
- Locate fences, walls, trees, pavement edges, driveways, shrubs, walks and any other improvement that may be disturbed or impacted by construction.
- ~~Locate existing visible utilities by on ground survey including existing covers, valve boxes, pipes, culverts, signs and fire hydrants.~~
- Utilities such as gas, electric, cable, water, etc. that may not be visible, will be shown on the plans from the best information available and using "Dig-Safe". "As-built" information will also be collected from the utilities that have facilities in the project area.



GAROFALO

- Existing pipe sizes, material types, flow directions and invert elevation will be determined for all drainage and sanitary sewer facilities.
- Permanent benchmarks will be provided suitable for construction.
- Surface elevations of waterways and flood plain levels will be shown.
- The edges of areas such as brush, woods or thickly vegetated ground covers will be located.
- Wetland flagging will be done by a certified wetland scientist, as required for RIDEM, CRMC and RIDOT permit applications.
- Locate man made and natural features such as ledge outcrops, stonewalls, fences, curbing, sidewalks, wetlands and wetlands flagging.
- Survey work will be tied into the RI State Plane Coordinate System, NAD83 and comply with National Map Accuracy standards.
- Vertical Data will be referenced to the National Vertical Geodetic Datum of 1988, NVGD88.

Task 2 - Preliminary Design Study

Garofalo will use the existing information collected from available sources in conjunction with available aerial mapping.

These preliminary design studies will include recommendations with regard to the most cost-effective means of providing the sewer force main to the project areas, as well as preliminary layouts of the force main alternatives and recommended sites for any easements and or land acquisitions.

This Preliminary Design Study Phase will investigate the alternatives for replacing or restoring the existing force main. We would anticipate those alternatives to include:

- Lining the existing fore main through pipe bursting or compression fit HDPE lining
- Replacing the existing force main in the present street network
- Replacing the existing force main in a combination of the present and new street network

We would address the feasibility of each of these alternatives by identifying the Pros and Cons of each. Additionally, we would develop a Preliminary Cost Estimate for each alternative. Some of these alternatives would require a Bypass Pumping Plan that would be logical for this Residential area.

~~As part of this phase, we will provide the plan view layout of the proposed force main alternatives superimposed on Aerial Photographs. The pipelines will be laid out in preliminary fashion, taking into account the topography, maximizing locations within the streets and identifying possible easements and/or takings requirements for cross-country pipe runs.~~

At the conclusion of the Study *Garofalo* will meet with the Sewer Authority to review the findings, and recommendations in detail, as well as, discuss our proposed approach for the Final Design.





Task 3 - Final Design

Upon acceptance of the preliminary design study phase by the Authority, *Garofalo* will proceed to the final design phase. A complete design will be prepared for the preferred alternative.

Plan Preparation & Submittals - The final design will include plans and profiles of the proposed 12-inch sewer force main within the service area. The design plans will be 24 inches by 36 inches at a scale of 1 inch = 40 feet horizontal and 1 inch = 4 feet vertical. In addition, we will provide complete project plans in electronic format on a rewritable CD in AutoCAD Civil 3D Version 2018 format. Each contract set of the final design drawings will comprise of the following drawings that will be prepared and ready for construction bidding as part of this Final Design phase.

- Cover Sheet with Index and Locus
- Construction Notes and Legend
- Key Plan of the Contract Area w/ Schematic Layout of the Force Main System
- Plans and Profiles of the Proposed Force Main System Piping
- Sewer Construction Details

Specifications - The Construction Standard Institute (CSI) Master Specification format has been employed at *Garofalo* for more than twenty years. Accordingly, the technical specifications will be prepared in CSI format for this project. The specification package will also include the following:

- Warwick Sewer Authority General Bid and Proposal Specifications (as supplied by the Sewer Authority)
- Bid Proposal Forms and Bonds
- Sample Contract and Agreement
- Labor Standards Section G (Davis Bacon & related acts)
- SRF Specifications (if applicable)
- Prevailing Wage Rates
- Technical Specifications
- Boring Logs

For the final submittal, we will provide 30 copies of the specifications ready for bidding. In addition, we will provide the complete contract specifications to the Authority in electronic format on a rewritable CD in Microsoft Word 2004 format.

Subsurface Investigation - Under the final design phase, *Garofalo* will develop and coordinate a boring program in order to ascertain subsurface soil conditions. We will prepare a layout with the boring locations from the recommended sewer layouts recommended from our preliminary design study. We will develop the program specifications, solicit proposals from drilling companies and provide a recommendation to the Sewer Authority. If the Sewer Authority desires, *Garofalo* could provide a field inspector to oversee the boring program. The costs for the subsurface services have not been included as part of our basic design costs within





this proposal and will be added by supplemental agreement upon approval of the preliminary design study.

Right-of-Way Plats and Easements – As part of this proposal *Garofalo* will also prepare the necessary documents to accurately define any property required by the Sewer Authority for the construction of the sewer systems. This would include any temporary or permanent easements. The documents will include description of parcels, research and preparation of drawings for recording. In addition, each identified easement will be described in a standard meets and bounds document and accompanied by a detailed Plan View Map. The costs for preparing these right-of-way plats and easements services have not been included as part of our basic design costs within this proposal since the nature of this work is indeterminate at this time. This work will be added by supplemental agreement upon approval of the preliminary design study.

Permitting & Approvals - *Garofalo* has significant experience working with the regulating agencies that may be involved in this project, including RIDEM, CRMC and RIDOT. We recognize the importance of the regulatory review and permit process as a significant factor in allowing this project to proceed on schedule. Our past experience indicates that early involvement with these agencies is the most effective means to avoid delays. Therefore, we will initiate our discussions with these agencies at the outset of the final design phase to ensure that the design is prepared in accordance with all regulatory requirements and that the permit/review time will be minimized. The following is a listing of the typical permits that may be required for these types of projects that *Garofalo* will prepare and submit with supporting documentation.

RIDEM Freshwater Wetlands – Wetland flagging will be performed by a Certified Wetland Scientist, where necessary. A Preliminary Determination Application for Freshwater Wetlands to RIDEM on behalf of the Sewer Authority may be submitted that will include engineering and biological narratives, calculations if needed and other supporting data. Estimated permit review time by agency 45 to 60 days.

CRMC Category B Assent – Wetland flagging will be performed by a Certified Wetland Scientist, where necessary. A Preliminary Determination Application for a Coastal Wetlands Category B Assent CRMS on behalf of the Sewer Authority may be submitted that will include engineering and biological narratives, calculations if needed and other supporting data. Estimated permit review time by agency 45 to 60 days.

RIDOT Physical Alteration Permit/Application for Utility Permit – Application with supporting documentation for pavement restoration if required. Estimated permit review time by agency 45 to 60 days.

Since the actual need for any or all of these permits is indeterminate at this time until the preliminary design study can be completed, this work will also be added by supplemental agreement upon approval of the preliminary design study by the Authority.





Task 4 - Construction Bidding Services

Bidding Services - Upon completion and submission of the final contract documents, *Garofalo* will act as the Sewer Authority's representative during the bidding phases of the project. This will include, but is not limited to, attending a pre-bid conference providing assistance to the Authority during the bidding phase, attendance at the opening of the bids, reviewing the bids and making a recommendation to the Authority of award of the construction contract.

Task 5 - Construction Administration & Inspection Services

If desired by the Sewer Authority, *Garofalo* will provide construction administration and resident inspection services during construction. *Garofalo* has provided these services on a number of projects similar in nature to this project, including to the Warwick Sewer Authority, Town of East Greenwich and the Town of Middletown. The scope of services for this task, as we understand it will consist of, but not be limited to, the following:

Construction Administration and Inspection - Upon award of the construction contract by the Authority, *Garofalo* will act as the Sewer Authority's representative during the construction phases of the project. This will include, but is not limited to, reviewing shop drawings and submittals, reviewing and approving the schedule of amounts for contract payment, and reviewing and approving the contractor's partial payment requests based upon site observations. Construction administration will include interpreting the requirements of the contract documents and advising the Authority of all claims of the contractor relating to the execution and progress of the work.

Resident Inspection Services - will consist of a full-time construction inspection of the work to monitor the day to day construction operations and attend weekly construction meetings. All phases of the construction will be inspected to determine that the work performed is in accordance with the design plans and specifications. Punch lists of items to be repaired, replaced, added or deleted will also be prepared. Final inspections will be conducted with the Sewer Authority to issue a Certificate of Substantial Completion.

The construction inspector will be responsible for recording the receipt and approval of shop drawings and material test reports, if required. *Garofalo* will maintain the following records:

1. Correspondence reports of job meetings, shop drawings and sample submissions with results, reproductions of original Contract Documents, including all addenda, change orders, field orders, additional drawings issued subsequent to the execution of the contract, the Engineer's clarifications and interpretations of the contract documents, Project schedules ~~progress reports and other project related documents;~~
2. Daily reports will be maintained that include hours on the job site, weather conditions, data relative to questions of extras or deductions, lists of principal visitors, daily activities, decisions, observations in general and specific observations such as in the case of observing test procedures. Daily manpower and equipment logs on the contractor and all subcontractors will also be listed.





Work to be added by supplemental agreement but not included in this proposal:

- 1) *Borings and Geotechnical Engineering Services*
- 2) *Preparation of Right-of-way Plats and Easements*
- 3) *Permit Applications required by the City or State reviewing agencies*

Work not anticipated nor included in this proposal:

- *Any Construction Layout or additional Survey work from those listed*
- *Any Phase I Site Assessment Reports for Hazardous Materials*
- *Any application fees required by the City or State reviewing agencies*
- *Any work not specifically mentioned herein*

Should any additional work be required beyond the scope outlined above, it will be billed at the following hourly rates:

Principal Engineer	\$175.00 per Hour
Senior Project Manager	\$150.00 per Hour
Project Engineer	\$110.00 per Hour
Staff Engineer	\$100.00 per Hour
Tech/Drafting	\$90.00 per Hour
Construction Engineer	\$110.00 per Hour
Resident Inspector	\$75.00 per Hour
2-Man Survey Crew	\$1,300.00 per Day

Note: These billing rates will be in effect through the year 2021.



*Proposed Engineering Fees
Replacement of The Oakland Beach Force Main*

<i>Project Tasks</i>	<i>Oakland Beach Force Main</i>	
	<i>Estimated Hours</i>	<i>Estimated Fees</i>
<i>Task 1 - Data Collection, Field Surveys & Mapping</i>		
a.) Land Surveys	**	**
b.) Aerial Mapping	**	**
<i>Task 2 - Preliminary Design Study</i>		
	228	\$ 28,500.00
<i>Task 3 - Final Design (Based on one (1) Bid Contract)</i>		
a.) Plan Preparation of Force Main	**	\$ -
b.) Contract Specifications, Quantities & Estimate	**	\$ -
c.) Pump Stations & FM Design Plans/Construction Details	**	\$ -
d.) Subsurface Soil Investigations	**	\$ -
e.) Right-of-way Plats and Easements (2)	**	\$ -
f.) Preparation of Permits and Approvals (2)	**	\$ -
<i>Direct Expense - Sub-Consultants and Sub-Contractors (Possibly)</i>		
g.) Public Archaeology Lab	**	\$ -
h.) New Hampshire Boring - Boring Contractor	**	\$ -
i.) Wetlands Biologist	**	\$ -
j.) Reimbursable Expenses (Printing, Mileage, Etc.)	**	\$ -
<i>Design Phase Sub-total</i>	228	\$ 28,500.00
<i>Task 4 - Construction Bidding Services (Based on one (1) constr. Contract)</i>		
a.) Pre-bid Conference	**	\$ -
b.) Contract Addenda & Assistance During Bidding	**	\$ -
c.) Bid Review & Contract Award	**	\$ -
<i>Bid Phase Sub-total</i>	\$ -	\$ -
<i>Task 5 - Construction Administration & Inspection (Based on one (1) constr. Contract)</i>		
a.) Review of Shop Drawings & RFIs	**	\$ -
b.) Contract Administration Services	**	\$ -
c.) Inspection Services	**	\$ -
d.) Drafting of As-built Drawings	**	\$ -
e.) Reimbursable Expenses (Printing, Mileage, Etc.)	**	\$ -
<i>Construction Services Sub-total</i>	\$ -	\$ -

Notes:

** (2) Indicates those work tasks that are anticipated but are indeterminate for fee pricing at this time and will be added by supplemental agreement as the design develops.



Warwick Sewer Authority
Purchase Authorization / Confirmation Memo

To: Patrice Peshka, Purchasing Agent

From: Dana DiScullo, Superintendent

Date: 9/18/2020

Re: DEM REQUIRED CLIMATE RESILIENCY PLAN FOR THE WARWICK
SEWER AUTHORITY

The recently renewed Rhode Island Pollution Discharge Elimination System (RIPDES) permit requires The Warwick Sewer Authority (WSA) to complete a comprehensive climate resiliency plan which is due on December 13, 2020.

The WSA advertised for a request for qualifications for this project on May 8, 2020 and closed on July 7, 2020. We received a total of five (5) submissions.

- o Stantec
- o Pare Corporation
- o VHB
- o Western Sampson
- o Dewberry

Due to the significant time limitation of completing this plan, we have chosen Stantec as the engineering firm. In reviewing all submissions, although qualified, Stantec provides a depth of resources that we are confident will be able to meet the deadline for the submission. We are requesting the board to approve the quote provided in the amount of \$ 74,989.00. This project has been budgeted for this fiscal year in line item 80 - 392.

Approval:



WSA Board of Directors

9/25/2020

Date

Consent:



Joseph Solomon, Mayor

10/13/2020

Date

Cc: Dana DiScullo, WSA Superintendent

Climate Resiliency Plan Evaluation – Request For Qualifications
RFP 2021-024

	Stantec	PARE	Dewberry	Weston and Sampson	VHB
Firm Qualifications	30 points	20 Points	20 points	25 points	20 points
Project Organization and Key Personnel	25 points	15 points	15 points	20 points	15 points
Experience with Resiliency Plans	30 points	25 points	20 points	25 points	20 points
References	15 points	10 points	10 points	10 points	10 points
Total	100 Points	70 points	65 points	80 points	65 points

Warwick Sewer Authority – Climate Resiliency Plan

Scope of Work for Stantec Consulting Services

I. INTRODUCTION

The City of Warwick Sewer Authority's (WSA) wastewater infrastructure is highly vulnerable to impacts from coastal and riparian flooding that will increase with sea level rise. As part of Permit No. RI0100234, the Rhode Island Department of Environmental Management (RIDEM) requires the WSA to submit a Climate Resiliency Plan and schedule of short and long-term actions that will be taken to maintain operation and protect key collection and treatment system assets from flooding. Therefore, the WSA is seeking to engage the services of an engineering firm (consultant) located in the general geographic area to develop this Climate Resiliency Plan. This plan must be submitted to RIDEM by December 16th, 2020.

The Climate Resiliency Plan shall be consistent with the RIDEM's *Guidance for the Consideration of Climate Change Impacts in the Planning and Design of Municipal Wastewater Collection and Treatment Infrastructure* ("RIDEM Guidance") and include consideration of the findings of the 2017 DEM report *Implications of Climate Change for Rhode Island Wastewater Collection and Treatment Infrastructure* ("RIDEM Findings").

This scope follows the general structure of USEPA's *Flood Resilience: A Basic Guide for Water and Wastewater Utilities* and incorporates the RIDEM permit requirements.

II. SCOPE OF SERVICES

Task 1: Data Collection to Understand the Threat of Flooding

Available data will be collected in two general categories: flood hazard data, and asset information.

For flood hazard data, RIDEM Guidance refers to several different methods for determining the base flood elevation for estimating the Base Flood Elevation (BFE) or equivalent for wastewater planning and design purposes, including:

- o FEMA 100-year base flood event plus 3 feet for sea level rise in coastal areas
- o FEMA 100-year base flood event plus 2 feet for extreme rain events in inland areas
- o STORMTOOLS mapping tools with additional wave data from STWAVE in coastal areas
- o Or some other method to determine equivalent BFE that accounts for climate change.

In this task, the Stantec team will research available flood hazard sources and use best available data to represent coastal and riverine flooding, inclusive of climate change projections. Sources to evaluate include STORMTOOLS, FEMA, NOAA, and other available regional flooding and climate change projections (which may include Climate Ready Boston, New York City's Office of Climate Policy and Programs, and Woods Hole Oceanographic Institute). Stantec will recommend a BFE for planning purposes, for approval by WSA.

Stantec will request available asset information from WSA, including a Geographic Information System (GIS) of collection system assets and any available elevation data for facilities and their components (such as as-builts or other reports). This scope assumes asset information will be provided by WSA and does not include any Stantec site visits.

Task 1 Deliverables:

- BFE Maps: GIS-based map illustrating riverine and coastal flooding inclusive of climate projections at up to three intervals (digital)

Task 2: Identify Vulnerable Assets and Determine Consequences

The BFEs developed in Task 1 will be compared with elevations of WSA assets to identify which assets are vulnerable to flooding. In an online workshop with WSA staff and operators, Stantec will facilitate a discussion of each vulnerable asset to:

- Review current and projected future flood depths, and compare to historical experience
- Understand the consequences of flooding
- Identify the asset's critical components to ensure the forward flow and treatment of wastewater in accordance with the limits set forth in the WSA RIPDES permit, and
- Inventory what adaptation/protection measures have been completed to date or considered for future implementation (including operational measures, concepts generated by WSA in the past or present, and 2017 RIDEM Findings).

Stantec assumed up to 7 assets would be identified as vulnerable, which includes the WWTF, pump stations, and individual force mains or pipes.

Task 2 Deliverables:

- WSA staff workshop (hosted online) to discuss assets vulnerable to flooding, including presentation materials and a memo summary of the meeting.

Task 3: Identify and Evaluate Adaptation/Protection Measures

Based on the staff workshop in Task 2, Stantec will identify and inventory adaptation/protection measures for each vulnerable asset. Measures considered will include operational plans and system flexibility to better respond to flooding conditions or the recovery thereof, such as quick connects for bypass pumping, etc.

For each given asset, potential alternative measures will be evaluated qualitatively using considerations such as the remaining life of the asset, the degree of threat to the asset, protection provided by the measure, operations and maintenance requirements, and comparative order-of-magnitude costs to implement the measure. The Stantec team will then propose the most appropriate measure to adapt and/or protect the asset from flooding, in coordination with WSA staff and operators.

In an online workshop with WSA staff and operators, Stantec will review the evaluation process and proposed adaptation/protection measure for each vulnerable asset.

Once the appropriate set of measures are confirmed with WSA, Stantec will advance the selected measures to a conceptual level of project development that is sufficient for a planning-level cost estimate.

Stantec will perform cost-benefit analyses to estimate the cost-effectiveness of adaptation measures considering projected flooding elevations. The project costs will be compared to the project benefits, or avoided costs - specifically avoided asset damages and avoided environmental impacts with the measures in place.

Once complete, each measure will be assessed qualitatively to provide an overall prioritization for implementation using the following factors:

- Criticality of the asset
 - Likelihood and projected timeline of potential flood-related outage
 - Severity of potential flood-related outage (population served, duration, environmental impact / permit violation)
- Ability of the measure to reduce or eliminate flood risk
- Benefit-cost of the recommended measure

This task also includes a limited review of the past design of the WWTF levee, with respect to elevation and level of protection provided.

Task 3 Deliverables:

- WSA staff workshop (hosted online) to discuss adaptation/protection measure concepts, including presentation materials and a memo summary of the meeting.
- Project sheet for each vulnerable asset describing the adaptation/protection measure(s), showing a GIS-based site layout, costs, and prioritization. (digital)

Task 4: Develop Climate Resiliency Plan

Develop a Climate Resiliency Plan to adapt and protect vulnerable components and systems from coastal and riparian flooding, including an implementation strategy that identifies short-term and long-term actions that will be taken to maintain operation and protect key collection and treatment system assets. Stantec will initiate early discussions with RIDEM at the beginning of the project to confirm the scope and intended approach are satisfactory to RIDEM. The Climate Resiliency Plan will contain the following chapters that correspond with permit requirements:

- Assessment of Current and Projected Impacts from Natural Hazards related to Climate Change
- Analysis of Adaptation Methods
- Cost Benefit Analyses
- Adaptation and Protection Plan

Following internal QA/QC, Stantec will submit the Draft Climate Resiliency Plan to WSA and will incorporate one consolidated set of comments before submitting the Climate Resiliency Plan to RIDEM. If, after Stantec submits the plan to RIDEM, RIDEM determines that modifications need to be made to the plan, Stantec will be responsible for making the needed modifications; modifications that deviate from early discussions with RIDEM will be outside of this scope. The consultant must submit the modifications as per the RIDEM schedule for making the modifications. The WSA shall submit the modifications/revisions to the RIDEM for their approval.

Task 4 Deliverables:

- Draft Climate Resiliency Plan to be submitted to WSA (electronic)
- Climate Resiliency Plan by WSA to be submitted to RIDEM (electronic plus 5 hard copies for WSA use upon request)

Task 5: Project Management

Project management activities throughout the duration of the contract would include:

- Finalizing the workplan
- Preparing monthly progress reports to submit with invoices (5 months)
- Day-to-day project management and coordination
- Monthly project status meetings with WSA staff, online. The first meeting will be a kick-off meeting. Monthly project meetings will be held in the months without workshops (3 months)

Task 5 Deliverables:

- Project Workplan (electronic)
- Monthly online project status meetings, including meeting materials and notes
- Monthly progress reports and invoices

Project Schedule

<u>Key Milestone</u>	<u>Weeks after NTP</u>	<u>Example Schedule</u>
NTP	0	August 26
BFE Maps	2.5	September 11
Workshop #1: Assets	4	September 23
Workshop #2: Adaptation/Protection Measures	8	October 21
Project Sheets	11	November 11
Draft Climate Resiliency Plan	14	December 2
Climate Resiliency Plan	16	December 16

Project Fee

<u>Task</u>	<u>Amount</u>
Task 1: Data Collection to Understand the Threat of Flooding	\$4,544
Task 2: Identify Vulnerable Assets and Determine Consequences	\$6,248
Task 3: Identify and Evaluate Adaptation/Protection Measures	\$39,112
Task 4: Develop Climate Resiliency Plan	\$16,556
Task 5: Project Management	\$8,529
Total	\$74,989