

Greater Uinta Basin
Oil and Gas Cumulative Impacts Technical Support Document
March 2012

*Greater Uinta Basin Cumulative Impacts Technical Support Document
Data Obtained August 2011*

PREFACE

The Oil and Gas Cumulative Impacts Technical Support Document which follows has been prepared for the Greater Uinta Basin which for this project is the Vernal Field Office planning area and the Tavaputs Plateau. The purpose of this document is to update the information that the Bureau of Land Management (BLM) Vernal Field Office uses when assessing cumulative impacts in National Environmental Policy Act (NEPA) documents.

In 2002, the BLM created a Mineral Potential Report for the Vernal Resource Management Plan Environmental Impact Statement that was intended to provide data which could be used to develop generic assumptions for mineral development over the life of the RMP using the best available data at that time. This Technical Support Document improves upon the accuracy of the information contained in the Mineral Potential Report because it contains updated information about the amount of activity, the location of that activity, and the effect of changing technology. It is intended to summarize the best available information related to existing oil and gas development impacts and the impacts expected to occur in the reasonably foreseeable future.

The information in this Technical Support Document is intended to be used as any other reference document, such as air quality models and resource inventories, would be used. It does not take the place of NEPA analysis for specific projects. It is a dynamic document which can and will be updated as significant new information becomes available. The substance of the document will be subject to public scrutiny when the information it contains appears in NEPA documents. Also, this Technical Support Document is not a decision document.

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Acronyms List

AGRC	Automated Geographic Reference Center
APD	application for permit to drill
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
EA	environmental assessment
EIS	environmental impact statement
ENBB	Environmental Notification Bulletin Board
FERC	Federal Energy Regulatory Commission
LOP	life-of-project
NAIP	National Agricultural Inventory Program
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
RFD	reasonably foreseeable development scenario
RMP	resource management plan
ROW	right-of-way
TUA	temporary use area
UDAQ	Utah Division of Air Quality
UDOGM	Utah Division of Oil, Gas, and Mining
VFO	Vernal Field Office (Bureau of Land Management)
VPA	Vernal Planning Area
WRAP	Western Regional Air Partnership

1.0 Introduction

This Technical Support Document has been prepared to update oil and gas development assumptions in the Greater Uinta Basin area to facilitate cumulative impacts analyses in future Bureau of Land Management (BLM) Vernal Field Office (VFO) National Environmental Policy Act (NEPA) projects. The background leading up to the preparation of this document, the purpose of the document, and the data collection and analysis methodology is explained in **Section 1**. The results for past and present development are included in **Section 2**. The results for reasonably foreseeable development are included in **Section 3**. The sum total of the results for past, present, and reasonably foreseeable development are included in **Section 4**. A map of the area this document covers is included as **Appendix A**. A detailed explanation of the sources used, spreadsheets prepared, and instructions for updating this document are included in **Appendix B**.

1.1 Background and Purpose

The BLM VFO administers federal lands within an area of approximately 5,518,859 acres in northeast Utah. The Field Office manages approximately 1,725,000 acres of federal surface and 3.8 million acres of federal mineral estate, including mineral rights located below National Forest Service lands, the Hill Creek Extension of the Uintah and Ouray Ute Indian Reservation, and a small portion of the northern part of BLM's Moab Field Office. Lands managed by the Vernal Field Office encompass much of the Uinta Basin and Tavaputs Plateau, which are areas of current and historic heavy oil and gas development.

In response to ongoing oil and gas development within the Vernal Field Office planning area (VPA), BLM determined that it was advisable to update the Book Cliffs (1985) and Diamond Mountain (1994) resource management plans (RMP), which provided the framework for management of the federal surface and mineral estate, and develop a new RMP encompassing the entire Vernal Planning Area. As part of the Vernal RMP revision process, BLM prepared a Mineral Report (BLM 2002) which incorporated a Reasonable Foreseeable Development (RFD) scenario. A BLM planning RFD scenario is:

...a long-term projection (scenario) of oil and gas exploration, development, production, and reclamation activity. The RFD covers oil and gas activity in a defined area for a specified period of time. The RFD projects a baseline scenario of activity assuming all potentially productive areas can be open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation or executive order. The baseline RFD scenario provides the mechanism to analyze the effects that discretionary management decisions have on oil and gas activity. The RFD also provides basic information that is analyzed in the NEPA document under various alternatives (BLM 2004).

Because of the timelines involved, typically 15-20 years, the RFD is a projection, including both known projects (for which some notice has been made) *and* projects which are likely to occur based on production potential.

The Vernal RFD estimated total oil and gas development over the succeeding 15 years to be up to 6,530 wells and total surface disturbance of up to 21,251 acres. However, continued proposals for high levels of oil and gas development within the VPA have resulted in future project well

counts and surface disturbance levels which have exceeded those forecast in the Vernal RFD. In addition, development specifications have changed in the Uinta Basin subsequent to the approval of the Vernal RMP. In particular, there is a much greater use of multiple directionally-drilled wells from a single pad, i.e. "pad drilling," than was envisioned in the RFD.

This Technical Support Document and its related data sources are designed to update oil and gas development assumptions to facilitate cumulative impacts analyses in future VFO NEPA projects. Data presented in this document account for the use of pad drilling to more accurately estimate levels of surface disturbance. This document is not a new RFD for the Vernal RMP because it does not project future oil and gas development potential, and because it includes information adjacent to but outside of the Vernal Planning Area. Its scope is limited to those projects within the CIAA which are determined to be reasonably foreseeable in the context of the BLM NEPA Handbook H-1790-1 which states:

Reasonably foreseeable future actions are those for which there are existing decisions, funding, formal proposals.

In addition, it was intended that this analysis serve as a template that could be updated for future NEPA analyses within the Vernal Field Office.

1.2 Scope of the Document

This document accounts for development in the Greater Uinta Basin, an area of approximately 5,853,000 acres in all or portions of five Utah counties as depicted in **Figure 1-1** (Appendix A). It includes the VPA, which includes the portion of the Moab Field Office for which Vernal oversees oil and gas development, the Hill Creek Extension, and the area of the West Tavaputs Plateau Environmental Impact Statement. The analysis deals with the entirety of this area and will not focus on the subdivision areas broken out in the Vernal Mineral Potential Report. This boundary was chosen for the following reasons:

1. It contains the entirety of the Uinta Basin and adjacent oil and gas productive areas on the Tavaputs Plateau, as well as minor oil and gas development within the Green River Basin in the VPA north of the Uinta Mountains.
2. It is largely geologically separated from oil and gas productive areas to the north in the Green River Basin of Wyoming, to the east in the Piceance Basin and Douglas Creek Arch of Colorado, and to the south and southwest in the Paradox Basin and Wasatch Plateau of Utah. More than 99% of the active wells in this area are located within the Uinta Basin or Tavaputs Plateau.
3. It encompasses all of the recent and pending oil and gas NEPA projects within the Uinta Basin and Tavaputs Plateau on BLM, USFS, or Tribal lands.

This document deals exclusively with cumulative surface disturbance resulting from past, present, and reasonably foreseeable oil and gas development projects and oil and gas related infrastructure. It does not address disturbance resulting from other mineral development which may exist or have been proposed in the CIAA, such as oil shale or gilsonite projects. Neither does it deal with disturbance resulting from non-mineral development projects.

1.3 Methodology Summary

This analysis uses well counts and pad counts (since the use of pad drilling is increasing in the area), supplemented with data from other projects, to estimate surface disturbance. Analyses in this document are based upon data obtained in August 2011. In some cases, data were assumed based on typical averages. However, the best available information regarding past, present, and reasonably foreseeable development within the boundary of this document was collected from sources that are publicly available so this analysis can be readily updated in the future. The results are summarized in **Chapters 2.0** (past and present), **3.0** (reasonably foreseeable), and **4.0** (total) of this document. A brief explanation of the methodology used to assemble this report is included in the following subsections. A detailed explanation of the sources used, spreadsheets prepared, and instructions for updating this document are included in **Appendix B**.

1.3.1 Well and Pad Count Methodology

The data sources and assumptions for the well and pad counts are as follows:

- The past and present well count was determined from the online oil and gas information from the Utah Division of Oil, Gas, and Mining (UDOGM). This source was used because all oil or gas wells drilled within the state are required to file an APD with UDOGM, regardless of surface or mineral ownership.
- The reasonably foreseeable well count was determined from the online UDOGM data for approved but not spudded drilling permits, and VFO GIS data relating to recent and pending NEPA projects. Substantial overlap between the UDOGM and BLM datasets is unlikely because wells and pads in pending VFO NEPA projects are considered to represent a longer look into the future, due to processing time, than the future horizon for UDOGM data, i.e. the APDs from the UDOGM database are likely to contain few, if any, of the wells in the BLM dataset.
- The past and present pad count was calculated from UDOGM GIS well data. Any wells which were located within 30 meters in a north-south and east-west direction of each other were assumed to be located on the same well pad.
- The reasonably foreseeable pad count utilized data from UDOGM GIS well data as well as the pending NEPA projects.

1.3.2 Surface Disturbance Estimates Methodology

The following data sources and assumptions were used to create the surface disturbance estimates:

- Past, present, and reasonably foreseeable oil and gas related surface disturbance was estimated from pending NEPA oil and gas projects. Data from the NEPA projects were used to determine weighted average values for various types of surface disturbance. Weighting was based on the number of well pads or wells. A certain unknown number of APDs from both the UDOGM data and the VFO NEPA projects will not be drilled due to

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changed company priorities or other reasons, so surface disturbance estimates based on well and well pad counts are conservative, likely overestimating the disturbance.

- Reasonably foreseeable surface disturbance from gathering pipelines associated with pending oil and gas development NEPA projects has been included in the overall totals from those projects.
- Reasonably foreseeable surface disturbance from pipelines not associated with pending oil and gas development NEPA projects was determined by examining the BLM ENBB website and the FERC pre-filing website. Disturbance was calculated using the indicated width times the indicated pipeline length. In some cases, the total construction disturbance was indicated, including temporary use areas. Where the total disturbance was indicated, this value was used.
- Past and present surface disturbance from other facilities, such as compressor stations and gas plants, were based on data obtained from UDOGM, the BLM's Environmental Notification Bulletin Board (ENBB), GIS data from the Utah Automated Geographic Reference Center (AGRC), notices from the Federal Energy Regulatory Commission (FERC), and facilities information included within the Phase III regional emissions inventory of the Western Regional Air Partnership (WRAP). Data for these facilities is not comprehensive. The WRAP data, for instance, are limited to major sources emitting more than 100 tons annually of any criteria pollutant. The data sources were combined and the facilities were examined on current (2011) National Agricultural Inventory Program (NAIP) digital aerial imagery (NRCS 2011) to determine size.
- Reasonably foreseeable surface disturbance from gas plant or compressor stations associated with pending oil and gas development NEPA projects has been included in the overall totals from those projects.
- Estimates of the success of past, present, and reasonably foreseeable interim and final reclamation were made based on the experience of VFO reclamation specialists. In the Basin, it is estimated that reclamation can take up to five years, assuming diligent application of approved reclamation procedures. Abandoned wells were assumed to exist on single well pads.
 - Interim reclamation of existing well pads was assumed because the vast majority of existing wells are more than five years old.
 - Interim reclamation estimates for reasonably foreseeable projects are based on information from the VFO pending NEPA projects.
 - Abandoned wells which were plugged within the last five years and their associated access roads have been assumed to represent existing disturbance because they are likely incompletely reclaimed.
 - Abandoned wells which were plugged more than five years ago have been assumed to be fully reclaimed.

1.3.3 Other Data Considered

The following data were not included in the surface disturbance estimates for the reasons stated:

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- Completed NEPA projects were not included in the foreseeable well/well pad calculations because they were considered to overlap with the UDOGM database of existing wells to an unknown degree.
- Disturbance from unreclaimed, existing pipelines was not included in the surface disturbance calculations for the following reasons: surface disturbance associated with existing pipelines is difficult to estimate because data sources are not readily available; many pipelines are installed on the surface, and construction permits would generally tend to overestimate post-installation disturbance; and reclamation of buried or surface pipelines is typically initiated immediately after installation so existing disturbance is likely limited to pipelines installed within the last five years.
- Seismic or other geophysical exploration projects were not included because the BLM previously determined that seismic projects typically result in negligible surface disturbance.

2.0 Past and Present Oil and Gas Development

2.1 Existing Well and Pad Counts

Table 2-1 summarizes existing well counts. *Productive wells* are those classified as producing, shut-in, or temporarily abandoned. *Other active wells* are those non-producers for which a well has been or is currently being drilled and which have not been plugged. *Abandoned wells* are those have been plugged.

Table 2-1 Existing Well Counts

Well Code	Well Status	Count
Productive Wells		
P	Producer	7,997
S	Shut-in	926
TA	Temp. Abandoned	113
Total Productive		9,036
Other Active Wells		
A	Active Service	1,054
APD	APD Approved	2,437
DRL	Drilling	495
I	Inactive Service	13
OPS	Drllg Ops. Suspended	91
Total Other Active		4,090
Abandoned Wells		
PA	Plugged & Abandoned	2,575
TOTAL		15,701

Source: UDOGM 2011

A summary of directional and horizontal wells (both existing and plugged) is in **Table 2-2**.

Table 2-2 Directional Drilling

Well Type	Count
Directional	2,849
Horizontal	112
TOTAL Directional	2,961
Directional % of all wells	18.9%

Source: UDOGM 2011

For productive wells, the breakdown by well type (gas or oil) is in **Table 2-3**.

Table 2-3 Productive Wells by Type

Well Type	Count
Gas Wells	5,565
Oil Wells	3,471
TOTALS	9,036

Source: UDOGM 2011

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A summary of the number of existing (drilled or drilling) well pads and the number of wells (well counts) per pad is in **Table 2-4**.

Table 2-4 Active Wells and Pads

Type Pad	Pad Count	Well Count
12-Well	3	36
11-Well	0	0
10-Well	1	10
9-Well	5	45
8-Well	7	56
7-Well	16	112
6-Well	16	96
5-Well	44	220
4-Well	82	328
3-Well	138	414
2-Well	663	1,326
Single	8,046	8,046
TOTALS	9,021	10,689
Multi-well Pads	975	2,643

Source: UDOGM 2011

2.2 Existing Oil and Gas Development Surface Disturbance

2.2.1 Well Pad Disturbance

Estimated existing well pad surface disturbance, including average access road disturbance, is indicated in **Table 2-5**.

Table 2-5 Existing Well Pad Surface Disturbance

Type Pad	Pad Count	Per Pad Disturbance (acs)	Total Disturbance (acs)
12-Well	3	5.8	17
11-Well	0	5.5	0
10-Well	1	5.2	5
9-Well	5	4.9	25
8-Well	7	4.6	32
7-Well	16	4.3	69
6-Well	16	4.0	64
5-Well	44	3.7	163
4-Well	82	3.4	279
3-Well	138	3.1	428
2-Well	663	2.8	1,856
Single	8,046	2.5	20,115
Unreclaimed PA Pads	176	2.5	440
TOTALS	9,197		23,493

Source: UDOGM 2011, BLM 2011a.

2.2.2 Disturbance from Other Facilities

Existing surface disturbance associated with identified gas plants and compressor stations is indicated in **Table 2-6**.

Table 2-6 Existing Gas Plant and Compressor Station Surface Disturbance

Facility	Location	Operator	County	Surface Disturbance (acs)
Dry Canyon CS	17-12S-16E S	Bill Barrett Corp.	Carbon	7
Interplanetary CS	13-12S-14E S	Bill Barrett Corp.	Carbon	5
Kastler Dew Pt GP	16-3N-24E S	Questar Pipeline Co.	Daggett	20
Kastler/Mursack CS	16-3N-24E S	Questar Pipeline Co.	Daggett	3
Altamont East CS	32-1S-3W S	El Paso Field Ops. Co.	Duchesne	7
Altamont Main GP	34-1S-4W S	El Paso Field Ops. Co.	Duchesne	42
Altamont South CS	34-2S-5W S	El Paso Field Ops. Co.	Duchesne	12
Altamont West CS	12-2S-5W S	El Paso Field Ops. Co.	Duchesne	7
Altonah GP	5-2S-3W S	Gary Energy Inc.	Duchesne	20
Berry GP	12-5S-4W U	Berry Petroleum Co.	Duchesne	5
Blind Canyon CS	23-11S-15E S	Bill Barrett Corp.	Duchesne	6
Bluebell GP	23-1S-2W S	El Paso Field Ops. Co.	Duchesne	18
Cedar Rim GP	21-3S-62 S	Koch Hydrocarbon Co.	Duchesne	2
Monument Butte GP	25-8S-16E S	Newfield Production Co.	Duchesne	3
Monument Butte Old GP	6-9S-17E S	Equitable Resources	Duchesne	3
Pleasant Valley New GP	10-4S-2W U	Newfield Production Co.	Duchesne	19
Pleasant Valley Old GP	10-4S-2W U	Interline Resources Corp.	Duchesne	9
Bridge CS	17-9S-22E S	Kerr McGee Oil & Gas	Uintah	5
Chipeta CS/GP	15-9S-22E S	Questar Gas Management	Uintah	26
Cottonwood Wash CS	27-9S-21E S	Kerr McGee Oil & Gas	Uintah	5
Diamond Mountain CS	2-2S-24E	Wyoming Interstate Co.	Uintah	17
Flat Rock CS	31-14S-20E S	Questar Gas Management	Uintah	2
Iron Horse GP	9-9S-22E S	Questar Gas Management	Uintah	10
Island CS	7-10S-20E S	Questar Gas Management	Uintah	2
Mesa Tap CS	3-10S-20E S	Canyon Gas Resources	Uintah	2
N. Hill Creek CS	3-15S-20E S	Wind River Resources	Uintah	5
Natural Buttes CS/GP	24-9S-21E S	Chipeta Processing LLC	Uintah	15
Vernal CS	9-3S-23E S	Northwest Pipeline	Uintah	2
Redwash GP	24-7S-23E S	Questar Gas Management	Uintah	6
Riverbend CS	15-10S-19E S	Questar Gas Management	Uintah	2
Riverbend Gathering GP	36-9S-18E S	Monarch Natural Gas	Uintah	7
Stagecoach GP	16-9S-22E S	Questar Gas Management	Uintah	13
Wasatch GP	14-1S-1W S	Darenco Inc.	Uintah	5
Wonsits CS	12-8S-21E S	Questar Gas Management	Uintah	4
TOTAL				318

Source: UDOGM 2011, UDAQ 2007, FERC 2011, WRAP 2006

2.2.3 Total Existing Surface Disturbance

A summary of total estimated existing surface disturbance associated with oil and gas development is indicated in **Table 2-7**.

Table 2-7 Total Existing Oil and Gas Development Surface Disturbance

Disturbance Type	Disturbance (acs)
Well Pads	23,493
Gas Plants/Compressors	318
TOTALS	23,811

3.0 Foreseeable Oil and Gas Development

3.1 Foreseeable Well and Well Pad Counts

A summary of foreseeable wells and pads from the UDOGM data is in **Table 3-1**.

Table 3-1 UDOGM Foreseeable Well and Pad Counts

Type Pad	Pad Count	Well Count
14-Well	1	14
13-Well	1	13
12-Well	1	12
11-Well	2	22
10-Well	2	20
9-Well	3	27
8-Well	12	96
7-Well	15	105
6-Well	13	78
5-Well	42	210
4-Well	36	144
3-Well	106	318
2-Well	210	420
Single	1,217	1,217
TOTALS	1,659	2,696

Source: UDOGM 2011

The foreseeable well and well pad counts from pending NEPA projects, the UDOGM counts, and the total from both sources is included in **Table 3-2**.

Table 3-2 Total Foreseeable Well and Pad Counts

Wells and Pads	Count
BLM/BIA/USFS	
Pending New Well Pads	14,137
Pending New Wells	25,721
UDOGM	
Pending New Well Pads	1,659
Pending New Wells	2,696
TOTAL FORESEEABLE	
Pending New Well Pads	15,796
Pending New Wells	28,417

Source: UDOGM 2011, BLM 2011, BLM 2011a

3.2 Foreseeable Oil and Gas Development Surface Disturbance

3.2.1 Well Pad Disturbance

The pending NEPA projects, their initial disturbance, and their life of plan (LOP) disturbance is summarized in **Table 3-3**.

Table 3-3 Analyzed Pending NEPA Projects

NEPA Project	Applicant	Construction Disturbance (acs)	LOP Disturbance (acs)
Big Pack EA	Enduring Resources	1,620	767
Little Canyon EA	XTO Energy	1,378	585
North Alger II EA	EOG Resources	115	58
Greater Natural Buttes EIS	Anadarko Petroleum	12,658	7,927
Gasco EIS	Gasco	7,584	6,440
River Bend Unit infill EA	Dominion	1,103	376
Southam Canyon EA	Enduring Resources	858	641
ANF South Unit EIS	Berry Petroleum	825	462
Greater Chapita Wells EIS	EOG Resources	3,661	1,160
Hill Creek Unit EA	XTO Energy	73	36
Monument Butte EIS	Newfield	15,612	7,152
Black Tail Ridge EDA EA	Bill Barrett Corporation	1,045	525
Randlett EDA Leasing Explor. EA	Ute Energy	2,613	1,314
Rocky Point EDA Leasing Explor EA	Ute Energy & Newfield	345	173
Uintah & Ouray Tribal Oil & Gas EIS	BIA	23,254	11,650
TOTALS		72,744	39,267

Source: BLM 2011a, BIA 2010, BIA 2011.

A summary of the average disturbance values for each disturbance type is indicated in **Table 3-4**.

Table 3-4 Pending NEPA Project Average Surface Disturbance Values

Disturbance Type	Value
New Well Pad Construction (acs)	2.9
New Well Pad LOP (acs)	1.9
Expansion Pad Additional Well (acs)	0.3
New Pad Access Road Construction ROW (ft)	33
New Pad Access Road LOP ROW (ft)	24
New Pad Access Road Length (mis)	0.21
Access Road Construction Disturbance/Pad (acs)	0.9
Access Road LOP Disturbance/Pad (acs)	0.6
New Pad Surface Pipeline Construction ROW (ft)	18
New Pad Buried Pipeline LOP ROW (ft)	60
New Pad Pipeline Length (mis)	0.40
Pipeline Construction Disturbance/Pad (acs)	1.4
Pipeline LOP Disturbance/Pad (acs)	0.0
Other Facility Construction Disturbance/Pad (acs)	0.1
Other Facility LOP Disturbance/Pad (acs)	0.1
New Pad Total Construction Disturbance (acs)	5.2
New Pad Total LOP Disturbance (acs)	2.6

Source: BLM 2011a. Weighted averages by well and pad counts.

3.2.2 Disturbance from Other Facilities

Construction disturbance from foreseeable pipelines is indicated in **Table 3-5**.

Table 3-5 CIAA Foreseeable Pipeline Project Construction Disturbance

Type and Project	Operator	Length (mis.)	ROW (feet)	Construction Disturbance (acs.)
Gathering Pipelines				
Little Joe 12"	Questar	6.5	30	24
Willow Creek to Morgan CS	Anadarko	2.5	75	23
King's Canyon 12"	XTO	3.0	50	18
LCU 16"	XTO	7.0	75	64
TOTAL GATHERING		19.0		128
Mainlines				
ML 103	Questar	8.3	100	101
ML 104 24"	Questar	23.5		336
TOTAL MAINLINES		31.8		437
TOTAL PIPELINES		50.8		565

Source: BLM 2011, FERC 2011

4.0 Total Existing and Foreseeable Surface Disturbance

A summary of existing, foreseeable, and total well and pad counts and surface disturbance estimates is in **Table 4-1**.

Table 4-1 Well, Pad, and Surface Disturbance Summary

Type	Count	Construction Disturbance (acs)	LOP Disturbance (acs)
EXISTING		Not Applicable	23,811
Well Pads	9,197		
Wells	10,689		
Gas Plants & Compressor Stations	34		
FORESEEABLE			
BLM/BIA/USFS Wells & Pads		72,744	39,267
New Well Pads	14,137		
New Wells	25,721		
UDOGM Wells & Pads		8,671	4,358
New Well Pads	1,659		
New Wells	2,696		
Other Facilities		565	0
Pipelines	6		
TOTAL FORESEEABLE		81,981	43,625
New Well Pads	15,796		
New Wells	28,417		
Pipelines	6		
EXISTING + FORESEEABLE		81,981	67,436

5.0 References

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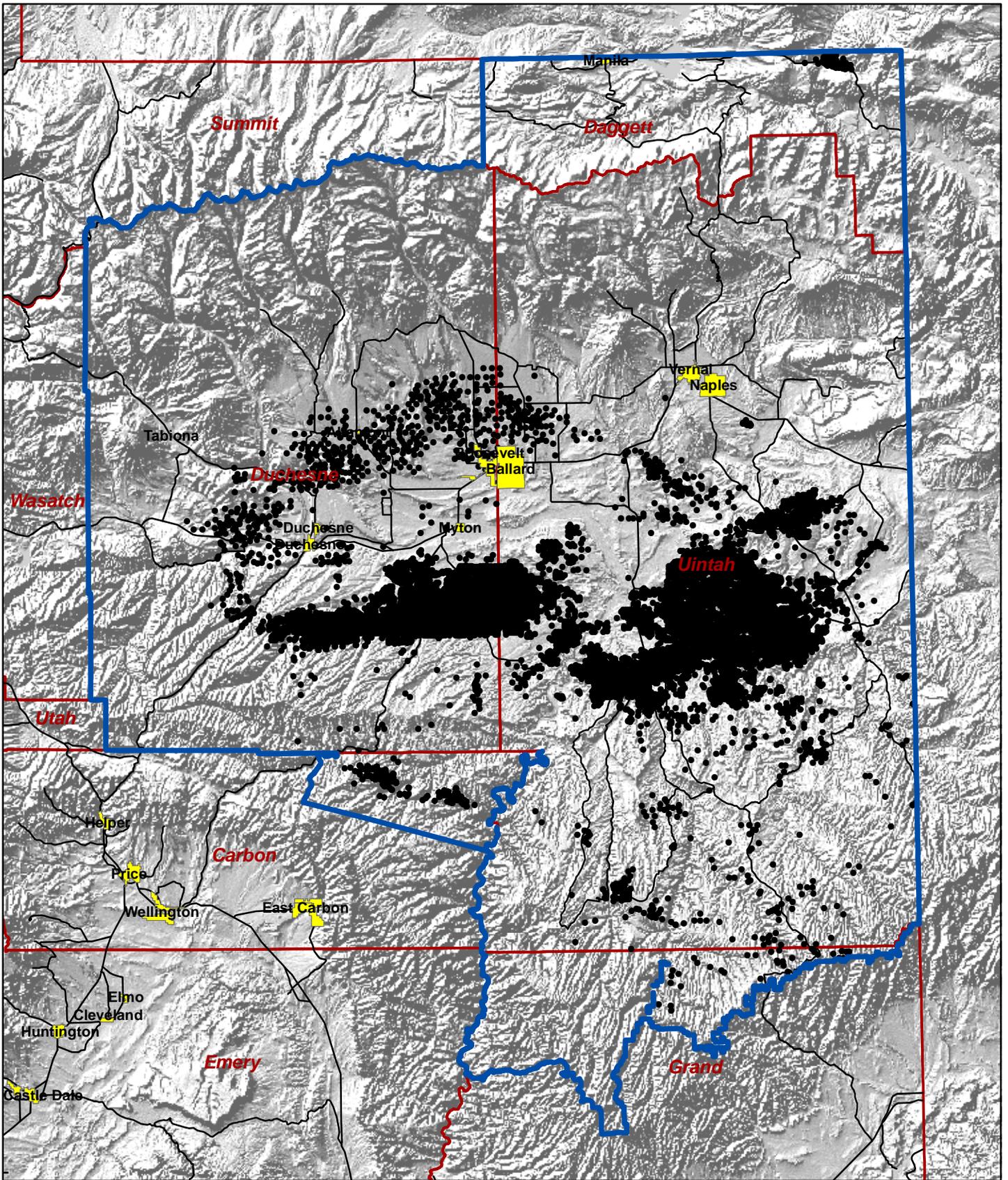
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Data Obtained August 2011*

http://www.wrapair.org/forums/ogwg/documents/2009-03_06_Baseline_Emissions_Uinta_Basin_Technical_Memo_03-25.pdf, June 2011.

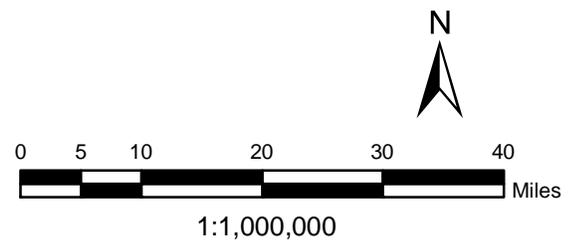
Appendix A

Figure 1-1



Appendix A
Greater Uinta Basin
Oil and Gas
Cumulative Impacts
Technical Support Document

- Analysis Area
- Utah Counties
- Utah Roads
- Productive Wells



Appendix B
Sources and Calculations

Cumulative Impacts Technical Support Document

Sources and Calculations

Introduction

The objective of this analysis was to update oil and gas development surface disturbance assumptions to facilitate cumulative impacts analyses in future VFO NEPA projects. Disturbance estimates were related to well and pad counts because it is the most readily available data and because well pads and related facilities are presumed to be the greatest sources of surface disturbance. Sources for the data are detailed below.

In addition, it was intended that this analysis serve as a template that could be updated for future NEPA analyses within the Vernal Field Office. All of the data contained in the Technical Support Document were based on spreadsheet calculations, as explained below, which can be updated for future revisions of the Technical Support Document. Instructions for updating the spreadsheets and the Technical Support Document are also included below.

Data Sources

Spatial and other data were obtained from a number of sources and assembled into a series of linked and related spreadsheets. Data sources used for the preparation of this document included:

- The Vernal Field Office NEPA Projects GIS layer, obtainable from the Field Office. Tabular data from the GIS layer were extracted to the **VFO_FieldDevProjects.xls** spreadsheet.
- The WELLDATA file, which includes GIS spatial and production data for wells, and HISTDATA, which does not include spatial data but does include information relating to operations timing and producing reservoirs from the UDOGM. Data from UDOGM also included a GIS layer for gas plants. Data are downloadable from http://oilgas.ogm.utah.gov/Data_Center/DataCenter.cfm#download
- Information regarding air emission sources permitted by the Utah Division of Air Quality are available in a GIS layer. The tabular and spatial data were extracted to a new gas plants and compressor station layer for this document. Data are downloadable from <http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=DAQAirEmissionsInventory>
- Tabular and limited spatial data for major source air emissions are obtainable from the Western Regional Air Partnership Phase III emissions inventory (2006). Data are downloadable from http://www.wrapair.org/forums/ogwg/documents/2009-03_06_Baseline_Emissions_Uinta_Basin_Technical_Memo_03-25.pdf
- Various information regarding transmission pipelines and some related facilities is available from the Federal Energy Regulatory Commission. Data are downloadable from <http://www.ferc.gov/industries/gas/indus-act/pre-filing.asp>
- Additional information regarding recent and pending NEPA projects within the CIAA are available from the BLM's Utah Environmental Notification Bulletin Board. Data are downloadable from <https://www.blm.gov/ut/enbb/index.php>

Calculation Details

Details on the spreadsheets used to compute existing and foreseeable disturbance within the CIAA are included in **Table A-1**.

Table A-1 Technical Support Document Data Spreadsheets

Spreadsheet/Worksheet	Purpose and Methodology
UDOGM_wells.xls	Main spreadsheet for UDOGM well data
/CIAA DRILLED WELLS	Source UDOGM WELLDATA GIS file, clipped to the CIAA. Records with WELLSTATUS of LA and RET removed to consider only wells actually drilled, drilling, or likely to be drilled. Used as source for other worksheets. Records sorted by API. Source for Tables 2-1 (well counts by WELLSTATUS), 2-2 (directional drilling well counts using DIR_HOR = D or H), and 2-3
/CIAA P&A	Source /CIAA DRILLED WELLS worksheet. Edited to remove all except WELLSTATUS = PA to obtain plugged wells count. Unnecessary data fields removed.
/CIAA PRODS	Source /CIAA DRILLED WELLS worksheet. Main worksheet for producing wells (WELLSTATUS = P, S, or TA). Sort by ascending API. Some unnecessary fields deleted. Fields API_NEXT and API_COMP ultimately not used. Fields with names in yellow highlighting were added from links to the /HIST PRODS ADJ worksheet, the main source for reservoir, TD, and spud and completion date information. These data imported to /CIAA PRODS using the VLOOKUP function.
/HIST PRODS	Source UDOGM HISTDATA GIS file. File does not contain spatial information, so records selected by county for all counties contained within CIAA, and other removed. Sort by ascending API. File is the main source for reservoir, TD, and operations date information. FILE IS NOT A 1 TO 1 MATCH TO /CIAA PRODS. Wells may have multiple records indicating different operations (spud, completion, reentry, etc.) Not all wells in /CIAA PRODS have corresponding record in HISTDATA, but match of various field data is better than 96%. Link between HISTDATA and WELLDATA by API key field.
/HIST PRODS ADJ	Source /HIST PRODS worksheet with WORK_TYPE records = PLUG, RECOMP, and REPERF removed to reduce duplicate record count and obtain better match for /CIAA PRODS. THIS IS THE WORKSHEET ACTUALLY USED FOR VLOOKUP MATCH TO /CIAA PRODS. Fields with names in yellow highlight used for the match to /CIAA PRODS.
/PRODUCTION	Source /CIAA PRODS worksheet. NOT USED FOR TSD, BUT DATA WOULD BE USED FOR MINERALS CUMULATIVE ANALYSIS. Data displayed are well counts and post-1983 production information by producing reservoir. Production data prior to 1984 not accurately tracked to well by UDOGM. Indicated reservoirs have been consolidated into fewer named producing intervals. A number of producing horizons deleted as records show no actual production from these zones and geologic identification is highly questionable in the Uinta Basin. A small number of producing wells do not identify the producing zone.
/TSD TABLES	Formatted tables linked here from /CIAA DRILLED WELLS for Tables 2-1, 2-2, 2-3. Tables automatically updated from source worksheets.

Spreadsheet/Worksheet	Purpose and Methodology
CIAA_well_pads.xls	Spreadsheet for determination of well pad counts derived from UDOGM well data
/CIAA ACTIVE WELL PADS	<p>Source UDOGM_wells.xls/CIAA DRILLED WELLS with unnecessary field removed. Fields with names in RED have been added for the well pad determination calculation. Wells with WELLSTATUS = APD, NEW, or PA have been removed. Added fields purpose:</p> <p>PRIME_SORT - Concatenate all of the STR + QTR_QTR into one field and sort to the qtr-qtr section.</p> <p>UTM_N_LAST - The UTM_SURF_N value of the immediately preceding well in the sort.</p> <p>UTM_E_LAST - The UTM_SURF_E value of the immediately preceding well in the sort.</p> <p>UTM_DELTA - Sum of the absolute values of the differences between the UTM easting and northing values for this well and the preceding well in the sort (meters).</p> <p>PAD_FLAG_1 - Determines whether the current well is located within 30 meters in a north-south and east-west direction from the preceding well in the sort.</p> <p>PAD_FLAG_2 - Flags the preceding well as a pad well if the successor is also a pad well.</p> <p>PAD_FLAG_3 - Compares the two other pad flags to the UTM_DELTA field and determines how many wells are located on the current well pad by incrementing successive wells in this field.</p> <p>Pad counts are summed based on the number of wells on the pad. This table becomes the source for Table 2-5. Disturbance values are based on averages determined from the VFO_FieldDevProjects.xls spreadsheet. Also the source for Table 2-4 and 2-7.</p>
/CIAA FUTURE	<p>Same as /CIAA ACTIVE WELL PADS, except records include wells with WELLSTATUS = APD or NEW. Future wells and pad (foreseeable) are determined by subtracting summary values from the /CIAA ACTIVE WELL PADS worksheet from the summary of this worksheet, which is existing + future. Source for Table 3-1.</p> <p>The EXIST_PAD field is a check field to find all the future pads not indicated in the /CIAA ACTIVE WELL PADS worksheet. The count of the #N/A error should equal the number of future wells. The error indicating the record was not found in the /CIAA ACTIVE WELL PADS worksheet.</p>
/TSD TABLES	Formatted tables linked here from /CIAA ACTIVE WELL PADS and /CIAA FUTURE worksheets for Tables 2-4, 2-5, 2-7, 3-1 . Tables automatically updated from source worksheets.
CIAA_PA_wells.xl	Spreadsheet for determination of disturbance associated with recent unreclaimed plugged wells.
/CIAA P&A WELLS COMPLETION DATES	Source UDOGM HISTDATA for all CIAA counties except Grand County. Grand County was ignored based on very low % of CIAA P&A wells located in Grand County. Records from this file lack spatial data. Records with WELLSTATUS = anything but PA removed to consider only plugged wells. Wells with completion dates were adjusted to the total number of wells to estimate % of all P&A wells completed in last five years and assume that these well pads are yet to be reclaimed. Wells assumed to represent single well pads.

Spreadsheet/Worksheet	Purpose and Methodology
CIAA_Other_Facilities.xls	Spreadsheets for determination of counts and disturbance associated with facilities not related to well pads.
/GAS PLANTS & COMPRESSORS	<p>Source UDOGM gas plants GIS data, UDAQ emissions inventory GIS layer, FERC pre-filing website, and WRAP Phase III listing of major emissions sources. Tabular data from the GIS layers were extracted to a spreadsheet and compared with each other and the non-GIS data sources. Locations for all facilities were made and a spreadsheet table (2-6) and GIS layer constructed for existing facilities.</p> <p>No foreseeable facilities were located at this time based on FERC pre-filing data and the Utah ENBB website.</p>
/PIPELINES	Existing pipelines were not investigated as readily available source data were not located and most pipelines are reclaimed. Foreseeable pipeline data were obtained from the FERC pre-filing website and the Utah ENBB website and information combined into a table (3-5)
/TSD TABLES	Tables 2-6, 3-5
VFO_FieldDevProjects.xls	Master spreadsheet for NEPA projects and all well- and well pad-related disturbance estimates.
/CIAA PENDING NEPA PROJECTS	<p>Source the VFO NEPA projects GIS layer, augmented with new disturbance fields. Tabular data extracted for Status = Pending. For each project, disturbance field data were derived, to the extent feasible, from draft NEPA documents and/or the Utah ENBB. Where no data were available, some fields were filled with assumed or average values based upon typical Uinta Basin values and averages from projects with known values. Assumed or average values are indicated in red font entries. Weighted average disturbance values calculated based on the numbers of wells or well pads, as applicable. Other facilities include such things as compressor stations or other non-well pad facilities. New pending NEPA projects can be added to the list and completed projects can be moved to the /CIAA COMPLETED NEPA PROJECTS worksheet and CIAA averages will be automatically recalculated. Source for tables 3-2, 3-3, 3-4, and 4-1</p> <p>NOTE: This spreadsheet uses array formulas for some of the calculations. Prior to updating, be sure that array formulas are understood to avoid obtaining erroneous results.</p>
/CIAA COMPLETED NEPA PROJECTS	Source same as for the pending NEPA projects worksheet, but containing only projects with Status = Completed.
/TSD TABLES	Tables 3-2, 3-3, 3-4, 4-1

Updating

Information in the Technical Support Document can be updated by obtaining current versions of the data and revising the data spreadsheets. The newly-updated tables can then be copied from the various /TSD TABLES worksheets in several of the spreadsheets and pasting in the appropriate spots in the TSD text. To perform an update:

1. Obtain current data from the listed sources.
2. Clip GIS data as applicable (particularly the UDOGM files) to the boundary of this document.
3. Extract the tabular data from the GIS .dbf files and store as spreadsheets.
4. Copy the current spreadsheets to a backup version by adding OLD to the file name to preserve the current calculation linkages.
5. Copy the new UDOGM data to the appropriate spreadsheets and worksheets. Make sure to match the correct data to the existing worksheet named fields. There will probably be a larger number of records, so the current formulas will need to be copied to cover the new range of records.
6. For the VFO_FieldDevProjects.xls data, copy new NEPA projects to the blank rows in the existing spreadsheet. Move any completed projects from the PENDING to the COMPLETED worksheet as needed. **NOTE: this spreadsheet is the master for surface disturbance calculation. Some of the fields contain array formulas. Do not edit these formulas unless you understand array formulas!** The formulas can be copied.
7. Check the results of the updated tables carefully to see if they make sense. When it appears the information is correct, copy the revised tables into the boilerplate text of the current Technical Support Document.