

2005 BRADENHEAD TESTING
And
COMPARISON WITH PRIOR DATA



BUREAU OF LAND MANAGEMENT
SAN JUAN RESOURCE AREA

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EXECUTIVE SUMMARY

In year 2005 the Bureau of Land Management requested oil and gas operators in the Ignacio-Blanco Field to perform bradenhead testing of all Conventional and CBM jurisdictional active gas wells, including Conventional wells re-completed in the Fruitland Formation. *Bradenhead tests in 2005 numbered 1121 of approximately 1279 active jurisdictional gas wells.* Fifteen currently known active wells not tested include CBM, conventional and conventional wells re-completed to the Fruitland Formation. A few wells are devoid of bradenhead testing capability. Others were in the APD process or approved and not yet drilled. About half were water disposal wells. Water disposal wells are of dual jurisdiction. They are permitted by EPA. BLM performs a well bore review to assure that producing and known water horizons are protected. Numbers presented in the tables reflect the data received for actual tests conducted and the 158 wells missed.

All gas wells including recently drilled CBM wells were required to be tested in 2005. Conventional gas wells with greater than 25 psig have decreased from 84 wells in 1992 to 47 wells in 2005 including 2 CBM-re-completed conventional gas wells.

The total number of conventional and conventional re-completed as CBM gas wells with bradenhead pressure between 2 psig and 25 psig declined from 272 wells in 1992, to 91 wells in 2005

Equally significant is the increase in the number of gas wells showing no significant bradenhead pressure (0-2 psig). Conventional gas wells in this category (numbering 326 in 1994) accounted for 396 of 540 wells tested in 2005 (including conventional wells re-completed as CBM).

The increased number of well-bores displaying lower bradenhead test pressure/flow may be ascribed to successful remediation and mitigation efforts. No gas well was approved for work-over in 2005. A single work-over (including seal repairs, casing/cement repairs) was completed at one well this year. Bradenhead venting was authorized at 9 conventional and 4 Fruitland coal gas wells in 2005. Five (5) wells were plugged and abandoned.

HISTORY OF SJRA BRADENHEAD TESTING AND RELATIONSHIP TO GROUNDWATER MONITORING

Glen T. Braden invented a casing head in the 1920's that became so popular that before long all casing heads were commonly called "bradenheads." Among other functions, the casing head seals the annular space between the production casing, intermediate casing (if present) and the surface casing.

Under the Notice to Lessees titled "NTL-MDO-91-1" (and subsequent revisions subtitled "Change 1", and "Change 2"), the San Juan Field Office of the Bureau of Land Management - has aggressively pursued bradenhead testing since 1991. Bradenhead testing has been instrumental in identification of defective gas well-bores. Gas wells have routinely been tested for aberrant quantities of gas/fluid flow. Gas/fluid compositions have been analyzed to aid in remedial action or mitigation plans.

Gas wells within designated "**critical**" groundwater areas (Areas constituting an approximate 1 mile buffer zone surrounding domestic wells where methane has been detected in higher concentrations than 1.0 mg/L in 1994 and 1995) are targeted by BLM for remediation when bradenhead pressures exceed five psig. In all other non-designated areas the bradenhead pressure *action threshold* is 25 psig. Wells with less than these threshold bradenhead pressures, but which exhibit sustained measurable flow throughout the 30-minute test period, and wells with bradenhead valves issuing a fluid flow are also subject to remediation.

The bradenhead testing program is loosely associated with groundwater quality monitoring of La Plata County domestic water wells. As a result of BLM and COGCC testing of domestic water wells in the San Juan Basin of Colorado, 17 areas of critical concern have been identified. The *Critical Areas* show anomalously **high concentrations of methane** entrained in groundwater **or** are of critical concern because of proximity to the **HD Mountain Area** or the **Tiffany Enhanced Coal Bed Methane Recovery** area. The gas signature (relative amounts of gas constituents and carbon isotope ratios) of the methane gas can indicate whether the gas is of shallow biologic generation, alteration of existing soil gas, or a possible gas well leak. The HD Mountain and Bondad/Sunnyside areas were specifically targeted in 1996 for domestic water well testing to determine the effectiveness of gas well remediation. Locations of continuing concern were identified where measurable bradenhead pressures and entrained methane in groundwater persisted. In 1998 the BLM and the COGCC combined efforts to retest areas not addressed in 1996. Water wells tested in 1998 were selected particularly in the proximity of remediated gas wells. Water wells with elevated baseline concentrations of methane and having methane stable carbon isotope ratios greater than -55 per mil (thereby indicating possible thermogenic signatures and association with natural gas producing horizons) were targeted. Water wells with lower baseline methane concentrations, but in proximity to remediated gas wells, were also tested. The results of monitoring in calendar year 2000 indicated that methane contamination of water wells was decreasing, presumably in response to

remedial actions of potentially defective well-bores. The findings continue to direct remediation efforts toward identifying potentially defective gas well-bores. Ongoing monitoring of groundwater is also being conducted.

YEAR 2005 IGNACIO-BLANCO FIELD TEST RESULTS

During calendar year 2005, San Juan Field Office personnel witnessed 124 bradenhead tests. This represented roughly 10% of all active BLM jurisdictional gas wells in 2005. Of 1358 jurisdictional gas wells on the BLM data base, approximately 1268 are currently active. Bradenhead tests were conducted at 1249 wells. Plugged and abandoned wells have lost their capacity for tubular testing, but many are regularly monitored by soil vapor tubes. Active conventional wells number 542. Approximately 77 of these have been re-completed to Fruitland CBM production. Of the latter, many wells produce Fruitland gas while retaining production capability in a conventional horizon. Most CBM gas wells were initially drilled to the Fruitland Formation, including two monitoring wells and four "slant" wells drilled solely for remediation purposes.

In witnessing bradenhead tests in 2005, the BLM focused on well-bores neglected in years past, but also included several high-profile gas wells in critical areas as well as those wells presenting recurrent high bradenhead pressure/flow characteristics. A summary of bradenhead test pressure results at *conventional* wells in 2005 is shown in **Table # 1**, at *conventional wells recompleted as CBM wells* in Table #2 and at CBM wells in Table #3. Actual documented bradenhead **tests** in 2005 include 1121 of 1279 *active* BLM jurisdictional gas wells in the Ignacio-Blanco Field data base. Approximately **78% (423** of 540 tested) *conventional* gas wells (not including those re-completed to CBM) showed insignificant (2 psig or less) bradenhead pressure. (See Table #1.) Those with measured pressure between two and 25 psig numbered **91**, or approximately **17%** of the **tested** conventional wells. *Conventional gas wells with initial test pressure greater than 25 psig* numbered **25**, or roughly **5%** of the total number of **tested** active conventional wells in the Ignacio-Blanco Field.

TABLE 1: CONVENTIONAL GAS WELLS: Critical/Non Critical Statistics

BRADENHEAD PSIG	INITIAL TEST	INITIAL TEST	% OF CONV (542)	%OF TOTAL ACTIVE WELLS (1279)
	Non-Critical Areas	Critical Areas		
BRADENHEAD N/T 2	incl.P&A, undrilled, and no bradenhead		0.3	0
0 - 2.0 PSIG	360	63	78	6
>2.0 & 25 PSIG	70	21	17	7
> 25 PSIG	24	1	5	2
578 ACTIVE WELLS	(454-active tested)	(85-active tested)		

Table 2 shows data regarding conventional wells recompleted as CBM wells. Of *Conventional-wells-recompleted-as-CBM-producers* within *Critical areas*, those with bradenhead pressures greater than 25# number merely **2**. There were 2 *Conventional-wells-recompleted-as-CBM producers* having bradenhead pressures greater than 25 psig and located within *Non-critical designated areas*. *Conventional-wells-recompleted-as-CBM-producers* in critical areas tested with bradenhead pressure exceeding 2 psig but less than or equal to 25 psig account for **3** wells and in non critical areas numbered **12**. **Note that high bradenhead pressure in re-completed gas wells may represent an artifact of the original well bore condition prior to the recompletion process in the Fruitland coal zones.** Therefore, aberrant bradenhead pressure may reflect pre-existing conditions, such as incomplete primary cement isolation. Lack of zonal isolation may provide a limited source of concern for the CBM recompletion process in old wells. No significant pressure (<2psig) was documented at **4** of the *re-completed conventional wells tested in critical area and 48 in non critical areas (52 of 76)*. Low pressure (<25 psig) was shown at **67 of the 71** tested *conventional-wells-recompleted-as-CBM-producers*. This amounted to less than a similar proportion for *conventional well-bores*, but half were not sampled and this therefore may skew the results.

TABLE 2: CONVENTIONAL WELLS RECOMPLETED AS CBM WELLS:

BRADENHEAD PRESSURE	INITIAL TEST	% CBM WELLS RECOMPLETED		TESTED 71 Of 77	% TOTAL OF ACTIVE WELLS
NOT TESTED #	6	Non-Critical 5	Critical 1	Total 8%	
0.0 - 2.0 PSIG		48	4	68%	4%
>2 & 25 PSIG		12	3	19%	1%
> 25 PSIG		2	2	5%	0.3%
CONV RECL. CBM	71 tested	67	10		

Table 3 shows data regarding CBM wells. Of *CBM-producers* within *Critical areas*, those with bradenhead pressures greater than 25# number merely **2**. There were 15 *CBM producers* having bradenhead pressures greater than 25 psig and located within *Non-critical designated areas*. *CBM-producers* in critical areas tested with bradenhead pressure exceeding 2 psig but less than or equal to 25 psig account for **17** wells and in non critical areas numbered **33**. No significant pressure (<2psig) was documented at **118** of the *CBM wells tested* in critical area and **396** in non critical areas (**81%**). Low pressure (<25 psig) was shown at **564** tested *CBM-producers*.

TABLE 3: CBM WELLS:

BRADENHEAD PSIG	INITIAL TEST	INITIAL TEST	% OF CBM (630)	%OF TOTAL ACTIVE WELLS (1279)
	Non-Critical Areas	Critical Areas		
BRADENHEAD N/T 49	incl.P&A, undrilled, and no bradenhead		8%	4
0 - 2.0 PSIG	396	118	81	40
>2.0 & 25 PSIG	33	17	8%	4
> 25 PSIG	15	2	3%	1
581 Tested ACTIVE WELLS	(444-active tested)	(137-active tested)		

In Summary, of 1121 wells tested in 2005, **937 or 85%** showed insignificant pressure of less than or equal to 2 psig. Those wells with low pressure (documented between two psig and 25 psig) numbered **95 (i.e. 8.6%)** of all wells tested. Gas wells with greater than 25 psig initial bradenhead pressure numbered **153** of the wells tested (approximately **14%** of all BLM jurisdictional gas wells tested).

TABLE 4: OVERALL STATISTICS: JURISDICTIONAL IGNACIO-BLANCO FIELD ACTIVE WELLS

BRADENHEAD PRESSURE	INITIAL TEST	% OF 1279 ACTIVE WELLS	% OF THE 1121 TESTED WELLS
BRADENHEAD NOT TESTED	158	12%	
0.0 - 2.0 PSIG	937	73%	83.5%
>2.0 & 25 PSIG	141	11%	12.5%
> 25 PSIG	42	3%	4%
TOTAL ACTIVE WELLS = 1279	1171		1121

It is important to observe that bradenhead test pressures documented in this report reflect initial pressure after a minimum of 14 day's closure of the bradenhead valve. Most of the wells with recorded pressure are being actively mitigated the other 50 weeks of the year. When anticipated gas flows are insignificant mitigation may take the form of venting bradenhead gas to the atmosphere to prevent pressure accumulation in the aquifers. Other surface casings with significant flow are approved for connection to on-site equipment enabling a beneficial use application. A few wells with bradenhead gas character indicative of production gas have been connected to production lines.

Appendix XI (p.47) includes a map showing BLM Jurisdictional gas wells encountered in 2005 which had initial bradenhead pressures exceeding the 25 psig threshold. These well locations are shown in spatial representation within the Colorado portion of the Northern San Juan Basin Ignacio Blanco Gas

Field. Gas well locations are represented by dots sized relative to initial bradenhead pressure. Many aberrant pressures were addressed and remediated/mitigated by 2005 year end.

YEAR 2005 BRADENHEAD TEST RESULTS COMPARED TO RESULTS FROM 1992-2004

A comparison of previous annual bradenhead findings (reports 1991-2004) with the current Year 2005 data reveals a reduction in well-bores exhibiting pressure greater than 25 psig within the surface casing. The overall number of gas wells exhibiting high bradenhead pressure has declined from 97 wells in 1992 to 42 wells in 2005 (Table 4). Some individual wells do show signs of increasing pressure. Gas analyses may indicate a possible source, whether a lack of internal well-bore integrity or incomplete annular isolation. Those gas wells showing surface casing pressure anomalies are tested and inspected for possible failure of well bore integrity. Persistent testing and monitoring will continue to be critical in managing the production of this natural gas resource

Table 4 (following) gives a tabular comparison of prior test results with Year 2005 bradenhead testing. Chart "A" offers a graphic comparison of data between years 1992 and 2005. Conventional gas wells with bradenhead pressure in excess of 25 psig decreased from 84 wells in 1992, to 25 wells in 2005. The aggregate number of gas wells, conventional (including conventional wells recompleted as CBM producers) and CBM well with bradenhead pressures greater than 25 psig declined from 138 wells in 1992, to 42 wells in 2005. See Chart "B".

**TABLE 4
COMPARISON OF 1992-2004 BRADENHEAD TEST STATISTICS**

YEAR OF TEST	92	93	94	95	96	97	98	99	00	01	02	03	04	05
WELL CATEGORY														
CONV WELLS 0 TO 2#	338	343	326	405	406	413	381	354	414	395	384	422	441	423
CONV WELLS 0 TO 25 #	556	490	497	503	513	526	479	430	499	483	475	464	475	514
CONV WELLS >2 & 25 #	218	147	171	95	107	113	98	83	85	88	91	88	39	91
CONV WELLS > 25 PSIG	84	80	59	60	47	43	32	27	28	31	18	18	15	25
TL CONV WELL TESTS	640	570	556	563	562	569	511	465	527	541	493	557	517	540
CBM WELLS >0 & 2 #	293	382	373	394	408	385	266	377	190	491	65	508	x	514
CBM WELLS 0 TO 25 #	347	440	448	440	442	430	310	412	217	543	74	96	x	564
CBM WELLS >2 & 25#	54	58	75	46	34	45	44	32	27	52	9	73	x	50
CBM WELLS WITH > 25#	13	15	11	17	13	10	13	11	10	17	7	17	x	17
TOTAL CBM TESTS	360	455	459	457	455	440	323	420	227	560	81	622	615	581
Conv Recompl to FC 0-2									48	61	27	60	34	52
Conv Recom to FC 0-25									60	70	29	73	40	67
Conv Recom to FC 2-25#									12	7	2	13	6	15
Conv Recom to FC >25#									6	3	2	3	1	4
TL Conv Recom to FC 77									66	73	31	76	77	77

										tested				
TOTAL 0 # TO 2 #	631	725	699	799	814	798	647	731	652	886	449	990	475	937
TOTAL 0 # TO 25 #	903	930	945	943	955	956	789	842	776	1026	424	633	520	1078
TOTAL >2 # & 25 #	272	205	246	144	141	158	142	115	124	93	100	174	45	141
TOTAL WELLS >25#	97	95	70	77	60	53	45	38	44	48	25	38	16	63
TL WELLS TESTED	1000	1025	1015	1027	1009	1054	834	884	820	1074	574	1126	536	1121

The numbers of gas wells with insignificant bradenhead pressure (0-2 psig) has increased from 631 wells in 1992. Lower numbers in 1998 - 2000 tests appear to be reflective of fewer wells tested; not a reversal in trend. Slight number discrepancies may be attributable to query inconsistencies.

Reviewing gas wells in designated critical areas, where significant entrained methane in groundwater was documented by earlier studies, **Table 5** gives an insight into past conditions and current comparisons. Statistics can be misleading, though, as critical areas have increased in number and gas well numbers are in a state of flux. Nevertheless, in designated critical areas overall, **5 Indian** (BLM jurisdictional) critical area gas wells indicated pressures above 25 psig in 2005, as opposed to 19 gas wells in 1995. Approximately 20% percent (12) of the conventional gas wells in critical areas had in excess of 25 psig initial bradenhead pressures in 1994. The expanded designated critical areas has increased, nevertheless, **(0.05%)** of the conventional gas wells tested in critical areas exceeded 25 psig in 2005.

TABLE 5: 1994-2004 CRITICAL AREA BRADENHEAD PSIG at BLM JURISDICTIONAL WELLS

WELL TYPE / CATEGORY	1994	1995	1996	1997	1998	1999	2000	2001	2003	2004	2005
CONVENTIONAL wells with 0>BHP 2	22	52	57	65	56	47	67	71	64	68	63
CONVENTIONAL wells with 2>BHP< 25	26	16	31	17	16	14	17	10	13	16	21
CONVENTIONAL wells with BHP>25	12	14	13	11	10	10	10	7	6	2	1
CONVENTIONAL not tested				2	7	23	0	9	8	22	2
Total conventional wells - critical areas	60	82	101	95	89	94	94	97	83	86	86
CBM wells with 0> BHP 2 psig	53	83	112	101	93	98	33	118	25	x	118
CBM wells with 2>BHP 25 psig		17	7	15	19	7	7	8	2	x	17
CBM wells with BHP>25 psig	1	5	2	3	5	4	1	6	2	x	2
CBM wells no test (56 tested)				3	0	25	93	5	108	568	49
Total CBM wells - critical areas	54	105	121	122	117	134	134	137	137	145	150
RECOMPL wells 0> BHP 2 #				(11)	1	4	3	6	3	2	4
RECOMPL wells 2>BHP 25#				(7)	4	4	4	2	2	2	3
RECOMPLETED >25 psig				(3)	1	0	1	1	1	1	1
TI RECOMPLETED wells in critical areas not tested				(2)	1	0	0	0	3	5	1

TL RECOMPL wells in crit areas				(23)	7	8	8	9	9	5	10
TL wells, critical. areas >0 <2#	75	135	169	177	150	149	103	189	89	70	181
TI wells,crit areas >2 # & < 25#	26	33	38	39	39	25	28	18	15	18	38
TI wells in crit areas >25 #	13	19	15	17	16	14	12	13	8	3	3
Total gas wells not tested				7	7	48	93	(45)	118	626	158
TI Jurisd. wells in critical areas	114	187	222	240	212	236	236	220	230	236	252

NOTE: The Tiffany area was added to the 17 designated critical areas in 1996 totaling 18 Designated Critical Areas. (Thirteen areas had been designated in 1993. A total of Seventeen areas were defined in 1994-95.)

By comparison, 41 gas wells outside of the designated critical areas (Table 7) showed pressures in excess of 25 psig in 2005, as opposed to 61 wells in 1994.

TABLE 6: BRADENHEAD PSIG in AREAS OUTSIDE of DESIGNATED CRITICAL AREAS.

WELL TYPE/CATEGORY	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Conv wells with bradenhead pressure <2 #	281	317	345	338	333	260	347	342	355	320	373	360
Conv wells with bradenhead pressure 2- 25#	147	83	74	88	83	53	68	78	69	78	23	70
Conv wells with bradenhead pressure > 25#	49	38	34	28	22	15	18	24	13	12	13	24
Conventional gas wells not tested			8	14	31	127	29	9	-	33	22	2
Total Conventional wells - non critical areas	477	438	453	468	469	461	462	453	437	443	463	454
CBM wells with bradenhead pressure <2 psig	316	320	296	284	172	279	157	373	392	40	x	396
CBM wells with bradenhead pressure 2- 25 psig	77	32	27	30	26	25	20	44	54	7	x	33
CBM wells with bradenhead pressure >25 psig	12	13	11	7	7	7	9	11	10	5	x	15
CBM wells not tested			5	16	3	133	258	36	9	413	x	49
TOTAL CBM wells-non critical areas	405	365	339	337	208	444	444	464	465	465	479	498
Rec conv wells with bradenhead press <2 #			4	7	24	37	45	55	54	24	2	48
Rec conv wells with bradenhead press 2- 25#			2	2	4	12	8	2	11	0	2	12
TI Jurisl Recom conv NC with BHD >25 psig			2	1	1	2	5	6	2	1	1	2
TI Juris Recom conv wells in NC areas not tested			0	0	8	0	2	0	0	42	36	6
TI juris Recom conv wells in non-critical areas			8	10	37	51	60	63	67	67	67	67
TI Juris wells in non-crit areas bhd press <2 #	597	637	645	629	529	582	549	715	801	360	405	756
Juris wells in non-crit areas, bhd press 2- 25 #	224	115	103	120	113	90	96	119	134	85	27	115
TI Juris wells, non-crit areas, bhd press >25#	61	51	47	36	30	24	32	35	25	17	13	41
TI Juris wells in non critl areas not tested	0	0	13	30	42	260	289	(45)	9	488	18	?
TI Juris wells in non-designated Crit areas	882	803	808	815	714	956	966	914	969	908	942	972

BEYOND BRADENHEAD TESTING - REMEDIAL ACTION

A BLM/COGCC representative is generally on-site when casing integrity testing, wellhead seal testing/repairs, or remedial cementing is accomplished to insure compliance with prescribed Conditions of Approval. Mitigation efforts have often incorporated bradenhead venting. If venting actions prove ineffective, more aggressive remedial efforts may be required. Decreases observed in bradenhead pressure and flow character appear attributable to successful remediation. Remedial action was **approved** at no wells with work-over action **completed** at no gas well under BLM jurisdiction in 2005. Where workovers are authorized, wells are remedially cemented and wellhead seal repairs made. An unknown (inaccessible) number of wells were plugged. Bradenhead venting to the atmosphere was authorized at 10 wells in 2005. **Appendix B would normally** provide a list of remediation efforts approved in 2005; efforts completed **at one well**, and action implemented in prior years. This data is inaccessible due to the Cobell lawsuit. **Appendix C** lists gas-well mitigation efforts approved during 2005.

Appendix D lists BLM jurisdictional gas wells in alphabetical order of well name showing historical initial bradenhead test pressure at individual gas wells since 1992. At wellheads authorized for bradenhead venting, test results were documented following a minimum 14-day pressure stabilization period during which the bradenhead valve was closed. Therefore, measured pressures/flows at the surface casing reflect a shut-in maximum. Such pressures and flows at vented wells reduce to negligible amounts during the remainder of the year when the bradenhead valve is left open.

2006 PROPOSED BRADENHEAD TESTING

Ignacio-Blanco Field BLM jurisdictional conventional gas wells and conventional gas wells re-completed to the Fruitland Formation coals are to be tested in 2006 (active, temporarily abandoned and shut-in wells). The BLM expects to witness 130 bradenhead tests basin-wide in 2006. Monitoring will decrease in the Tiffany Unit for Enhanced Methane Recovery. Tiffany area domestic water well monitoring will cease in 2006. Soil vapor and monthly bradenhead monitoring terminated at the end of 2005.

REFERENCES

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4. The Bureau of Land Management, "1994 Bradenhead Testing Program, Overview and Test Results", March 20, 1995, BLM-SJRA
5. The Bureau of Land Management, "1995 Bradenhead Testing with Prior Years Test Results", March 15, 1996, BLM-SJRA
6. The Bureau of Land Management, "1996 Bradenhead Testing with Review of Prior Years Test Results," March 15, 1997, Revised October 30, 1997; BLM-SJRA
7. The Bureau of Land Management, "1997 Bradenhead Testing and Comparison with Prior Data," June 15, 1998, BLM-SJRA
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13. The Bureau of Land Management, "2003 Bradenhead Testing and Comparison with Prior Data," January 2005, BLM-SJRA
14. The Bureau of Land Management, "2004 Bradenhead Testing and Comparison with Prior Data," March 2005, BLM-SJRA
15. The Bureau of Land Management, "2005 Bradenhead Testing and Comparison with Prior Data," April 2007, BLM-SJRA

LIST and BRIEF of BLM BRADENHEAD and GROUNDWATER REPORTS

The "Notice to Lessees (NTL) MDO-91-1" issued by the Bureau of Land Management (BLM) in July 1991, requires annual bradenhead testing of all BLM jurisdictional gas wells located within the Colorado portion of the Ignacio-Blanco Field. NTL MDO-91-1 Changes 1 & 2 have altered the frequency of testing to annual for conventional wells and semiannual for CBM wells. Pressure thresholds requiring

gas analyses have been raised to five psig in designated critical areas and 25 psig in non-designated areas. The Colorado Oil and Gas Conservation Commission issued "Rule 10 of Order 112-85" also requiring annual bradenhead testing of all gas wells under State of Colorado Jurisdiction in the Ignacio-Blanco Field of Colorado. Since 1991, bradenhead testing has been an integral part of BLM and COGCC efforts to remediate gas wells which have exhibited excessive pressures indicating potential for ground water contamination and/or natural gas resource loss.

Earlier BLM reports have presented the following results:

Bradenhead Testing and Groundwater Protection Program Overview and 1992 Results

This report discussed groundwater protection and the results of 1992 testing. In summary, 37 percent of jurisdictional gas wells tested showed bradenhead pressures exceeding 0 psig, and 10 percent had pressures greater than 25 psig.

Dissolved Methane Concentrations in Groundwater, La Plata and Archuleta Counties, Colorado

More than 200 domestic water wells within the Ignacio-Blanco Field were tested by the BLM during 1993. Relatively high concentrations of methane gas were discovered in 13 geographic areas of La Plata County. Within these 13 areas, gas wells with measurable bradenhead pressure received high priority as remediation candidates.

1993 Bradenhead Testing Program Overview and Test Results

Bradenhead test results for calendar year 1993 were presented. Gas production related potentials for shallow aquifer contamination were discussed. In summary, 29 percent of jurisdictional gas wells had pressures exceeding 0 psig, and 9 percent exhibited pressures greater than 25 psig.

Final Report - 1994 Groundwater Monitoring, San Juan Basin, La Plata County, Colorado Comprehensive Infill Testing

This cooperative report released by the BLM and the COGCC, produced water quality measurements from 383 domestic water well sites in La Plata County, supplementing the 1993 BLM water study of 200 wells. A groundwater quality baseline was established. Redefining and expanding the 13 areas depicted in the 1993 study, a total of 17 areas with relatively high concentrations of entrained methane-in-water were delineated by diminishing methane concentrations and apparent isotopic transitional zones. Data regarding wells coincident with those tested in the 1994 BLM/COGCC testing was incorporated from the 1990 USGS study of water wells in the Animas River Valley, and from data listed in the Ignacio-Blanco Groundwater Task Force study of 1991. The 17 areas were further defined by carbon isotopic analyses that suggested biogenic or thermogenic origins of the entrained methane.

1994 Bradenhead Testing Program Overview and Testing Results

This report noted results of the 1994 bradenhead testing program, including statistics for the Ignacio-Blanco Field and the 17 Critical Areas. A discussion presented results of remedial actions. In summary, 31 percent of the gas wells tested had greater than 0 psig bradenhead pressure, while those with greater than 25 psig bradenhead pressure accounted for 7 percent of jurisdictional gas wells.

1995 Bradenhead Testing and Prior Testing Review

This report summarized the test results of the 1995 bradenhead testing program and discussed areas targeted for remediation, and the success of remediation to date. In summary, 21 percent (219) of the gas wells tested had greater than 2.0 psig bradenhead pressure, while those with greater than 25 psig bradenhead pressure accounted for 6.8 percent of Jurisdictional gas wells.

1996 Bradenhead Testing and Prior Testing Review

This report summarized the test results of the 1996 bradenhead testing program and discussed remediation methods employed. Gas wells with bradenhead pressure in excess of 2 psig accounted for 140 gas wells (13.8 percent) of all BLM jurisdictional wells in the Ignacio-Blanco Field. Coal-bed methane (CBM) and conventional gas wells with bradenhead pressure of greater than 25 psig numbered 58 (5.5 percent) of the BLM jurisdictional Ignacio-Blanco wells.

1997 Bradenhead Testing and Comparison with Prior Data

This report summarized the test results of 1997 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Gas wells with measured bradenhead pressures between two and twenty-five psig initial pressure numbered 159 wells or 15.1 percent of all BLM jurisdictional gas wells. Coal Bed Methane and conventional gas wells with greater than twenty-five psig initial bradenhead test pressure numbered 53 and accounted for 5.0 percent of all BLM jurisdictional I-B gas wells. Eight hundred and four gas wells, or 76.3% exhibited bradenhead pressure of two psig or less.

1998 Bradenhead Testing and Comparison with Prior Data

This report summarized the test results of 1998 jurisdictional gas well monitoring in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with greater than twenty-five psig initial bradenhead test pressure numbered 45 (5.2 percent) of all tested BLM jurisdictional I-B gas wells. Gas wells with measured bradenhead pressures between two and twenty-five psig initial pressure numbered 150 wells, or 17.3 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 672, or 77.5 percent of all wells tested in 1998.

1999 Bradenhead Testing and Comparison with Prior Data

This report summarizes the test results of 1999 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered 38, accounting for 4 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with measured bradenhead pressures between 2-25psig initial pressure numbered 115 wells, or 13 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 731, or 83 percent of all wells tested in 1999.

2000 Bradenhead Testing and Comparison with Prior Data

This report summarizes the test results of 2000 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig bradenhead test pressure numbered 44, accounting for 5 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with measured bradenhead pressures between 2-25psig initial pressure numbered 124 wells, or 15 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 652, or 80 percent of all wells tested in 2000.

2001 Bradenhead Testing and Comparison with Prior Data. This report summarizes the test results of 2001 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered 48, accounting for 4 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with bradenhead pressures between 2-25psig initial pressure numbered 140 wells, or 13 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 886, or 79 percent of all wells tested in 2001.

2002 Bradenhead Testing and Comparison with Prior Data. This report summarizes the test results of 2002 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered 27, accounting for 5 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with bradenhead pressures between 2-25psig initial pressure numbered 102 wells, or 18 percent

of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 476, or 83 percent of all wells tested in 2002.

2003 Bradenhead Testing and Comparison with Prior Data. This report summarizes the test results of 2003 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered 16, accounting for 2.5 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with bradenhead pressures between 2-25# initial pressure consisted of 88 wells, or 15 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 475, or 78 percent of all wells tested in 2003.

2004 Bradenhead Testing and Comparison with Prior Data. This report summarizes the test results of 2004 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered __, accounting for __ percent of all tested BLM jurisdictional I-B gas wells. Gas wells with bradenhead pressures between 2-25psig initial pressure numbered __ wells, or __ percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered ____, or __ percent of all wells tested in 2004.

2005 Bradenhead Testing and Comparison with Prior Data. This report summarizes the test results of 2005 bradenhead monitoring at jurisdictional gas wells in the Ignacio-Blanco (I-B) field. Coal bed methane and conventional gas wells with >25psig initial bradenhead test pressure numbered 41, accounting for 4 percent of all tested BLM jurisdictional I-B gas wells. Gas wells with bradenhead pressures between 2-25psig initial pressure numbered 156 wells, or 12 percent of tested BLM jurisdictional gas wells. Gas wells under BLM jurisdiction that exhibited bradenhead pressure of two psig or less numbered 989 or 77percent of all wells tested in 2005.

IX. APPENDIX: A1

Gas Wells Approved for Remedial Action in 2005

APPENDIX: A2

Gas Wells with Remedial Action Completed During 2005

APPENDIX: A3

Gas Wells Plugged and Abandoned in 2005

APPENDIX: B1

Conventional Gas Well Mitigation Approved during 2005

APPENDIX: B2

Fruitland CBM Gas Well Mitigation Approved during 2005

APPENDIX: C
Conventional Gas Wells Not Tested This Year

APPENDIX: D

HISTORIC BRADENHEAD PRESSURES
1992-2005

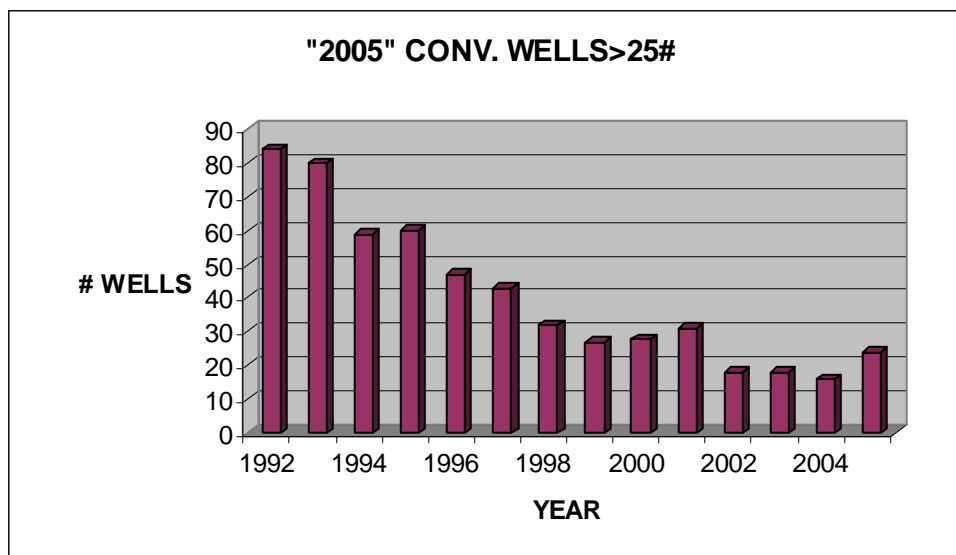
Note: 9999.9 indicates that no bradenhead exists.
9090.9 indicates that a bradenhead exists, but was not tested

APPENDIX X: AREA MAP

**JURISDICTIONAL GAS WELLS:
BRADENHEAD PRESSURE
GREATER THAN 25 PSIG**

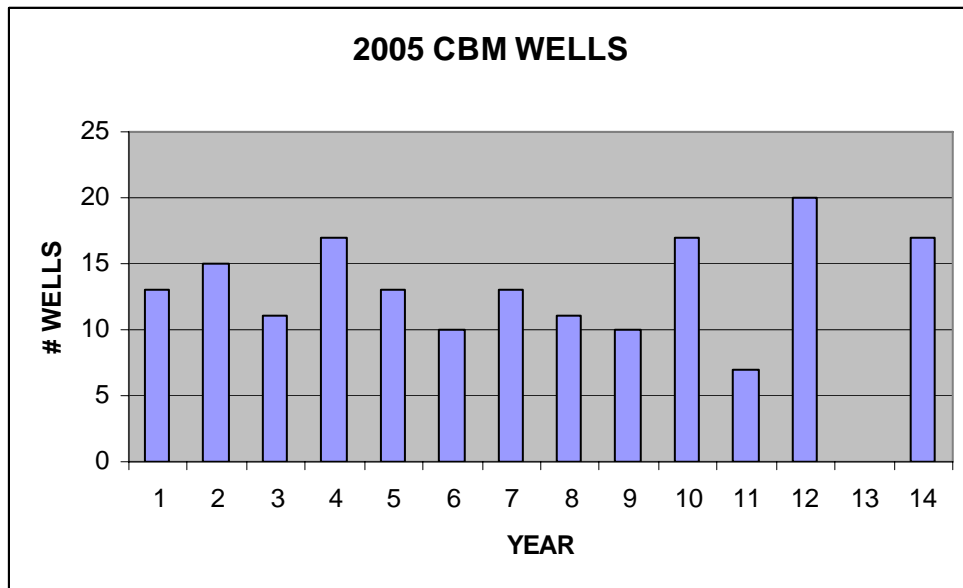
APPENDIX XI: CHART A

CONVENTIONAL GAS WELLS
GREATER THAN 25 PSIG
BRADENHEAD PRESSURE
1992-2005



APPENDIX XII: CHART B

CBM GAS WELLS
GREATER THAN 25 PSIG
BRADENHEAD PRESSURE
1992-2005



APPENDIX XI: CHART C
ALL IGNACIO-BLANCO FIELD GAS WELLS
GREATER THAN 25 PSIG
BRADENHEAD PRESSURE
1992-2005

