1. REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

At this time it is unknown when, where, or if future well sites or roads might be proposed on any leased parcel, or even if a lease would be issued. Should a lease be issued, site specific analysis of individual wells or roads would occur when a lease holder submits an APD (Application for Permit to Drill).

For the purpose of analysis the BLM has created a Reasonably Foreseeable Development (RFD) scenario, which helps identify and quantify direct, indirect, and cumulative effects of oil and gas activity. These numbers are used for analysis purpose only and carry with them no guarantees of lease issuance or subsequent development. The RFD is 690 wells on 161 parcels, with an estimated total surface disturbance of 3396.5 acres. It is assumed that each parcel would have at least one well developed within it. If proven to be capable of production in paying quantities, that is the minimum requirement to hold a lease. The surface disturbance associated with the well(s) (well pad, access road, etc.) could be located on or off the parcels depending on the parcel's stipulations. Please refer to the RFD for the assumed wells and disturbance per parcel.

When estimating the number of wells per parcel, the BLM assumed a 40-acre down hole spacing on each parcel, unless there were State-issued spacing orders that stipulated otherwise, and also considered oil and gas production ongoing in a mile radius around each parcel over the last few years. When estimating the surface disturbance per well, the BLM referred to assumption in existing field development NEPA documents that overlapped the parcels. Where there were no existing NEPA documents the BLM extrapolated disturbance assumptions from the Greater Uintah Basin Technical Support Document (BLM, 2012), which estimated the total number of wells per pad, and the total acreage of disturbance in the Greater Uintah Basin area.

The following sections provide a general discussion of possible post-leasing RFD activities. All of these activities would require additional NEPA review.

a. Well Pad and Road Construction

Equipment for well pad construction would consist of dozers, excavators, backhoes, scrapers, and graders. Topsoil from each well pad would be stripped to an approximate depth of six inches and stockpiled for future reclamation. The size of the well pad would be determined by size of the drilling rig, number of wells on the pad, and type of well-being drilled. The well pad would be constructed of native material and might have gravel placed on it to maintain year round access.

It is anticipated that new or upgraded access roads would be required to access well pads and maintain production facilities. Construction of new roads or upgrades to existing roads would usually require a 30-foot construction width and would be constructed of native material. Any new roads constructed for the purpose of oil and gas development would be utilized year-round for maintenance of the proposed well and other facilities, and for the transportation of fluids and/or equipment, and would remain open to other land users. The type of equipment required for these activities would be the same as those needed for well pad construction. Please refer to Appendix G for the well pad and road assumptions per parcel.

b. Well Drilling and Completion Operations

Once construction or expansion of an individual well pad is completed, drilling equipment would be moved onto the new well pad. It is assumed that wells would be drilled utilizing a conventional, mechanically-powered mobile drilling rig. The exact type and size and engine tier of drilling rig would be dependent upon rig availability at the time of project implementation. Drilling operations would consist of drilling the hole, running and cementing intermediate casing, drilling the production hole, and running and cementing production casing. Water required for the drilling and completion of the proposed gas wells would be hauled by truck from a combination of the permitted water sources. It is estimated that approximately 3 acre-feet of water would be needed for the drilling and completion (including hydrofracturing) of one well. For the purposes of this document it is assumed that the water would be obtained from a fresh water source that would be depleting to the Colorado River System.

The casing and cementing program would be designed to isolate and protect the shallower formations, especially usable ground water, encountered in the well bore as directed by BLM Utah Instruction Memorandum (IM) 2010-055 and to prohibit pressure communication or fluid migration between zones. The cement would protect the well by preventing formation pressure from damaging the casing and by retarding corrosion by minimizing contact between the casing and formation fluids. The type of casing used and the depth to which it is set would depend upon the physical characteristics of the formations that are drilled. Site-specific descriptions of drilling procedures would be included in the APD and the COAs for each well.

If testing indicates economic potential, completion operations would set production casing to the total drilled depth, perforate the casing in target production zones, and may hydraulically fracture the productive formation under high pressure. The hydraulic fracturing material would contain sand or other proppant material to keep the fractures open, thereby allowing hydrocarbons to flow more freely into the casing. The next phase would be to flow and test the well to determine rates of production.

i. Hydraulic Fracturing

Hydraulic fracturing (HF) is a well stimulation technique used to increase oil and gas production from underground rock formations. As summarized below, HF technology is not used on all wells drilled in the VFO, MFO, and SLFO. As a result, HF will be evaluated at the APD stage should the parcel be leased, and a development proposal submitted. The following paragraphs provide a general

discussion of the HF process that could potentially be implemented if development were to occur, including well construction information and general conditions encountered within the VFO, MFO, and SLFO.

HF involves the injection of fluids through a wellbore under pressures great enough to fracture the oil and gas producing formations. The fluid is generally comprised of a liquid such as water and proppant (commonly sand or ceramic beads), and a minor percentage of chemicals to give the fluid desirable flow characteristics, corrosion inhibition, etc. The amount of water used in a HF cannot be exactly determined at the leasing stage because it depends on the depth of the well, the number of completions done on the well, and the HF fluid composition. However, for the purposes of this analysis, the three acre-feet of water needed for the completion operations is assumed to be sufficient to satisfy the needs for hydrofracturing. The proppant holds open the newly created fractures after the injection pressure is released. Oil and gas flow through the fractures and up the production well to the surface.

HF has been used by oil and natural gas producers since the late 1940s and, for the first 50 years, was mostly used in vertical wells in conventional formations. HF is still used in these settings, but the process has evolved. Technological developments (including horizontal drilling) have led to the use of HF in "unconventional" hydrocarbon formations that could not otherwise be profitably produced.

The use of horizontal drilling through unconventional reservoirs combined with high-volume water based multi-stage HF activities has led to an increase in oil and gas activity in several areas of the country which has, in turn, resulted in a dramatic increase in domestic oil and gas production nationally. However, along with the production increase, HF activities are suspected of causing contamination of fresh water by creating fluid communication between oil and gas reservoirs and aquifers. In 2016, the EPA conducted an assessment of HF on drinking water resources (https://www.epa.gov/hfstudy).

c. Production Operations

If wells were to go into production, facilities could be located at the well pad or off location and typically include a well head, a dehydrator/separator unit, and storage tanks for produced fluids. The production facility would typically consist of two storage tanks, a truck load-out, separator, and dehydrator facilities. Oil wells will also have a pump jack on the well head. Construction of the production facility would be located on the well pad and not result in any additional surface disturbance.

All permanent surface structures would be painted a flat, non-reflective color (e.g., Juniper Green, Carlsbad Canyon, Shadow Gray) specified by the BLM in order to blend with the colors of the surrounding natural environment. Facilities that are required to comply with the Occupational Safety and Health Act (OSHA) would be excluded from painting color requirements. All surface facilities would be painted immediately after installation and under the direction and approval of the BLM.

If oil is produced, the oil would be stored on location in tanks and the majority transported by truck to a refinery with a smaller portion being transported by pipeline. The volume of tanker truck traffic for oil production would be dependent upon production of the wells, however, it is estimated oil would be transported to a Salt Lake City refinery at least once a week, in 280-barrel tanker trucks.

If natural gas is produced, construction of a gas pipeline would be necessary to transport the gas. An additional Sundry Notice, right of way (ROW) and NEPA analysis would be completed, as needed, for any pipelines and/or other production facilities across public lands if not included in the original APD. BLM Best Management Practices (BMPs), such as burying the pipeline or installing the pipeline within the road, would be considered at the time of the proposal. Please refer to Section 2 of this Appendix for the pipeline assumptions per parcel.

All operations would be conducted following the "Gold Book" Surface Operating Standards for Oil and Gas Exploration and Development. The Gold Book was developed to assist operators by providing information on the requirements for conducting environmentally responsible oil and gas operations on federal lands. The Gold Book provides operators with a combination of guidance and standards for ensuring compliance with agency policies and operating requirements, such as those found at 43 CFR 3000; Onshore Oil and Gas Orders (Onshore Orders); and Notices to Lessees. Included in the Gold Book are environmental BMPs; these measures are designed to provide for safe and efficient operations while minimizing undesirable impacts to the environment.

Periodically, a workover or recompletion on a well may be required to ensure that efficient production is maintained. Workovers can include repairs to the well bore equipment (casing, tubing, rods, or pump), the wellhead, or the production facilities. These repairs would usually be completed in 7 days per well, during daylight hours. The frequency for this type of work cannot be accurately projected because workovers vary by well; however, an average work time may be one workover per well per year after about 5 years of production. In the case of a recompletion, where the wellbore casing is worked on or valves and fittings are replaced to stimulate production, all by-products would be stored in tanks and hauled from the location. For workover operations, it may be necessary to rework the surface location to accommodate equipment. At the completion of the work, the surface location would be re-graded and reclaimed to pre-existing conditions.

Exploration and development on split-estate lands is also addressed in the Gold Book, along with IM 2003-131, Permitting Oil and Gas on Split-Estate Lands and Guidance for Onshore Oil and Gas Order No. 1, IM 2007-165, Split-Estate Report to Congress – Implementation of Fluid Mineral Leasing and Land Use Planning Recommendations, and PIM 2018-014 Directional Drilling into Federal Mineral Estate from Well Pads on Non-Federal Locations (Fee-Fee-Fed IM). Proper planning and consultation, along with the proactive incorporation of these BMPs into the APD Surface Use Plan of Operations by the operator typically result in a more efficient APD and environmental review process, increased operating efficiency, reduced long-term operating costs, reduced final reclamation needs, and less impact to the environment.

d. Produced Water Handling

Water is often associated with either produced oil or natural gas. Water is separated out of the production stream and can be temporarily stored in the reserve pit for 90 days. Permanent disposal options include discharge to evaporation pits or underground injection. Handling of produced water is addressed in Onshore Oil and Gas Order No. 7.

e. Maintenance Operations

Traffic volumes during production would be dependent upon whether the wells produced natural gas and/or oil, and for the latter, the volume of oil and/or water produced.

Well maintenance operations may include periodic use of work-over rigs and heavy trucks for hauling equipment to the producing well, and would include inspections of the well by a pumper on a regular basis or by remote sensing. The road and the well pad would be maintained for reasonable access and working conditions.

f. Plugging and Abandonment

If the well does not produce economic quantities of oil or gas, or when it is no longer commercially productive, the well would be plugged and abandoned. Wells would be plugged and abandoned following procedures reviewed by a BLM Petroleum Engineer and Geologist, and approved by the Authorized Officer. Plugging would include cement plugs at strategic positions in the well bore. Surface disturbance would be reclaimed according to the standards established by the Green River District Reclamation Guidelines.

2. WELL NUMBER AND ACREAGE ESTIMATES

Parcel ID	Parcel Acres	Maximum Number of Wells Allowed on Parcel (Total Acreage / Spacing Index)	Maximum Disturbance Per Parcel	Reasonably Foreseeable Number Of Wells	Surface Disturbance for Estimated Number of Wells (Acres)	County	Acreage Assumptions from Development Documents
066	1200.00	30	105	4	14	Duchesne	Gasco EIS[1]
086	1120.00	28	140	5	25	Duchesne	GUB TSD[2,3]
087	1920.00	48	168	10	35	Duchesne	Gasco EIS[1]
097	40.00	1	5	1	5	Uintah	GUB TSD[3]

Parcel ID	Parcel Acres	Maximum Number of Wells Allowed on Parcel (Total Acreage / Spacing Index)	Maximum Disturbance Per Parcel	Reasonably Foreseeable Number Of Wells	Surface Disturbance for Estimated Number of Wells (Acres)	County	Acreage Assumptions from Development Documents
100	2468.91	62	309	10	50	Uintah	GUB TSD[3]
101	1958.32	49	245	10	50	Uintah	GUB TSD[3]
102	1742.66	44	218	5	25	Uintah	GUB TSD[3]
106	640.00	16	88	1	5.5	Uintah	GNB EIS[4]
107	1279.88	32	160	3	15	Uintah	GUB TSD[3]
108	1920.56	48	240	2	10	Uintah	GUB TSD[3]
109	1148.00	29	144	2	10	Uintah	GUB TSD[3]
110	1444.44	36	181	4	20	Uintah	GUB TSD[3]
111	2240.00	56	280	3	15	Uintah	GUB TSD[3]
112	2330.40	58	291	3	15	Uintah	GUB TSD[3]
115	1984.75	51	253	10	50	Uintah	GUB TSD[3]
117	2080.00	52	260	3	15	Uintah	GUB TSD[3]
122	1989.43	50	249	3	15	Uintah	GUB TSD[3]
124	2560.00	64	320	3	15	Uintah	GUB TSD[3]
127	1600.00	40	200	2	10	Uintah	GUB TSD[3]
129	1680.00	42	210	10	50	Uintah	GUB TSD[3]
130	1465.16	37	183	2	10	Uintah	GUB TSD[3]
131	1440.00	36	180	3	15	Uintah	GUB TSD[3]
132	1891.80	47	236	2	10	Uintah	GUB TSD[3]
133	1923.48	48	240	2	10	Uintah	GUB TSD[3]
134	2537.44	63	317	3	15	Uintah	GUB TSD[3]
135	2560.00	64	320	10	50	Uintah	GUB TSD[3]
136	2547.00	64	318	2	10	Uintah	GUB TSD[3]
139	1940.00	49	243	15	75	Uintah	GUB TSD[3]
141	1108.17	28	139	12	60	Uintah	GUB TSD[3]

Parcel ID	Parcel Acres	Maximum Number of Wells Allowed on Parcel (Total Acreage / Spacing Index)	Maximum Disturbance Per Parcel	Reasonably Foreseeable Number Of Wells	Surface Disturbance for Estimated Number of Wells (Acres)	County	Acreage Assumptions from Development Documents
162	301.93	8	38	2	10	Uintah	GUB TSD[3]
165	1920.00	48	240	4	20	Uintah	GUB TSD[3]
167	2398.28	60	300	5	25	Uintah	GUB TSD[3]
169	2241.24	56	280	8	40	Uintah	GUB TSD[3]
170	280.00	7	35	6	30	Uintah	GUB TSD[3]
171	1440.00	36	180	8	40	Uintah	GUB TSD[3]
172	1294.76	32	129	4	16	Uintah	WB EA[6]
173	1766.53	44	177	3	12	Uintah	WB EA[6]
175	1500.45	38	150	4	16	Uintah	WB EA[6]
176	1600.00	40	160	3	12	Uintah	WB EA[6]
177	1279.95	32	128	4	16	Uintah	WB EA[6]
178	164.41	4	16	2	8	Uintah	WB EA[6]
179	1875.02	47	188	10	40	Uintah	WB EA[6]
197	1831.84	46	229	4	20	Uintah	GUB TSD[3]
198	2560.00	64	320	5	25	Uintah	GUB TSD[3]
199	2418.33	60	302	4	20	Uintah	GUB TSD[3]
200	1840.64	46	230	5	25	Uintah	GUB TSD[3]
201	2240.00	56	280	10	50	Uintah	GUB TSD[3]
202	2303.02	58	288	4	20	Uintah	GUB TSD[3]
203	2080.00	52	260	4	20	Uintah	GUB TSD[3]
204	1440.00	36	180	8	40	Uintah	GUB TSD[3]
205	1195.95	30	149	3	15	Uintah	GUB TSD[3]
206	1570.36	39	196	3	15	Uintah	GUB TSD[3]
207	1808.58	45	181	4	16	Uintah	WB EA[6]
208	1159.20	29	116	2	8	Uintah	WB EA[6]

Parcel ID	Parcel Acres	Maximum Number of Wells Allowed on Parcel (Total Acreage / Spacing Index)	Maximum Disturbance Per Parcel	Reasonably Foreseeable Number Of Wells	Surface Disturbance for Estimated Number of Wells (Acres)	County	Acreage Assumptions from Development Documents
211	779.41	19	97	2	10	Uintah	GUB TSD[3]
212	1920.00	48	240	2	10	Uintah	GUB TSD[3]
213	1360.00	34	170	2	10	Uintah	GUB TSD[3]
214	1670.67	42	209	10	50	Uintah	GUB TSD[3]
217	2152.83	54	269	10	50	Uintah	GUB TSD[3]
218	1250.355	31	156	3	15	Uintah	GUB TSD[3]
226	975.55	24	122	2	10	Daggett	GUB TSD[3]
227	2064.33	52	258	4	20	Daggett	GUB TSD[3]
228	859.44	21	107	1	5	Daggett	GUB TSD[3]
229	927.12	23	116	1	5	Daggett	GUB TSD[3]
260	250.58	6	31	1	5	Uintah	GUB TSD[3]
261	1402.67	35	175	1	5	Uintah	GUB TSD[3]
262	158.25	4	20	1	5	Uintah	GUB TSD[3]
264	2200.00	55	275	3	15	Uintah	GUB TSD[3]
266	1475.32	37	184	2	10	Uintah	GUB TSD[3]
268	1842.34	46	230	3	15	Uintah	GUB TSD[3]
271	1280.00	32	160	5	25	Uintah	GUB TSD[3]
272	640.00	16	80	2	10	Uintah	GUB TSD[3]
273	2240.00	56	280	3	15	Uintah	GUB TSD[3]
274	1760.00	44	220	2	10	Uintah	GUB TSD[3]
276	527.03	13	66	2	10	Uintah	GUB TSD[3]
278	2342.78	59	293	8	40	Uintah	GUB TSD[3]
279	704.92	18	88	7	35	Uintah	GUB TSD[3]
295	1440.00	36	180	10	50	Uintah	GUB TSD[3]
296	40.00	1	5	1	5	Uintah	GUB TSD[3]

Parcel ID	Parcel Acres	Maximum Number of Wells Allowed on Parcel (Total Acreage / Spacing Index)	Maximum Disturbance Per Parcel	Reasonably Foreseeable Number Of Wells	Surface Disturbance for Estimated Number of Wells (Acres)	County	Acreage Assumptions from Development Documents
298	680.00	17	85	2	10	Grand	GUB TSD[3]
305	80.00	2	10	1	5	Uintah	GUB TSD[3]
309	80.00	2	10	1	5	Uintah	GUB TSD[3]
318	2406.46	60	301	5	25	Uintah	GUB TSD[3]
319	629.51	16	79	1	5	Uintah	GUB TSD[3]
320	279.72	7	35	1	5	Uintah	GUB TSD[3]
321	1920.00	48	240	5	25	Uintah	GUB TSD[3]
337	2200.00	55	275	8	40	Uintah	GUB TSD[3]
356	1436.18	36	180	3	15	Uintah	GUB TSD[3]
358	2154.20	54	269	4	20	Uintah	GUB TSD[3]
359	1918.64	48	240	4	20	Uintah	GUB TSD[3]
381	720.00	18	90	1	5	Summit	GUB TSD[3]
382	1802.19	45	225	4	20	Daggett	GUB TSD[3]
383	917.81	23	115	1	5	Summit	GUB TSD[3]
384	1147.29	29	143	4	20	Daggett	GUB TSD[3]
405	80.00	2	10	2	10	Uintah	GUB TSD[3]
UTU78225	80.00	2	10	1	5	Uintah	GUB TSD[3]
Total	**142,106.49**	**3553**	**17343.1**	**148**	**1943.5**		

1 **Gasco EIS** Assume 3.5 acres of disturbance per well including the well pad, road, and pipeline based on the Gasco Uinta Basin FEIS Table 2-7. The Gasco ROD allowed 1 well pad per 160 acres. It is assumed that only one well would be drilled on the pad until more production information is available.

2 Gasco EIS Although this parcel is located within the boundary of the Gasco Uinta Basin EIS, no development assumed in this Township and Range under any alternatives due to the area not being leased, or due to the leases belonging to other companies. Therefore the Greater Uinta Basin Technical Support Document assumptions should be used.

3 GUB TSD Assume 5 acres of disturbance per well including the well pad, road, and pipeline based on table 4.1 in the Greater Uinta Basin Technical Support Document. Number derived from data in Table 4-1 by dividing total foreseeable construction disturbance by the total foreseeable new well pads. Pads, roads, and pipelines counted together in this estimate.

4 GNB EIS Assume 5.5 acres of disturbance per well including the well pad, road, and pipeline based on the ROD section 3. The Greater Natural Buttes ROD allowed 1 well pad per 80 acres. It is assumed that only one well would be drilled on the pad until more production information is available.

5 RH EA Assume 4.5 acres of disturbance per well including the well pad, road, and pipeline based on Rock House EA Chapter 2. The Rock House state director decision allowed 9 well pads total. It is assumed that any development would be drilled on one of those nine well pads until more production information is available.

6 West Bonanza Assume 4 acres of disturbance per well including the well pad, road, and pipeline based on the proposed action of the West Bonanza EA. The West Bonanza EA Decision Record allowed 1 well pad per 80 or greater acres. It is assumed that each well pad will have one well on it, until further production information is available.

3. REFERENCES

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