EPA 2016 REQUEST #7 - AIR POLLUTION TESTING SINCE 2014					
This table includes a list of air pollution tests for pollutants other than VOCs conducted since June 2014, which supplements the list provided in response to EPA's 2014 Request #9 . The table also includes a list of additional tests located since the response to EPA 2014 Request #9, and VOC tests listed in EPA 2014 Request #9 that should also have been included in EPA 2014 Request #8					
Unit	**Tested**	**Dates Tested**			**Bates Nos. for Summary Pages**
CA-1&2	Particulate	6/13/2014			SOLVAY_7_000134
CA-2	Particulate	8/12/2014	8/13/2014		SOLVAY_7_000135
CA-1	Particulate	9/3/2014			SOLVAY_7_000136
CA-1&2	Particulate	6/3/2015			SOLVAY_7_000137
CA-3	Nitrogen Oxides	4/14/2015			SOLVAY_7_000138
CA-4	Particulate	6/17/2014			SOLVAY_7_000139
CA-4	Nitrogen Oxides	4/14/2015			SOLVAY_7_000140
ADDITIONAL AIR POLLUTION TESTS INADVERTENTLY OMITTED FROM 2014 REQUEST #9					
CA1&2	Particulate	6/4/2010	6/5/2010		SOLVAY_7_000141
CA1&2	Aldehydes and Ketones	7/26/1996			SOLVAY_7_000142
CA1&2	Hydrogen Flouride	4/19/2013			SOLVAY_7_000143
VOC AIR POLLUTION TESTS INCLUDED IN 2014 REQUEST #9 BUT OMITTED FROM 2014 REQUEST #8					
CA1&2	Particulate, Non-methane, Hydrocarbons, Carbon Monoxide and Nitrogen Oxides	1/22/1998			SOLVAY_7_000030
CA-3	Particulate, Non-methane, Hydrocarbons, Carbon Monoxide and Nitrogen Oxides	1/21/1998			SOLVAY_7_000099
CA-3	Particulate, Non-methane, Hydrocarbons, Carbon Monoxide and Nitrogen Oxides	3/31/1998	4/2/1998		SOLVAY_7_000104 and 105

2.0 SUMMARY OF RESULTS

Table 2 CA - 1 & 2 Particulate Test and Parameters Results, Solvay Chemical, June 13, 2014

	Start Time	8:50	11:05	13:10	
	Stop Time	10:00	12:19	14:22	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.42	23.42	23.42	
Y (Dry Gas Meter Calibration Factor)	unitless	0.996	0.996	0.996	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.295	0.295	0.295	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
DH (Orifice Pressure Drop)	In. H2O	2.01	2.13	2.01	
V_m (Dry Gas Sampled - as measured)	ft3 (dry)	52.811	55.042	53.439	
T_m (Gas Meter Temperature, avg.)	Degr. F	80	84	85	
V_{lc} (Condensate and silica gel)	ml or g	243.5	272.5	241.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft2	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H2O	-0.57	-0.57	-0.57	-0.57
T_s (Temperature of Stack Gas)	Deg. F	418	411	418	415
ÖDp (Sq. root of velocity head of gas)	Ö In. H2O	0.8051	0.8274	0.8044	0.8123
CO_2 (Carbon Dioxide)	%	10.20	10.40	10.50	10.37
O_2 (Oxygen)	%	13.00	12.80	12.80	12.87
N_2 (Nitrogen)	%	76.8	76.8	76.7	76.8
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	40.46	41.92	40.61	41.00
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	11.48	12.85	11.40	11.91
B_w (Water Vapor in Gas, by Vol.)	%	22.10	23.46	21.92	22.49
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.15	30.18	30.19	30.17
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.47	27.32	27.52	27.44
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.38	23.38	23.38	23.38
Iso (Percent of Isokinetic Sampling)	%	95.7	97.5	96.0	96.4
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	4,055	4,162	4,048	4,088
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	458,649	470,706	457,826	462,394
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	167,890	170,675	167,965	168,843
Particulate Results					
Filterable Inorganic PM Mass	mg/sample	73.30	64.85	67.20	
Filterable Inorganic Conc. - std.	gr/dscf	0.0280	0.0239	0.0255	0.0258
Filterable Inorganic Emissions	lb/mmBtu	0.1033	0.0861	0.0944	0.0946
Filterable Inorganic Emissions	lb/hr	40.22	34.92	36.76	37.30
Mass of Condensable Inorganic PM	mg/sample	7.4	7.4	13.6	
Condensable Inorganic Conc. - std.	gr/dscf	0.0028	0.0027	0.0052	0.0036
Condensable Inorganic Emission Rate	lb/hr	4.06	3.99	7.46	5.17
Total Inorganic Particulate Collected	mg/sample	80.70	72.25	80.80	
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0308	0.0266	0.0307	0.0294
Total Inorganic Particulate Emissions	lb/hr	44.28	38.91	44.22	42.47
Condensable Organic PM Mass	mg/sample	103.6	11.2	22.1	
Condensable Organic Conc. - std.	gr/dscf	0.0395	0.0041	0.0084	0.0174
Condensable Organic Emission Rate	lb/hr	56.85	6.03	12.13	25.00

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA - 2 Test Parameters and Results, Solvay Chemicals, August 12 and 13, 2014

	Date	8/12/14	8/12/14	8/13/14	8/13/14	
	Start Time	10:05	11:48	9:36	13:44	
	Stop Time	11:15	12:56	10:45	14:55	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.56	23.56	23.90	23.90	
Y (Dry Gas Meter Calibration Factor)	unitless	1.0069	1.0069	1.0069	1.0069	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.426	0.391	0.426	0.426	
θ (Total Sampling Time of Test)	Minutes	60	60	60	60	
ΔH (Orifice Pressure Drop)	In. H_2O	1.40	1.22	1.47	1.70	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	44.090	41.844	45.433	49.066	
T_m (Gas Meter Temperature, avg.)	Degree F	89	97	76	93	
V_{lc} (Condensate and silica gel)	ml or g	272.3	267.3	302.3	303.1	
Location/Process Parameters						
A_s (Cross-sectional Area of Stack)	ft^2	113.1	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.30	-0.30	-0.31	-0.30	-0.30
T_s (Temperature of Stack Gas)	Deg. F	412	404	413	407	409
√Δp (Sq. root of velocity head of gas)	√In. H_2O	0.3167	0.3518	0.3303	0.3525	0.3378
CO_2 (Carbon Dioxide)	%	12.60	12.60	14.10	14.10	13.35
O_2 (Oxygen)	%	10.80	10.80	10.70	10.70	10.75
N_2 (Assumed Balance Nitrogen)	%	76.6	76.6	75.2	75.2	75.9
Calculations						
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	33.74	31.55	36.15	37.86	34.82
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	12.84	12.60	14.25	14.29	13.50
B_w (Water Vapor in Gas, by Vol.)	%	27.57	28.54	28.28	27.41	27.95
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.45	30.45	30.68	30.68	30.57
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.02	26.89	27.10	27.21	27.05
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.54	23.54	23.88	23.88	23.71
Iso (Percent of Isokinetic Sampling)	%	103.1	103.7	106.4	103.0	104.0
Flow Results						
Vs (Average Stack Gas Velocity)	ft/m (fpm)	1,598	1,771	1,653	1,754	1,694
Qa (Actual Volumetric Flow Rate)	ft^3/m (cfm)	180,683	200,338	186,918	198,402	191,585
Qstd (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	62,354	68,761	64,708	70,006	66,457
Particulate Results						
Filterable (Inorganic) PM Mass	mg/sample	3.15	7.40	2.50	1.70	
Filterable (Inorganic) Conc. - std.	gr/dscf	0.0014	0.0036	0.0011	0.0007	0.0017
Filterable (Inorganic) Emissions	lb/hr	0.77	2.13	0.59	0.42	0.98
Mass of Condensable Inorganic PM	mg/sample	14.0	15.3	15.8	9.5	
Condensable Inorganic Conc. - std.	gr/dscf	0.0064	0.0075	0.0067	0.0039	0.0061
Condensable Inorganic Emission Rate	lb/hr	3.42	4.41	3.74	2.32	3.47
Total Inorganic Particulate Collected	mg/sample	17.15	22.70	18.30	11.20	
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0078	0.0111	0.0078	0.0046	0.0078
Total Inorganic Particulate Emissions	lb/hr	4.19	6.54	4.33	2.74	4.45
Condensable Organic PM Mass	mg/sample	18.4	42.0	21.2	13.6	
Condensable Organic Conc. - std.	gr/dscf	0.0084	0.0205	0.0090	0.0055	0.0109
Condensable Organic Emission Rate	lb/hr	4.50	12.11	5.02	3.33	6.24

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA - 1 Test Parameters and Results, Solvay Chemicals, September 3, 2014

	Date	9/3/14	9/3/14	9/3/14	
	Start Time	10:22	13:10	15:16	
	Stop Time	11:31	14:23	16:30	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	22.88	22.88	22.88	
Y (Dry Gas Meter Calibration Factor)	unitless	1.0069	1.0069	1.0069	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.425	0.392	0.425	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H2O	2.31	1.78	2.34	
V_m (Dry Gas Sampled - as measured)	ft3 (dry)	53.279	51.054	57.623	
T_m (Gas Meter Temperature, avg.)	Degr. F	85	85	88	
V_{lc} (Condensate and silica gel)	ml or g	292.0	240.8	244.1	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft2	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H2O	-0.26	-0.24	-0.24	-0.25
T_s (Temperature of Stack Gas)	Deg. F	394	387	389	390
√Δp (Sq. root of velocity head of gas)	√ In. H2O	0.4139	0.4304	0.4153	0.4199
CO_2 (Carbon Dioxide)	%	8.7	8.6	8.5	8.6
O_2 (Oxygen)	%	12.6	12.7	12.9	12.7
N_2 (Assumed Balance Nitrogen)	%	78.7	78.7	78.6	78.7
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	40.05	38.30	43.06	40.47
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	13.77	11.35	11.51	12.21
B_w (Water Vapor in Gas, by Vol.)	%	25.58	22.87	21.09	23.18
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	29.90	29.88	29.88	29.89
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	26.85	27.17	27.37	27.13
P_s (Pressure of Stack Gas, Absolute)	In. Hg	22.86	22.86	22.86	22.86
Iso (Percent of Isokinetic Sampling)	%	91.7	95.8	93.2	93.6
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	2,103	2,166	2,084	2,118
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	237,867	244,978	235,713	239,519
Q_{std} (Dry Volumetric Flow Rate, std.)	(dscfm)	83,623	89,935	88,379	87,312
Particulate Results					
Filterable Inorganic PM Mass	mg/sample	18.55	14.15	20.60	
Filterable Inorganic Conc. - std.	gr/dscf	0.0071	0.0057	0.0074	0.0067
Filterable Inorganic Emissions	lb/hr	5.12	4.39	5.59	5.04
Mass of Condensable Inorganic PM	mg/sample	3.9	7.9	8.4	
Condensable Inorganic Conc. - std.	gr/dscf	0.0015	0.0032	0.0032	0.0026
Condensable Inorganic Emission Rate	lb/hr	1.08	2.45	2.32	1.95
Total Inorganic Particulate Collected	mg/sample	22.45	22.05	29.00	
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0086	0.0089	0.0106	0.0094
Total Inorganic Particulate Emissions	lb/hr	6.20	6.85	7.91	6.99
Condensable Organic PM Mass	mg/sample	39.7	30.7	39.9	
Condensable Organic Conc. - std.	gr/dscf	0.0153	0.0124	0.0154	0.0143
Condensable Organic Emission Rate	lb/hr	10.96	9.54	11.02	10.50

2.0 SUMMARY OF RESULTS

Table 2 CA - 1 & 2 Particulate Test and Parameters Results, Solvay Chemicals, June 3, 2015

	Start Time	9:39	11:29	15:33	
	Stop Time	10:43	12:41	16:51	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.50	23.50	23.50	
Y (Dry Gas Meter Calibration Factor)	unitless	1.000	1.000	1.000	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.305	0.305	0.311	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H2O	1.53	1.61	1.65	
V_m (Dry Gas Sampled - as measured)	ft3 (dry)	45.621	47.288	48.126	
T_m (Gas Meter Temperature, avg.)	Degr. F	75	86	82	
V_{lc} (Condensate and silica gel)	ml or g	268.2	262.6	268.5	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft2	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H2O	-0.45	-0.44	-0.44	-0.44
T_s (Temperature of Stack Gas)	Deg. F	369	373	370	371
√Δp (Sq. root of velocity head of gas)	√ In. H2O	0.6246	0.6446	0.6483	0.6392
CO_2 (Carbon Dioxide)	%	11.76	12.32	12.32	12.13
O_2 (Oxygen)	%	11.77	11.78	11.78	11.78
N_2 (Nitrogen)	%	76.5	75.9	75.9	76.1
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	35.52	36.05	36.98	36.18
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	12.65	12.38	12.66	12.56
B_w (Water Vapor in Gas, by Vol.)	%	26.25	25.56	25.51	25.77
G_d (Proportion of Dry Gas in stack)	%	73.75	74.44	74.49	74.23
EA (Excess Air)	%	140	143	143	
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.35	30.44	30.44	30.41
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.11	27.26	27.27	27.21
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.47	23.47	23.47	23.47
Iso (Percent of Isokinetic Sampling)	%	103.2	101.1	98.8	101.0
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,073	3,170	3,181	3,141
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	347,500	358,504	359,743	355,249
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	127,917	132,565	133,689	131,390
Particulate Results					
Filterable Inorganic PM Mass	mg/sample	8.99	8.85	10.16	
Filterable Inorganic Conc. - std.	gr/dscf	0.0039	0.0038	0.0042	0.0040
Filterable Inorganic Emissions	lb/mmBtu	0.0125	0.0121	0.0136	0.0127
Filterable Inorganic Emissions	lb/hr	4.28	4.30	4.86	4.48
Mass of Condensable Inorganic PM	mg/sample	4.3	5.7	3.4	
Condensable Inorganic Conc. - std.	gr/dscf	0.0019	0.0024	0.0015	0.0019
Condensable Inorganic Emission Rate	lb/hr	2.05	2.77	1.62	2.15
Total Inorganic Particulate Collected	mg/sample	13.29	14.55	13.56	
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0058	0.0062	0.0057	0.0059
Total Inorganic Particulate Emissions	lb/hr	6.33	7.08	6.48	6.63
Condensable Organic PM Mass	mg/sample	16.1	18.4	15.0	
Condensable Organic Conc. - std.	gr/dscf	0.0070	0.0079	0.0065	0.0071
Condensable Organic Emission Rate	lb/hr	7.66	8.95	7.14	7.91

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 Solvay Chemicals CA-3 Test Parameters, April 14, 2015

	Start Time:	9:50	11:20	12:47	
	Stop Time:	10:50	12:20	13:47	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.46	23.46	23.46	
Y (Dry Gas Meter Calibration Factor)	unitless	1.000	1.000	1.000	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H2O	0.93	0.93	0.93	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	37.821	37.392	37.739	
T_m (Gas Meter Temperature, avg.)	Degr. F	69	80	88	
V_{lc} (Condensate and silica gel)	ml or g	205.6	205.9	199.1	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	96.84	96.84	96.84	**96.84**
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.28	-0.30	-0.30	**-0.29**
T_s (Temperature of Stack Gas)	Deg. F	251	256	254	**253**
√Δp (Sq. root of velocity head of gas)	√ In. H_2O	0.4579	0.4426	0.4614	**0.4540**
CO_2 (Carbon Dioxide)	%	8.84	8.64	8.55	**8.68**
O_2 (Oxygen)	%	13.65	13.83	13.98	**13.82**
N_2 (Nitrogen)	%	77.51	77.53	77.47	**77.50**
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	29.66	28.73	28.58	**28.99**
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	9.68	9.69	9.37	**9.58**
B_{ws} (Water Vapor in Gas, by Vol.)	%	24.60	25.23	24.69	**24.84**
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	29.96	29.94	29.93	**29.94**
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.02	26.92	26.98	**26.98**
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.44	23.44	23.44	**23.44**
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	2,091	2,031	2,112	**2,078**
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	202,460	196,640	204,510	**201,203**
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	88,750	84,960	89,240	**87,650**
NOx Results					
Concentration, Drift Corrected - dry	ppm_d	12.08	11.48	11.85	**11.80**
Emissions as NO_x	lb/hr	7.68	6.99	7.58	**7.41**

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA 4 Particulate Test and Parameters Results, Solvay Chemical, June 17, 2014

	Start Time	9:41	11:40	16:02	
	Stop Time	10:53	12:48	17:51	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	22.80	22.80	22.80	
Y (Dry Gas Meter Calibration Factor)	unitless	1.007	1.007	1.007	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.3110	0.3115	0.3110	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H_2O	1.67	1.63	1.66	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	48.181	48.134	46.000	
T_m (Gas Meter Temperature, avg.)	Degr. F	65	64	45	
V_{lc} (Condensate and silica gel)	ml or g	335.0	302.7	282.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	90.4	90.4	90.4	90.4
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.38	-0.38	-0.27	-0.34
T_s (Temperature of Stack Gas)	Deg. F	279	269	259	269
√Dp (Sq. root of velocity head of gas)	√ In. H_2O	0.6686	0.6537	0.6592	0.6605
CO_2 (Carbon Dioxide)	%	9.49	9.47	9.45	9.47
O_2 (Oxygen)	%	12.37	12.30	12.39	12.35
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	37.38	37.37	37.07	37.27
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	15.80	14.27	13.33	14.47
B_w (Water Vapor in Gas, by Vol.)	%	29.71	27.64	26.46	27.93
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.01	30.01	30.01	30.01
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	26.44	26.69	26.83	26.65
P_s (Pressure of Stack Gas, Absolute)	In. Hg	22.77	22.77	22.78	22.77
Iso (Percent of Isokinetic Sampling)	%	96.8	95.7	92.5	95.0
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,191	3,086	3,080	3,119
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	288,526	278,980	278,455	281,987
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	110,258	111,174	114,507	111,980
Particulate Results					
Filterable Inorganic Conc. - std.	gr/dscf	0.0020	0.0020	0.0024	0.0021
Filterable Inorganic Emissions	lb/hr	1.91	1.91	2.33	2.05
Condensable Inorganic Conc. - std.	gr/dscf	0.0060	0.0057	0.0097	0.0071
Condensable Inorganic Emission Rate	lb/hr	5.70	5.47	9.48	6.88
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0081	0.0077	0.0120	0.0093
Total Inorganic Particulate Emissions	lb/hr	7.61	7.38	11.81	8.93
Condensable Organic Conc. - std.	gr/dscf	0.0115	0.0124	0.0172	0.0137
Condensable Organic Emission Rate	lb/hr	10.85	11.81	16.87	13.17

Optimal AIR TESTING SERVICES, INC

Table 3 Solvay Chemicals CA-4 Test Parameters, April 14, 2015

	Start Time:	14:15	15:33	16:54	
	Stop Time:	15:15	16:33	17:54	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.46	23.46	23.46	
Y (Dry Gas Meter Calibration Factor)	unitless	1.000	1.000	1.000	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H2O	0.87	0.83	0.83	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	36.478	35.881	36.059	
T_m (Gas Meter Temperature, avg.)	Degr. F	86	77	78	
V_{lc} (Condensate and silica gel)	ml or g	248.5	238.7	240.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	90.41	90.41	90.41	**90.41**
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.36	-0.35	-0.35	**-0.35**
T_s (Temperature of Stack Gas)	Deg. F	287	285	285	**286**
√Δp (Sq. root of velocity head of gas)	√ In. H_2O	0.6984	0.6417	0.6288	**0.6563**
CO_2 (Carbon Dioxide)	%	11.18	10.74	10.64	**10.85**
O_2 (Oxygen)	%	11.82	11.96	11.95	**11.91**
N_2 (Nitrogen)	%	77.00	77.30	77.41	**77.24**
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	27.75	27.72	27.82	**27.77**
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	11.70	11.24	11.33	**11.42**
B_{ws} (Water Vapor in Gas, by Vol.)	%	29.65	28.84	28.95	**29.15**
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.26	30.20	30.18	**30.21**
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	26.63	26.68	26.65	**26.65**
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.43	23.43	23.43	**23.43**
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,293	3,019	2,958	**3,090**
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	297,740	272,960	267,450	**279,383**
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	115,880	107,720	105,500	**109,700**
NOx Results					
Concentration, Drift Corrected - dry	ppm_d	14.47	12.53	11.84	**12.95**
Emissions as NO_x	lb/hr	12.01	9.67	8.95	**10.21**

2.0 SUMMARY OF RESULTS

2.1 Particulate Results

Operating Conditions	Run 1	Run 2	Run 4	Average
Calciner Production Rate, Ton/hr	237	228	220	**228**
Opacity, %	1.7	1.8	2.0	**1.8**

Particulate Results	Run 1	Run 2	Run 4	Average
Front Half Particulate, gr/dscf	0.00223	0.00271	0.00186	**0.00227**
Front Half Particulate, lb/hr	2.67	3.06	2.18	**2.64**
Back Half Inorganic Particulate, gr/dscf	0.00388	0.00441	0.00258	**0.00363**
Back Half Inorganic Particulate, lb/hr	4.65	4.98	3.03	**4.22**
Back Half Organic Particulate, gr/dscf	0.00335	0.00167	0.000965	**0.00200**
Back Half Organic Particulate, lb/hr	4.02	1.88	1.13	**2.34**
Total Inorganic Particulate, gr/dscf	0.00612	0.00712	0.00444	**0.00589**
Total Inorganic Particulate, lb/hr	7.32	8.04	5.22	**6.86**

Parameters	Run 1	Run 2	Run 4	Average
Date (2010)	6/4	6/4	6/5	
Start Time	10:17	13:46	9:00	
Stop Time	11:45	15:07	10:24	
Stack Temp, °F	345	344	347	**345**
O_2, %	11.54	11.48	11.92	**11.65**
CO_2, %	12.54	12.64	12.21	**12.46**
Moisture, %	29.3	29.2	28.1	**28.9**
Velocity, ft/sec	55.6	52.4	54.6	**54.2**
Acfm	377,620	355,350	370,390	**367,790**
Scfm	197,390	185,850	190,610	**191,280**
Dscfm	139,680	131,610	137,100	**136,130**
Isokinetics, %	101.6	99.3	98.0	**99.6**

RESULTS

Table 2-2:
CA 1 & 2 Calciner Stack - Aldehydes and Ketones

Run No.		2	3	4	Average
Date (1996)		July 26	July 26	July 26	
Start Time (approx.)		14:01	16:21	18:27	
Stop Time (approx.)		15:42	18:08	20:08	
Process Conditions[1]					
	Feed Rate (tons/hr)	282	280	278	**280**
Gas Conditions					
T_s	Temperature (°F)	372	372	374	**373**
B_{wo}	Moisture (volume %)	24.59	25.42	25.74	**25.25**
O_2	Oxygen (dry volume %)	14.9	14.2	13.7	**14.3**
CO_2	Carbon dioxide (dry volume %)	7.0	7.1	7.7	**7.3**
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	392,900	400,100	410,300	**401,100**
Q_{std}	Standard conditions (dscfm)	149,000	150,100	153,000	**150,700**
Formaldehyde					
C	Concentration (lb/dscf)	3.50E-08	2.32E-08	1.46E-08	**2.43E-08**
C	Concentration (µg/dscm)	5.60E+02	3.72E+02	2.34E+02	**3.89E+02**
C	Concentration (ppmdv)	0.449	0.298	0.187	**0.311**
E	Emission rate (lb/hr)	0.313	0.209	0.134	**0.219**
E	Emission rate (lb/ton of trona)	0.0011	0.0007	0.0005	**0.0008**
Acetaldehyde					
C	Concentration (lb/dscf)	3.27E-08	2.50E-08	5.58E-08	**3.78E-08**
C	Concentration (µg/dscm)	5.24E+02	4.00E+02	8.94E+02	**6.06E+02**
C	Concentration (ppmdv)	0.286	0.218	0.488	**0.331**
E	Emission rate (lb/hr)	0.293	0.225	0.512	**0.343**
E	Emission rate (lb/ton of trona)	0.0010	0.0008	0.0018	**0.0012**
Propionaldehyde					
C	Concentration (lb/dscf)	1.26E-08	9.20E-09	1.59E-08	**1.25E-08**
C	Concentration (µg/dscm)	2.01E+02	1.47E+02	2.54E+02	**2.01E+02**
C	Concentration (ppmdv)	0.083	0.061	0.105	**0.083**
E	Emission rate (lb/hr)	0.112	0.083	0.146	**0.114**
E	Emission rate (lb/ton of trona)	0.0004	0.0003	0.0005	**0.0004**
Acrolein[2]					
C	Concentration (lb/dscf)	8.46E-08	6.95E-08	6.81E-08	**7.41E-08**
C	Concentration (µg/dscm)	1.35E+03	1.11E+03	1.09E+03	**1.19E+03**
C	Concentration (ppmdv)	0.581	0.478	0.468	**0.509**
E	Emission rate (lb/hr)	0.756	0.626	0.625	**0.669**
E	Emission rate (lb/ton of trona)	0.0027	0.0022	0.0022	**0.0024**
Acetone[2]					
C	Concentration (lb/dscf)	3.97E-08	3.43E-08	3.37E-08	**3.59E-08**
C	Concentration (µg/dscm)	6.35E+02	5.50E+02	5.39E+02	**5.75E+02**
C	Concentration (ppmdv)	0.263	0.228	0.223	**0.238**
E	Emission rate (lb/hr)	0.354	0.309	0.309	**0.324**
E	Emission rate (lb/ton of trona)	0.0013	0.0011	0.0011	**0.0012**
2-Butanone					
C	Concentration (lb/dscf)	2.38E-08	1.66E-08	1.85E-08	**1.96E-08**
C	Concentration (µg/dscm)	3.81E+02	2.67E+02	2.96E+02	**3.14E+02**
C	Concentration (ppmdv)	0.127	0.089	0.099	**0.105**
E	Emission rate (lb/hr)	0.213	0.150	0.169	**0.177**
E	Emission rate (lb/ton of trona)	0.0008	0.0005	0.0006	**0.0006**

[1] Process conditions provided by Solvay Minerals, Inc.
[2] Acetone and acrolein peaks unresolved. See comments in project overview.

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA - 1 & 2 Hydrogen Fluoride Test Parameters and Results, Solvay, April 19, 2013

	Start Date/Time	4/19/13 10:44	4/19/13 12:25	4/19/13 14:08	
	Stop Time	12:11	13:58	15:30	
Coal Consumption	**Units**	**Run 1**	**Run 2**	**Run 3**	-
AQD #17 "A" Calciner	TPH	5.6	5.6	5.6	
AQD #17 "B" Calciner	TPH	5.6	5.6	5.6	
Combined Coal Consumption	TPH	11.2	11.2	11.2	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.70	23.70	23.70	
Y (Dry Gas Meter Calibration Factor)	unitless	0.992	0.992	0.992	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.304	0.304	0.304	
θ (Total Sampling Time of Test)	Minutes	80	80	80	
ΔH (Orifice Pressure Drop)	In. H2O	1.87	1.94	2.04	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	61.435	63.796	66.612	
T_m (Gas Meter Temperature, avg.)	Degr. F	83	87	87	
V_{lc} (Condensate and silica gel)	ml or g	306.5	316.6	330.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H2O	-0.60	-0.61	-0.60	-0.60
T_s (Temperature of Stack Gas)	Deg. F	401	400	402	401
√Δp (Sq. root of velocity head of gas)	√ In. H2O	0.6902	0.6829	0.6940	0.6890
CO_2 (Carbon Dioxide)	%	9.4	9.4	9.0	9.3
O_2 (Oxygen)	%	13.0	13.4	13.4	13.3
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	47.17	48.68	50.78	48.88
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	14.45	14.93	15.60	14.99
B_{ws} (Water Vapor in Gas, by Vol.)	%	23.45	23.47	23.50	23.47
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.02	30.04	29.98	30.01
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.20	27.21	27.16	27.19
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.66	23.66	23.66	23.66
Iso (Percent of Isokinetic Sampling)	%	91.7	95.6	98.2	95.2
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,440	3,400	3,464	3,435
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	389,040	384,540	391,750	388,443
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	144,340	142,850	145,040	144,077
HF Results		-	-	-	
Mass of HF Collected	mg/sample	<0.123	<0.126	<0.128	
HF Concentrations in gas - std.	$mg/m^3{}_{gas}$	<0.092	<0.094	<0.096	
HF Concentrations in gas - std.	gr/dscf	<0.00004	<0.00004	<0.00004	
HF Concentrations in gas	ppm	<0.111	<0.113	<0.115	<0.113
HF Emission Rate (Coal Fd = 9780)	lb/mmBtu	<1.5E-04	<1.6E-04	<1.5E-04	<1.5E-04
HF Emission Rate	lb/hr	<0.050	<0.049	<0.048	<0.049
HF Emission Rate	lb/ton of coal	<0.0044	<0.0044	<0.0043	<0.0044

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA 4 Particulate Test and Parameters Results, Solvay Chemical, June 17, 2014

	Start Time	9:41	11:40	16:02	
	Stop Time	10:53	12:48	17:51	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	22.80	22.80	22.80	
Y (Dry Gas Meter Calibration Factor)	unitless	1.007	1.007	1.007	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.3110	0.3115	0.3110	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H_2O	1.67	1.63	1.66	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	48.181	48.134	46.000	
T_m (Gas Meter Temperature, avg.)	Degr. F	65	64	45	
V_{lc} (Condensate and silica gel)	ml or g	335.0	302.7	282.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	90.4	90.4	90.4	90.4
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.38	-0.38	-0.27	-0.34
T_s (Temperature of Stack Gas)	Deg. F	279	269	259	269
√Dp (Sq. root of velocity head of gas)	√ In. H_2O	0.6686	0.6537	0.6592	0.6605
CO_2 (Carbon Dioxide)	%	9.49	9.47	9.45	9.47
O_2 (Oxygen)	%	12.37	12.30	12.39	12.35
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	37.38	37.37	37.07	37.27
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	15.80	14.27	13.33	14.47
B_w (Water Vapor in Gas, by Vol.)	%	29.71	27.64	26.46	27.93
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.01	30.01	30.01	30.01
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	26.44	26.69	26.83	26.65
P_s (Pressure of Stack Gas, Absolute)	In. Hg	22.77	22.77	22.78	22.77
Iso (Percent of Isokinetic Sampling)	%	96.8	95.7	92.5	95.0
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,191	3,086	3,080	3,119
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	288,526	278,980	278,455	281,987
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	110,258	111,174	114,507	111,980
Particulate Results					
Filterable Inorganic Conc. - std.	gr/dscf	0.0020	0.0020	0.0024	0.0021
Filterable Inorganic Emissions	lb/hr	1.91	1.91	2.33	2.05
Condensable Inorganic Conc. - std.	gr/dscf	0.0060	0.0057	0.0097	0.0071
Condensable Inorganic Emission Rate	lb/hr	5.70	5.47	9.48	6.88
Total Inorganic Particulate Conc. - std.	gr/dscf	0.0081	0.0077	0.0120	0.0093
Total Inorganic Particulate Emissions	lb/hr	7.61	7.38	11.81	8.93
Condensable Organic Conc. - std.	gr/dscf	0.0115	0.0124	0.0172	0.0137
Condensable Organic Emission Rate	lb/hr	10.85	11.81	16.87	13.17

Optimal AIR TESTING SERVICES, INC

Table 3 Solvay Chemicals CA-4 Test Parameters, April 14, 2015

	Start Time:	14:15	15:33	16:54	
	Stop Time:	15:15	16:33	17:54	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.46	23.46	23.46	
Y (Dry Gas Meter Calibration Factor)	unitless	1.000	1.000	1.000	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
θ (Total Sampling Time of Test)	Minutes	60	60	60	
ΔH (Orifice Pressure Drop)	In. H2O	0.87	0.83	0.83	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	36.478	35.881	36.059	
T_m (Gas Meter Temperature, avg.)	Degr. F	86	77	78	
V_{lc} (Condensate and silica gel)	ml or g	248.5	238.7	240.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	90.41	90.41	90.41	**90.41**
P_g (Static Pressure of Stack Gas)	In. H_2O	-0.36	-0.35	-0.35	**-0.35**
T_s (Temperature of Stack Gas)	Deg. F	287	285	285	**286**
√Δp (Sq. root of velocity head of gas)	√ In. H_2O	0.6984	0.6417	0.6288	**0.6563**
CO_2 (Carbon Dioxide)	%	11.18	10.74	10.64	**10.85**
O_2 (Oxygen)	%	11.82	11.96	11.95	**11.91**
N_2 (Nitrogen)	%	77.00	77.30	77.41	**77.24**
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	27.75	27.72	27.82	**27.77**
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	11.70	11.24	11.33	**11.42**
B_{ws} (Water Vapor in Gas, by Vol.)	%	29.65	28.84	28.95	**29.15**
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.26	30.20	30.18	**30.21**
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	26.63	26.68	26.65	**26.65**
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.43	23.43	23.43	**23.43**
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,293	3,019	2,958	**3,090**
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	297,740	272,960	267,450	**279,383**
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	115,880	107,720	105,500	**109,700**
NOx Results					
Concentration, Drift Corrected - dry	ppm_d	14.47	12.53	11.84	**12.95**
Emissions as NO_x	lb/hr	12.01	9.67	8.95	**10.21**

2.0 SUMMARY OF RESULTS

2.1 Particulate Results

Operating Conditions	Run 1	Run 2	Run 4	Average
Calciner Production Rate, Ton/hr	237	228	220	**228**
Opacity, %	1.7	1.8	2.0	**1.8**

Particulate Results	Run 1	Run 2	Run 4	Average
Front Half Particulate, gr/dscf	0.00223	0.00271	0.00186	**0.00227**
Front Half Particulate, lb/hr	2.67	3.06	2.18	**2.64**
Back Half Inorganic Particulate, gr/dscf	0.00388	0.00441	0.00258	**0.00363**
Back Half Inorganic Particulate, lb/hr	4.65	4.98	3.03	**4.22**
Back Half Organic Particulate, gr/dscf	0.00335	0.00167	0.000965	**0.00200**
Back Half Organic Particulate, lb/hr	4.02	1.88	1.13	**2.34**
Total Inorganic Particulate, gr/dscf	0.00612	0.00712	0.00444	**0.00589**
Total Inorganic Particulate, lb/hr	7.32	8.04	5.22	**6.86**

Parameters	Run 1	Run 2	Run 4	Average
Date (2010)	6/4	6/4	6/5	
Start Time	10:17	13:46	9:00	
Stop Time	11:45	15:07	10:24	
Stack Temp, °F	345	344	347	**345**
O_2, %	11.54	11.48	11.92	**11.65**
CO_2, %	12.54	12.64	12.21	**12.46**
Moisture, %	29.3	29.2	28.1	**28.9**
Velocity, ft/sec	55.6	52.4	54.6	**54.2**
Acfm	377,620	355,350	370,390	**367,790**
Scfm	197,390	185,850	190,610	**191,280**
Dscfm	139,680	131,610	137,100	**136,130**
Isokinetics, %	101.6	99.3	98.0	**99.6**

RESULTS

Table 2-2:
CA 1 & 2 Calciner Stack - Aldehydes and Ketones

Run No.		2	3	4	Average
Date (1996)		July 26	July 26	July 26	
Start Time (approx.)		14:01	16:21	18:27	
Stop Time (approx.)		15:42	18:08	20:08	
Process Conditions[1]					
	Feed Rate (tons/hr)	282	280	278	**280**
Gas Conditions					
T_s	Temperature (°F)	372	372	374	**373**
B_{wo}	Moisture (volume %)	24.59	25.42	25.74	**25.25**
O_2	Oxygen (dry volume %)	14.9	14.2	13.7	**14.3**
CO_2	Carbon dioxide (dry volume %)	7.0	7.1	7.7	**7.3**
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	392,900	400,100	410,300	**401,100**
Q_{std}	Standard conditions (dscfm)	149,000	150,100	153,000	**150,700**
Formaldehyde					
C	Concentration (lb/dscf)	3.50E-08	2.32E-08	1.46E-08	**2.43E-08**
C	Concentration (µg/dscm)	5.60E+02	3.72E+02	2.34E+02	**3.89E+02**
C	Concentration (ppmdv)	0.449	0.298	0.187	**0.311**
E	Emission rate (lb/hr)	0.313	0.209	0.134	**0.219**
E	Emission rate (lb/ton of trona)	0.0011	0.0007	0.0005	**0.0008**
Acetaldehyde					
C	Concentration (lb/dscf)	3.27E-08	2.50E-08	5.58E-08	**3.78E-08**
C	Concentration (µg/dscm)	5.24E+02	4.00E+02	8.94E+02	**6.06E+02**
C	Concentration (ppmdv)	0.286	0.218	0.488	**0.331**
E	Emission rate (lb/hr)	0.293	0.225	0.512	**0.343**
E	Emission rate (lb/ton of trona)	0.0010	0.0008	0.0018	**0.0012**
Propionaldehyde					
C	Concentration (lb/dscf)	1.26E-08	9.20E-09	1.59E-08	**1.25E-08**
C	Concentration (µg/dscm)	2.01E+02	1.47E+02	2.54E+02	**2.01E+02**
C	Concentration (ppmdv)	0.083	0.061	0.105	**0.083**
E	Emission rate (lb/hr)	0.112	0.083	0.146	**0.114**
E	Emission rate (lb/ton of trona)	0.0004	0.0003	0.0005	**0.0004**
Acrolein[2]					
C	Concentration (lb/dscf)	8.46E-08	6.95E-08	6.81E-08	**7.41E-08**
C	Concentration (µg/dscm)	1.35E+03	1.11E+03	1.09E+03	**1.19E+03**
C	Concentration (ppmdv)	0.581	0.478	0.468	**0.509**
E	Emission rate (lb/hr)	0.756	0.626	0.625	**0.669**
E	Emission rate (lb/ton of trona)	0.0027	0.0022	0.0022	**0.0024**
Acetone[2]					
C	Concentration (lb/dscf)	3.97E-08	3.43E-08	3.37E-08	**3.59E-08**
C	Concentration (µg/dscm)	6.35E+02	5.50E+02	5.39E+02	**5.75E+02**
C	Concentration (ppmdv)	0.263	0.228	0.223	**0.238**
E	Emission rate (lb/hr)	0.354	0.309	0.309	**0.324**
E	Emission rate (lb/ton of trona)	0.0013	0.0011	0.0011	**0.0012**
2-Butanone					
C	Concentration (lb/dscf)	2.38E-08	1.66E-08	1.85E-08	**1.96E-08**
C	Concentration (µg/dscm)	3.81E+02	2.67E+02	2.96E+02	**3.14E+02**
C	Concentration (ppmdv)	0.127	0.089	0.099	**0.105**
E	Emission rate (lb/hr)	0.213	0.150	0.169	**0.177**
E	Emission rate (lb/ton of trona)	0.0008	0.0005	0.0006	**0.0006**

[1] Process conditions provided by Solvay Minerals, Inc.
[2] Acetone and acrolein peaks unresolved. See comments in project overview.

Optimal AIR TESTING SERVICES, INC

2.0 SUMMARY OF RESULTS

Table 2 CA - 1 & 2 Hydrogen Fluoride Test Parameters and Results, Solvay, April 19, 2013

	Start Date/Time	4/19/13 10:44	4/19/13 12:25	4/19/13 14:08	
	Stop Time	12:11	13:58	15:30	
Coal Consumption	**Units**	**Run 1**	**Run 2**	**Run 3**	-
AQD #17 "A" Calciner	TPH	5.6	5.6	5.6	
AQD #17 "B" Calciner	TPH	5.6	5.6	5.6	
Combined Coal Consumption	TPH	11.2	11.2	11.2	
Test Parameters	**Units**	**Run 1**	**Run 2**	**Run 3**	**Avg.**
P_{bar} (Barometric Pressure, absolute)	In. Hg	23.70	23.70	23.70	
Y (Dry Gas Meter Calibration Factor)	unitless	0.992	0.992	0.992	
C_p (Pitot tube Coefficient)	unitless	0.84	0.84	0.84	
D_n (Diameter of Nozzle)	Inches	0.304	0.304	0.304	
θ (Total Sampling Time of Test)	Minutes	80	80	80	
ΔH (Orifice Pressure Drop)	In. H2O	1.87	1.94	2.04	
V_m (Dry Gas Sampled - as measured)	ft^3 (dry)	61.435	63.796	66.612	
T_m (Gas Meter Temperature, avg.)	Degr. F	83	87	87	
V_{lc} (Condensate and silica gel)	ml or g	306.5	316.6	330.8	
Location/Process Parameters					
A_s (Cross-sectional Area of Stack)	ft^2	113.1	113.1	113.1	113.1
P_g (Static Pressure of Stack Gas)	In. H2O	-0.60	-0.61	-0.60	-0.60
T_s (Temperature of Stack Gas)	Deg. F	401	400	402	401
√Δp (Sq. root of velocity head of gas)	√ In. H2O	0.6902	0.6829	0.6940	0.6890
CO_2 (Carbon Dioxide)	%	9.4	9.4	9.0	9.3
O_2 (Oxygen)	%	13.0	13.4	13.4	13.3
Calculations					
V_{mstd} (Gas Sampled, standard (std) cond.)	ft^3	47.17	48.68	50.78	48.88
V_{wstd} (Water Vapor in Gas Sampled, std)	ft^3	14.45	14.93	15.60	14.99
B_{ws} (Water Vapor in Gas, by Vol.)	%	23.45	23.47	23.50	23.47
M_d (Molecular Weight of Dry Stack Gas)	lb/lb-mole	30.02	30.04	29.98	30.01
M_s (Molecular Weight of Wet Stack Gas)	lb/lb-mole	27.20	27.21	27.16	27.19
P_s (Pressure of Stack Gas, Absolute)	In. Hg	23.66	23.66	23.66	23.66
Iso (Percent of Isokinetic Sampling)	%	91.7	95.6	98.2	95.2
Flow Results					
V_s (Average Stack Gas Velocity)	ft/m (fpm)	3,440	3,400	3,464	3,435
Q_a (Actual Volumetric Flow Rate)	ft^3/m (cfm)	389,040	384,540	391,750	388,443
Q_{std} (Dry Volumetric Flow Rate, std.)	ft^3/m (dscfm)	144,340	142,850	145,040	144,077
HF Results		-	-	-	
Mass of HF Collected	mg/sample	<0.123	<0.126	<0.128	
HF Concentrations in gas - std.	$mg/m^3{}_{gas}$	<0.092	<0.094	<0.096	
HF Concentrations in gas - std.	gr/dscf	<0.00004	<0.00004	<0.00004	
HF Concentrations in gas	ppm	<0.111	<0.113	<0.115	<0.113
HF Emission Rate (Coal Fd = 9780)	lb/mmBtu	<1.5E-04	<1.6E-04	<1.5E-04	<1.5E-04
HF Emission Rate	lb/hr	<0.050	<0.049	<0.048	<0.049
HF Emission Rate	lb/ton of coal	<0.0044	<0.0044	<0.0043	<0.0044