BISON CONNECT

O'Reilly, Erin <erin.o'reilly@boem.gov>

double checking my understanding of a few items from the NPDES permit

3 messages

O'Reilly, Erin <erin.o'reilly@boem.gov> Fri, Oct 25, 2013 at 2:59 PM
To: Isaac Chen <Chen.Isaac@epamail.epa.gov>

Hi Isaac. I wanted to double check my understanding of something in the NPDES permit as I think some of our folks may want me to explain some more to them. 1) For purposes of the NPDES permit, hydraulic fracturing fluids are generally considered well treatment fluids and to be discharged would have to have no free oil and meet oil and grease limitations, correct? 2) If hydraulic fracturing fluids are comingled with produced water, they fall under produced water limitations and a toxicity test should include a representative sample of produced water with the comingled fluids, correct? Furthermore, propping agents that may be used for hydraulic fracturing would be considered produced sand and not allowed to be discharged, correct? Thanks so much for letting me double check this with you.

All the best,

Erin

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S. Erin O'Reilly, Ph.D.

Susan E. O. Vaughan

Physical Scientist

Bureau of Ocean Energy Management, GOM Region

Leasing and Environment

1201 Elmwood Park Boulevard, GM673E

New Orleans, LA 70123-2394

phone: (504) 736-1759

fax: (504) 736-2901

email: Erin.O'Reilly@boem.gov

Chen, Isaac <Chen.Isaac@epa.gov> Mon, Oct 28, 2013 at 8:35 AM
To: "O'Reilly, Erin" <erin.o'reilly@boem.gov>

Erin,

Good to hear you. The OCS GP does treat hydraulic fracturing fluids (HFF) as well treatment fluids. So the discharge of HFF must comply with the limits and restrictions established for well treatment fluids. Propping agents are treated as produced sands. There is a "no discharge" limit- but to remove all propping agent may not be feasible, so the technology used to remove produced sands may be used to remove propping agents. Hope this answers your questions.

Produced Water Characterization Study - Sampling Results
Linder Oil Company - GMG290059

Lease Block/Area	Lease No.	Sampling Date
West Cameron 168-Platform A	OCS-G: 05283	1/1/2014

Parameter *All metals analyzed for dissolved phase	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	<0.100	<0.100	<0.100	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	0.201	0.201	0.201	0.200

Produced Water Characterization Study - Sampling Results
Peregrine Oil & Gas, LP - GMG290308

Lease Block/Area	Lease No.	Sampling Date
West Delta 64 -Platform C	OCS-G: 25008	11/12/2013

Parameter *All metals analyzed for dissolved phase	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	<0.100	<0.100	<0.100	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	<0.200	<0.200	<0.200	0.200

Lease Block/Area	Lease No.	Sampling Date
Galveston 155 -Platform A	OCS-G: 30654	12/12/2013

Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	<0.100	<0.100	<0.100	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	0.404	0.404	0.404	0.200

Produced Water Characterization Study - Sampling Results
Jefferson Block - GMG290336

Lease Block/Area	Lease No.	Sampling Date
High Island 24 -Platform A	MF 103387	1/28/2015

Parameter *All metals analysed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MDL mg/L	MRL mg/L
Arsenic	< 0.050	< 0.050	< 0.050	0.050	0.250
Cadmium	< 0.040	< 0.040	< 0.040	0.040	0.010
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010	0.010
Copper	< 0.050	< 0.050	< 0.050	0.050	0.250
Free Cyanide	< 0.020	< 0.020	< 0.020	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.0002
Nickel	< 0.050	< 0.050	< 0.050	0.050	0.250
Selenium	0.191 J	0.191 J	0.191 J	0.050	0.250
Silver	< 0.040	< 0.040	< 0.040	0.040	0.250
Zinc	< 0.125	< 0.125	< 0.125	0.125	0.250

MDL - Minimum Detection Limit
MRL Method Reporting Limit. Also known as:LOQ Limit of Quantitation (LOQ)
Values between the MDL and MRL are estimated (see J qualifier).
J - Analyte Detected Below Quantitation Limit

Produced Water Characterization Study - Sampling Results
Peregrine Oil & Gas II, LP - GMG290345

Lease Block/Area	Lease No.	Sampling Date
North Padre Island 975 -Pltfm A	OSC-G: 33388	11/21/2013

Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	<0.100	<0.100	<0.100	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	<0.200	<0.200	<0.200	0.200

Lease Block/Area	Lease No.	Sampling Date
West Cameron 565 -Pltfm A	OSC-G: 02015	12/16/2013

Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	<0.100	<0.100	<0.100	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	<0.200	<0.200	<0.200	0.200

Water Based Mud Cr ampling Results

Deep Gulf Energy II, LLC - GMG290356

Lease Block/Area	Lease No.	Sampling Date	
Mississippi Canyon 215	OCS-G: 24060	11/11/2014	
Parameter *All metals analyzed for **dissolved phase** concentrations.	Conc. mg/L	MDL mg/L	RL mg/L
Arsenic	< 0.250	0.250	1.25
Cadmium	< 0.200	0.200	0.500
Chromium, VI	< 0.040	0.0400	0.100
Copper	< 0.250	0.250	1.25
Cyanide	**0.200**	**0.200**	**0.200**
Lead	**1.50**	**0.175**	**1.25**
Mercury	**0.00472**	**0.000168**	**0.00080**
Nickel	< 0.250	0.250	**1.25**
Selenium	< 0.250	0.250	**1.25**
Silver	< 0.200	0.200	**1.25**
Zinc	< 0.625	0.625	**1.25**

Summary of Results

Lab_Locati	Matrix_ID	Cas_no	Analyte	Detected	result	Result_uni	MDL	MDL_units	Quantitatic	quantitatic	Reporting_	reportable_result
GBLKW3-9	Aqueous	7439-97-6	Mercury	N	0	MG/L	0.000042	MG/L	0.000042	MG/L	0.0002	Yes
GLCSW3-9	Aqueous	7439-97-6	Mercury	Y	0.00501	MG/L	0.000042	MG/L	0.000042	MG/L	0.0002	Yes
GOMEX; VI	Water	7439-97-6	Mercury	N	0	mg/L	0.000042	mg/L	0.000042	mg/L	0.0002	YES
GOMEX; VI	Water	7440-38-2	Arsenic	N	0	mg/L	0.001	mg/L	0.05	mg/L	0.25	Yes
GOMEX; VI	Water	7440-43-9	Cadmium	N	0	mg/L	0.0008	mg/L	0.04	mg/L	0.1	Yes
GOMEX; VI	Water	7440-50-8	Copper	N	0	mg/L	0.001	mg/L	0.05	mg/L	0.25	Yes
GOMEX; VI	Water	7439-92-1	Lead	N	0	mg/L	0.0007	mg/L	0.035	mg/L	0.25	Yes
GOMEX; VI	Water	7440-02-0	Nickel	Y	0.0515	mg/L	0.001	mg/L	0.05	mg/L	0.25	Yes
GOMEX; VI	Water	7782-49-2	Selenium	N	0	mg/L	0.001	mg/L	0.05	mg/L	0.25	Yes
GOMEX; VI	Water	7440-22-4	Silver	N	0	mg/L	0.0008	mg/L	0.04	mg/L	0.25	Yes
GOMEX; VI	Water	7440-66-6	Zinc	N	0	mg/L	0.0025	mg/L	0.125	mg/L	0.25	Yes
HS150604(	Aqueous	57-12-5	Cyanide, Dissolve	Y	0.185	MG/L	0.02	MG/L	0.02	MG/L	0.02	Yes
HS150604(	Aqueous	57-12-5	Cyanide, Dissolve	Y	0.184	MG/L	0.02	MG/L	0.02	MG/L	0.02	Yes
GOMEX; VI	Water	57-12-5	Cyanide, Dissolve	N	0	mg/L	0.02	mg/L	0.02	mg/L	0.02	Yes
LCS-94328	Aqueous	57-12-5	Cyanide, Dissolve	Y	0.196	MG/L	0.02	MG/L	0.02	MG/L	0.02	Yes
MBLK-942	Aqueous	7440-38-2	Arsenic	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLK-942	Aqueous	7440-43-9	Cadmium	N	0	MG/L	0.0008	MG/L	0.0008	MG/L	0.002	Yes
MBLK-942	Aqueous	7440-50-8	Copper	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLK-942	Aqueous	7439-92-1	Lead	N	0	MG/L	0.0007	MG/L	0.0007	MG/L	0.005	Yes
MBLK-942	Aqueous	7440-02-0	Nickel	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLK-942	Aqueous	7782-49-2	Selenium	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLK-942	Aqueous	7440-22-4	Silver	N	0	MG/L	0.0008	MG/L	0.0008	MG/L	0.005	Yes
MBLK-942	Aqueous	7440-66-6	Zinc	N	0	MG/L	0.0025	MG/L	0.0025	MG/L	0.005	Yes
MBLK-943	Aqueous	57-12-5	Cyanide, Dissolve	N	0	MG/L	0.02	MG/L	0.02	MG/L	0.02	Yes
MBLKF1-9	Aqueous	7440-38-2	Arsenic	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7440-43-9	Cadmium	N	0	MG/L	0.0008	MG/L	0.0008	MG/L	0.002	Yes
MBLKF1-9	Aqueous	7440-50-8	Copper	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7439-92-1	Lead	N	0	MG/L	0.0007	MG/L	0.0007	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7440-02-0	Nickel	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7782-49-2	Selenium	N	0	MG/L	0.001	MG/L	0.001	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7440-22-4	Silver	N	0	MG/L	0.0008	MG/L	0.0008	MG/L	0.005	Yes
MBLKF1-9	Aqueous	7440-66-6	Zinc	Y	0.004908	MG/L	0.0025	MG/L	0.0025	MG/L	0.005	Yes

MLCS-942	Aqueous	7440-38-2	Arsenic	Y	0.04833	MG/L	0.001	MG/L	0.001	MG/L	0.005 Yes
MLCS-942	Aqueous	7440-43-9	Cadmium	Y	0.04944	MG/L	0.0008	MG/L	0.0008	MG/L	0.002 Yes
MLCS-942	Aqueous	7440-50-8	Copper	Y	0.04977	MG/L	0.001	MG/L	0.001	MG/L	0.005 Yes
MLCS-942	Aqueous	7439-92-1	Lead	Y	0.04762	MG/L	0.0007	MG/L	0.0007	MG/L	0.005 Yes
MLCS-942	Aqueous	7440-02-0	Nickel	Y	0.0492	MG/L	0.001	MG/L	0.001	MG/L	0.005 Yes
MLCS-942	Aqueous	7782-49-2	Selenium	Y	0.04852	MG/L	0.001	MG/L	0.001	MG/L	0.005 Yes
MLCS-942	Aqueous	7440-22-4	Silver	Y	0.04996	MG/L	0.0008	MG/L	0.0008	MG/L	0.005 Yes
MLCS-942	Aqueous	7440-66-6	Zinc	Y	0.04998	MG/L	0.0025	MG/L	0.0025	MG/L	0.005 Yes

Produced Water Characterization Study - Sampling Results
Emerald Gathering and Transmission - GMG290378

Lease Block/Area	Lease No.		Sampling Date		
Galveston 214 -Platform A	MF 114331		2/5/2015		
Parameter *All metals analyzed for dissolved phase	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MDL mg/L	MRL mg/L
Arsenic	< 0.05	< 0.05	< 0.05	0.050	0.250
Cadmium	< 0.04	< 0.04	< 0.04	0.040	0.100
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010	0.250
Copper	< 0.035	< 0.035	< 0.035	0.035	0.250
Free Cyanide	< 0.02	< 0.02	< 0.02	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.000200
Nickel	< 0.05	< 0.05	< 0.05	0.050	0.250
Selenium	0.104 J	0.104 J	0.104 J	0.050	0.250
Silver	< 0.04	< 0.04	< 0.04	0.040	0.250
Zinc	< 0.125	< 0.125	< 0.125	0.125	0.250

MDL - Minimum Detection Limit
MRL Method Reporting Limit. Also known as:LOQ Limit of Quantitation (LOQ)
Values between the MDL and MRL are estimated (see J qualifier).
J - Analyte Detected Below Quantitation Limit

Produced Water Characterization Study - Sampling Results
TR Offshore, LLC - GMG290406

Lease Block/Area/Permitted Feature	Lease No.	Sampling Date
Mustang Island 746 -Pltfm A-PF0002	Texas S/L MF-092000	2/18/2014

Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	<0.100	<0.100	<0.100	0.100
Cadmium	<0.050	<0.050	<0.050	0.050
Chromium, VI	<0.010	<0.010	<0.010	0.010
Copper	<0.100	<0.100	<0.100	0.100
Free Cyanide	0.253	0.253	0.253	0.100
Lead	<0.050	<0.050	<0.050	0.050
Mercury	<0.0002	<0.0002	<0.0002	0.000
Nickel	<0.400	<0.400	<0.400	0.400
Selenium	<0.350	<0.350	<0.350	0.350
Silver	<0.100	<0.100	<0.100	0.100
Zinc	<0.200	<0.200	<0.200	0.200

Produced Water Characterization Study - Sampling Results
Northstar Offshore Group, LLC - GMG290502

Lease Block/Area	Lease No.			Sampling Date	
Eugene Island 184 - Platform A	OSC-G: 05498			12/11/2014	
Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MDL mg/L	MRL mg/L
Arsenic	< 0.050	< 0.050	< 0.050	0.050	0.250
Cadmium	< 0.040	< 0.040	< 0.040	0.040	0.100
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010	0.010
Copper	< 0.050	< 0.050	< 0.050	0.050	0.250
Free Cyanide	< 0.020	< 0.020	< 0.020	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.000200
Nickel	< 0.050	< 0.050	< 0.050	0.050	0.250
Selenium	**0.0887 J**	**0.0887 J**	**0.0887 J**	0.050	0.250
Silver	< 0.040	< 0.040	< 0.040	0.040	0.250
Zinc	**2.95**	**2.95**	**2.95**	0.125	0.250

Lease Block/Area	Lease No.			Sampling Date	
Ship Shoal 202 - Platform A	OSC-G: 31394			1/21/2015	
Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MDL mg/L	MRL mg/L
Arsenic	< 0.050	< 0.050	< 0.050	0.050	0.250
Cadmium	< 0.040	< 0.040	< 0.040	0.040	0.100
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010	0.010
Copper	< 0.050	< 0.050	< 0.050	0.050	0.250
Free Cyanide	< 0.020	< 0.020	< 0.020	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.000200
Nickel	< 0.050	< 0.050	< 0.050	0.050	0.250
Selenium	**0.103 J**	**0.103 J**	**0.103 J**	0.050	0.250
Silver	< 0.040	< 0.040	< 0.040	0.040	0.250
Zinc	< 0.125	< 0.125	< 0.125	0.125	0.250

MDL - Minimum Detection Limit
MRL Method Reporting Limit. Also known as LOQ Limit of Quantitation (LOQ)
Values between the MDL and MRL are estimated (see J qualifier).
J - Analyte Detected Below Quantitation Limit
U - Analyzed but not detected above the MDL/SDL. Reported as < MDL

Produced Water Characterization Study - Sampling Results
Northstar Offshore Group, LLC - GMG290502

Lease Block/Area	Lease No.			Sampling Date	
West Cameron 21-Platform G	OSC-G: 23730			12/10/2014	
Parameter *All metals analyzed for dissolved phase concentrations.	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MDL mg/L	MRL mg/L
Arsenic	< 0.050	< 0.050	< 0.050	0.050	0.250
Cadmium	< 0.040	< 0.040	< 0.040	0.040	0.100
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010	0.010
Copper	< 0.050	< 0.050	< 0.050	0.050	0.250
Free Cyanide	< 0.020	< 0.020	< 0.020	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.000200
Nickel	< 0.050	< 0.050	< 0.050	0.050	0.250
Selenium	**0.0598 J**	**0.0598 J**	**0.0598 J**	0.050	0.250
Silver	< 0.040	< 0.040	< 0.040	0.040	0.250
Zinc	< 0.125	< 0.125	< 0.125	0.125	0.250

MDL - Minimum Detection Limit
MRL Method Reporting Limit. Also known as LOQ Limit of Quantitation (LOQ)
Values between the MDL and MRL are estimated (see J qualifier).
J - Analyte Detected Below Quantitation Limit
U - Analyzed but not detected above the MDL/SDL. Reported as < MDL

Produced Water Characterization Study - Sampling Results
Whistler Energy II, LLC - GMG290538

Lease Block/Area	Lease No.		Sampling Date		
Green Canyon 18 -Platform A	OSC-G: 04940		3/16/2015		
Parameter ***All metals analyzed for dissolved phase concentrations.**	**Min. Conc. mg/L**	**Max.Conc. mg/L**	**Avg. Conc. mg/L**	**MDL mg/L**	**MRL mg/L**
Arsenic	< 0.05	< 0.05	< 0.05	0.050	0.250
Cadmium	< 0.04	< 0.04	< 0.04	0.040	0.100
Chromium, VI	< 0.001	< 0.001	< 0.001	0.001	0.001
Copper	< 0.035	< 0.035	< 0.035	0.050	0.250
Free Cyanide	< 0.02	< 0.02	< 0.02	0.020	0.020
Lead	< 0.035	< 0.035	< 0.035	0.035	0.250
Mercury	< 0.000042	< 0.000042	< 0.000042	0.000042	0.000200
Nickel	< 0.05	< 0.05	< 0.05	0.050	0.250
Selenium	**0.0986 J**	**0.0986 J**	**0.0986 J**	0.050	0.250
Silver	< 0.04	< 0.04	< 0.04	0.040	0.250
Zinc	**0.712**	**0.712**	**0.712**	0.125	0.250

MDL - Minimum Detection Limit
MRL Method Reporting Limit. Also known as LOQ Limit of Quantitation (LOQ)
Values between the MDL and MRL are estimated (see J qualifier).
J - Analyte Detected Below Quantitation Limit

...ced Water Characterization Study - Sampling Results
Hoactzin- GMG290540

Lease Block/Area	Lease No.	Sampling Date
Ship Shoal 145 -Platform E	OCS-G: 01929	2/16/2015 *

Parameter *All metals analyzed for dissolved phase	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L
Arsenic	0.146	0.146	0.146	0.100
Cadmium	< 0.010	< 0.010	< 0.010	0.010
Chromium, VI	< 0.010	< 0.010	< 0.010	0.010
Copper	< 0.050	< 0.050	< 0.050	0.050
Free Cyanide	< 0.004	< 0.004	< 0.004	0.004
Lead	< 0.050	< 0.050	< 0.050	0.050
Mercury	< 0.0002	< 0.0002	< 0.0002	0.0002
Nickel	< 0.050	< 0.050	< 0.050	0.050
Selenium	< 0.200	< 0.200	< 0.200	0.200
Silver	< 0.020	< 0.020	< 0.020	0.020
Zinc	< 0.100	< 0.100	< 0.100	0.100

*** Chromium 6 Sample Collected on 03/23/15**
MAL = RL - Reporting Detection Limit
MAL = LOQ (Limit of Quantitation) - for Free Cyanide

Produced Water Characterization Study - Sampling Results
Cochon Properties, LLC - GMG290549

Lease Block/Area	Lease No.	Sampling Date
Vermilion 67 -Platform A	OSC-G: 00560	12/17/2013

Parameter *All metals analyzed for dissolved phase	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L	MAL mg/L	
Arsenic	<0.100	<0.100	<0.100	0.100	
Cadmium	<0.050	<0.050	<0.050	0.050	
Chromium, VI	<0.010	<0.010	<0.010	0.010	
Copper	<0.100	<0.100	<0.100	0.100	
Free Cyanide	0.0047	0.052	<0.100	0.1/0.004	Also sampled for CN on 03/04/15
Lead	<0.050	<0.050	<0.050	0.050	
Mercury	<0.0002	<0.0002	<0.0002	0.0002	
Nickel	<0.400	<0.400	<0.400	0.400	
Selenium	<0.350	<0.350	<0.350	0.350	
Silver	<0.100	<0.100	<0.100	0.100	
Zinc	<0.200	<0.200	<0.200	0.200	

Lease Block/Area	Lease No.				Sampling Date		
West Delta 45	OSC-G: 00138				2/3/2015*		
	Platform A		Platform C		West Delta 45 Block		
Parameter *All metals analyzed for dissolved phase concentrations.	Conc. mg/L	MAL mg/L	Conc. mg/L	MAL mg/L	Min. Conc. mg/L	Max.Conc. mg/L	Avg. Conc. mg/L
Arsenic	<0.100	0.100	0.106	0.100	<0.100	0.106	0.103
Cadmium	<0.010	0.010	0.014	0.010	<0.010	0.014	0.012
Chromium, VI	<0.010	0.010	<0.010	0.010	<0.010	<0.010	<0.010
Copper	<0.050	0.050	<0.050	0.050	<0.100	<0.100	<0.100
Free Cyanide	<0.040	0.004	<0.040	0.004	<0.100	<0.100	<0.100
Lead	<0.050	0.050	<0.050	0.050	<0.050	<0.050	<0.050
Mercury	<0.0002	0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Nickel	<0.050	0.050	<0.050	0.050	<0.400	<0.400	<0.400
Selenium	<0.200	0.200	<0.200	0.200	<0.200	<0.200	<0.200
Silver	<0.100	0.020	<0.100	0.020	<0.100	<0.100	<0.100
Zinc	<0.200	0.100	<0.200	0.100	<0.200	<0.200	<0.200

*** Chromium 6 and Free Cyanide Samples Collected on 02/25/15**
MAL = RL - Reporting Detection Limit
MAL = LOQ (Limit of Quantification) - for Free Cyanide

5041 Toravella Road, Marrero, LA 70072
(504) 371-8557 • Fax (504) 371-8560 • Toll Free 1(800) 291-1294
acculab@acculabnola.com

Sample Identification/Result

Metals and Conventionals - Analyte	Units	65632 GB 783 A Sample # 1 1/15/2015 0747	65633 GB 783 A Sample # 2 1/16/2015 0630	65634 GB 783 A Sample # 3 1/16/2015 1215	65657 GB 783 A Sample # 4 1/17/2015 1500	**Minimum**	**Average**	**Maximum**
Total Cyanide	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Dissolved Arsenic	mg/L	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
Dissolved Cadmium	mg/L	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Dissolved Chromium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Dissolved Copper	mg/L	< 0.050	< 0.050	0.05	0.05	< 0.050	< 0.050	< 0.050
Dissolved Lead	mg/L	< 0.060	< 0.060	< 0.060	< 0.060	< 0.060	< 0.060	< 0.060
Dissolved Mercury	mg/L	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Dissolved Nickel	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Dissolved Selenium	mg/L	< 0.100	0.105	0.139	< 0.100	< 0.100	0.115	0.139
Dissolved Silver	mg/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Dissolved Zinc	mg/L	0.381	0.362	0.379	0.559	0.362	0.420	0.559