COGCC OIL AND GAS FIELD SCOUT CARD

Date	04/18/2016
Document No.	2056127

FIELD NAME	**MAMM CREEK**
FIELD NUMBER	**52500**

LOCATION

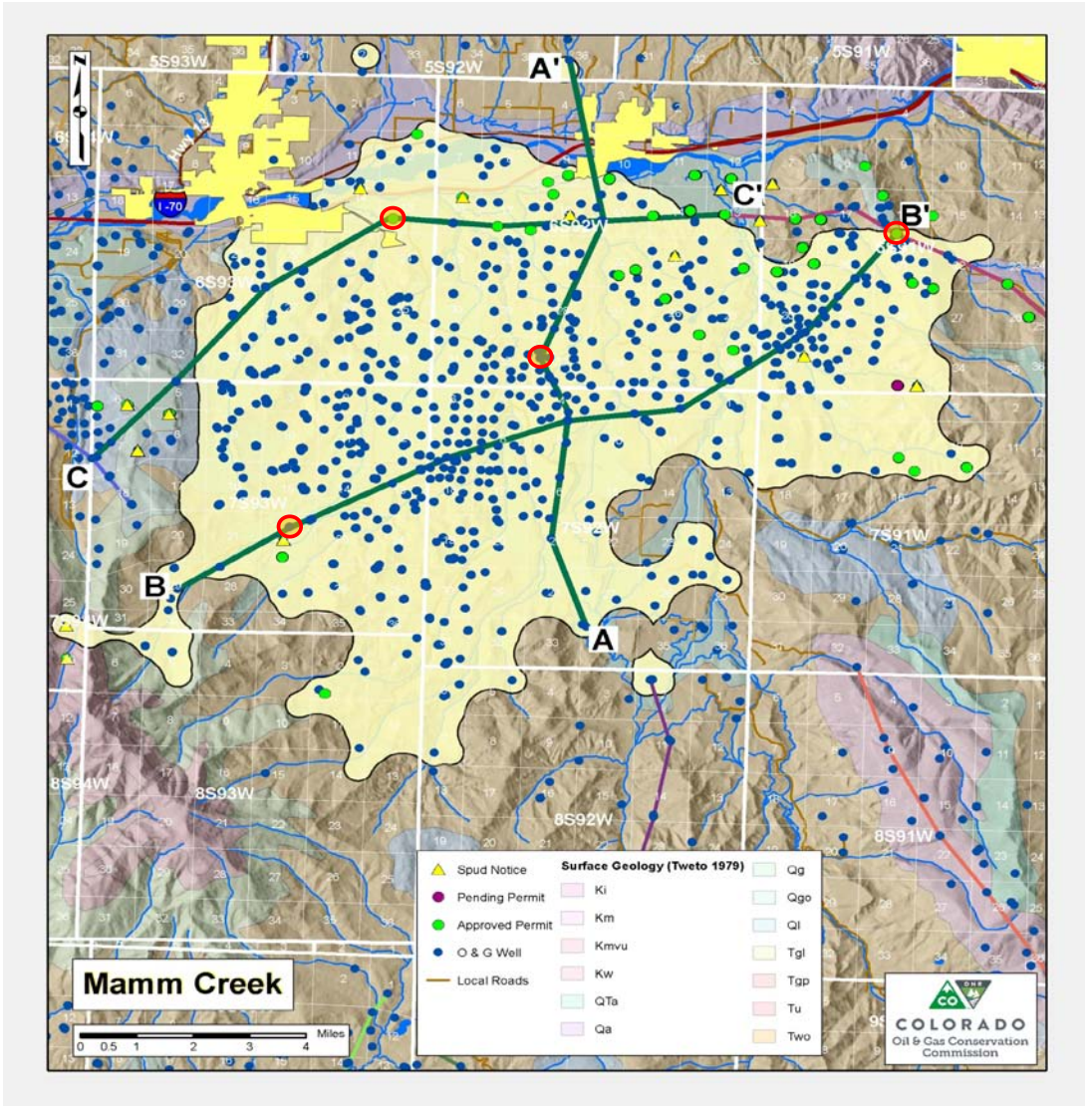
Basin	Piceance
Township(s)	5S to 8S
Range(s)	91W to 93W

SURFACE GEOLOGY

The Wasatch Formation outcrops at surface throughout most of the field. The Colorado River generally flows from east to west along the northern fringe of the field. Most of the field is south of the Colorado River. Alluvium is prevalent along the Colorado River and tributary creeks. Landslide deposits are present in the western portion of the field along Ramsey Gulch (primarily in 7S93W). The Green River Formation is present, overlying the Wasatch Formation, in the extreme southwestern portion of the field at higher elevations, approaching the eastern end of Battlement Mesa.

GEOLOGIC STRUCTURE

The northwestern extension of a northwest - southeast trending anticline is present on COGCC's 250K GIS Geology layer in the southeast portion of the field (7S92W) . A northwest-southeast trending, southwesterly-dipping monocline (the Grand Hogback Monocline along the northeastern edge of the basin) is present within three miles of the extreme northeastern portion of the field (bordering Kokopelli Field) and the extreme northern portion of the field (locally known as Peach Valley).



Type Log Wells

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				A - North						A' - South
STRATIGRAPHY			**API Number =>**	**045-19924**	**045-14368**	**045-07254**	**045-07149**	**045-13428**	**045-06844**	**045-06723**
			Surface Elevation =>	**5,650**	**5,519**	**5,742**	**6,069**	**6,358**	**6,290**	**6,551**
All depths are measured depths			**Well Type =>**	**Directional**	**Directional**	**Vertical**	**Vertical**	**Directional**	**Vertical**	**Vertical**
Group	**Formation**	**Interval/Member**	**Isolation Concern**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**
	Alluvium		Water			0			0	0
	Landslide Deposit		Water							
	Uinta		Water							
	Green River		Water							
	Wasatch	Upper	Shallow Water	0	0		0	0		
	Wasatch	G-Sand*	Possible Gas	1,074/1,192*	922/1,018*					
	Wasatch	Fort Union*	None	1,560*	1,452*					
	Wasatch	Middle	UIC							
	Wasatch	Lower*	Water / UIC	3,448*	3,346*	2,168*	1,920*	2,060*	1,629*	2,262*
Mesaverde	Williams Fork	Ohio Creek	Water / UIC	3,642*	3,498*	2,525*	2,190*	2,258*	1,890*	2,490*
Mesaverde	Williams Fork	U. Mesaverde	Water / UIC	4,022	3,758*	2,875*	2,540*	2,570*	2,330	2,730*
Mesaverde	Williams Fork	Top of Gas	Gas		5,587	4,570		4,320		
Mesaverde	Williams Fork	Cameo	Gas	6,594	6,400					
Mesaverde	Iles	Rollins	Gas / UIC	7,738	7,402					5,994*
Mesaverde	Iles	Cozzette	Gas / UIC		7,959					6,596*
Mesaverde	Iles	Corcoran	Gas / UIC		8,189					6,810*
	Mancos		Possible Gas		8,404					7,260*
	Niobrara		Possible Gas		11,757					10,404
	Frontier		Possible Gas		12,038*					11,555*
	Mowry		Possible Gas		13,026					11,622*
Dakota	Dakota		Possible Gas							11,890*
	Morrison		Possible Gas							12,118*
San Rafael	Curtis		None							12,548*
San Rafael	Entrada		Possible Gas							12,630*
	Chinle		None							12,760*
	Weber		Possible Gas							12,958*
	Maroon		None							12,968*
	Leadville		Possible Gas							17,800

Annotated Type Log for 045-07254: COGCC Document Number 2056191

Stippled cells indicate that the respective log top was not apparent on logs or the top may be covered by a shallower casing string above the logged interval. "Middle Wasatch" is an interval that may include multiple formation members, and therefore, log tops are not presented for the Middle Wasatch.

** COGCC log picks (Wasatch G-Sand [top of upper and lower intervals] and Fort Union are not commonly recognized by operators in this field; "Lower" Wasatch, as shown herein for water isolation, is not recognized in geologic literature)*

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				B - Southwest							B' - Northeast
STRATIGRAPHY			**API Number =>**	**045-15910**	**045-06899**	**045-07040**	**045-06907**	**045-09306****	**045-10341**	**045-07152**	**045-14576**
			Surface Elevation =>	**7,676**	**6,889**	**6,165**	**6,103**	**6,160**	**5,911**	**5,978**	**6,792**
All depths are measured depths			**Well Type =>**	**Directional**	**Vertical**	**Vertical**	**Vertical**	**Vertical**	**Directional**	**Vertical**	**Directional**
Group	**Formation**	**Member**	**Isolation Concern**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**
	Alluvium		Water		0	0			0		0
	Landslide Deposit		Water								
	Uinta		Water								
	Green River		Water								
	Wasatch		Shallow Water	0			0	0		0	
	Wasatch	G-Sand*	Possible Gas	3,758/3928*	2,630/2820*	820/1,003*		194/278*	784/878*	780/860*	1,120/1,262*
	Wasatch	Fort Union*	None	4,276	3,154*	1,307*		736*	1,373*	1,352*	1,650*
	Wasatch	Middle	UIC								
	Wasatch	Lower*	Water / UIC	5,610*	4,800*	2,660*	1,910*	2,094*	2,754*	2,730*	3,356*
Mesaverde	Williams Fork	Ohio Creek	Water / UIC	5,895*	5,070*	3,038*	2,330*	2,325*	3,095*	3,040*	3,543*
Mesaverde	Williams Fork	U. Mesaverde	Water / UIC	6,389	5,266*	3,302*	2,522*	2,652*	3,386	3,400*	3,914*
Mesaverde	Williams Fork	Top of Gas	Gas	7,546					4,535 tog***	4,134	
Mesaverde	Williams Fork	Cameo	Gas		7,962	6,802	6,088				
Mesaverde	Iles	Rollins	Gas / UIC	9,838	8,580	6,930		6,299	6,971		7,497
Mesaverde	Iles	Cozzette	Gas / UIC	10,370							8,047
Mesaverde	Iles	Corcoran	Gas / UIC	10,582							8,242
	Mancos		Possible Gas								
	Niobrara		Possible Gas								

Annotated Type Log for 045-06899: COGCC Document Number 2056128
Annotated Type Log for 045-14576: COGCC Document Number 2056080 (Kokopelli Field)

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** COGCC log picks (Wasatch G-Sand [top of upper and lower intervals] and Fort Union are not commonly recognized by operators in this field; "Lower" Wasatch, as shown herein for water isolation, is not recognized in geologic literature)*

** Schwartz 2-15B (O2) - well associated with West Divide Creek seep.

**** Top of Gas (tog), as reported by operator or top Williams Fork production perforation (tp)*

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				Rulison Field		Mamm Creek Field				Kokopelli Field
				C - West						C' - East
STRATIGRAPHY			**API Number =>**	**045-18422**	**045-18259**	**045-09997**	**045-15178**	**045-14190**	**045-14368**	**045-18168**
			Surface Elevation =>	**7,357**	**7,602**	**6,313**	**5,492**	**5,665**	**5,519**	**5,650**
All depths are measured depths			**Well Type =>**	**Directional**	**Directional**	**Directional**	**Directional**	**Directional**	**Directional**	**Directional**
Group	**Formation**	**Interval/Member**	**Isolation Concern**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**	**Log Top**
	Alluvium		Water		0	0	0			0
	Landslide Deposit		Water	0						
	Uinta		Water							
	Green River		Water							
	Wasatch	Upper	Shallow Water					0	0	
	Wasatch	G-Sand*	Possible Gas (limited area	3,308/3,410*	3,667/3,777*	2,218/2,312*	1,326/1,424*	1,060/1,173*	922/1,018*	753/862*
	Wasatch	Fort Union*	None	3,820*	4,160*	2,694*	1,820*	1,530*	1,452*	1,256*
	Wasatch	Middle	UIC							
	Wasatch	Lower*	Water / UIC	5,390*	5,960*	4,492*	3,475*	3,340*	3,346*	3,132*
Mesaverde	Williams Fork	Ohio Creek	Water / UIC	5,510*	6,218*	4,800*	3,747*	3,618*	3,498*	3,330*
Mesaverde	Williams Fork	U. Mesaverde	Water / UIC	5,783*	6,550	5,118*	4,063	3,892	3,758*	3,600*
Mesaverde	Williams Fork	Top of Gas	Gas		8,158 tp**		5,930	5,887	5,587	
Mesaverde	Williams Fork	Cameo	Gas	8,476	9,470		6,686	6,617	6,400	6,216
Mesaverde	Iles	Rollins	Gas / UIC	9,352	10,318		7,753	7,604	7,402	7,221
Mesaverde	Iles	Cozzette	Gas / UIC				8,287	8,176	7,959	
Mesaverde	Iles	Corcoran	Gas / UIC				8,551	8,426	8,189	
	Mancos		Possible Gas						8,404	
	Niobrara		Possible Gas						11,757	
	Frontier		Possible Gas						12,038*	
	Mowry		Possible Gas						13,026	
Dakota	Dakota		Possible Gas							

Annotated Type Log for 045-15178: COGCC Document Number 2056192

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** COGCC log picks (Wasatch G-Sand [top of upper and lower intervals] and Fort Union are not commonly recognized by operators in this field; "Lower" Wasatch, as shown herein for water isolation, is not recognized in geologic literature)*

*** Top of Gas (tog), as reported by operator or top Williams Fork production perforation (tp)*

WATER RESOURCE ISOLATION

Alluvium, landslide deposits, Uinta, Green River, Upper Wasatch (weathered portion in which water supply wells are screened), Lower Wasatch, Ohio Creek, and Upper Mesaverde.
Water wells are typically screened in alluvium or upper, weathered portions of the Wasatch Formation. Two water wells north of the Colorado River are 620' and 750' deep, but otherwise, all permitted water wells within the field have total depths of 600' or shallower.

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PRODUCING ZONE ISOLATION

Primary Objectives: Mesaverde Group (Williams Fork and Iles)

Secondary Objectives: Eight wells completed in the Wasatch Formation (production reported in two wells and one other well was tested then squeezed with cement, some other completions for UIC); two wells completed in the Sego Member of the Iles Formation (045-10599 and 045-18869); seven wells completed in the Mancos Formation; and one well completed in the Leadville Formation (045-06723).

UNDERGROUND INJECTION CONTROL

API Number	Well Name and No.	Type	Zone	Sample Top	Sample Bot.	TDS	Source
045-09403	HMU #14-8 (P11SW)	Disposal Fm	Wasatch[1]	N/A	N/A	8,200	WH - 6/9/2009
045-10146	MCU Disposal #3	Disposal Fm	Wasatch[1]	N/A	N/A	8,200	WH - 6/9/2009
045-10123	MCU Fed. Disp #2	Disposal	Wasatch	4,562	5,198	8,200	WH - 6/9/2009
045-11225	MCU Disposal #1	Disposal	Wasatch	4,108	4,962	27,000	LOG CALC - OGCC
045-07463	BJM Disposal #1	Disposal	Ohio Creek	N/A	N/A	4,350	White River Field UIC Facility ID 159065[2]
045-08973	Buerger Disposal #1	Disposal Test	Ohio Creek[3]	2,324	3,096	3,300	WH - 10/28/2010
045-19732	Maves #A1	Source	Williams Fork - Rollins	3,208	5,493	11,367	WH - 11/23/2010
045-06868	Daley #1	Source	Williams Fork	4,076	5,470	5,320	WH - 6/13/2005
045-06928	Broome #1	Source	Williams Fork	4,223	6,434	5,587	WH - 6/13/2005
045-10344	GGU Broome #34C-30-691	Source	Williams Fork	4,400	6,952	9,397	WH - 4/10/2006
045-10343	GGU Broome #44A-30-691	Source	Williams Fork - Rollins	4,442	7,028	10,559	WH - 4/10/2006
045-06819	Duane Scott #1	Source	Williams Fork	4,522	6,354	10,172	WH - 4/13/2006
045-08971	Buerger #16-14C (C21)	Disposal Fm	Williams Fork[4]	4,617	5,070	18,180	WH - 6/7/2003
045-13482	GGU Miller #11B-32-691	Source	Williams Fork	4,715	6,729	18,409	WH - 9/30/2005
045-13482	GGU Miller #11B-32-691	Source	Williams Fork	4,715	6,729	7,936	WH - 4/10/2006
045-10451	GGU Daley #11C-29-691	Source	Williams Fork	4,754	6,646	7,418	WH - 4/13/2006
045-13484	GGU Miller #11D-32-691	Source	Williams Fork	4,809	6,822	10,228	WH - 4/10/2006
045-09003	Buerger Disposal #2	Disposal Test	Williams Fork	4,832	5,324	16,422	FLOW - 6/7/2003
045-13499	Scott #34C-25-692	Source	Williams Fork - Rollins	4,867	7,026	9,728	WH - 4/13/2006
045-19582	GGU Daley #14A-19-691	Source	Williams Fork - Rollins	4,949	7,335	11,944	WH - 4/13/2006
045-13498	Scott #24B-25-692	Source	Williams Fork	5,000	6,727	5,415	WH - 7/8/2005
045-13498	Scott #24B-25-692	Source	Williams Fork	5,000	6,727	9,622	WH - 4/13/2006
045-10616	GGU Barge #12D-32-691	Source	Williams Fork	5,016	7,186	9,958	WH - 4/10/2006

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UNDERGROUND INJECTION CONTROL

API Number	Well Name and No.	Type	Zone	Sample Top	Sample Bot.	TDS	Source
045-10339	GGU VanOrdstrand #33A-30-691	Source	Williams Fork	5,020	6,610	18,380	WH - 4/13/2006
045-19728	Fenno Ranch #A1	Source	Williams Fork - Rollins	5,045	6,628	10,201	WH - 11/23/2010
045-10341	GGU Broome #43A-30-691	Source	Williams Fork - Rollins	5,090	7,057	12,413	WH - 4/10/2006
045-10543	GGU Barge #12B-32-691	Source	Williams Fork	5,129	6,699	10,189	WH - 4/10/2006
045-10347	GGU VanOrdstrand #43C-30-691	Source	Williams Fork - Rollins	5,156	7,100	10,415	WH - 4/13/2006
045-10524	Ferguson 34D-27-692	Source	Williams Fork	5,268	6,675	13,036	WH - 4/13/2006
045-10522	Ferguson 44D-27-692	Source	Williams Fork	5,292	6,751	10,524	WH - 4/13/2006
045-10425	GGU Miller #13A-32-691	Source	Williams Fork	5,334	6,974	8,475	WH - 4/10/2006
045-06053	Benzel Disposal #1	Disposal	Williams Fork[5]	5,406	6,680	12,772	FLOW - 10/18/1974
045-10342	GGU Broome #44C-30-691	Source	Williams Fork	5,420	6,568	14,404	WH - 4/10/2006
045-19816	CSF #32C-09-07-91	Source	Williams Fork - Rollins	5,461	7,780	12,674	SEP - 2/1/2011
045-10393	Scott #24D-25-692	Source	Williams Fork - Rollins	5,516	7,270	14,937	WH - 4/13/2006
045-13751	O'Toole #A4	Source	Williams Fork - Iles	5,559	8,457	46,968	SEP - 1/7/2009
045-14516	Burckle #A11	Source	Williams Fork - Iles	5,673	8,547	32,940	SEP - 12/10/2008
045-12161	Valley Farms #C2	Source	Williams Fork - Iles	5,674	8,245	21,559	SEP - 12/8/2008
045-12055	Valley Farms #B6	Source	Williams Fork - Iles	5,780	8,698	29,391	SEP - 12/8/2008
045-10335	GGU VanOrdstrand #33C-30-691	Source	Williams Fork - Iles	5,870	7,836	17,645	WH - 4/13/2006
045-12189	Hangs #B1	Source	Williams Fork - Iles	5,909	8,926	47,143	SEP - 12/10/2008
045-15168	Norcross #A14	Source	Williams Fork - Iles	5,912	8,565	40,445	SEP - 12/8/2008
045-14673	Robinson #C13	Source	Williams Fork - Iles	5,970	8,755	29,336	SEP - 12/10/2008
045-13935	Robinson #A3	Source	Williams Fork - Iles	6,012	8,648	37,368	SEP - 12/9/2008
045-13629	Dever #A10	Source	Williams Fork - Iles	6,100	8,702	30,828	SEP - 12/8/2008
045-19905	Three Siblings #A1	Source	Williams Fork	6,124	6,930	11,667	WH - 11/23/2010
045-10849	River Ranch #A1	Source	Williams Fork - Iles	6,156	8,678	36,371	SEP - 12/9/2008
045-10851	River Ranch #B2	Source	Williams Fork - Iles	6,195	8,701	39,238	SEP - 12/9/2008
045-19723	CSF #34D-10-07-91	Source	Williams Fork	6,279	7,784	9,263	SEP - 2/1/2011
045-12293	North Bank #B2	Source	Williams Fork - Iles	6,305	8,919	47,434	SEP - 12/11/2008
045-16043	Gypsum Ranch #B13	Source	Williams Fork - Iles	6,306	9,038	35,684	SEP - 12/8/2008
045-10850	Island Park #B3	Source	Williams Fork	6,359	7,588	21,881	SEP - 12/8/2008
045-13222	Valley Farms #E10	Source	Williams Fork - Iles	6,444	8,294	34,476	SEP - 12/11/2008
045-17068	McPherson #A2	Source	Williams Fork - Iles	6,525	8,444	29,561	WH - 12/3/2008
045-16012	Valley Farms Fed. #F14	Disposal/Source	Williams Fork - Iles[6]	6,536	8,520	42,358	SEP - 12/11/2008

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UNDERGROUND INJECTION CONTROL

API Number	Well Name and No.	Type	Zone	Sample Top	Sample Bot.	TDS	Source
045-19724	CSF #43D-10-07-91	Source	Williams Fork - Rollins	6,595	8,321	9,307	SEP - 2/1/2011
045-10901	Snyder #C1	Source	Williams Fork	6,596	7,924	23,985	SEP - 12/8/2008
045-15131	Weinreis #A2	Source	Williams Fork - Iles	6,599	8,684	38,668	SEP - 12/10/2008
045-13927	Gentry #E1	Source	Williams Fork - Iles	6,640	8,482	38,111	SEP - 12/9/2008
045-14666	Robinson #C5	Source	Williams Fork - Iles	6,672	8,671	34,607	SEP - 1/7/2009
045-12337	Hangs #A2	Source	Williams Fork - Iles	6,689	8,510	37,553	SEP - 12/10/2008
045-13752	O'Toole #A3	Source	Williams Fork - Iles	6,795	8,522	34,924	SEP - 12/11/2008
045-12398	Snyder #A10	Source	Williams Fork - Iles	6,811	8,800	34,617	SEP - 12/8/2008
045-14941	Dever #C3	Source	Williams Fork - Iles	6,862	8,818	84,210	SEP - 12/9/2008
045-14109	Valley Farms #D13	Source	Williams Fork - Iles	6,866	8,644	35,138	SEP - 12/11/2008
045-15297	Gentry #C10	Source	Williams Fork - Iles	6,938	8,816	27,003	SEP - 12/10/2008
045-14188	Gentry #B10	Source	Williams Fork - Iles	6,987	8,717	27,557	SEP - 12/9/2008
045-14512	Gypsum Ranch #A4	Source	Williams Fork - Iles	7,031	9,098	31,329	SEP - 12/8/2008
045-08134	Brynildson #14C-20-692	Disposal Fm	Rollins[7]	7,914	8,070	23,648	WH - 1/11/2005
045-13222	Valley Farms #E10	Disposal Fm	Cozzette[8]	7,962	8,046	12,398	SWAB - 5/26/2009
045-12082	Valley Farms #D3	Disposal/Source	Cozzette - Corcoran	8,065	8,407	50,186	SEP - 12/11/2008
045-13803	GGU Rodreick #21B-31-691 SWD	Disposal	Cozzette - Corcoran	7,435	7,725	15,000	Estimate
045-05064	Schaeffer Disposal #1	Disposal	Cozzette - Corcoran	8,200	8,626	19,308	SWAB - 7/3/2005
045-09501	Benzel Disp. #2 (J26NWB)	Disposal	Cozzette - Corcoran	8,338	8,744	15,656	WH - 8/23/2005
045-11169	Scott #41D-36-692 SWD	Disposal/Source	Corcoran[9]	7,838	7,928	13,183	SWAB - 4/20/2006
045-13222	Valley Farms #E10	Disposal Fm	Corcoran[8]	8,190	8,294	13,871	SWAB - 4/29/2009
045-16241	River Ranch #C9	Source	Mancos	8,921	11,405	38,443	SEP - 12/9/2008
045-13614	North Bank #C10	Source	Mancos	9,825	11,972	32,070	SEP - 12/11/2008
045-14368	Dixon #B8	Source	Mancos	11,575	13,321	50,202	SEP - 12/10/2008

Aquifer Exemptions: BJM Disposal #1 (Ohio Creek) [data may not be representative of actual Ohio Creek Formation concentration] and MCU Federal Disposal #2 (Atwell Gulch Member of Wasatch) [tops reported as 3298' Molina Member, 3509' G-Sand interval, and 3764' Atwell Gulch Member of Wasatch]

Data in this table is listed first by zone from shallowest to deepest, then by Sample Top depth.

(1) Sample appears to have been collected from offset well 045-10123 on 6/9/2009 with a P11SW sample name. The Wasatch Formation was not completed in 045-09403 and 045-10146 until 5/25/2013 and 6/7/2012, respectively.

(2) At the time of the UIC Application, the sample was considered representative of the Ohio Creek Formation. The sample was collected from a well in the White River Dome Field, Rio Blanco County, approximately 54 miles NW of 045-07463. COGCC staff's opinion in 2016 is that this TDS concentration cannot be considered representative of Ohio Creek water quality in the Mamm Creek Field.

(3) Designated the Ohio Creek Formation by the operator, but in 2016 COGCC staff contends that this interval is entirely Upper Mesaverde.

(4) Perfs added from 4,260' to 4,429' on 6/9/2003 after collecting this sample. This sample was a representative formation sample for the Buerger #2 (045-09003) UIC application.

(5) Sample collected from the Williams Fork gas producing zone prior to recompleting the well for injection into the Cozzette - Corcoran.

(6) This sample was a representative formation sample for the Valley Farms #F4 (045-14287) UIC application.

(7) This sample was a representative formation sample for the Scott #41D-36-692 SWD (045-11169) UIC application.

(8) This sample was a representative formation sample for the Valley Farms #D3 (045-12082) UIC application.

(9) This sample was a representative formation sample for the Circle B Land #33A-35-692 SWD (045-18493) and Specialty #13A-28-692 SWD (045-14054) UIC applications.

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COMMISSION ORDER SUMMARY (Significant Engineering and Spacing Issues)

191-1 (12/14/1965)	Mesaverde: Recognizes the Mesaverde as a **Common Source** of supply. Established 640-acre drilling and spacing units Order specifies minimum 350' surface casing with size and weight of casing approved by COGCC. Requires sufficient cement be used to fill the annular space behind the pipe to the surface.
191-2 (5/18/1981)	Rescinds 191-1 and makes lands subject to the general rules and regulations.
191-3 (7/19/1982)	Mesaverde: Established 640-acre drilling and spacing units, 990' from unit boundary. Recognizes the Cozzette and Corcoran to be part of the Upper Mancos formation as a **Common Source** of supply with the Mesaverde.
191-4 (2/22/1994)	Expand areas of 640-acre drilling and spacing.
191-5 (10/20/1997)	Mesaverde including Williams Fork: decreased spacing unit size to 40 acres, 400' from unit line, 800' well-to-well in one section (16 wells per 640 acres).
1V-276 (8/16/2004)	West Divide Creek Seep Order Finding Violation: Moratorium on drilling within 2 miles of the Divide Creek Seep until the appropriate safety precautions are set forth in the Notice to All Operators Drilling Wells to the Mesaverde Group or Deeper in the Mamm Creek Field, Garfield County, effective July 23, 2004 (Cementing NTO); penalty assigned to EnCana Oil & Gas (USA) Inc. for the Schwartz 2-15B well.
Various	Williams Fork and Iles: established 640, 320, 160, and 80-acre drilling and spacing units in certain parts of the field with 10 acre well density (no more than 4 wells on one pad per quarter quarter section, to be drilled vertically or directionally), 100' from boundary lines or 200' (Williams Fork) / 400' (Iles) from boundaries if offset wells are not 10-acre spaced.
191-12 (7/11/2005)	Allows drilling by BBC in a portion of the Order 1V-276 moratorium area. Requires compliance with 2004 Cementing NTO, Bradenhead Testing and Reporting Requirements for the Mamm Creek Field (Aug 23, 2004), BBC's Ground Water and Methane Monitoring Plan, walking surveys within 1/2 mile of drill site, surface water samples prior to drilling and after completion, monthly monitoring of surface water during drilling, and defines sampling analytes. Requires gas compositional and stable isotope analysis if methane detected at > 2 mg/L. Requires compliance with BBC's Additional Subsurface Data Collection Plan (including Wasatch gas sample collection during drilling surface hole, if practibable). Requires compliance with BBC's Mamm Creek Field Operations Plan dated Dec 2004 and concerns and conditions expressed in the July 4, 2005 correspondence from Garfield County's consultant, Dr. Geoffrey Thyne. Sample results were to be submitted to to augment hydrogeologic study.
191-22 (9/20/2004)	Established Bradenhead Monitoring Area, including the Mamm Creek Field.
191-23 (4/24/2006)	Eliminated the Order 1V-276 drilling moratorium area within 2 miles of Divide Creek Seep. Operators drilling in the area are required to comply with the Cementing NTO.
Various	Mancos Group: established various drilling and spacing units with 10 acre well density (no more than 4 wells on one pad per quarter quarter section) for the Mancos Group, including the Mancos, Niobrara, and Mowry Formations, 100' from boundary lines or 400' from boundaries if offset wells are not 10-acre spaced.
Various	Williams Fork: Established horizontal wellbore spacing units

HISTORIC WELL CONSTRUCTION

Historic surface casing setting depths vary throughout the field as a function of age of the well and ground surface elevation. Old wells drilled during early development of the field commonly have surface casing setting depths ranging from 200' to 500' deep. Effective 11/20/1997, the minimum surface casing setting depth standard was changed to 10% TVD for all Williams Fork gas wells drilled in Garfield County, which includes this entire field. Effective 2/9/2007, the minimum surface casing setting depth was increased to 15% TVD for wells drilled in the East Mamm Creek Area. Surface casing setting depths for newer wells are generally set between 1,000' to 3,000', but deeper surface casing (3,000' to 4,000') has been used in isolated areas of the field. Production casing generally terminates in the Iles Formation or the underlying Mancos Formation. Production casing cement (or intermediate casing cement, if used) may be limited to coverage of the producing intervals, and coverage may be lacking across parts of the Mesaverde Group and Wasatch Formation.

NEW WELL CONSTRUCTION (effective 04/18/2016)

Minimum surface casing of 10% TVD (or 15% TVD in the East Mamm Creek Area) for well control and to cover water resources in the upper interval of the Wasatch Formation. Recommend setting depth of at least 50 feet below the Wasatch Formation top for high-elevation wells that must drill through the Green River Formation, if that criterion is more stringent than the 10% TVD criterion. Check for deep alluvium on offset logs with wells drilled near the Colorado River, but a cursory review of wells with shallow surface casing of 300' to 400' near the river showed that minimum surface casing setting depths will likely provide full coverage of alluvium. Full cement coverage of the Mesaverde Group and Ohio Creek is required in the Piceance Basin through 2015. New Standards require cementing intermediate (if used) or production casing at least 200' above Lower Wasatch sands in the southwest portion of Township 7S-93W (Sections 19, 20, 29, 30, 31, and 32) and the northwest portion of Township 8S-93W (Sections 5 and 6), or at least 500' above Lower Wasatch sands in the northern, central, and eastern portions of the field to the northeast of the Molina/Atwell Gulch Middleton Creek UIC Area, or 200' above the Molina Member top within an area inclusive of a one-mile buffer around the Middleton Creek UIC Area.

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PLUGGING OBJECTIVES

Plug(s) above Mancos and other deeper formations (if penetrated) to address potential future horizontal wells; plug above Mesaverde Group completions; plug above Ohio Creek and across Lower Wasatch (squeeze if no annular cement coverage); stray gas isolation squeezes (if no annular cement) or in-casing stabilization plugs (if annular cement present) at 3,000-foot intervals if plugs are not already planned in those intervals as described above; surface casing shoe plug and surface plug. Consider setting plug(s) from 1,000' to surface for shallow surface casing strings that are less than 1,000 feet deep.

WELL CONTROL

Well control events summarized below were controlled without incident. The 2004 Schwartz 2-15B (O2) underground blowout to West Divide Creek was uncontrolled until cement remediation was performed, with gas kicks encountered in the Wasatch (rare occurrence) and Williams Fork. Well Control events have been reported in 6S-92W, 6S-93W, 7S-91W, 7S-92W, 7S-93W, and 7S-94W.
Well Control Reports (Form 23s) by Year: 2003 (1), 2004 (1), 2005 (1), 2006 (1), 2007 (2), 2008 (3), 2009 (5), 2010 (9), 2011 (18), 2012 (18), 2013 (3), 2014 (none), and 2015 (none). Reporting was inconsistent prior to 2009, when requirements for Form 23 reporting was emphasized with the operators.
Form 23s by Formation: Williams Fork (40), Iles [including Sego Member] (14), and Mancos/Niobrara (9)

NOTES

Except for T5S, the entire field is located within the Mamm Creek Field Cementing Notice to Operators Area. Special requirements and Form 2 Conditions of Approval apply.
Except for T5S, the entire field is located within the Bradenhead Monitoring Area. Special requirements and Form 2 Conditions of Approval apply.
An Uranium Mill Tailings Remedial Action area is located along I-70 and the Colorado River to the northwest of the field in 6S93W. Special requirements and Form 2 Conditions of Approval apply.
Hydrogen Sulfide: Detectable concentration reported in T7S, R93W (Section 12), during blowdown of a former UIC disposal well prior to plugging and abandonment of the well.