



Comprehensive Drilling Plans and Applications

Section (W) Alternative Site Analysis

Broomfield Development

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1.0 Introduction

In 2015, Extraction Oil & Gas, Inc. (“Extraction”) acquired various oil and gas leases and other related interests and was assigned certain agreements that granted them the right to conduct oil and gas operations (the “Broomfield Project”) within the City and County of Broomfield, Colorado (“Broomfield”). The Broomfield Project had been ongoing since 2012 by Extraction’s predecessors-in-interest, Sovereign Oil & Gas, LLC and Noble Energy, Inc. in their respective projects. The acquisition of these leases and agreements entitled Extraction to commence operations as early as 2015, given the rights within those agreements had already vested and been assigned to Extraction. However, given the proximity of the Broomfield Project to the Broomfield community and its citizens, Extraction engaged in over two (2) years of negotiations and compromise with Broomfield and its City Council (the “City Council”) to demonstrate its commitment to conducting safe and innovative oil and gas operations while keeping at all times the health, safety, and welfare of Broomfield citizens a paramount consideration. This Alternative Site Analysis summarizes the various siting that was considered in the evolution of the project.

2.0 Noble Surface Use Agreement

On or about November 13, 2012, Noble Energy, Inc. (“Noble”) entered into a Surface Use Agreement (the “Noble SUA”) with Broomfield (and recorded on November 15, 2012).¹ The Noble SUA governed the rights and obligations of both Noble and Broomfield with respect to proposed oil and gas operations Noble intended on conducting in Broomfield. The Noble SUA granted Noble the right to drill and/or operate oil and/or gas wells within only two locations within Broomfield: the Livingston Location and the North Location.² In addition to the already existing well at the Livingston Location, the Noble SUA granted Noble the right to drill three (3) additional wells at this location. *Id.* The language in §1(a) placed no limit on the number of directional or horizontal wells that could be drilled at the North Location.

¹ See generally Noble SUA (Recorded on Nov. 15, 2012 as Instrument No. 2012014944 by the Broomfield City and County Clerk and Recorder).

² See *id.*

3.0 Sovereign MOU (Rec. Oct. 24, 2013)

On August 27, 2013, Sovereign Operating Company, LLC (“Sovereign”) entered into a Memorandum of Understanding (the “Sovereign MOU”) with Broomfield.³ The Sovereign MOU governed the rights and obligations of both Sovereign and Broomfield with respect to the proposed oil and gas operations Sovereign intended on conducting in Broomfield. Pursuant to a Use by Special Review Permit (the “SovereignUSR Permit”), approved by Broomfield prior to August 27, 2013, the following ten (10) well sites upon which Sovereign could conduct drilling operations were identified:

1. Brozovich MA 8-11 Well Pad;
2. Brozovich MA 8-13 Well Pad;
3. Brozovich MA 8-14J Well Pad;
4. Webber H Unit 1 Pad (as approved by Broomfield per Resolution No. 2013-22)
5. Hulstrom G Unit 1 Pad (as approved by Broomfield City Resolution No 2013-23)
6. Brozovich 8-8J Well Pad;
7. Nordstrom 5-4 Well Pad;
8. Nordstrom 2-4 Well Pad;
9. Brozovich MA 8-2 Well Pad; and
10. Memorial 22-3 Well Pad⁴

At the time of execution of the Sovereign MOU, the following thirty-one (31) wells had been approved by Broomfield for drilling in the following manner:

1. Six wells approved for the Webber H Unit 1 Well Pad, by City Council Resolution No. 2013-22, dated February 12, 2013;
2. Four wells approved for the Hulstrom G Unit 1 Well Pad by City Council Resolution No. 2013-23, dated February 12, 2013;
3. Four wells approved for the Brozovich MA 8-2 Well Pad by City Council Resolution No. 2013-55, dated August 27, 2013;
4. Six wells approved for the Memorial 22-3 Well Pad by City Council Resolution No. 2013-55, dated August 27, 2013;
5. Six wells approved for the Nordstrom 2-4 Well Pad by City Council Resolution No. 2013-55, dated August 27, 2013; and
6. Five wells approved for the Nordstrom 5-4 Well Pad, by City Council Resolution No. Resolution No. 2013-55, dated August 27, 2013.

³ See generally Sovereign MOU ((Recorded on Oct. 24, 2013, as Instrument No. 2013015088 by the Broomfield City and County Clerk and Recorder).

⁴ At the time of execution of the Sovereign MOU, the following well pads had not yet been approved, but Use by Special Review Applications had been filed: (1) the Nordstrom 5-4 Well Pad; (2) Nordstrom 2-4 Well Pad; (3) Brozovich MA 8-2 Well Pad; (4) and the Memorial 22-3 Well Pad. See *id.*

4.0 Extraction Pre-Conceptual Review and Conceptual Review

As mentioned previously, in 2015 Extraction acquired several oil and gas leases among other interests in Broomfield from Sovereign and Noble. By virtue of the acquisition, Extraction became the successor-in-interest to both the Noble SUA and the Sovereign MOU. With these acquisitions, Extraction planned on continuing the proposed work of both Noble and Sovereign and began planning to implement the Broomfield Project to conduct oil and gas operations in Broomfield.

In response to the growing sensitivity within Broomfield surrounding the Broomfield Project and in a good-faith effort to address concerns related to the health and safety of Broomfield citizens, in August 2015, Extraction engaged Broomfield in a Pre-Conceptual Review Process (the “Review”) pursuant to Appendix A, §3 of the Sovereign MOU. Based on the Review, in or around June 2016, Extraction proposed to supplement and update the existing Sovereign MOU⁵ to allow consolidation of the ten (10) well pad sites to three (3) newly-named well pad sites in the following manner:

1. Sheridan Well Pad (proximate to the existing Brozovich 8-2 Well Pad) will consolidate:
 - a. Brozovich 8-2 Well Pad
 - b. Brozovich 8-8J Well Pad
 - c. Brozovich MA 8-11 Well Pad
 - d. Brozovich MA 8-13 Well Pad
 - e. Brozovich MA 8-14J Well Pad
2. Huron Well Pad (approximately 800 feet from previously-approved Webber H Unit 1 Pad) will consolidate:
 - a. Webber H Unit 1 Pad
 - b. Various wells from the Hulstrom G Unit 1 Pad
 - c. Memorial 22-3 Well Pad
3. United Well Pad (proximate to existing Nordstrom 5-4 Well Pad) will consolidate:
 - a. Nordstrom 5-4 Well Pad
 - b. Nordstrom 2-4 Well Pad
 - c. Various wells from the Hulstrom G Unit 1 Pad

The supplementation to the Sovereign MOU contemplated consolidation of well pad sites within Broomfield to allow Extraction to reduce the aerial extent of its operations; reduce surface disturbances; reduce zoning conflicts; generally minimize potential impacts to adjacent landowners; reduce emissions and traffic; increase setbacks; and generally improve public health, safety, and welfare. Also, the consolidation of the well pads would allow Extraction to

better implement the best management practices (“BMPs”) required by the Sovereign MOU.⁶ In addition to the aforementioned consolidation and re-expressed intent to comply with the Sovereign MOU BMPs, Extraction planned at this time to construct three (3) new facilities at the new Well Sites (one each at the Sheridan Well Pad, Huron Well Pad, and United Well Pad) that used best engineering practices to eliminate or reduce air emissions, improve safety, and reduce other potential impacts to the surrounding communities.

These consolidations to the Sheridan Well Pad, the Huron Well Pad, and the United Well Pad only pertained to the previously-identified ten (10) well pad sites pursuant to the Sovereign MOU.

Extraction had already decided previously to consolidate the Livingston Location and the North Location, pursuant to the Noble SUA, into one (1) well pad site. This well pad site was named the Lowell Well Pad. As such, this decreased the total number of well sites Extraction had acquired from Noble and Sovereign from twelve (12) well pad sites to four (4) well pad sites.

Following the supplementation of the MOU that will be discussed to follow, Extraction submitted an extensive package for Conceptual Review of its Sheridan well site on or about December 2016.

⁶ All of these consolidations were memorialized in Extraction’s Proposed Plan of Development for the Broomfield Project presented to Broomfield in June 2016 but for various reasons, Extractions Proposed Plan of Development was not made an exhibit to the Supplement.

5.0 Supplement MOU

Pursuant to the Review and discussions between Extraction and Broomfield, on or about June 14, 2016, Extraction entered into a Supplement to Oil & Gas Operator Agreement (the “Extraction Supplement MOU”) with Broomfield.⁷ The Extraction Supplement MOU adopted the above well pad site consolidations, reducing the number of well pad sites from ten (10), as was the case with the Sovereign MOU, to three (3). In addition to the well pad site consolidation, Extraction agreed to comply with all of the BMPs listed in Appendix to the extent technically and economically feasible, including but not limited to:

1. Focusing lighting down during the drilling, completion and production phases of its operations, as part of its lighting plan in compliance with Appendix A paragraph 29;
2. Preparing a landscape plan for the City’s review, in cooperation and consultation with the surface owner consistent with current and future planned development;
3. Evaluating the feasibility of employing oil pipelines to transport oil from the Well Sites, or in the alternative, using closed loop truck loading facilities to reduce emissions;
4. Preparing a site security plan for the Well Sites, to include twenty-four (24) hour monitoring during the drilling and completion phases;
5. Developing Well Sites as soon as practicable, such as the Sheridan Well Pad, to attempt to avoid conflicting uses between the Well Sites and future urban and commercial development;
6. Plugging and reclaiming vertical wells operated by Extraction within twelve (12) months after drilling replacement well(s) from the consolidated Well Sites or as soon as necessary permits and permissions can be acquired and the work scheduled.

See generally, Extraction Plan of Development for Broomfield Project June 2016 draft.

There were a series of items that were left for discussion in the project planning stages among other things such as a commitment to pipelines contingent on Broomfield providing right-of-ways, the use of electric rigs and determination of certain wells to plug and abandon. Thus, negotiations were ongoing.

⁷ *See generally* Supplement to Oil and Gas Operator Agreement (Recorded on June 29, 2016 as Instrument No. 2016007563 by the Broomfield City and County Clerk and Recorder).

6.0 Broomfield Oil & Gas Comprehensive Plan Update Committee

On or about February 14, 2017, by City Council Resolution No. 2017-29, Broomfield commissioned a fourteen (14) member Oil and Gas Comprehensive Plan Update Committee (the “Committee”). The Committee was commissioned for the purpose of focusing attention to oil and gas drilling within Broomfield concerning development and production activities and how these activities should be addressed in the Comprehensive Plan adopted by City Council in November 2016. The Committee conducted a multitude of study sessions and meetings from February 2017 to August 2017.

In consideration of public comment and Broomfield feedback on Extraction’s proposed plan of development, Extraction evaluated its plan and agreed to reduce the total well count to ninety-nine (99), with twenty-nine (29) wells on the Lowell Pad, nineteen (19) wells on the Sheridan Pad, twenty-one (21) wells on the United Pad, and thirty (30) wells on the Huron Pad. The Committee presented its proposed recommendations (the “Committee Recommendations”) to Broomfield on August 29, 2017.⁸

Within the Committee Recommendations was the proposal to mandate an Alternative Site Analysis tool or matrix when considering siting for all future oil and gas operations in Broomfield. The purpose of the Alternative Site Analysis matrix was to create a tool to assist in more effectively responding to Broomfield citizens’ concerns about the proximity to neighborhoods of certain operator-proposed locations and to explore and recommend specific criteria to avoid potential adverse community impacts related to public health, safety, welfare and the environment.⁹ The Committee was attempting to construct a tool using the best available data and taking multiple weighted factors into account to compare a wide variety of possible sites.

The Alternative Site Analysis matrix created by the Commission consisted of the following three (3) steps:

1. Identify the Operator’s most desired site and select fifteen (15) additional sites;
2. Use eleven (11) weighted criteria¹⁰ reflecting residents’ concerns about site proximity to residential neighborhoods and surface water to evaluate community impacts of sites;

⁸ See generally Task Force Recommendations to Broomfield City Council.

⁹ *Id.*

¹⁰ The weighted criteria, in order of most importance, were as follows: (1) Number of Occupiable Residential Units within 1500 foot radius circle; (2) Distance to Nearest Surface Water; (3) Distance to Nearest Occupied Residence; (4) Distance to Nearest School Property Line; (5) Potential Impact on Residential Property Values during Drilling through Flowback Phases; (6) Visual Impact during Drilling through Completion Phase; (7) Distance to Nearest Hospital/Overnight Health Care Facility; (8) Number of Occupiable Residential Units within 3000’ radius (Major

- Using a rating scaled 1-10 developed for each criterion, apply information gained from City GIS Software and apply the criteria to each site.¹¹

The Committee utilized the Alternative Site Analysis matrix to rate the Huron Pad, United Pad, Sheridan Pad, and Lowell Pad at their respective locations as proposed by Extraction. *Id.* at pp. 28-33. Those well pads received a respective score on a scale of 1 to 100 of the following: 93, 92, 76, and 65. *Id.* at p. 30.

After Committee consideration and analysis, the Committee came to the following Conclusions & Recommendations regarding the utilization of an Alternative Site Analysis:

- Alternative Site Analysis Tracks & Quantifies Broomfield Citizens’ Concerns;
- Urban Settings’ Community Impacts Require both Distances & Residential Density in Proximity to Well Sites to be Considered in Well Site Selection;
- Alternative Site Analysis is an Excellent Tool for City to Evaluate Community Impacts; and
- The Alternative Site Analysis and its Decision Matrix puts the “Mean on the Bones” of the Governor’s Task Force Recommendation #17 for Evaluation Alternative Well Sites¹²

Id. at p. 34. Given the Committee’s Conclusions & Recommendations, in conjunction with the results from the Alternative Site Analysis for the four (4) proposed Extraction well pad sites, the Committee proposed Extraction consider different locations for both the Sheridan Pad and the Lowell Pad.

In addition to the newly-developed Alternative Site Analysis, the Committee also recommended increased setback requirements for all well pads in Broomfield in Action Step OG-18.5 of the Committee Recommendations.¹³ Action Step OG-18.5 proposed the following buffer zones apply to oil and gas development within Broomfield:

Level	#of Wells	Buffer Zone
1	1	500 feet
2	2-8	750 feet, unless there are more than 100 homes within 3,000 feet, in which case it moves to 1,000 feet
3	9-17	1,000 feet, unless there are more than 125 homes within

Event impact case); (9) Use of Active Well Site or Previously Disturbed Industrial Use Site; (10) Distance to Nearest Platted Residential lot; and (11) Land Use Percentage Breakdown within 80-Acre Circle (Radius of 1050 feet from Center of Well Site). *Id.*

¹¹ *See id.*

¹² Colorado Governor’s Oil & Gas Task Force Recommendation #17 was to “Recommend COGCC rulemaking to address Local Government collaboration with Operators concerning locations for ‘Large Scale Oil and Gas Facilities’ in ‘Urban Mitigation Areas,’ as defined in COGCC Rules.”

¹³ *See generally* BROOMFIELD CITY COUNCIL, OIL & GAS NEGOTIATIONS STUDY SESSIONS (Oct. 17, 2017).

		3,000 feet, in which case it moves to 1,320 feet
4	18+	1,320 feet

Following the Committee Recommendations being presented to the Council, including both the Alternative Site Analysis and setback increases pursuant to OG-18.5, the Council directed its staff (the “Council Staff”) to begin negotiations with Extraction with regards to their proposed well sites in Broomfield. Council Staff requested that Extraction consider various alternative sites pursuant to the results gleaned from the Alternative Site Analysis.

7.0 Extraction Revisits Well Pad Sites in Light of Committee Recommendations

To address Broomfield citizen concerns and the Committee Recommendations, as well as growing concerns from the citizens of neighboring Adams County¹⁴, Extraction obliged Council Staff by re-entering negotiations to consider potentially alternative sites to replace the Lowell Pad, the Sheridan Pad, the United Pad, and the Huron Pad. Extraction and Broomfield eventually agreed upon four (4) newly-named well pad locations. These negotiations were presented to the City Council on October 17, 2017.¹⁵

7.1 The Livingston Pad

A pad south and west of the Lowell Pad, known as the Livingston Pad, would be created with nineteen (19) wells to be drilled in Phase 1 and an additional fifteen (15) wells to be drilled in Phase II,¹⁶ with Phase II drilling only to take place if Broomfield and Extraction agree upon an alternative location by June 30, 2020 (Secondary Site). Due to the proposed pad's proximity to the proposed Broomfield reservoir, the Master Operator Agreement would still require tertiary containment through separators, steel-rim berms around equipment, engineered liners, and a berm around the pad. The reservoir will also be protected because of the use of pipelines and no tanks.

7.2 The Northwest and United Pads

The next portion of the alternative site proposal was the elimination of the Sheridan Pad and the original United Pad. These two (2) well pads were replaced with the Northwest Pad A and Northwest Pad B. Both of these pads would have eight (8) wells drilled upon them south of the Northwest Parkway on the Davis Open Space. Also, the elimination of the Sheridan and the original United Pads would be replaced with the United Pads A and B, of eight (8) wells each, to be drilled north of the Northwest Parkway on the Nordstrom Open Space.

7.3 Proposed Interchange Pads

On the approximately 100 acres of property south of the Northwest Parkway and west of I-25 purchased by Extraction, Extraction agreed to consolidate what was once four (4) proposed well pads into two (2) pads. These pads, named Interchange A Pad and Interchange B Pad would consist of sixteen (16) wells and seventeen (17) wells, respectively.

¹⁴ Extraction's continued efforts to accommodate Broomfield with the location of its well pads resulted in a well pad being placed closer to Adams County than originally planned; as such, Adams County raised concerns as well related to the proximity of well pad sites to residential units within Adams County.

¹⁵ See BROOMFIELD CITY COUNCIL, OIL & GAS NEGOTIATIONS STUDY SESSIONS (Oct. 17, 2017).

¹⁶ The Livingston Phase II was eliminated in the final Operator Agreement.

7.4 Summary of New Well Pad Site Locations

In summary, Extraction agreed with Broomfield to enter into a Master Operator Agreement to drill only ninety-nine (99) wells, at the following well sites and well numbers per pad (collectively, the “New Well Pad Sites”), in Broomfield:

1. Livingston Pad – 19 New Wells during Livingston Phase I
2. Livingston Pad – 15 New Wells if Livingston Phase II is triggered¹⁷
3. Northwest A Pad – 8 New Wells
4. Northwest B Pad – 8 New Wells
5. United A Pad – 8 New Wells
6. United B Pad – 8 New Wells
7. Interchange A Pad – 16 New Wells
8. Interchange B Pad – 17 New Wells¹⁸

Extraction saw many benefits to the rearrangement of its well pad sites to the New Well Pad Sites mentioned above. First, the relocation of well pad sites to the New Well Pad Sites directly addressed the Alternative Site Analysis presented by the Committee in its Recommendations, demonstrating Extraction’s commitment to collaborate with Broomfield citizens to ensure their health and safety was of paramount importance. Second, the New Well Pad Sites were not next to anticipated future development. Third, no wells would be drilled within 1,000 feet of Adams County homes. Finally, the New Well Pad Sites would allow Extraction to achieve project completion quicker and more effectively to ensure minimization of Broomfield community impact.

7.5 Other Negotiations Between Extraction and Broomfield

Extraction made other commitments to Broomfield throughout the negotiation process beyond its contractual obligations stemming from the Noble SUA, the Sovereign MOU, and Extraction Supplemental MOU. First, Extraction agreed that thirty two and a half (32 ½) acres of the 100 acre parcel purchased by Extraction for the Interchange A Well pad and the Interchange B Well Pad would be dedicated to Broomfield for Open Space.¹⁹ Extraction also agreed to pay Broomfield \$650,000 for the lease of the open space for the Northwest and Parkway well pads, and \$20 per linear foot for pipeline easements in the open space.

Second, in addition to the plugging and abandoning of existing wells in Broomfield that Extraction was already completing, Extraction agreed to plug and abandon of all its remaining wells in Broomfield beginning in early 2019 and completed no later than 2022.²⁰

Third, Extraction agreed to additional BMPs that addressed Broomfield concerns not addressed in the BMPs already agreed to under both the Sovereign MOU and the Extraction Supplement MOU.²¹ These additional BMPs were as follows:

¹⁷ The Livingston Phase II was eliminated in the final Operator Agreement.

¹⁸ See BROOMFIELD CITY COUNCIL, OIL & GAS NEGOTIATIONS STUDY SESSIONS (Oct. 17, 2017).

¹⁹ *Id.*

²⁰ *Id.*

1. Adopt all of the Committee's air quality recommendations, except those recommendations for Tier 4 engines²²;
2. Increase general liability insurance coverage to \$100,000,000 while the well sites are under Extraction control and \$25,000,000 for the duration of the agreement if there is a change in ownership;
3. Conduct soil gas monitoring;
4. Adopt Committee Recommendation setbacks pursuant to Action Step OG-18.5 and maintain a 1,000 foot setback from all Adams County homes;
5. Conduct noise modeling at 1,000 feet from the pads at a 55 decibel level; and
6. Conduct a risk analysis

²¹ *Id.*

²² Extraction indicated that Tier 4 engines are not generally available for pumping operations and the remainder of the permanent equipment was anticipated to be electric.

8.0 Final Negotiations and Execution of Extraction Operator Agreement

Despite the above concessions made by Extraction to Broomfield with the goal of preserving the health and safety, addressing all Broomfield citizens' concerns and working in a collaborative manner, Broomfield continued to make efforts to negotiate further with Extraction regarding the final location of the well pad sites and the number of wells. Over the next seven (7) days following the presentation of negotiations on October 17, 2017, Extraction willingly collaborated with Broomfield to reach a fair compromise of, *inter alia*, well pad sites, number of well pads, number of well pads on each well, and BMPs. On October 24, 2017, Extraction entered into the Amended and Restated Oil and Gas Operator Agreement (the "Master Operator Agreement") with Broomfield.²³ The Master Operator Agreement memorialized the final compromise made between Extraction and Broomfield with regards to the new well pad sites (the "Final Well Pad Sites") and the number of wells on each pad. Extraction also agreed to reduce the number of well pads from nine (9) to six (6) and also agreed to lower the maximum number of wells from ninety-nine (99) to eighty-four (84). The Final Well Pad Sites and corresponding well pad numbers were as follows:

<u>Well Site</u>	<u>Number of Wells</u>
1. Livingston Pad	19
2. Northwest A Pad	8
3. Northwest B Pad	8
4. United Pad	16
5. Interchange A Pad	16
6. Interchange B Pad	17 ²⁴

²³ See generally, Operator Agreement.

²⁴ *Id.*

9.0 Conclusion

Extraction has made over ten (10) alterations to the Broomfield Project and the location of the project's respective well pad sites and wells as a direct response to concerns raised by Broomfield and its citizens during the course of two years despite having contracts in place that authorized them to commence operations when it acquired assets from Noble and Sovereign in 2015 from different sites to the present planned Well Sites.