

COGCC OIL AND GAS FIELD SCOUT CARD

Date 10/31/2016
Document No. 2056241

FIELD NAME **BATTLESHIP**
FIELD NUMBER **5680**

LOCATION

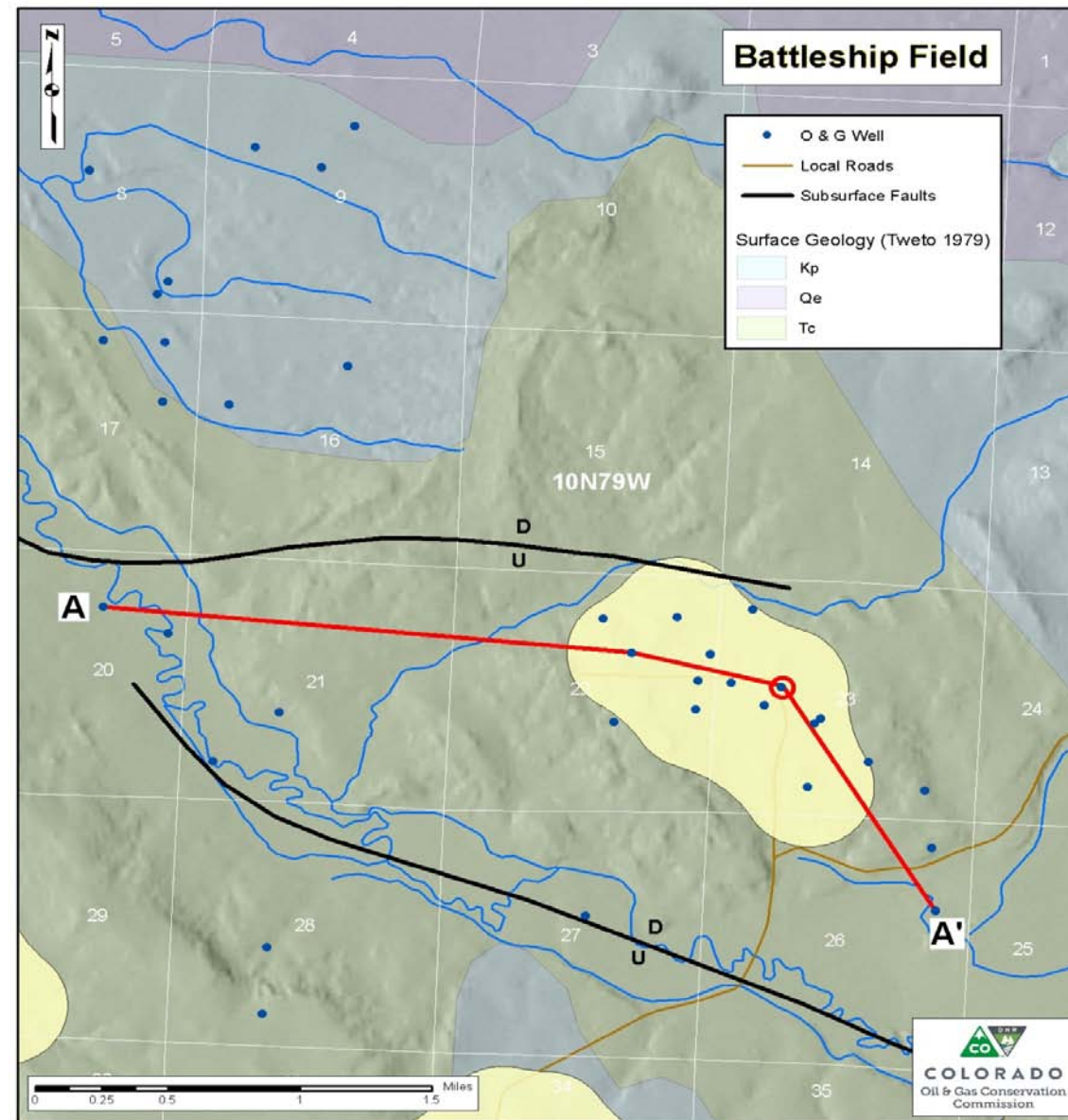
Basin North Park
Township(s) 10N
Range(s) 79W

SURFACE GEOLOGY

Surface Geology consists of the Coalmont Formation, underlain by Pierre Shale, which outcrops to the north, east, and south of the field.

GEOLOGIC STRUCTURE

The field is situated between two faults: the northern fault is oriented west to east, and the southern fault is oriented west-northwest to east-southeast. Northwest-Southeast oriented structures (the McCallum Field anticline and a syncline to the east of McCallum Field) are present south of the southern fault.



○ Type Log Well

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			A - Northwest		A' - Southeast		
STRATIGRAPHY			API Number =>	057-05139	057-05136	057-06226	057-05123
All depths are measured depths			Surface Elevation =>	7,920 DF	8,130 KB	8,075GL/8,087KB	7,985 DF
			Well Type =>	Vertical	Vertical	Vertical	Vertical
Group	Formation	Interval/Member	Isolation Concern	Log Top	Log Top	Log Top	Log Top
	Coalmont		Water	0	0	0	0
	Pierre		None	.....	710	914*	1,560*
	Pierre	Pierre A	Possible Water	.....	.....	1,211*	1,866*
	Pierre	Pierre B	Possible Water	.....	.....	1,652**	2,330*
	Niobrara		Possible Oil / Gas	4,364	3,785	3,240*	3,973
Benton	Carlile		None	4,764	4,150	3,613*	4,350*
Benton	Frontier		Oil / Gas/ Water	4,998	4,363	3,848	4,580
Benton	Graneros		None	.....	.....	.....	.....
Benton	Mowry		None	.....	.....	4,406*	4,994*
Dakota	Muddy		Possible Oil / Gas	5,548	4,896	4,523*	5,119
Dakota	Dakota		Oil / Gas/ Water / UIC	5,618	4,957	4,590	5,188
Dakota	Fuson		None	5,643	4,989	.....	.....
Dakota	Lakota		Oil / Gas/ Water / UIC	5,684	5,015	4,664	5,245
	Morrison		Possible Oil / Gas	5,753	5,084	4,717	.....
	Sundance		Possible Oil / Gas	.....	.....	.....	.....
	Chugwater		Possible Oil / Gas	.....	.....	.....	.....

Annotated Type Log for 057-06226: COGCC Document Number 2056242

..... Stippled cells indicate that the respective formation top was not apparent on logs or logs were not available.
 Graneros log tops have not been reported by operators in this field.

* COGCC log picks

** "Stray" water sand shown on drilling completion report (appears to be Pierre B). Pierre A and Pierre B log tops have not been reported by operators in this field.

WATER RESOURCE ISOLATION

Coalmont, "Stray" water sand in Pierre shale (appears to be Pierre B), Frontier, Muddy, and Morrison; water also noted in Dakota and Lakota in non-productive areas or "watered-out" areas. The deepest water well in the vicinity of the field is 245' (likely screened in the Coalmont Formation)

PRODUCING ZONE ISOLATION

Primary Objectives: Dakota and Lakota
 Secondary Objective: Frontier

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UNDERGROUND INJECTION CONTROL

API Number	Well Name and Number	Type	Zone	Sample Top	Sample Bottom	TDS	Source
057-05127	Dwinell #2	Disposal	Dakota	4,821	4,841	N/A	perf interval shown (no sample)
057-05129	Dwinell #1	Disposal	Dakota - Lakota	4,562	4,651	N/A	perf interval shown (no sample)
057-05132	Cody #3	Disposal (P&A)	Dakota - Lakota	4,792	4,915	N/A	perf interval shown (no sample)
057-06441	Rooke 9-79 #25-1	Source	Coalmont	3,380	3,573	13,197	Well - 8/3/2005
057-06226	Dwinell #3A	Source	Frontier	3,850	3,890	34,929	Well - 6/17/2003
057-05136	Cody #2	Source	Dakota	4,968	4,976	522	Well - 6/17/2003
057-05131	Dwinell #3	Source	Lakota	4,656	4,662	1,086	Well - 6/17/2003

Aquifer Exemptions: Dakota Formation and Lakota Formation

List sorted first by well type (disposal then source) and second by zone (shallow to deep).

Calculated fracture gradients of 0.72 psi/foot and 0.70 psi/foot were presented for the Dwinell #1 and Cody #3 wells in the June 29, 1973 hearing application for water disposal into the Dakota and Lakota formations. The application stated that surface pressure would not exceed 1,000 psi. Dwinell #2: approved for injection into the Dakota formation (Lakota completion was plugged back) on 11/28/2006 with a fracture gradient of 0.82 psi/foot and a maximum permitted injection pressure of 1,850 psi (equivalent to a fracture gradient of 0.82 psi/foot). Dwinell #1: Subsequent reports in COGCC's UIC file showed a maximum permitted injection pressures of 1,750 psi, prior to an approved increase to 2,200 psi. The listed maximum injection pressure was 2,200 psi in COGCC's UIC file on 10/17/2016 (equivalent to a fracture gradient of 0.92 psi/foot). Cody #3: UIC reports not available in COGCC's file. Cody #3 was plugged and abandoned on 10/23/2004.

COMMISSION ORDER SUMMARY (Significant Engineering and Spacing Issues)

141-1 (4/26/1960)	Dakota and Lakota Formations: Allowed exceptions to drilling setbacks to other wells based on geologic testimony regarding proximity to a fault.
141-2 (10/19/1987)	Dakota and Lakota Formations: Allowed exceptions to drilling setbacks to other wells based on geologic testimony regarding proximity to a fault.

HISTORIC WELL CONSTRUCTION

Surface casing setting depths are typically about 300'-400'. Production casing generally terminates in the Morrison Formation. Production casing cement may be limited to coverage of the producing intervals, and coverage may be lacking across portions of the Niobrara, Pierre, and Coalmont formations.

NEW WELL CONSTRUCTION (effective as conditions of approval on drilling permits for wells in the North Park Basin as of 2013)

Surface casing must be set 50' below the Pierre Formation top to cover water resources in the Coalmont Formation or a minimum 1150' if Pierre Shale top is deeper than 1100'. Full cement coverage of productive formations, the Frontier Formation, the Niobrara Formation, and possible water sands in the Pierre Formation. Permit conditions of approval require cementing to 200' above the surface casing shoe.

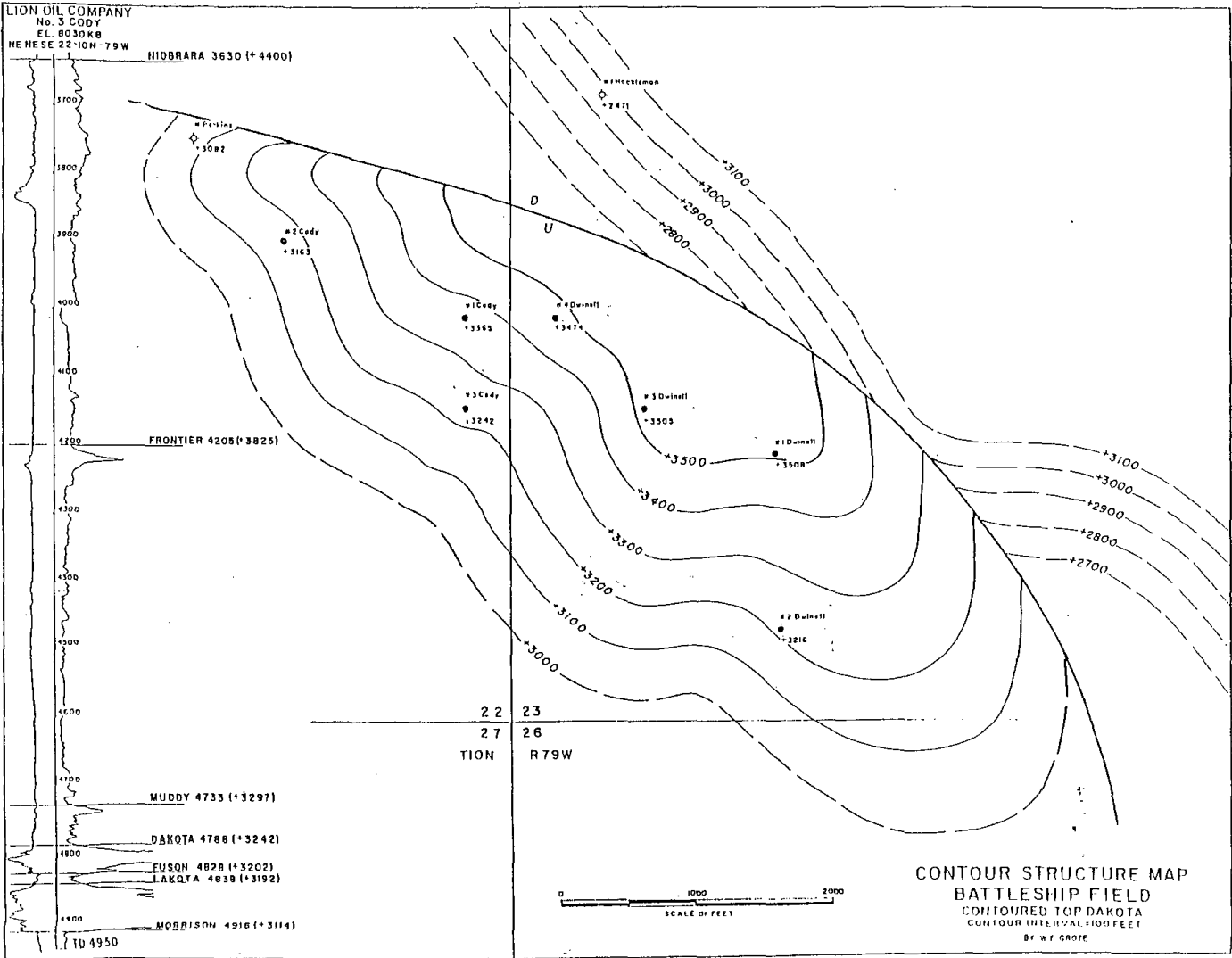
PLUGGING OBJECTIVES

Plug(s) across the following formation tops: Dakota (above Dakota top and across Muddy), Frontier, Niobrara, and Pierre; surface casing shoe plug and surface plug.

NOTES

In October 2016, BLM staff informed COGCC staff that five (5) producing wells and two (2) UIC wells in this field had an approximate production of 10 bopd and 1,500 bwpd with UIC wells injecting at pressures of 1,500 psi and 2,000 psi. The BLM-observed injection pressures were less than the maximum approved injection pressures, as stated above.

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NORTH AND MIDDLE PARKS BASIN, COLORADO



Stratigraphy of the Battleship Field

SYSTEM	FORMATION	THICKNESS	DESCRIPTION
Tertiary	POTABLE WATER 200 → 300' (Coalmont Fm. ○)	200- 850'	<u>COALMONT FORMATION</u> ARKOSIC SANDSTONE, CONGLOMERATE, and CONGLOMERATIC SANDSTONE, brown, grey, and grey-green; sandy CLAYSTONE or MUDSTONE, and locally, silty to micaceous carbonaceous SHALE and thin COAL beds or streaks; volcanic rock PEBBLE CONGLOMERATE in lower part. Fluvial, lacustrine, and paludal.
	Pierre Sh. *	3,000'	<u>PIERRE SHALE</u> Upper Part: SANDSTONE, fine to very fine grained, calcareous, light to medium grey, glauconitic, interbedded with SILTSTONE and SHALE and thin COAL beds. Lower Part: SHALE, medium to dark grey, fissile, micaceous, slightly calcareous near base becoming silty to sandy near top. Marine. <u>NIORARA FORMATION (SMOKY HILL MEMBER)</u> SHALE, grey-brown, white speckled, calcareous, fissile, interbedded with thin SHALY LIMESTONE in upper part. Marine. <u>NIORARA FORMATION (FT. HAYS MEMBER)</u> As above, with thin bentonite streaks, grey to brownish grey LIMESTONE at base. Marine. <u>CARLILE SHALE</u> SHALE, dark grey to black, white speckled, calcareous, thin COAL beds. <u>FRONTIER SANDSTONE</u> Upper Part: SANDSTONE, grey to brown, fine to very fine, slightly calcareous, silty, glauconitic, argillaceous, grades laterally into sandy SHALE. Near-shore marine. Lower Part: SHALE, dark grey to black, slightly calcareous with thin brown sandy LIMESTONE beds, fossiliferous. <u>GRANEROS SHALE</u> SHALE, dark grey to black, with some thin bentonite beds. Bathyl. <u>MOWRY SHALE</u> SHALE, medium grey to black, slight silvery sheen, siliceous, occasional fish scales, thin bentonite interbeds. Marine. <u>MUDDY SANDSTONE</u> SANDSTONE, light grey to tan, medium grained grading to SILTSTONE, slightly salt & pepper, siliceous to friable. <u>THERMOPOLIS (SAND CREEK) SHALE</u> at base makes up over half of the indicated thickness. Transgressive marine.
Cretaceous	Niobrara Fm. *	380'	<u>DAKOTA SANDSTONE</u> SANDSTONE, light grey to tan, very fine to coarse, angular unfrosted grains ("sparkly"), well-cemented to friable. Near-shore marine to lagoonal. Variegated <u>FUSON SHALE</u> at base varies in thickness at the expense of the adjacent sandstones. Regressive marine-continental.
	Smoky Hill Mbr. Ft. Hays Mbr.		
	Carlile Sh.	210'	SANDSTONE, light grey to tan, very fine to coarse, angular unfrosted grains, well-cemented to friable. Near-shore marine to lagoonal. Variegated FUSON SHALE at base varies in thickness at the expense of the adjacent sandstones. Regressive marine-continental.
	Frontier Ss. *	230'	<u>MORRISON FORMATION</u> Variegated SHALES & SILTSTONES, thin greyish-brown LIMESTONE in upper part, white to grey to buff SANDSTONE in lower part. Floodplain and paludal.
	Graneros Sh.	210'	<u>SUNDANCE FORMATION / ENTRADA SANDSTONE</u> SANDSTONE, light grey to greyish-green, very fine to medium grained, calcareous, glauconitic, frosted grains, occasional greenish-grey SHALE laminations. Near-shore marine.
	Mowry Sh.	125'	<u>CHUGWATER FORMATION</u> SHALE, brownish-red to orange-red, dolomitic to calcareous; interbedded with SILTSTONE and fine SANDSTONE, upper part is orange-pink SANDSTONE sometimes termed <u>JELM FORMATION</u> . The Permian <u>FORELLE FORMATION</u> , a variegated LIMESTONE, may be present at the base of the Chugwater.
	Muddy Ss. *	70'	
	Dakota Fm. *	60'	
Jurassic	Morrison Fm. *	370'	<u>PRECAMBRIAN</u> GNEISSES with intrusive QUARTZ MONZONITE.
	Sundance/Entrada *	185'	
Triassic	Chugwater Fm. ○	500'	FORMATIONS WHICH PRODUCE OIL & GAS IN NORTH PARK BASIN: * Oil and Gas ○ Show of Oil br Gas