District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

Incident ID	NRM2005230899
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party: Wapiti Operating, LLC	OGRID: 328741
Contact Name: Randy L. Madison	Contact Telephone: 575-445-6706
Contact email: rmadison@wapitienergy.com	Incident # *(assigned by OCD)*
Contact mailing address: P.O. Box 190, 309 Silver St., Raton, NM 87740	

Location of Release Source

Latitude: N 36.97470 Longitude: W 104.81300

(NAD 83 in decimal degrees to 5 decimal places)

Site Name: VPR A-47	Site Type: Gas Well
Date Release Discovered: 2/11/20	API# *(if applicable)*: 30-007-20197

Unit Letter	Section	Township	Range	County
P	28	32N	20E	Colfax

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name:* Vermejo Park Ranch)

Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

☐ Crude Oil	Volume Released (bbls)	Volume Recovered (bbls)
☒ Produced Water	Volume Released (bbls): 356	Volume Recovered (bbls): 0
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	☐ Yes ☒ No
☐ Condensate	Volume Released (bbls)	Volume Recovered (bbls)
☐ Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
☐ Other (describe)	Volume/Weight Released (provide units)	Volume/Weight Recovered (provide units)

Cause of Release: 2" water line froze and split along the length of the pipe. The length of the split was about 6 feet.

State of New Mexico
Oil Conservation Division

Incident ID	NRM2005230899
District RP	
Facility ID	
Application ID	

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? We calculated the amount of produced water to be about 356 Barrels.
If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)? A phone call was made to Cory Smith. A follow-up email was also sent to Cory. Randy Madison made the notification	

Initial Response

The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury

☒ The source of the release has been stopped.

☐ The impacted area has been secured to protect human health and the environment.

☐ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.

☐ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why:
The source was stopped by closing the valves on each end of the split pipe. The pipe was replaced. The water ran off the location and dissipated into the ground. The water presents no threat to humans or the environment. See the attached water analysis. See the attached map with GPS points showing the water did not get close to any water-ways or sources.

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

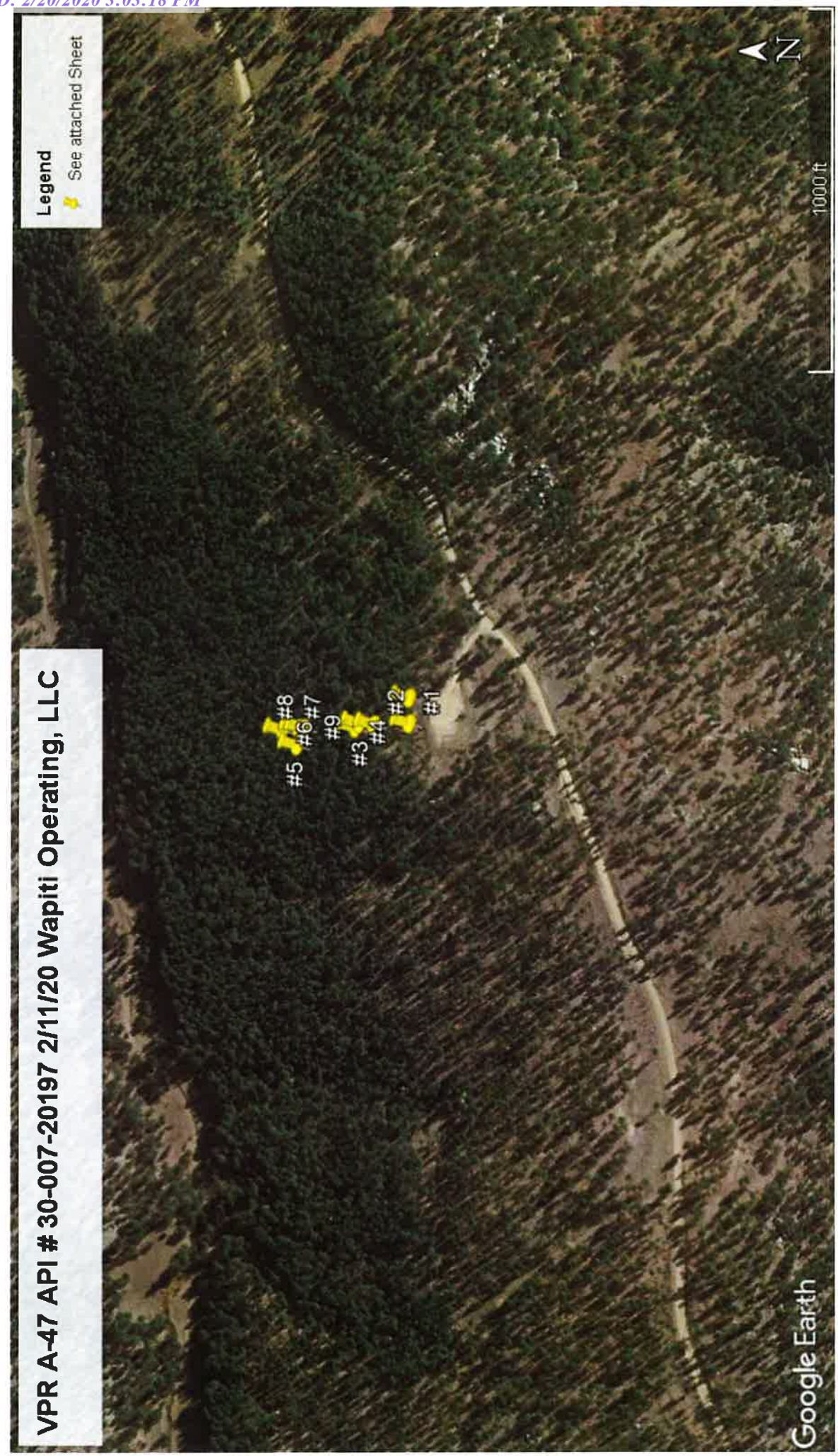
Printed Name: Randy L. Madison Title: HSE Specialist

Signature: Randy L Madison Date: 2/20/20

email: rmadison@wapitienergy.com Telephone: 575-445-6706

OCD Only

Received by: Ramona Marcus Date: 02/21/2020


VPR A-47 API # 30-007-20197 2/11/20 Wapiti Operating, LLC
Legend
See attached Sheet
#1
#2
#3
#4
#5
#6
#7
#8
#9
N
1000 ft
Google Earth

NRM2005230899

A-47 Spill of Produced Water GPS points

1. N. 36.9747
   W. 104.81300

2. N. 36.97482
   W. 104.81323

3. N. 36.97509
   W. 104.81324

4. N. 36.9750
   W. 104.81327

5. N 36.97552
   W. 104.81343

6. N. 36.97563
   W. 104.81329

7. N. 36.97547
   W. 104.81327

8. N 36.97551
   W. 104.8132

9. N. 36.97500
   W. 104.81323

NRM2005230899

BAKER HUGHES

Central Area Laboratory
12701 N. Santa Fe Ave, Suite 151
Oklahoma City, Oklahoma 73114

Upstream Chemicals

REPORT DATE: 2/18/2020

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	WAPITI OPERATING	**ACCOUNT REP:**	TY L. CLINESMITH
DISTRICT:	OKLAHOMA	**SAMPLE ID:**	201910011049
AREA/LEASE:	VERMEJO PARK RANCH	**SAMPLE DATE:**	7/31/2019
SAMPLE POINT NAME	VPR A 47	**ANALYSIS DATE:**	11/21/2019
SITE TYPE:	WELL SITES	**ANALYST:**	BS
SAMPLE POINT DESCRIPTION:	WELL HEAD		

WAPITI OPERATING, VERMEJO PARK RANCH, VPR A 47

FIELD DATA

Initial Temperature (°F):	250
Final Temperature (°F):	68
Initial Pressure (psi):	100
Final Pressure (psi):	15
pH:	
pH at time of sampling:	8.0

ALKALINITY BY TITRATION:	**mg/L**	**meq/L**
Bicarbonate (HCO_3^-):	815.0	13.4
Carbonate (CO_3^{2-}):	ND	
Hydroxide (OH^-):	ND	

aqueous CO_2 (ppm):	44.0
aqueous H_2S (ppm):	ND
aqueous O2 (ppb):	ND
Calculated TDS (mg/L):	2467
Density/Specific Gravity (g/cm³):	0.9989
Measured Specific Gravity	ND
Conductivity (mmhos):	ND
Resistivity:	ND
MCF/D:	No Data
BOPD:	No Data
BWPD:	No Data

ANALYSIS OF SAMPLE

ANIONS:	**mg/L**	**meq/L**
Chloride (Cl^-):	702.2	19.8
Sulfate (SO_4^{2-}):	0.0	0.0
Borate (H_3BO_3):	0.0	0.0
Fluoride (F^-):	ND	
Bromide (Br^-):	ND	
Nitrite (NO_2^-):	ND	
Nitrate (NO_3^-):	ND	
Phosphate (PO_4^{3-}):	0.9	0.0
Silica (SiO_2):	ND	

ORGANIC ACIDS:	**mg/L**	**meq/L**
Formic Acid:	ND	
Acetic Acid:	ND	
Propionic Acid:	ND	
Butyric Acid:	ND	
Valeric Acid:	ND	

CATIONS:	**mg/L**	**meq/L**
Sodium (Na^+):	928.6	40.4
Potassium (K^+):	3.2	0.1
Magnesium (Mg^{2+}):	2.9	0.2
Calcium (Ca^{2+}):	9.9	0.5
Strontium (Sr^{2+}):	2.4	0.1
Barium (Ba^{2+}):	2.3	0.0
Iron (Fe^{2+}):	0.9	0.0
Manganese (Mn^{2+}):	0.0	0.0
Lead (Pb^{2+}):	ND	
Zinc (Zn^{2+}):	0.0	0.0
Aluminum (Al^{3+}):	ND	
Chromium (Cr^{3+}):	ND	
Cobalt (Co^{2+}):	ND	
Copper (Cu^{2+}):	ND	
Molybdenum (Mo^{2+}):	ND	
Nickel (Ni^{2+}):	ND	
Tin (Sn^{2+}):	ND	
Titanium (Ti^{2+}):	ND	
Vanadium (V^{2+}):	ND	
Zirconium (Zr^{2+}):	ND	
Lithium (Li):	ND	
Total Hardness:	41	N/A

Anion/Cation Ratio: 0.80 **ND = Not Determined**

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS

Conditions		**Barite ($BaSO_4$)**		**Calcite ($CaCO_3$)**		**Gypsum ($CaSO_4 \cdot 2H_2O$)**		**Anhydrite ($CaSO_4$)**	
Temp	**Press.**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**
68°F	15 psi		0.000	0.24	3.034		0.000		0.000
88°F	24 psi		0.000	0.32	3.861		0.000		0.000
108°F	34 psi		0.000	0.43	4.840		0.000		0.000
129°F	43 psi		0.000	0.55	5.737		0.000		0.000
149°F	53 psi		0.000	0.69	6.484		0.000		0.000
169°F	62 psi		0.000	0.83	7.075		0.000		0.000
189°F	72 psi		0.000	0.98	7.524		0.000		0.000
210°F	81 psi		0.000	1.14	7.871		0.000		0.000
230°F	91 psi		0.000	1.30	8.117		0.000		0.000
250°F	100 psi		0.000	1.46	8.288		0.000		0.000

Conditions		**Celestite ($SrSO_4$)**		**Halite (NaCl)**		**Iron Sulfide (FeS)**		**Iron Carbonate ($FeCO_3$)**	
Temp	**Press.**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**	**Index**	**Amt (ptb)**
68°F	15 psi		0.000	-4.82	0.000	-8.04	0.000	1.00	0.597
88°F	24 psi		0.000	-4.85	0.000	-8.15	0.000	1.16	0.618
108°F	34 psi		0.000	-4.87	0.000	-8.19	0.000	1.34	0.634
129°F	43 psi		0.000	-4.88	0.000	-8.20	0.000	1.52	0.645
149°F	53 psi		0.000	-4.88	0.000	-8.17	0.000	1.70	0.652
169°F	62 psi		0.000	-4.88	0.000	-8.13	0.000	1.87	0.656
189°F	72 psi		0.000	-4.87	0.000	-8.06	0.000	2.03	0.659
210°F	81 psi		0.000	-4.85	0.000	-7.97	0.000	2.19	0.661
230°F	91 psi		0.000	-4.84	0.000	-7.86	0.000	2.35	0.662
250°F	100 psi		0.000	-4.81	0.000	-7.75	0.000	2.49	0.663

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.

Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations

ScaleSoftPitzer™ SSP2010

Comments:

NRM2005230899

BAKER HUGHES

Central Area Laboratory
12701 N. Santa Fe Ave, Suite 151
Oklahoma City, Oklahoma 73114

Upstream Chemicals

REPORT DATE: 2/18/2020

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	WAPITI OPERATING	**ACCOUNT REP:**	TY L. CLINESMITH
DISTRICT:	OKLAHOMA	**SAMPLE ID:**	201910011048
AREA/LEASE:	VERMEJO PARK RANCH	**SAMPLE DATE:**	7/31/2019
SAMPLE POINT NAME	VPR A 48	**ANALYSIS DATE:**	11/21/2019
SITE TYPE:	WELL SITES	**ANALYST:**	BS
SAMPLE POINT DESCRIPTION:	WELL HEAD		

WAPITI OPERATING, VERMEJO PARK RANCH, VPR A 48

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl^-):	680.3	19.2	Sodium (Na^+):	903.0	39.3
Final Temperature (°F):	65	Sulfate (SO_4^{2-}):	0.0	0.0	Potassium (K^+):	2.8	0.1
Initial Pressure (psi):	100	Borate (H_3BO_3):	1.7	0.0	Magnesium (Mg^{2+}):	2.9	0.2
Final Pressure (psi):	15	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	18.5	0.9
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	2.5	0.1
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	1.8	0.0
pH at time of sampling:	7.7	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	2.1	0.1
		Phosphate (PO_4^{3-}):	0.0	0.0	Manganese (Mn^{2+}):	0.0	0.0
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	ND	
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	835.0	13.7			Aluminum (Al^{3+}):	ND	
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	ND	
aqueous CO_2 (ppm):	33.0		Formic Acid:	ND		Molybdenum (Mo^{2+}):	ND	
aqueous H_2S (ppm):	ND		Acetic Acid:	ND		Nickel (Ni^{2+}):	ND	
aqueous O2 (ppb):	ND		Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
			Butyric Acid:	ND		Titanium (Ti^{2+}):	ND	
Calculated TDS (mg/L):	2449		Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	0.9989					Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	ND					Lithium (Li):	ND	
Conductivity (mmhos):	ND							
Resistivity:	ND					Total Hardness:	62	N/A
MCF/D:	No Data							
BOPD:	No Data							
BWPD:	No Data		Anion/Cation Ratio:		0.81	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
65°F	15 psi		0.000	0.23	5.292		0.000		0.000
86°F	24 psi		0.000	0.31	6.921		0.000		0.000
106°F	34 psi		0.000	0.43	8.847		0.000		0.000
127°F	43 psi		0.000	0.57	10.609		0.000		0.000
147°F	53 psi		0.000	0.71	12.076		0.000		0.000
168°F	62 psi		0.000	0.87	13.230		0.000		0.000
188°F	72 psi		0.000	1.03	14.103		0.000		0.000
209°F	81 psi		0.000	1.20	14.774		0.000		0.000
229°F	91 psi		0.000	1.37	15.242		0.000		0.000
250°F	100 psi		0.000	1.55	15.562		0.000		0.000

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
65°F	15 psi		0.000	-4.84	0.000	-7.97	0.000	1.08	1.417
86°F	24 psi		0.000	-4.87	0.000	-8.07	0.000	1.25	1.460
106°F	34 psi		0.000	-4.89	0.000	-8.10	0.000	1.44	1.492
127°F	43 psi		0.000	-4.90	0.000	-8.09	0.000	1.63	1.513
147°F	53 psi		0.000	-4.90	0.000	-8.05	0.000	1.82	1.526
168°F	62 psi		0.000	-4.90	0.000	-7.99	0.000	2.00	1.534
188°F	72 psi		0.000	-4.89	0.000	-7.91	0.000	2.18	1.540
209°F	81 psi		0.000	-4.88	0.000	-7.80	0.000	2.35	1.543
229°F	91 psi		0.000	-4.86	0.000	-7.68	0.000	2.52	1.545
250°F	100 psi		0.000	-4.84	0.000	-7.55	0.000	2.68	1.547

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

ScaleSoftPitzer™ SSP2010

Comments:

NRM2005230899

BAKER HUGHES

Central Area Laboratory
12701 N. Santa Fe Ave, Suite 151
Oklahoma City, Oklahoma 73114

Upstream Chemicals

REPORT DATE: 2/18/2020

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	WAPITI OPERATING	**ACCOUNT REP:**	TY L. CLINESMITH
DISTRICT:	OKLAHOMA	**SAMPLE ID:**	201910011621
AREA/LEASE:	VERMEJO PARK RANCH	**SAMPLE DATE:**	8/1/2019
SAMPLE POINT NAME	VPR A 49	**ANALYSIS DATE:**	11/25/2019
SITE TYPE:	WELL SITES	**ANALYST:**	BS
SAMPLE POINT DESCRIPTION:	WELL HEAD		

WAPITI OPERATING, VERMEJO PARK RANCH, VPR A 49

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl^-):	1423.7	40.2	Sodium (Na^+):	1135.1	49.4
Final Temperature (°F):	69	Sulfate (SO_4^{2-}):	0.0	0.0	Potassium (K^+):	4.0	0.1
Initial Pressure (psi):	100	Borate (H_3BO_3):	0.0	0.0	Magnesium (Mg^{2+}):	5.4	0.4
Final Pressure (psi):	15	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	25.3	1.3
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	4.1	0.1
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	3.9	0.1
pH at time of sampling:	8.0	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	1.7	0.1
		Phosphate (PO_4^{3-}):	0.0	0.0	Manganese (Mn^{2+}):	0.0	0.0
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	ND	
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	1086.0	17.8			Aluminum (Al^{3+}):	ND	
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	ND	
aqueous CO_2 (ppm):	0.0		Formic Acid:	ND		Molybdenum (Mo^{2+}):	ND	
aqueous H_2S (ppm):	0.5		Acetic Acid:	ND		Nickel (Ni^{2+}):	ND	
aqueous O2 (ppb):	ND		Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
			Butyric Acid:	ND		Titanium (Ti^{2+}):	ND	
Calculated TDS (mg/L):	3689		Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	0.9997					Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	ND					Lithium (Li):	ND	
Conductivity (mmhos):	ND							
Resistivity:	ND					Total Hardness:	93	N/A
MCF/D:	No Data							
BOPD:	No Data							
BWPD:	No Data		Anion/Cation Ratio:		1.13	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	0.73	15.910		0.000		0.000
89°F	24 psi		0.000	0.81	16.840		0.000		0.000
110°F	34 psi		0.000	0.92	17.941		0.000		0.000
130°F	43 psi		0.000	1.04	18.937		0.000		0.000
150°F	53 psi		0.000	1.17	19.759		0.000		0.000
170°F	62 psi		0.000	1.31	20.404		0.000		0.000
190°F	72 psi		0.000	1.45	20.892		0.000		0.000
210°F	81 psi		0.000	1.61	21.269		0.000		0.000
230°F	91 psi		0.000	1.77	21.537		0.000		0.000
250°F	100 psi		0.000	1.93	21.723		0.000		0.000

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	-4.45	0.000	1.90	0.492	1.38	1.171
89°F	24 psi		0.000	-4.48	0.000	1.79	0.488	1.53	1.187
110°F	34 psi		0.000	-4.50	0.000	1.74	0.486	1.71	1.199
130°F	43 psi		0.000	-4.51	0.000	1.73	0.486	1.88	1.207
150°F	53 psi		0.000	-4.51	0.000	1.75	0.487	2.05	1.212
170°F	62 psi		0.000	-4.51	0.000	1.80	0.488	2.22	1.216
190°F	72 psi		0.000	-4.50	0.000	1.87	0.491	2.38	1.218
210°F	81 psi		0.000	-4.49	0.000	1.96	0.493	2.54	1.220
230°F	91 psi		0.000	-4.47	0.000	2.06	0.496	2.69	1.221
250°F	100 psi		0.000	-4.45	0.000	2.17	0.498	2.83	1.222

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations

ScaleSoftPitzer™ SSP2010

Comments:

NRM2005230899

BAKER HUGHES

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12701 N. Santa Fe Ave, Suite 151
Oklahoma City, Oklahoma 73114

Upstream Chemicals

REPORT DATE: 2/18/2020

COMPLETE WATER ANALYSIS REPORT SSP v.2010

CUSTOMER:	WAPITI OPERATING	ACCOUNT REP:	TY L. CLINESMITH
DISTRICT:	OKLAHOMA	SAMPLE ID:	201910011623
AREA/LEASE:	VERMEJO PARK RANCH	SAMPLE DATE:	8/1/2019
SAMPLE POINT NAME	VPR A 57	ANALYSIS DATE:	11/25/2019
SITE TYPE:	WELL SITES	ANALYST:	BS
SAMPLE POINT DESCRIPTION:	WELL HEAD		

WAPITI OPERATING, VERMEJO PARK RANCH, VPR A 57

FIELD DATA	
Initial Temperature (°F):	250
Final Temperature (°F):	69
Initial Pressure (psi):	100
Final Pressure (psi):	15
pH:	
pH at time of sampling:	8.2

ALKALINITY BY TITRATION:	mg/L	meq/L
Bicarbonate (HCO_3^-):	1146.0	18.8
Carbonate (CO_3^{2-}):	ND	
Hydroxide (OH^-):	ND	

aqueous CO_2 (ppm):	0.0
aqueous H_2S (ppm):	0.5
aqueous O2 (ppb):	ND
Calculated TDS (mg/L):	2517
Density/Specific Gravity (g/cm³):	0.9989
Measured Specific Gravity	ND
Conductivity (mmhos):	ND
Resistivity:	ND
MCF/D:	No Data
BOPD:	No Data
BWPD:	No Data

ANALYSIS OF SAMPLE — ANIONS:	mg/L	meq/L
Chloride (Cl^-):	611.2	17.2
Sulfate (SO_4^{2-}):	0.0	0.0
Borate (H_3BO_3):	0.0	0.0
Fluoride (F^-):	ND	
Bromide (Br^-):	ND	
Nitrite (NO_2^-):	ND	
Nitrate (NO_3^-):	ND	
Phosphate (PO_4^{3-}):	0.0	0.0
Silica (SiO_2):	ND	

ORGANIC ACIDS:	mg/L	meq/L
Formic Acid:	ND	
Acetic Acid:	ND	
Propionic Acid:	ND	
Butyric Acid:	ND	
Valeric Acid:	ND	

CATIONS:	mg/L	meq/L
Sodium (Na^+):	737.2	32.1
Potassium (K^+):	2.3	0.1
Magnesium (Mg^{2+}):	2.3	0.2
Calcium (Ca^{2+}):	13.7	0.7
Strontium (Sr^{2+}):	1.8	0.0
Barium (Ba^{2+}):	1.7	0.0
Iron (Fe^{2+}):	1.1	0.0
Manganese (Mn^{2+}):	0.0	0.0
Lead (Pb^{2+}):	ND	
Zinc (Zn^{2+}):	0.0	0.0
Aluminum (Al^{3+}):	ND	
Chromium (Cr^{3+}):	ND	
Cobalt (Co^{2+}):	ND	
Copper (Cu^{2+}):	ND	
Molybdenum (Mo^{2+}):	ND	
Nickel (Ni^{2+}):	ND	
Tin (Sn^{2+}):	ND	
Titanium (Ti^{2+}):	ND	
Vanadium (V^{2+}):	ND	
Zirconium (Zr^{2+}):	ND	
Lithium (Li):	ND	
Total Hardness:	47	N/A

Anion/Cation Ratio: 1.09

ND = Not Determined

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	0.70	8.815		0.000		0.000
89°F	24 psi		0.000	0.77	9.301		0.000		0.000
109°F	34 psi		0.000	0.88	9.862		0.000		0.000
129°F	43 psi		0.000	1.00	10.364		0.000		0.000
149°F	53 psi		0.000	1.13	10.775		0.000		0.000
170°F	62 psi		0.000	1.27	11.095		0.000		0.000
190°F	72 psi		0.000	1.41	11.336		0.000		0.000
210°F	81 psi		0.000	1.56	11.521		0.000		0.000
230°F	91 psi		0.000	1.72	11.653		0.000		0.000
250°F	100 psi		0.000	1.88	11.744		0.000		0.000

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	-4.98	0.000	1.93	0.463	1.42	0.736
89°F	24 psi		0.000	-5.01	0.000	1.82	0.456	1.58	0.745
109°F	34 psi		0.000	-5.02	0.000	1.76	0.453	1.75	0.752
129°F	43 psi		0.000	-5.03	0.000	1.75	0.452	1.92	0.757
149°F	53 psi		0.000	-5.04	0.000	1.77	0.453	2.09	0.760
170°F	62 psi		0.000	-5.03	0.000	1.81	0.456	2.26	0.762
190°F	72 psi		0.000	-5.02	0.000	1.87	0.460	2.42	0.763
210°F	81 psi		0.000	-5.01	0.000	1.96	0.465	2.58	0.764
230°F	91 psi		0.000	-4.99	0.000	2.06	0.470	2.73	0.765
250°F	100 psi		0.000	-4.97	0.000	2.18	0.474	2.87	0.765

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.

Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

EQ91 ScaleSoftPitzer™ SSP2010

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CUSTOMER:	WAPITI OPERATING	ACCOUNT REP:	TY L. CLINESMITH
DISTRICT:	OKLAHOMA	SAMPLE ID:	201910011622
AREA/LEASE:	VERMEJO PARK RANCH	SAMPLE DATE:	8/1/2019
SAMPLE POINT NAME	VPR A 59	ANALYSIS DATE:	11/25/2019
SITE TYPE:	WELL SITES	ANALYST:	BS
SAMPLE POINT DESCRIPTION:	WELL HEAD		

WAPITI OPERATING, VERMEJO PARK RANCH, VPR A 59

FIELD DATA		ANALYSIS OF SAMPLE					
		ANIONS:	mg/L	meq/L	CATIONS:	mg/L	meq/L
Initial Temperature (°F):	250	Chloride (Cl^-):	2767.4	78.1	Sodium (Na^+):	1630.8	71.0
Final Temperature (°F):	69	Sulfate (SO_4^{2-}):	0.0	0.0	Potassium (K^+):	4.7	0.1
Initial Pressure (psi):	100	Borate (H_3BO_3):	1.4	0.0	Magnesium (Mg^{2+}):	12.7	1.0
Final Pressure (psi):	15	Fluoride (F^-):	ND		Calcium (Ca^{2+}):	50.6	2.5
		Bromide (Br^-):	ND		Strontium (Sr^{2+}):	9.5	0.2
pH:		Nitrite (NO_2^-):	ND		Barium (Ba^{2+}):	7.4	0.1
pH at time of sampling:	7.7	Nitrate (NO_3^-):	ND		Iron (Fe^{2+}):	1.0	0.0
		Phosphate (PO_4^{3-}):	0.0	0.0	Manganese (Mn^{2+}):	0.0	0.0
		Silica (SiO_2):	ND		Lead (Pb^{2+}):	ND	
					Zinc (Zn^{2+}):	0.0	0.0
ALKALINITY BY TITRATION:	mg/L	meq/L					
Bicarbonate (HCO_3^-):	848.0	13.9			Aluminum (Al^{3+}):	ND	
Carbonate (CO_3^{2-}):	ND				Chromium (Cr^{3+}):	ND	
Hydroxide (OH^-):	ND				Cobalt (Co^{2+}):	ND	
			ORGANIC ACIDS:	mg/L	meq/L	Copper (Cu^{2+}):	ND	
aqueous CO_2 (ppm):	0.0	Formic Acid:	ND		Molybdenum (Mo^{2+}):	ND	
aqueous H_2S (ppm):	0.5	Acetic Acid:	ND		Nickel (Ni^{2+}):	ND	
aqueous O2 (ppb):	ND	Propionic Acid:	ND		Tin (Sn^{2+}):	ND	
		Butyric Acid:	ND		Titanium (Ti^{2+}):	ND	
Calculated TDS (mg/L):	5332	Valeric Acid:	ND		Vanadium (V^{2+}):	ND	
Density/Specific Gravity (g/cm³):	1.0008				Zirconium (Zr^{2+}):	ND	
Measured Specific Gravity	ND				Lithium (Li):	ND	
Conductivity (mmhos):	ND						
Resistivity:	ND				Total Hardness:	195	N/A
MCF/D:	No Data						
BOPD:	No Data						
BWPD:	No Data	Anion/Cation Ratio:		1.23	ND = Not Determined		

SCALE PREDICTIONS BASED ON FIELD PROVIDED DATA; FUTHER MODELING MAY BE REQUIRED FOR VALIDATION OF SCALE PREDICTION RESULTS.

Conditions		Barite ($BaSO_4$)		Calcite ($CaCO_3$)		Gypsum ($CaSO_4 \cdot 2H_2O$)		Anhydrite ($CaSO_4$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	0.58	24.115		0.000		0.000
89°F	24 psi		0.000	0.66	26.625		0.000		0.000
109°F	34 psi		0.000	0.77	29.791		0.000		0.000
130°F	43 psi		0.000	0.90	32.852		0.000		0.000
150°F	53 psi		0.000	1.04	35.540		0.000		0.000
170°F	62 psi		0.000	1.18	37.766		0.000		0.000
190°F	72 psi		0.000	1.33	39.532		0.000		0.000
210°F	81 psi		0.000	1.49	40.952		0.000		0.000
230°F	91 psi		0.000	1.66	41.989		0.000		0.000
250°F	100 psi		0.000	1.82	42.723		0.000		0.000

Conditions		Celestite ($SrSO_4$)		Halite (NaCl)		Iron Sulfide (FeS)		Iron Carbonate ($FeCO_3$)	
Temp	Press.	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)	Index	Amt (ptb)
69°F	15 psi		0.000	-4.03	0.000	1.25	0.410	0.65	0.544
89°F	24 psi		0.000	-4.06	0.000	1.16	0.395	0.81	0.592
109°F	34 psi		0.000	-4.08	0.000	1.12	0.390	0.99	0.629
130°F	43 psi		0.000	-4.09	0.000	1.12	0.390	1.16	0.654
150°F	53 psi		0.000	-4.09	0.000	1.16	0.396	1.34	0.670
170°F	62 psi		0.000	-4.09	0.000	1.21	0.404	1.51	0.681
190°F	72 psi		0.000	-4.08	0.000	1.28	0.415	1.67	0.688
210°F	81 psi		0.000	-4.07	0.000	1.38	0.428	1.83	0.692
230°F	91 psi		0.000	-4.06	0.000	1.49	0.441	1.99	0.695
250°F	100 psi		0.000	-4.04	0.000	1.60	0.454	2.13	0.698

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered
Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the eight (8) scales.
Note 3: Saturation Index predictions on this sheet use pH and alkalinity; $\%CO_2$ is not included in the calculations.

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