MEMORANDUM

Shaw Environmental and Infrastructure, Inc.
Contract No. EP-C-08-034

In reply refer to: 11-LH-22

To: Cindy Paul
Dennis Miller

From: Lisa Hudson

Lab: GC

Thru: Sujith Kumar
John Cox

Date: 5/4/11

Technical Directive: 7OA724SF
Task No.: 23993

Originator: Rick Wilkin
Copies: Rick Wilkin
Steve Vandegrift
Lisa Hudson
John Cox

Project/Sample Site: Pavillion Groundwater
Date Collected: 4/14-21/11
Date Received: 4/21-22/11
Date Analyzed: 4/28/11
No. Samples Analyzed: 18

Shaw Sample Set No.: 6030, 6032
Sample Matrix: Water
Analysis Type: Dissolved Gas
Sample Preparation: Not applicable

Method(s) Used : RSKSOP-194 rev4 Gas Analysis by Micro Gas Chromatograph
RSKSOP-175 rev5 Sample Preparation and Calculations for Dissolved Gas Analysis in Water Samples Using a GC Headspace Equilibration Technique

Comments: All QC results met criteria established in RSKSOP-194, and RSKSOP-175.

	A	B	C	D	E	F	G	H	I	J	K
1										Method	HLC
2	Gas	CAS #	mol. wt.	A	B	C	D	T, °C	Quant limit (ppm) *	Det. Limit (ppm) *	atm mol fraction
3	Methane	74-82-8	16	-365.183	18106.7	49.7554	-0.00028503	25	10.0	1.47	39,769
4	Ethane	74-84-0	30	-533.392	26565.0	74.6240	-0.00457313	25	10.0	2.65	29,771
5	Propane	74-98-6	44	-628.866	31638.4	88.0808	0.00000000	25	10.0	2.05	36,809
6	n-Butane	106-97-8	58	-639.209	32785.7	89.1483	0.00000000	25	10.0	1.99	45,275
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12			ppm	ppm (syr dil corr)		ppm	ppm (syr dil corr)		ppm	ppm (syr dil corr)	
13	Sample	sample ID	Methane	Methane	PPG	Ethane	Ethane	PPG	Propane	Propane	PPG
14	PGDW20-0411	s	743.363	1003.540	1.434E-03	214.299	289.304	4.133E-04	0.000	0.000	0.00E+00
15	PGDW26-0411	s	135.979	178.873	2.835E-04	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
16	PGDW30-0411	s	3408.141	4562.511	6.735E-03	196.865	263.546	3.890E-04	0.000	0.000	0.00E+00
17	PGDW32-0411	s	439.765	639.288	7.045E-04	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
18	PGDW32d-0411	s	350.397	486.663	6.257E-04	193.318	268.497	3.452E-04	0.000	0.000	0.00E+00
19	EPAMW02-0411	s	103510.000	140441.966	1.968E-01	6917.143	9385.153	1.315E-02	4420.031	5997.080	8.40E-03
20	EPAMW02d-0411	s	119680.000	160216.774	2.365E-01	8138.600	10895.223	1.608E-02	5216.504	6983.384	1.03E-02
21	Trip Blank	s	2279.967	3226.733	3.885E-03	318.512	450.776	5.428E-04	0.000	0.000	0.00E+00
22	PGDW05-0411	s	545.464	766.964	9.444E-04	196.754	276.651	3.406E-04	0.000	0.000	0.00E+00
23	PGDW45-0411	s	143.545	202.487	2.466E-04	190.818	269.171	3.278E-04	0.000	0.000	0.00E+00
24	EPAMW01-0411	s	97527.000	131824.773	1.874E-01	7914.865	10698.323	1.521E-02	2427.461	3281.138	4.67E-03
25	PGDW41-0411	s	2298.228	3216.270	4.026E-03	417.370	584.091	7.311E-04	0.000	0.000	0.00E+00
26	Blank	s	266.337	371.583	4.702E-04	198.069	276.339	3.497E-04	0.000	0.000	0.00E+00
27	PGDW14-0411	s	135.191	189.194	2.368E-04	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
28	PGDW49-0411	s	150.034	213.777	2.516E-04	190.884	271.982	3.201E-04	0.000	0.000	0.00E+00
29	PGDW49-0411	s	155.706	221.859	2.611E-04	191.006	272.155	3.203E-04	0.000	0.000	0.00E+00
30	PGDW23-0411	s	1039.087	1441.050	1.863E-03	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
31	PGDW-44-0411	s	136.927	189.073	2.482E-04	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
32	Field Blank	s	0.000	0.000	0.000E+00	0.000	0.000	0.000E+00	0.000	0.000	0.00E+00
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10									headspace	
11							headspace	instrument	dilution	
12	ppm	ppm (syr dil corr)			sample		gas volume	injection	injection	
13	n-Butane	n-Butane	PPG	T C	pressure, psi	Bottle vol, mL	mL	volume mL	volume mL	
14	4.499	6.074	8.68E-06	24.0	6.3	60.0	6.0	3.0	3.0	
15	0.000	0.000	0.00E+00	24.0	8.6	60.0	6.0	3.0	3.0	
16	6.908	9.247	1.37E-05	24.0	7.0	60.0	6.0	3.0	3.0	
17	0.000	0.000	0.00E+00	24.0	1.5	60.0	6.0	3.0	3.0	
18	5.403	7.504	9.65E-06	24.0	4.2	60.0	6.0	3.0	3.0	
19	429.240	582.391	8.16E-04	24.0	5.9	60.0	6.0	3.0	3.0	
20	532.558	712.940	1.05E-03	24.0	7.0	60.0	6.0	3.0	3.0	
21	8.558	12.112	1.46E-05	24.0	3.0	60.0	6.0	3.0	3.0	
22	2.219	3.120	3.84E-06	24.0	3.4	60.0	6.0	3.0	3.0	
23	0.000	0.000	0.00E+00	24.0	3.2	60.0	6.0	3.0	3.0	
24	265.593	358.995	5.10E-04	24.0	6.2	60.0	6.0	3.0	3.0	
25	4.637	6.489	8.12E-06	24.0	3.7	60.0	6.0	3.0	3.0	
26	0.000	0.000	0.00E+00	24.0	3.9	60.0	6.0	3.0	3.0	
27	0.000	0.000	0.00E+00	24.0	3.7	60.0	6.0	3.0	3.0	
28	0.000	0.000	0.00E+00	24.0	2.6	60.0	6.0	3.0	3.0	
29	0.000	0.000	0.00E+00	24.0	2.6	60.0	6.0	3.0	3.0	
30	0.000	0.000	0.00E+00	24.0	4.3	60.0	6.0	3.0	3.0	
31	0.000	0.000	0.00E+00	24.0	4.6	60.0	6.0	3.0	3.0	
32	0.000	0.000	0.00E+00	24.0	1.0	60.0	6.0	3.0	3.0	
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EPAPAV0128838

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1												
2		Shaw Environmental and Infrastructure, Inc.										
3		Analytical Service Results Report										
4												
5												
6		Laboratory:	GC		Report Date:	5/4/11						
7												
8		Technical Directive:	7OA724SF									
9												
10		Analyst:	Lisa Hudson		Analytes				Methane			Ethane
11					CAS #				74-82-8			74-84-0
12		Method:	RSKSOP-175, RSKSOP-194		Unit				ppm, v/v in gas			ppm, v/v in gas
13		Lab Sample ID	Date Collected	Date Analyzed	Field Sample ID	SyrDilCorr	MDL	QL	Data	MDL *	QL *	Data
14		6030-1	4/18/2011	4/28/2011	PGDW20-0411	1.350	1.98	13.50	1,000	3.58	13.5	289
15		6030-2	4/18/2011	4/28/2011	PGDW26-0411	1.315	1.93	13.15	179	3.49	13.2	ND
16		6030-3	4/18/2011	4/28/2011	PGDW30-0411	1.339	1.97	13.39	4,560	3.55	13.4	264
17		6030-4	4/18/2011	4/28/2011	PGDW32-0411	1.454	2.14	14.54	639	3.85	14.5	ND
18		6030-5	4/18/2011	4/28/2011	PGDW32d-0411	1.389	2.04	13.89	487	3.68	13.9	268
19		6030-6	4/19/2011	4/28/2011	EPAMW02-0411	1.357	1.99	13.57	140,000	3.60	13.6	9,390
20		6030-7	4/19/2011	4/28/2011	EPAMW02d-0411	1.339	1.97	13.39	160,000	3.55	13.4	10,900
21		6030-9	4/14/2011	4/28/2011	Trip Blank	1.415	2.08	14.15	3,230	3.75	14.2	451
22		6030-11	4/19/2011	4/28/2011	PGDW05-0411	1.406	2.07	14.06	767	3.73	14.1	277
23		6030-12	4/19/2011	4/28/2011	PGDW45-0411	1.411	2.07	14.11	202	3.74	14.1	269
24		6030-13	4/20/2011	4/28/2011	EPAMW01-0411	1.352	1.99	13.52	132,000	3.58	13.5	10,700
25		6030-14	4/20/2011	4/28/2011	PGDW41-0411	1.399	2.06	13.99	3,220	3.71	14.0	584
26		6030-15	4/18/2011	4/28/2011	Blank	1.395	2.05	13.95	372	3.70	14.0	276
27		6032-1	4/20/2011	4/28/2011	PGDW14-0411	1.399	2.06	13.99	189	3.71	14.0	ND
28		6032-2	4/20/2011	4/28/2011	PGDW49-0411	1.425	2.09	14.25	214	3.78	14.2	272
29		6032-2 Lab Dup	4/20/2011	4/28/2011	PGDW49-0411	1.425	2.09	14.25	222	3.78	14.2	272
30		6032-3	4/21/2011	4/28/2011	PGDW23-0411	1.387	2.04	13.87	1,440	3.68	13.9	ND
31		6032-4	4/21/2011	4/28/2011	PGDW-44-0411	1.381	2.03	13.81	189	3.66	13.8	ND
32		6032-5	4/21/2011	4/28/2011	Field Blank	1.468	2.16	14.68	ND	3.89	14.7	ND
33												
34		1. If the parameter was detected above the quantitation limit (QL), the numeric result is reported; BQL denotes that the parameter was not detected at or above the										
35		quantitation limit; BQL ( ) denotes that the parameter was detected above the method detection limit (MDL) but below QL and the estimated numeric result is reported in										
36		parenthesis; ND denotes that the parameter was not detected at all. All the results are corrected with dilution factors (DF), if applicable.										
37		2. "-" denotes that the information is not available or the analyte is not analyzed.										
38		3. When there is pressure in the sample, the values of the QL and MDL for the dissolved gas concentration (mg/L) change.										
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10			**Propane**			**n-Butane**	
11			**74-98-6**			**106-97-8**	
12			**ppm, v/v in gas**			**ppm, v/v in gas**	
13	**MDL ***	**QL ***	**Data**	**MDL ***	**QL ***	**Data**	
14	2.768	13.5	ND	2.69	13.5	BQL(6.07)	
15	2.697	13.2	ND	2.62	13.2	ND	
16	2.744	13.4	ND	2.66	13.4	BQL(9.25)	
17	2.980	14.5	ND	2.89	14.5	ND	
18	2.847	13.9	ND	2.76	13.9	BQL(7.50)	
19	2.781	13.6	6,000	2.70	13.6	582	
20	2.744	13.4	6,980	2.66	13.4	713	
21	2.901	14.2	ND	2.82	14.2	BQL(12.1)	
22	2.882	14.1	ND	2.80	14.1	BQL(3.12)	
23	2.892	14.1	ND	2.81	14.1	ND	
24	2.771	13.5	3,280	2.69	13.5	359	
25	2.869	14.0	ND	2.78	14.0	BQL(6.49)	
26	2.860	14.0	ND	2.78	14.0	ND	
27	2.869	14.0	ND	2.78	14.0	ND	
28	2.921	14.2	ND	2.84	14.2	ND	
29	2.921	14.2	ND	2.84	14.2	ND	
30	2.843	13.9	ND	2.76	13.9	ND	
31	2.831	13.8	ND	2.75	13.8	ND	
32	3.010	14.7	ND	2.92	14.7	ND	
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	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM
1																		
2	**Shaw Environmental and Infrastructure, Inc.**																	
3	**Analytical Service Results Report**																	
4																		
5			**Report Date:**	**5/4/11**														
6	**Laboratory:**	**GC**																
7																		
8	**Technical Directive:**	**7OA724SF**																
9																		
10	**Analyst:**	**Lisa Hudson**		**Analytes**					**Methane**			**Ethane**			**Propane**			**n-Butane**
11				**CAS #**					**74-82-8**			**74-84-0**			**74-98-6**			**106-97-8**
12	**Method:**	**RSKSOP-175, RSKSOP-194**		**Unit**					**µg/L, in water**			**µg/L, in water**			**µg/L, in water**			**µg/L, in water**
13	**Lab Sample ID**	**Date Collected**	**Date Analyzed**	**Field Sample ID**	**SyrDilCorr**	**p_{hs} (atm)**	**MDL ***	**QL ***	**Data**	**MDL ***	**QL ***	**Data**	**MDL ***	**QL ***	**Data**	**MDL ***	**QL ***	**Data**
14	6030-1	4/18/11	4/28/11	PGDW20-0411	1.350	1.43	0.366	2.48	137	1.34	5.05	80.2	1.431	6.99	ND	1.76	8.8	BQL(2.93)
15	6030-2	4/18/11	4/28/11	PGDW26-0411	1.315	1.59	0.385	2.62	27.1	1.41	5.33	ND	1.513	7.38	ND	1.84	9.3	ND
16	6030-3	4/18/11	4/28/11	PGDW30-0411	1.339	1.48	0.372	2.53	644	1.37	5.14	75.5	1.459	7.11	ND	1.78	8.9	BQL(4.61)
17	6030-4	4/18/11	4/28/11	PGDW32-0411	1.454	1.10	0.327	2.22	67.4	1.20	4.52	ND	1.284	6.27	ND	1.57	7.9	ND
18	6030-5	4/18/11	4/28/11	PGDW32d-0411	1.389	1.29	0.349	2.38	59.8	1.28	4.82	67.0	1.367	6.67	ND	1.67	8.4	BQL(3.26)
19	6030-6	4/19/11	4/28/11	EPAMW02-0411	1.357	1.40	0.362	2.47	18,820	1.33	5.01	2,550	1.425	6.93	2,260	1.74	8.7	276
20	6030-7	4/19/11	4/28/11	EPAMW02d-0411	1.339	1.48	0.372	2.53	22,620	1.37	5.14	3,120	1.459	7.11	2,770	1.78	8.9	356
21	6030-9	4/14/11	4/28/11	Trip Blank	1.415	1.20	0.340	2.31	372	1.24	4.68	105	1.329	6.48	ND	1.63	8.2	BQL(4.93)
22	6030-11	4/19/11	4/28/11	PGDW05-0411	1.406	1.23	0.342	2.33	90.3	1.25	4.72	66.1	1.341	6.54	ND	1.63	8.2	<MDL
23	6030-12	4/19/11	4/28/11	PGDW45-0411	1.411	1.22	0.341	2.31	23.6	1.25	4.70	63.6	1.336	6.52	ND	1.64	8.2	ND
24	6030-13	4/20/11	4/28/11	EPAMW01-0411	1.352	1.42	0.365	2.49	17,930	1.34	5.04	2,950	1.433	6.99	1,250	1.74	8.8	172
25	6030-14	4/20/11	4/28/11	PGDW41-0411	1.399	1.25	0.344	2.35	385	1.26	4.76	142	1.350	6.59	ND	1.65	8.3	BQL(2.74)
26	6030-15	4/18/11	4/28/11	Blank	1.395	1.27	0.346	2.36	45.0	1.27	4.79	67.9	1.357	6.63	ND	1.66	8.3	ND
27	6032-1	4/20/11	4/28/11	PGDW14-0411	1.399	1.25	0.344	2.35	22.6	1.26	4.76	ND	1.350	6.59	ND	1.65	8.3	ND
28	6032-2	4/20/11	4/28/11	PGDW49-0411	1.425	1.18	0.336	2.28	24.1	1.23	4.63	62.1	1.317	6.43	ND	1.61	8.1	ND
29	6032-2 Lab Dup	4/20/11	4/28/11	PGDW49-0411	1.425	1.18	0.336	2.28	25.0 (RPD=3.67)	1.23	4.63	62.2 (RPD=0.161)	1.317	6.43	ND (RPD=NA)	1.61	8.1	ND (RPD=NA)
30	6032-3	4/21/11	4/28/11	PGDW23-0411	1.387	1.29	0.349	2.37	178	1.28	4.83	ND	1.370	6.68	ND	1.68	8.4	ND
31	6032-4	4/21/11	4/28/11	PGDW-44-0411	1.381	1.31	0.352	2.39	23.7	1.29	4.86	ND	1.379	6.72	ND	1.68	8.5	ND
32	6032-5	4/21/11	4/28/11	Field Blank	1.468	1.07	0.323	2.20	ND	1.18	4.46	ND	1.268	6.20	ND	1.54	7.8	ND
33																		
34	1. If the parameter was detected above the quantitation limit (QL), the numeric result is reported; BQL denotes that the parameter was not detected at or above the quantitation limit; BQL ( )																	
35	denotes that the parameter was detected above the method detection limit (MDL) but below QL and the estimated numeric result is reported in parenthesis; ND denotes that the parameter was not																	
36	detected at all. All the results are corrected with dilution factors (DF), if applicable.																	
37	2. "-" denotes that the information is not available or the analyte is not analyzed.																	
38	3. "*" denotes that the MDL and QL values presented here are for the cases where no pressure is found in the sample and where no dilution of the sample is made.																	
39	4. When there is pressure in the sample and when the sample is diluted, the values of the QL and MDL for the dissolved gas concentration (mg/L) change. When expressed as gas concentation																	
40	(ppm), dilution of the sample but not sample pressure changes the QL and MDL.																	
41	5. SyrDilCorr is the correction to the measured concentration that is applied when a dilution is done. SyrDilCorr = (1 + (Vdil * p1atm/(Vhs *(1 atm + p_{gauge} / 14.7psi/atm))))																	

	A	B	C	D	E	F	G	H	I	J	K
1	**Shaw Environmental and Infrastructure, Inc.**										
2	**Analytical Service Results Report**										
3											
4	**Laboratory:**	**GC**	**Report Date:**	**5/4/11**							
5											
6	**Technical Directive:**	**7OA724SF**									
7											
8	**Analyst:**	**Lisa Hudson**		**Lab Sample ID**			6030-1	6030-2	6030-3	6030-4	6030-5
9				**Date Collected**			4/18/2011	4/18/2011	4/18/2011	4/18/2011	4/18/2011
10				**Temperature ^{0}C**			24.0	24.0	24.0	24.0	24.0
11				**Pressure, psi**			6.3	8.6	7.0	1.5	4.2
12				**Date Analyzed**			4/28/2011	4/28/2011	4/28/2011	4/28/2011	4/28/2011
13				**Sample Name**			PGDW20-0411	PGDW26-0411	PGDW30-0411	PGDW32-0411	PGDW32d-0411
14	**Analytes**		**CAS #**	**Unit**	**MDL**	**QL**	**Data**	**Data**	**Data**	**Data**	**Data**
15	Methane		74-82-8	ppm	1.47	10.0	743	136	3410	440	350
16	Ethane		74-84-0	ppm	2.65	10.0	214	ND	197	ND	193
17	Propane		74-98-6	ppm	2.05	10.0	ND	ND	ND	ND	ND
18	i-Butane		7553-56-2	ppm	10.0*	10.0*	ND	ND	ND	ND	ND
19	n-Butane		106-97-8	ppm	1.99	10.0	BQL (4.50)	ND	BQL (6.91)	ND	BQL (5.40)
20	dilution factor		-	-	-	-	1	1	1	1	1
21											
22	**Comments:**										
23	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported represent those completed on January 13, 2011. *Estimated value.										
24	1. If the parameter was detected above the quantitation limit (**QL**), the numeric result is reported; **BQL** denotes that the parameter was not detected at or above the quantitation limit; **BQL ( )** denotes that the parameter was detected above the										
25	method detection limit (**MDL**) but below **QL** and the estimated numeric result is reported in parenthesis; **ND** denotes that the										
26	parameter was not detected at all. All the results are corrected with dilution factors (**DF**), if applicable.										
27	2. " **-**" denotes that the information is not available or the analyte is not analyzed.										

	A	B	C	D	E	F	L	M	N	O	P
1	**Shaw Environmental and Infrastructure, Inc.**										
2	**Analytical Service Results Report**										
3											
4	**Laboratory:**	**GC**	**Report Date:**	**5/4/11**							
5											
6	**Technical Directive:**	**7OA724SF**									
7											
8	**Analyst:**	**Lisa Hudson**		**Lab Sample ID**			6030-6	6030-7	6030-9	6030-11	6030-12
9				**Date Collected**			4/19/2011	4/19/2011	4/14/2011	4/19/2011	4/19/2011
10				**Temperature ^{0}C**			24.0	24.0	24.0	24.0	24.0
11				**Pressure, psi**			5.9	7.0	3.0	3.4	3.2
12				**Date Analyzed**			4/28/2011	4/28/2011	4/28/2011	4/28/2011	4/28/2011
13				**Sample Name**			EPAMW02-0411	EPAMW02d-0411	Trip Blank	PGDW05-0411	PGDW45-0411
14	**Analytes**		**CAS #**	**Unit**	**MDL**	**QL**	**Data**	**Data**	**Data**	**Data**	**Data**
15	Methane		74-82-8	ppm	1.47	10.0	104000	120000	2280	545	144
16	Ethane		74-84-0	ppm	2.65	10.0	6920	8140	319	197	191
17	Propane		74-98-6	ppm	2.05	10.0	4420	5220	ND	ND	ND
18	i-Butane		7553-56-2	ppm	10.0*	10.0*	545	716	10.5	ND	ND
19	n-Butane		106-97-8	ppm	1.99	10.0	429	533	BQL (8.56)	BQL (2.22)	ND
20	dilution factor		-	-	-	-	1	1	1	1	1
21											
22	**Comments:**										
23	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported represent those completed on January 13, 2011. *Estimated value.										
24	1. If the parameter was detected above the quantitation limit (**QL**), the numeric result is reported; **BQL** denotes that the parameter was not detected at or above the quantitation limit; **BQL ( )** denotes that the parameter was detected above the										
25	method detection limit (**MDL**) but below **QL** and the estimated numeric result is reported in parenthesis; **ND** denotes that the										
26	parameter was not detected at all. All the results are corrected with dilution factors (**DF**), if applicable.										
27	2. " **-**" denotes that the information is not available or the analyte is not analyzed.										

	A	B	C	D	E	F	Q	R	S	T	U
1	**Shaw Environmental and Infrastructure, Inc.**										
2	**Analytical Service Results Report**										
3											
4	**Laboratory:**	**GC**	**Report Date:**	**5/4/11**							
5											
6	**Technical Directive:**	**7OA724SF**									
7											
8	**Analyst:**	**Lisa Hudson**		**Lab Sample ID**			6030-13	6030-14	6030-15	6032-1	6032-2
9				**Date Collected**			4/20/2011	4/20/2011	4/18/2011	4/20/2011	4/20/2011
10				**Temperature ^{0}C**			24.0	24.0	24.0	24.0	24.0
11				**Pressure, psi**			6.2	3.7	3.9	3.7	2.6
12				**Date Analyzed**			4/28/2011	4/28/2011	4/28/2011	4/28/2011	4/28/2011
13				**Sample Name**			EPAMW01-0411	PGDW41-0411	Blank	PGDW14-0411	PGDW49-0411
14	**Analytes**		**CAS #**	**Unit**	**MDL**	**QL**	**Data**	**Data**	**Data**	**Data**	**Data**
15	Methane		74-82-8	ppm	1.47	10.0	97500	2300	266	135	150
16	Ethane		74-84-0	ppm	2.65	10.0	7910	417	198	ND	191
17	Propane		74-98-6	ppm	2.05	10.0	2430	ND	ND	ND	ND
18	i-Butane		7553-56-2	ppm	10.0*	10.0*	210	ND	ND	ND	ND
19	n-Butane		106-97-8	ppm	1.99	10.0	266	BQL (4.64)	ND	ND	ND
20	dilution factor		-	-	-	-	1	1	1	1	1
21											
22	**Comments:**										
23	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported represent those completed on January 13, 2011. *Estimated value.										
24	1. If the parameter was detected above the quantitation limit (**QL**), the numeric result is reported; **BQL** denotes that the parameter was not detected at or above the quantitation limit; **BQL ( )** denotes that the parameter was detected above the										
25	method detection limit (**MDL**) but below **QL** and the estimated numeric result is reported in parenthesis; **ND** denotes that the										
26	parameter was not detected at all. All the results are corrected with dilution factors (**DF**), if applicable.										
27	2. " -" denotes that the information is not available or the analyte is not analyzed.										

	A	B	C	D	E	F	V	W	X	Y
1	**Shaw Environmental and Infrastructure, Inc.**									
2	**Analytical Service Results Report**									
3										
4	**Laboratory:**	**GC**	**Report Date:**	**5/4/11**						
5										
6	**Technical Directive:**	**7OA724SF**								
7										
8	**Analyst:**	**Lisa Hudson**		**Lab Sample ID**			6032-2 Lab Dup	6032-3	6032-4	6032-5
9				**Date Collected**			4/20/2011	4/21/2011	4/21/2011	4/21/2011
10				**Temperature ^{0}C**			24.0	24.0	24.0	24.0
11				**Pressure, psi**			2.6	4.3	4.6	1.0
12				**Date Analyzed**			4/28/2011	4/28/2011	4/28/2011	4/28/2011
13				**Sample Name**			PGDW49-0411	PGDW23-0411	PGDW-44-0411	Field Blank
14	**Analytes**		**CAS #**	**Unit**	**MDL**	**QL**	**Data**	**Data**	**Data**	**Data**
15	Methane		74-82-8	ppm	1.47	10.0	156 (RPD=3.92)	1040	137	ND
16	Ethane		74-84-0	ppm	2.65	10.0	191 (RPD=0)	ND	ND	ND
17	Propane		74-98-6	ppm	2.05	10.0	ND (RPD=NA)	ND	ND	ND
18	i-Butane		7553-56-2	ppm	10.0*	10.0*	ND (RPD=NA)	ND	ND	ND
19	n-Butane		106-97-8	ppm	1.99	10.0	ND (RPD=NA)	ND	ND	ND
20	dilution factor		-	-	-	-	1	1	1	1
21										
22	**Comments:**									
23	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported represent those completed on January 13, 2011. *Estimated value.									
24	1. If the parameter was detected above the quantitation limit (**QL**), the numeric result is reported; **BQL** denotes that the parameter was not detected at or above the quantitation limit; **BQL ( )** denotes that the parameter was detected above the									
25	method detection limit (**MDL**) but below **QL** and the estimated numeric result is reported in parenthesis; **ND** denotes that the									
26	parameter was not detected at all. All the results are corrected with dilution factors (**DF**), if applicable.									
27	2. " **-**" denotes that the information is not available or the analyte is not analyzed.									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**Shaw Environmental and Infrastructure, Inc.**													
2	**Analytical Service Results Report**													
3														
4	**Laboratory:**	**GC**		**Report Date:**	**5/4/11**									
5														
6	**Technical Directive:**	**7OA724SF**												
7														
8	**Analyst:**	**Lisa Hudson**		**QC Sample ID**		Argon Blank			Water Blank			Refinery Gas #2		
9				**Additional ID**		GB			MB			CCC		
10				**Date Prepared**		4/28/11			4/28/11			7/8/10		
11				**Date Analyzed**		4/28/11			4/28/11			4/28/11		
12	**Analytes**		**Unit**	**MDL**	**QL**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**
13	**Names**	**CAS #**												
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	ND	-	-	47200	50080	94.2
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	ND	-	-	38600	40120	96.2
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	ND	-	-	60700	60150	101
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	ND	-	-	48200	50180	96.1
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	ND	-	-	40300	40220	100
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	**Comments:**													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	**Notes:**													
25	1. **MB** - Method Blank. GB - Gas Blanks. **CCC** - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. **LCS** - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. **MS** - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. **SS** - Samples obtained from a second source. **DUP** - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. **% REC** - Percent Recovery. Calculated as the percentage of the results to													
	the true values. It equals to % accuracy for CCC.													
	2. **" -"** denotes that the information is not available or the analyte is not analyzed.													

	A	B	C	D	E	O	P	Q	R	S	T	U	V	W
1	**Shaw Environmental and Infrastructure, Inc.**													
2	**Analytical Service Results Report**													
3														
4	**Laboratory:**	**GC**		**Report Date:**	**5/4/11**									
5														
6	**Technical Directive:**	**7OA724SF**												
7														
8	**Analyst:**	**Lisa Hudson**		**QC Sample ID**		Refinery Gas #2			Argon Blank			Refinery Gas #2		
9				**Additional ID**		SS			GB			CCC		
10				**Date Prepared**		5/13/10			4/28/11			7/8/10		
11				**Date Analyzed**		4/28/11			4/28/11			4/28/11		
12	**Analytes**		**Unit**	**MDL**	**QL**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**
13	**Names**	**CAS #**												
14	Methane	74-82-8	ppm	1.47	10.0	47900	50080	95.6	ND	-	-	48500	50080	96.8
15	Ethane	74-84-0	ppm	2.65	10.0	39200	40120	97.7	ND	-	-	38500	40120	96.0
16	Propane	74-98-6	ppm	2.05	10.0	59800	60150	99.4	ND	-	-	62100	60150	103
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	47300	50180	94.3	ND	-	-	50400	50180	100
18	n-Butane	106-97-8	ppm	1.99	10.0	39500	40220	98.2	ND	-	-	41800	40220	104
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-
20														
21	**Comments:**													
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported													
23	represent those completed on January 13, 2011. *Estimated values.													
24	**Notes:**													
25	1. **MB** - Method Blank. GB - Gas Blanks. **CCC** - Continuing Calibration Check. A calibration standard													
26	analyzed within the batch of samples. **LCS** - Laboratory Control Spike. A laboratory blank spiked with													
27	analytes at known concentrations. **MS** - Matrix Spike. A field sample spiked with known concentrations of													
28	analytes. The field sample id is identified. **SS** - Samples obtained from a second source. **DUP** - Field													
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported													
30	in the sample result section. **% REC** - Percent Recovery. Calculated as the percentage of the results to													
	the true values. It equals to % accuracy for CCC.													
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	A	B	C	D	E	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
1	**Shaw Environmental and Infrastructure, Inc.**																
2	**Analytical Service Results Report**																
3																	
4	**Laboratory:**	**GC**		**Report Date:**	**5/4/11**												
5																	
6	**Technical Directive:**	**7OA724SF**															
7																	
8	**Analyst:**	**Lisa Hudson**		**QC Sample ID**		Argon Blank			Refinery Gas #2			502000 ppm			Argon Blank		
9				**Additional ID**		GB			CCC			CCC			GB		
10				**Date Prepared**		4/28/11			7/8/10			3/1/10			4/28/11		
11				**Date Analyzed**		4/28/11			4/28/11			4/28/11			4/28/11		
12	**Analytes**		**Unit**	**MDL**	**QL**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**	**Data**	**True Values**	**% Rec.**
13	**Names**	**CAS #**															
14	Methane	74-82-8	ppm	1.47	10.0	ND	-	-	48500	50080	96.8	-	-	-	ND	-	-
15	Ethane	74-84-0	ppm	2.65	10.0	ND	-	-	39500	40120	98.5	457000	502000	91.0	ND	-	-
16	Propane	74-98-6	ppm	2.05	10.0	ND	-	-	56800	60150	94.4	-	-	-	ND	-	-
17	i-Butane	7553-56-2	ppm	10.0*	10.0*	ND	-	-	44500	50180	88.7	-	-	-	ND	-	-
18	n-Butane	106-97-8	ppm	1.99	10.0	ND	-	-	36700	40220	91.2	-	-	-	ND	-	-
19	dilution factor	-	-	-	-	-	1	-	-	1	-	-	1	-	-	1	-
20																	
21	**Comments:**																
22	The data quality objectives (DQO) of RSKSOP-194 have been met. The MDL's and QL's reported																
23	represent those completed on January 13, 2011. *Estimated values.																
24	**Notes:**																
25	1. **MB** - Method Blank. GB - Gas Blanks. **CCC** - Continuing Calibration Check. A calibration standard																
26	analyzed within the batch of samples. **LCS** - Laboratory Control Spike. A laboratory blank spiked with																
27	analytes at known concentrations. **MS** - Matrix Spike. A field sample spiked with known concentrations of																
28	analytes. The field sample id is identified. **SS** - Samples obtained from a second source. **DUP** - Field																
29	sample duplicate analysis. A sample selected by the lab analyst to analyze as a duplicate. It is reported																
30	in the sample result section. **% REC** - Percent Recovery. Calculated as the percentage of the results to the true values. It equals to % accuracy for CCC. 2. **" -"** denotes that the information is not available or the analyte is not analyzed.																

	Henrys Law Constants Used for the Calculations (atm/mol fraction)					
	Sample	T °C	Methane	Ethane	Propane	n-Butane
	PGDW20-0411	24	39,024	28,974	35,689	43,690
	PGDW26-0411	24	39,024	28,974	35,689	43,690
	PGDW30-0411	24	39,024	28,974	35,689	43,690
	PGDW32-0411	24	39,024	28,974	35,689	43,690
	PGDW32d-0411	24	39,024	28,974	35,689	43,690
	EPAMW02-0411	24	39,024	28,974	35,689	43,690
	EPAMW02d-0411	24	39,024	28,974	35,689	43,690
	Trip Blank	24	39,024	28,974	35,689	43,690
	PGDW05-0411	24	39,024	28,974	35,689	43,690
	PGDW45-0411	24	39,024	28,974	35,689	43,690
	EPAMW01-0411	24	39,024	28,974	35,689	43,690
	PGDW41-0411	24	39,024	28,974	35,689	43,690
	Blank	24	39,024	28,974	35,689	43,690
	PGDW14-0411	24	39,024	28,974	35,689	43,690
	PGDW49-0411	24	39,024	28,974	35,689	43,690
	PGDW49-0411	24	39,024	28,974	35,689	43,690
	PGDW23-0411	24	39,024	28,974	35,689	43,690
	PGDW-44-0411	24	39,024	28,974	35,689	43,690
	Field Blank	24	39,024	28,974	35,689	43,690