

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action consists of a site-specific proposal that has been designed in cooperation between Stewart and the BLM. The Proposed Action and analyses within this EA evaluates the construction and drilling of up to nine deep exploratory natural gas wells from seven well pads (Tumbleweed Unit Federal #4-3, #5-8, #9-3, #9-11, #17-4, #17-12, and #18-9), production facilities, roads, and pipelines on Federal and State lands in the Tumbleweed II Project Area (**Figure 2-1 – Appendix E**). As discussed in **Appendix B**, the TUF #18-9 was drilled and completed in 2007. However, given that the DR approving that well was remanded, the surface disturbance and impacts of that existing well pad, well, and associated facilities are fully analyzed within this new EA. As such, the seven well pads and nine wells evaluated under this Proposed Action are listed below in **Table 2-1**.

Table 2-1 Proposed Well Pads and Wells Under the Proposed Action

Well Pad	Well	Federal Lease Number
New Wells on New Well Pads		
#4-3	#4-3	UTU-72059
#5-8	#5-8	UTU-72667
#9-3	#9-3	UTU-72059
#9-11	#9-11	UTU-72059
#17-4	#17-4	UTU-84256
#17-12	#17-12	UTU-84256
New Wells on Existing Well Pad		
#18-9	#18-8	UTU-72018
	#19-1	
Existing Well on Existing Well Pad		
#18-9	#18-9	UTU-72018

Approximately 5.5 miles of the proposed 10-inch diameter pipeline would be installed off-lease within the existing pipeline corridor that runs through the southern end of the Tumbleweed II Project Area to the existing Wolf Point compressor station.

2.1.1 WELL PERMITTING PROCESS

Stewart’s Proposed Action for the Tumbleweed Project would require approval of the individual wells through the APD process. The detailed information required to be submitted for each APD is identified in Onshore Oil and Gas Order Number 1 and 43 CFR 3162.3.

The BLM’s approval of the APDs is contingent on compliance with the following requirements:

- All activities must comply with applicable Federal, State, and local laws and regulations to the extent that such State and local laws are applicable to Federal leases;
- All activities must contain adequate safeguards to protect the environment;
- Disturbed lands must be properly reclaimed; and
- Public health and safety must be protected.

The TUF #18-9 is an existing, producing well with associated well pad, pipeline, and access road. In addition, onsite inspections have been conducted by the BLM for three of the proposed well pads (Tumbleweed Unit Federal #4-3, #9-3, #5-8) and access roads, and pipelines. As a result of those onsite evaluations, some of the originally proposed surface locations have been moved or drilling operations changed to accommodate site-specific concerns and reduce or eliminate potential impacts to resource values. For example, **Section 2.5.1** includes discussion on alternate road locations for the proposed TUF #4-3. However, this alternative was eliminated from further analysis after an onsite evaluation. In another example, the operator and BLM determined that the proposed well for the TUF #18-9 would have to be directionally drilled from the proposed well pad, as the bottomhole location occurs below a topographically challenging area. Following onsite inspections and subsequent re-locations and re-routes, APDs for the above-mentioned wells discussed in this EA were submitted to BLM.

Onsite inspections have not been completed for the proposed TUF #17-4, TUF #17-12, or TUF #9-11 well pads, access roads, and pipelines, or for the proposed well pads under Alternative D. After filing a Notice of Staking (NOS) or an APD, the BLM would conduct an onsite inspection of the proposed well, access road, and pipeline locations to identify site-specific impacts and to identify any avoidance techniques or other mitigation measures. Following the onsite evaluation the project proponent (Stewart) would either submit or revise the APD as determined appropriate.

2.1.2 WELL PAD CONSTRUCTION

In order to drill the proposed nine exploratory gas wells within the Tumbleweed II Project Area, up to seven well pads would be constructed³. Each well pad would initially occupy approximately 1.3 acres (approximately 350 x 160 feet). Based on topographical constraints, Stewart is proposing to drill three directional wells from the TUF #18-9. The well pad for the TUF #18-9 would be constructed using the same techniques as the well pads for single vertical wells. The addition of the TUF #18-8 and #19-1 to the TUF #18-9 well pad would not result in any additional surface disturbance. Total initial disturbance from well pad construction in the Tumbleweed II Project Area would be approximately 9.1 acres.

Construction of a well pad typically would involve the use of the following heavy equipment: a D6 or larger crawler tractor, a D12 or larger motor grader, a Class 125 or larger track hoe, a mid-sized backhoe, a 10-yard dump truck, and possibly a Class 988 loader. Equipment needs would vary depending on the site-specific conditions. All surface-disturbing activities would be supervised by a company representative who is familiar with the terms and conditions in the Decision Record and associated APDs.

In order to clear surfaces for well pad construction, a crawler tractor would strip existing topsoil and brush, and would stockpile the soil along the uphill side of the well pad, if feasible. All cut and fill slopes needed for the well pad would be constructed so that stability would be maintained for the life of the project. To prevent storm water from washing onto each well pad, diversion ditches and berms would be constructed with a motor grader. Prior to drilling operations, a reserve pit (approximately 190 feet by 80 feet by 10 feet deep) would be excavated adjacent to the working area. To avoid impacts to soils and shallow groundwater, the reserve pit would be lined with 12-milimeter (minimum) plastic nylon reinforced material. The liner would overlay a felt liner pad if rock is encountered during excavation. The pit liner would overlap the pit walls and be covered with dirt and/or rocks to hold it in place. The reserve pit liners would have minimum burst strength equal to or greater than 300 pounds, puncture strength equal to or greater than 160 pounds, and grab tensile strength exceeding 150 pounds. Each liner would be resistant to deterioration by hydrocarbons, and all liners would be tested in accordance with

³ As previously stated, the TUF #18-9 well pad was constructed and the well was drilled and completed in 2007. However, given that the DR approving that well was remanded, the surface disturbance and impacts of that existing well pad, well, and associated facilities are fully analyzed within this new EA.

American Society for Testing and Materials standards. Spoil from the pit would be stockpiled within a drainage control berm along the edge of each pit and adjacent to each well pad. The depth of the reserve pit would be approximately 10 feet, with 2 feet of freeboard.

To assure stability, the reserve pit would be constructed on the cut side of the pads. The pit would not be constructed in a natural drainage, where flood hazards exist, or where surface run-off could enter the pit or damage the pit walls. Three sides of the reserve pit would be fenced before drilling, and the fourth side would be fenced as soon as drilling is completed. All fences would remain until the liquids are removed and the pits are backfilled. After the well has been drilled, all pits containing materials that might be hazardous to wildlife would be covered with steel mesh screen or netting to prevent entry by migratory birds, bats, or other wildlife species and livestock.

Each well pad would be surrounded by a berm to minimize erosion, and all drainage from the pads would be directed toward the reserve pit. The berm would also divert drainage from adjacent lands around areas of disturbance. Energy dissipaters such as straw bales, rock gabions, and silt fences may be used in areas where the possibility of down-cutting exists.

Well pad construction would take approximately 5 to 10 days per pad.

If the wells are productive, a portion of each well pad would be reclaimed following completion of the well(s). Production equipment at each well pad would include a well head(s), meter house(s), separator(s), produced water and oil tanks, and pipelines. Portions of the well pad surfaces not used to house production facilities, and not needed to provide continued access to those facilities, would be re-graded so that water would drain away from the reclaimed drilling pits. The re-graded areas would then be seeded with a seed mixture approved by the Authorized Officer (**Section 2.1.13**).

Approximately 0.35 acres (100 x 150 feet) of each well pad would remain in place over the life of the project. Total long-term well pad disturbance from the existing #18-9 well pad and six proposed well pads is estimated to be approximately 2.45 acres. If a well is unproductive, the pad would be entirely reclaimed following well plugging and abandonment. In the case of either a productive or unproductive well, reclamation activities would take place within one year of drilling activities.

2.1.3 ROAD CONSTRUCTION

Access to the Tumbleweed II Project Area would be achieved by following the Seep Ridge Road to the Three Pines Road. The Three Pines Road would be followed in a westerly direction to the intersection of the Winter Ridge Road. The Winter Ridge Road would then be followed in a northwest direction to the just beyond then Bull Canyon - Winter Ridge Road intersection. Tumbleweed II Project Area access would leave the Winter Ridge Road and proceed along unmarked roads for 0.8 miles to a point where new access would begin. A new access road 0.6 mile in length would then continue to the proposed Tumbleweed Unit exploratory wells.

Proposed access roads on federal lands would be permitted through the APD, Sundry Notice, or ROW grant process as appropriate⁴. Construction of new access roads and upgrading of existing roads would only occur within areas approved for disturbance and would be in accordance with BLM road guidelines established for oil and gas exploration and development activities as described in the BLM and U.S. Forest Service (USFS) publication *Surface Operating Standards for Oil and Gas Exploration and Development* (Fourth Edition) (i.e., the Gold Book), *BLM Manual Section 9113*, and BLM's

⁴ A small portion of road/pipeline corridor is proposed off-lease, and would be permitted through the BLM's ROW grant process.

Hydrological Modification Standards for Roads (BLM and USFS 2007). Site-specific approval of road ROWs would be obtained through the BLM ROW grant process as appropriate. Impacts from all currently proposed ROWs are included in this EA.

The Proposed Action would require construction of up to approximately 4.2 miles of new road surface and upgrading of up to approximately 1.9 miles of existing roads (unnamed Class D roads) within the Tumbleweed II Project Area. Where possible, disturbance to steep slopes, rugged terrain, and ephemeral/intermittent drainages would be avoided. The initial construction width for both new roads and existing road upgrades would be 32-foot wide, which would result in approximately 23.7 acres of disturbance. Following road construction, unused road surfaces would be reclaimed, and each road would have a 16-foot running surface. All roads would be composed of a base overlain with 0.75-inch gravel, as needed. The surface would have a crown to facilitate drainage to a borrow ditch designed to minimize erosion potential. Grades would be less than 10 percent, and the maximum degree of curve would be less than 50 degrees. No cuts, fills, or turnouts would be necessary to access proposed well locations. The new and upgraded roads would have a design speed of approximately 20 miles-per-hour (mph). Reseeding of unused portions of the road would occur in the first planting season after construction is completed.

Road construction is estimated to take approximately 1 to 2 days per well pad. Timing of new road construction would be dependent upon the drilling schedule. New road construction in the Tumbleweed II Project Area would utilize a crawler tractor or track hoe to windrow vegetation to one side. A grader or bulldozer would establish borrow ditches and crown the road surface. If culverts are required, a track hoe or backhoe would trench the road and install the culverts. Some manual labor would be required when installing and armoring the culvert. Road base or gravel would be hauled in and a grader used to smooth the running surface as needed. If gravel is used, it would be obtained from a State-approved gravel pit. No unnecessary side-casting of material on steep slopes would occur.

Improvements of existing roads would typically require the following equipment: a class 12 or greater motor grader, a class D6 or larger crawler tractor, several 10-yard end dump trucks, and a water truck(s). Methods for improving the existing roads and two-tracks would be similar to those described above for new road construction.

Road traffic, to and within the Tumbleweed II Project Area, is estimated to be greater during the development phase than the production phase. During the exploratory development phase, average daily traffic (ADT) due to project-related activity would be approximately 10-20 vehicles per day per well. Because of timing limitations, development traffic would not occur during the winter season; however, all roads within Uintah and Grand counties, to and within the Tumbleweed II Project Area, would be maintained to provide all weather access when possible on a year-round basis in order to accommodate limited production traffic. Production traffic would be limited to 1-2 vehicles per day. Typical maintenance activities would include:

- Work necessary to preserve the existing roads;
- Physical upkeep and repair due to wear or damage whether from natural or other causes;
- Work required to maintain the shape of the road (grade and crown);
- Work required to maintain drainage features of the road (e.g., culverts and water bars);
- Work required to remove snow; and
- Work required to fill mud holes and dust pockets with acceptable road material.

All existing, upgraded, and new roads in the Tumbleweed II Project Area would require routine maintenance. Depending on moisture conditions, each roadway would be watered or treated with other approved dust suppressants to control dust and to facilitate grading. Up to approximately 320 barrels of water could be used per day during drilling and completion operations for dust abatement, depending on weather conditions. Drilling and completion may require up to 100 days to complete per well, therefore, up to 27.8 acre-feet of water could potentially be used for dust suppression to construct, drill and complete all wells and associated infrastructure. As discussed in **Section 2.1.10**, water would be obtained from a local water right owner in Main Canyon (State of Utah Application #49-123 [t34667]).

In order to protect road networks and the public, Stewart would comply with existing Federal, State, and county requirements and restrictions. All drivers and rig crews would be advised of potential hazards from recreational traffic along the access roads, as well as hazards due to blind corners, vehicles parked in the road, pedestrian traffic, livestock, wild horses, and wildlife. In addition, appropriate signs would be erected to warn non-project personnel about traffic hazards associated with project-related activities.

2.1.4 PIPELINE CONSTRUCTION

Pipelines would be necessary to transport gas from producing wells to their tie-in locations (i.e., the existing Winter Ridge Pipeline) in the SW ¼ of Section 16, T15S R21E. Approximately 12.3 miles of 10-inch diameter steel pipeline would be constructed and placed on the surface, co-located/adjacent to new or existing access roads within the Tumbleweed II Project Area. Surface disturbance for pipelines co-located with access roads was also accounted for in **Section 2.1.3**. Of the proposed pipelines, approximately 5.5 miles would be installed on BLM-administered lands outside of Stewart's leases and the Tumbleweed Unit but adjacent to the Winter Ridge Road and within the existing Winter Ridge pipeline corridor that leads to the Wolf Point compressor station. Prior to construction, all proposed pipelines would be permitted through the APD or ROW grant process as appropriate. Pipeline construction methods and practices would be completed in such a manner so as to minimize surface disturbance. Where surface pipeline is proposed adjacent to existing roads, the operator would need a construction area of approximately 10 feet wide outside and adjacent to the road. Pipelines co-located with new roads would be constructed within the disturbance corridor discussed in **Section 2.1.3**. Pipelines would be constructed by welding joints into long segments on the existing road surfaces. The welded segments would then be dropped into position using a boom adjacent to the existing roads, and a final welding pass would then be made to join all segments together. Following pipeline installation, portions of the construction area not occupied by the pipeline would be reclaimed (i.e., all but where the proposed pipeline sits on the surface), resulting in approximately 1.2 acres of long-term disturbance.

Pipeline construction is estimated to take a total of 1 to 2 days per mile of pipeline.

2.1.5 DRILLING OPERATIONS

Once construction of the well pads is completed, drilling equipment would be moved onto each drilling site. A standard drilling rig appropriate for the target depth would be set up on each well pad and powered by diesel engines. Only one rig would be operating in the Project Area at any one time. Diesel fuel would be delivered by tanker truck to a storage tank located on each well pad. The exact type and size of rig would be dependent upon rig availability at the time of project implementation. Drilling water would be trucked in from a local landowner (State of Utah Application #49-123 [t33231]). The water source consists of an unnamed spring branch in Main Canyon. Approximately 2 acre-feet of water would be needed to drill and complete each well. Wells would utilize a semi closed-loop circulation system with reserve and flare pits.

As was discussed in **Section 1.2**, the TUF #18-9 was directionally drilled from a well pad in the NE/SE ¼ of Section 18, T15S R21E. The bottomhole for the TUF #18-9 is located in a topographically inaccessible area in the SW/SE ¼ of Section 18. As illustrated on **Figure 2-1 - Appendix E**, Stewart is proposing to drill two additional directional wells (TUF #19-1 and TUF #18-8) from the TUF #18-9, which are also located in topographically inaccessible areas.

All proposed wells would be drilled to the Entrada, Dakota, and Wingate Formations at approximately 11,000 to 12,000 feet in depth. Any shallow water zones encountered during drilling would be isolated by either casing or cement, and reported to the appropriate agencies. All potentially productive hydrocarbon zones would be cemented. Site-specific descriptions of drilling procedures would be included in the individual APDs submitted to the Authorized Officer by Stewart.

Upon completion of drilling, any hydrocarbons in the reserve pit would be removed as soon as possible and processed or disposed of at an appropriate offsite commercial facility. Cuttings generated during the drilling process would be buried in the reserve pit following the evaporation or removal of free liquids.

Under routine conditions, approximately three weeks (21 days) would be required for drill rig setup, drilling, and rig takedown for each vertical well. For the purposes of analysis, it is assumed an additional 10 days would be required for each directional well. Drilling and completion problems have the potential to extend this schedule. As many as 15 people may be present during construction and drilling operations.

2.1.6 WELL COMPLETION

Once the wells are drilled and assuming indications of potential well productivity, completion operations would commence. This would involve perforating the casing in target production zones, followed by fracturing (fracing) the formation by injecting an agent (i.e., water and carbon dioxide) into the formation under high pressure. The fracing material would contain sand or other proppant to keep the fractures from closing, thereby providing a conduit to allow the gas to flow to the well bore. The next phase would be to flow and test the well to determine rates or production. After the fracing fluid is recovered and gas meets pipeline specifications, the gas would be sent down the pipeline.

Well completion would be conducted using a truck-mounted work-over rig and would take approximately three weeks (21 days) per well, depending on site-specific conditions.

2.1.7 PRODUCTION OPERATIONS

When it is determined that a well is productive, production facilities would be consolidated to the extent feasible on the well pad, and would be placed where interim reclamation would be maximized. Production equipment to be installed at each well pad would include:

- 1 well head for each producing well,
- 1 meter house for each producing well,
- Gas flow and gathering pipelines for each producing well;
- 1, 1 MMbtu/day separator per producing well;
- 1, 400-bbl water tank per producing well; and
- 2, 400-bbl oil tanks per producing well.

Produced water and oil tanks would be surrounded by a secondary containment berm of sufficient capacity to contain the entire capacity of the largest single container and sufficient freeboard to contain precipitation. Produced water would be transported to commercial disposal sites by tanker trucks. Oil would be hauled by truck to an off-site processing facility.

All loading lines and valves would be placed inside the berm to contain spills. In addition to the tank battery and berm, a gas meter run would also be constructed within 500 feet of the wellhead. All gas flow lines would be buried between the production equipment and the housed meter. Gathering lines would be laid on the surface beyond the meter.

All security guidelines identified in 43 CFR 3162.7-3 and 312.7-5, *Onshore Oil and Gas Order No. 3-5*, and *American Gas Association Report No. 3*, would be followed. All permanent structures constructed or installed would be painted a flat, non-reflective standard color as directed by the BLM. Facilities would be painted within 6 months of installation. As required by the Occupational Safety and Health Administration (OSHA), some equipment may be excluded from this painting for safety considerations (e.g., fire extinguishers). All facilities and equipment associated with the Proposed Action would be restricted to areas approved for disturbance.

As practical, meters at all producing gas wells would be equipped with remote telemetry monitoring systems, which could reduce the number of pumper visits. However, for purposes of providing the most conservative impact analysis, it is assumed that each well would be visited once daily for visual inspection of equipment. A single pumper would complete daily inspections for all of the wells using a standard pick-up truck.

2.1.7.1 Compressor Station

If the wells are successful, produced natural gas would be transported via the proposed eight-inch diameter pipeline that ties into the existing Winter Ridge pipeline to the existing Wolf Point compressor station located on State of Utah lands (NW/NW of Section 32, T15S R22E). Additional field compression is not proposed for this exploration project.

2.1.8 DRY HOLE/NON-PRODUCING WELL PROCEDURES

If a drilled well is a dry hole or not capable of production, the entire well pad, and associated access road, would be reclaimed. Stewart would follow the procedures of the BLM and Utah Division of Oil, Gas and Mining (UDOGM) for plugging and abandonment of the well. All surface production equipment would be removed, and the well pad (and possibly associated access road) would be closed and reclaimed according to BLM specifications, the Surface Use Plan of Operations (SUPO), and applicable Conditions of Approval (COAs).

2.1.9 SURFACE DISTURBANCE ESTIMATES

Initial disturbances are those that would last the 7 to 8 years it generally takes for woody vegetation to be re-established in the Uinta Basin. Long-term disturbances are those that would last for the life of the project (20-30 years) plus the time it takes to re-establish vegetation.

Stewart's Proposed Action includes a commitment to reclaim those areas not needed for production. Recent BLM monitoring has documented that interim reclamation efforts in oil and gas development areas within the Vernal planning area have largely been unsuccessful due to the arid environment of the Uinta Basin. However, precipitation is higher and the affected soils have greater reclamation potential in the Tumbleweed II Project Area than elsewhere in the Vernal planning area. Therefore, implementation

of interim reclamation and revegetation practices could effectively reduce the initial disturbance resulting from the project, thus reducing the amount of long-term disturbance. However, for impact analyses within Chapter 4 of this EA, all surface disturbance and resulting direct and indirect impacts will be analyzed using the initial surface disturbance (worst-case scenario) calculations listed in **Table 2-1**.

Construction of the proposed well pads and associated access roads and pipeline ROWs would result in the initial disturbance of approximately 47.7 acres of vegetation and soils as outlined in **Table 2-2**. Once the proposed wells are completed, interim reclamation could reestablish approximately 32 acres of vegetation. Approximately 15.5 acres of vegetation and soils would remain disturbed for the life of the project.

Table 2-2. Initial and Long-Term Surface Disturbance Estimates - Proposed Action

Proposed Surface Facility/Activity	Initial Size - Length/Width	Initial Surface Disturbance	Long-term Size - Length/Width	Long-term Surface Disturbance
Proposed Well Pads (7)	1.3 acres / pad	9.1 acres	0.35 acre	2.45 acres
Proposed Roads	4.2 miles/32-foot wide	16.3 acres	4.2 miles/16-foot	8.1 acres
Existing Roads Needing Upgrades/Improvement	1.9 miles/32-foot wide	7.4 acres	1.9 miles/16-foot	3.7 acres
Proposed Surface-laid Pipeline	12.3 miles/10-foot wide	14.9 acres	12.3 miles/0.8 feet	1.2 acres
Total Surface Disturbance	NA	47.7 acres*	NA	15.5 acres

*The total estimated surface disturbance for the Proposed Action differs slightly from the additive acreage of the individual disturbance components as a result of GIS analysis (47.4 acres), which removes areas of overlapping development (0.3 acre).

2.1.10 WATER SOURCES AND WATER USE

Stewart would haul water for drilling, completion, and dust suppression by truck from a local water right owner in Main Canyon (State of Utah Application #49-123 [t35783]). The water source consists of an unnamed spring branch in Main Canyon. There is no flow or water quality information available for this spring. Drilling and completion of up to nine proposed wells in the Tumbleweed II Project Area would require approximately 18 acre-feet of water (i.e., approximately 2 acre-feet per well). Up to 320 barrels of water could be used per day during drilling and completion operations for dust abatement. Drilling and completion may require up to 100 days per well, therefore up to 27.8 acre-feet of water could potentially be used for dust suppression. Total water use for drilling, completion, and dust suppression over the life of the project would be approximately 45.8 acre-feet.

2.1.10.1 Endangered Fish and Water Depletion

The U.S. Fish and Wildlife Service (USFWS) has identified four Federally-listed fish species (pikeminnow, humpback chub, bonytail, and razorback sucker) that could be affected by water depletion from the Green River as a result of the water wells proposed for use in construction of the Proposed Action. Water depletion for these exploratory gas wells is based off of the use of water permit 49-123 (t34667) in the SW1/4 of Section 32, T15S R23E. This State-approved water right consists of an unnamed spring branch in Main Canyon, which is fed by Main Canyon, a tributary to Willow Creek, and subsequently to the Green River. The water taken from this spring would qualify as an historic depletion to the Green River. **Table 2-3** summarizes water use and water depletion for this project:

Table 2-3. Water Source Information

Project Name and or Applicant Name	Stewart Petroleum
Permit number and or special use authorization	t35783
Lease Number(s)	U-72059 U-72667 U-74858 U-72018 U-84256
Water Right Number & Location	49-123, Main Canyon
General location and legal description	SW1/4 of Section 32, T15S R23E
Depletion amount in acre-feet	45.8 acre-feet total (drilling, completion and dust suppression)
Timing of depletion	Spring, Summer, Fall, or Winter
Identify if new or historic depletion	Historic
Sub-total water depletion for each applicant	45.8 acre-feet
Total depletion for the entire year in acre-feet	Approximately 15.3 acre-feet
Total number of APDs approved	One (18-9)
Total number of wells spudded	One (18-9)

2.1.11 HAZARDOUS MATERIALS AND OTHER WASTES

As mentioned previously, any hydrocarbons remaining in the reserve pit would be removed as soon as possible and processed or disposed of at an appropriate offsite commercial facility. All drilling mud/water would be hauled off-site to a licensed, commercial disposal facility. Cuttings generated during the drilling process would be buried in the reserve pit following removal of any excess liquids. On Federal lands, this would occur within 90-days of completing the well per BLM regulations.

Reportable quantities of chemicals on the EPA *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986* (SARA Title III) that would be used during drilling and completion include diesel fuel, sand (silica), hydrochloric acid, and carbon dioxide (gas). During production operations, natural gas condensate and crude oil would be produced. Triethylene glycol, ethylene glycol mix (50 percent), and methanol would also be used during production. Small quantities of consumer products (paint/spray paint, solvents, and lubrication oil) containing non-reportable volumes of hazardous substances may be stored and used during the life of the project. No extremely hazardous substances, as defined in 40 CFR Part 355, would be used, produced, stored, transported, or disposed of in association with the Proposed Action. Any spills of oil, gas, produced water, or any other potentially contaminating substances would be cleaned up and immediately removed to an approved disposal site in Vernal, Utah. Portable self-contained chemical toilets would be rented from and maintained by a commercial supplier in Uintah County. Upon completion of operations, or as required, these toilets would be removed and the contents disposed of in an approved sewage disposal facility in Vernal, Utah.

A Spill Prevention, Control, and Countermeasure (SPCC) Plan, which outlines the methodology to be used in the event of a spill, would be prepared and would be maintained onsite at all times. The SPCC Plan would describe how to contain a spill and how to facilitate rapid clean up of any hydrocarbon spill prior to its contamination of either surface or subsurface waters. Produced liquid hydrocarbons would be stored in tanks surrounded by an impervious berm. According to the 2002 Federal Register, Volume 67, Number 137, produced liquid hydrocarbons and condensates must be stored in tanks surrounded by a secondary containment berm of sufficient capacity to contain the entire capacity of the largest single container and sufficient freeboard to contain precipitation. All loading lines and valves would be placed inside the berm surrounding the tank, or would be surrounded by berms to contain spills. The tanks would be emptied, as necessary, and the liquids transported to market via 100-barrel capacity trucks.

2.1.12 WORKOVERS

Periodic workovers may be required to correct downhole problems in a producing well, return a well to production, increase or maintain production from a producing zone or to re-complete in a new zone. Workovers are generally completed within 1 to 2 weeks. Workovers do not require additional surface disturbance. A producing well could require a workover for any of the following reasons:

- Changing or replacing production tubing;
- Refracturing producing formations using advanced techniques designed to stimulate additional production;
- Cleaning out the well bore and perforations to stimulate/facilitate production; and
- Possibly “re-completing” in another potentially productive zone that was not originally completed at the time the well was drilled.

2.1.13 RECLAMATION

The following reclamation practices were designed to rehabilitate the Tumbleweed II Project Area so that disturbed areas would achieve visual compatibility with the surrounding undisturbed areas. Implementation of these practices could re-establish vegetative cover that would provide wildlife foraging habitat and livestock grazing habitat as soon as is practicable after construction, drilling and completion are finalized.

As described in **Section 2.1.9** above, implementation of interim reclamation and revegetation practices could effectively reduce the initial disturbance resulting from the project, thus the long-term disturbance could be substantially less. Therefore, for impact analyses within Chapter 4 of this EA, all surface disturbance and resulting direct and indirect impacts were analyzed using the initial or maximum surface disturbance calculations.

Following construction, drilling, and completion activities, all disturbed areas not needed for production would be reclaimed. These areas would include portions of new road and pipeline ROWs, as well as portions of well pads. The seed mixture for reclamation on BLM lands would be comprised of the grasses, forbs, and shrubs listed in **Table 2-4**. On BLM lands, seeding would be applied with a rangeland drill between August 15 and December 15. Stewart or their contractor would notify the BLM prior to seeding and would retain all seed tags from reclamation conducted on BLM lands.

Table 2-4 Seed Mixture for Reclamation on BLM Lands

Common Name	Scientific Name	Seed Rates ¹
Thickspike wheatgrass	<i>Elymus lanceolatus</i>	2 pounds (lbs)/acre
Paiute orchardgrass	<i>Dactylis glomerata</i> v. <i>paiute</i>	2 lbs/acre
Bluebunch wheatgrass	<i>Agropyrum spicatum</i>	2 lbs/acre
Blue flax	<i>Linum lewisii</i>	1 lb (pound)/acre
Scarlet globemallow	<i>Sphaeralcea coccinea</i>	1 lb/acre
Fourwing saltbush	<i>Atriplex canescens</i>	2 lbs/acre

¹ All seed rates are in terms of Pure Live Seed (PLS).

At the end of the life of each well, all lease roads associated with this development project would be reclaimed in accordance with the requirements of the responsible SMA. Reclamation would generally

involve re-contouring the surface to the approximate natural contours, re-establishing soil conditions, and reseeded with approved seed mixtures. Reclamation procedures would continue until the responsible SMA determines that the reclamation has been successful.

Stewart would initiate reclamation of disturbed habitat as appropriate. On producing wells, Stewart would re-contour the location as appropriate to minimize slopes (not to exceed 3:1). Areas not used for production purposes would be backfilled and blended into the surrounding terrain, topsoil would be re-spread and re-seeded, and erosion control devices installed. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization. Reclamation of all unused portions of road and pipeline ROWs would take place in the first planting season after initial disturbance. Road surfaces and other compacted areas would be ripped to a depth of 1 foot on 1.5-foot centers to reduce compaction prior to spreading the topsoil across the disturbed area. Stripped vegetation would be spread over the disturbed area for nutrient recycling, where practical. Road barriers to discourage travel would be used where necessary. Stewart would monitor reclamation to ensure successful reestablishment of vegetation in accordance with the Green River District Reclamation Guidelines for Reclamation Plans (BLM 2009a). In accordance with the Green River District Reclamation Guidelines, a site-specific reclamation plan will be attached to each APD.

Follow-up seeding or corrective erosion or weed control measures would occur in areas where initial reclamation efforts are unsuccessful. Any mulch used by Stewart would be weed and noxious weed seeds free and reasonably free from mold and fungi. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch would contain fibers long enough to facilitate crimping and provide the greatest cover.

Prior to application of herbicides on BLM-administered land, a Pesticide Use Proposal (PUP) would be submitted and approved. Information about special status plant avoidance would be outlined in the PUP. Pesticide application record forms will be completed after each application and submitted to the BLM weed coordinator before November 1st of each year.

In the event that wells are not producers, or at such time the well is plugged and abandoned, the operator would submit a Notice of Intent to Abandon to the BLM. The BLM would then attach the appropriate surface rehabilitation COAs. Back filling, leveling, and re-contouring of the well pads would be performed as soon as possible after cessation of production and removal of structures and completion operations. Reclamation measures for plugged and abandoned wells and associated roads and pipeline ROWs would be identical to those described above for interim reclamation.

2.1.14 REQUIRED MEASURES

The following section discusses resource-specific environmental protection measures that would be implemented as required by law, the Vernal Field Office Approved RMP (BLM 2008a), Stewart's leases, and/or other statutory or regulatory requirements under any of the alternatives. Implementation of these required measures would help eliminate or minimize impacts to resources within the Tumbleweed II Project Area.

2.1.14.1 Air Quality

Stewart would comply with all applicable local, State, and Federal air quality laws, statutes, regulations, standards, and implementation plans.

As required by the EPA, Stewart would obtain all necessary air quality permits to construct, test, and operate facilities.

2.1.14.2 Cultural/Historical Resources

In accordance with the National Historic Preservation Act (NHPA) of 1966, as amended, the Archaeological Resources Protection Act (ARPA) of 1979, and the Native American Graves Protection and Repatriation Act (NAGPRA), prior to any project-related surface disturbance, all locations proposed for surface disturbance would be examined by an archaeologist approved by the appropriate SMA to determine the presence of cultural resources (i.e., Class III cultural resource inventories with 100 percent pedestrian field survey would be completed). Consultation would be completed with the Utah State Historic Preservation Office (SHPO) prior to the onset of development, as set out in existing regulations. If any cultural resources eligible for listing to the National Register of Historic Places (NRHP) are identified, recommendations would be made to avoid or recover such resources. To date, Class III inventories have been completed for the TUF #18-9, #17-4, and #17-12 proposed well pads and associated access roads and pipeline corridors. Additional Class III survey work would be completed following project approval and prior to any surface-disturbing activities.

If cultural resources are uncovered during surface-disturbing activities, Stewart would suspend operations at the site and immediately contact the appropriate AO, who would arrange for a determination of eligibility in consultation with the Utah SHPO and if necessary, would recommend a recovery or avoidance plan.

2.1.14.3 General Environmental Protection

As provided for in Stewart's lease serial number UTU-72059 (applicable to all or portions of Sections 4, 7-9, and 18, T15S, R21E), the Authorized Officer may require modifications of the SUPO to protect the environment during severe winter weather conditions.

2.1.14.4 Geological/Paleontological Resources

If paleontological resources are uncovered during surface-disturbing activities, Stewart would suspend operations at the site if they would further disturb such materials and immediately contact the Authorized Officer, who would arrange for a determination of significance, and, if necessary, recommend a recovery or avoidance plan.

2.1.14.5 Health and Safety/Hazardous Materials

Stewart would institute a Hazard Communication Program for its employees and require subcontractor programs to operate in accordance with OSHA (29 CFR 1910.1200).

As required by OSHA, Stewart would place warning signs near hazardous areas and along roadways.

In accordance with 29 CFR 1910.1200, a Material Safety Data Sheet (MSDS) for every chemical or hazardous material brought on-site would be kept on file in Stewart's field office.

Chemicals and hazardous materials would be inventoried and reported by Stewart in accordance with the SARA Title III (40 CFR 335). If quantities exceeding 10,000 pounds or the threshold planning quantity are produced or stored, Stewart would submit appropriate Section 311 and 312 forms to the State and county emergency management coordinators and the local fire departments.

Stewart would transport and/or dispose of any hazardous wastes, as defined by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, in accordance with all applicable Federal, State, and local regulations.

All storage tanks that contain oil, glycol, produced water, or other fluid, which may constitute a hazard to public health or safety, would be surrounded by secondary means of containment for the entire contents of the largest single tank in use plus freeboard for precipitation. The appropriate containment and/or diversionary structures or equipment, including walls and floor, would be constructed so that any discharge from a primary containment system, such as a tank or pipe, would not drain, infiltrate, or otherwise escape to groundwater or surface waters before cleanup is completed.

Production facilities that have the potential to leak or spill oil, glycol, produced water, or other fluids, which may constitute a hazard to public health or safety, would be placed within appropriate containment and/or diversionary structures to prevent spilled or leaking fluid from reaching groundwater or surface waters. The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be installed so that any spill or leakage would not drain, infiltrate, or otherwise escape to groundwater or surface waters prior to completion of cleanup.

Notice of any spill or leakage, as defined in BLM NTL 3A, would be immediately reported to the Authorized Officer by Stewart, as well as to such other Federal and State officials as required by law. Oral notice would be given as soon as possible, but within no more than 24 hours, and those oral notices would be confirmed in writing within 72 hours of any such occurrence.

2.1.14.6 Water Resources

As required under 40 CFR 112.3(e), Stewart would maintain a copy of the SPCC plan at each facility, if the facility is normally attended at least 8 hours per day, or at the nearest field office if the facility is not so attended. Stewart would also implement and adhere to SPCC plans in a manner such that any spill or accidental discharge of oil would be reported and remediated.

Where proposed activities would affect Waters of the U.S., Stewart would obtain appropriate approvals from the USACE.

2.1.15 APPLICANT-COMMITTED ENVIRONMENTAL PROTECTION MEASURES

In addition to the environmental protection measures that are required by law, the Vernal Field Office Approved RMP (BLM 2008a), Stewart's leases, or other applicable regulatory authorities, the following Applicant-Committed Environmental Protection Measures (ACEPMs) would also be applied to all activities on all Federal surface estate within the Tumbleweed II Project Area. Implementation of these measures would help avoid or minimize impacts to the environment.

2.1.15.1 Air Quality

All internal combustion equipment would be kept in good working order.

Stewart would use water or other approved dust suppressants at construction sites and along roads, as determined appropriate by the Authorized Officer.

Stewart would not allow any open burning of garbage or refuse at well sites or other facilities.

Drill rigs used for drilling in the Tumbleweed II Project Area would be equipped with Tier II or better diesel engines. The use of Tier II or better engines would greatly reduce the amount of NO_x that would be emitted during drilling operations. *Note: A Tier II rig was used to drill the Tumbleweed 18-9.*

Vent emissions from stock tanks and natural gas TEG dehydrators would be controlled by routing the emissions to a flare or similar control device which would reduce emissions by 95% or greater. This control measure would reduce VOC and HAP emissions from the project.

During drilling and completion operations, temporary worker housing would be located on the existing TUF #18-9 well pad. By providing housing close to the project, and reducing the amount of miles that the drilling and completion crews would travel, emissions associated with vehicle impacts would be reduced, specifically particulate matter from unpaved roads and tailpipe (VOC and NO_x) emissions. Approximately 10 workers (comprised of 2-4 person rig crews working 12-hour shifts, plus 2 drilling/geological consultants) would occupy the temporary worker housing site at any one time.

Low bleed pneumatics would be installed on separator dump valves and other controllers. The use of low bleed pneumatics would result in a lower emission of VOCs.

During completion operations Stewart would limit flaring to clean up uses and as soon as possible would install production equipment and gathering line which would limit VOC emissions.

Well site telemetry would be utilized to eliminate unnecessary pumper travel to the well site, thus further reducing vehicle tailpipe emissions.

2.1.15.2 Cultural/Historical Resources

Stewart would inform their employees, contractors and subcontractors about relevant Federal regulations intended to protect archaeological and cultural resources. All personnel would be informed that collecting artifacts, including arrowheads, is a violation of Federal law and that employees engaged in this activity would be subject to disciplinary action.

2.1.15.3 Health and Safety/Hazardous Materials

Stewart would utilize portable sanitation facilities at drill sites; place dumpsters at each construction site to collect and store garbage and refuse; and ensure that all refuse and garbage is transported to a State-approved sanitary landfill for disposal.

2.1.15.4 Rangeland Management and Wild Horses

Stewart would repair or replace to current BLM standards any fences, cattle guards, gates, drift fences, and natural barriers that are damaged as a result of the Proposed Action. Cattle guards would be used instead of gates for livestock control on most roads.

Where the proposed pipeline (from the existing compressor station) would cross the Horse Point and Winter Ridge Allotment boundary, Stewart would keep the boundary intact with an appropriate cattleguard and gate, and would make any fence modification to the four-strand barbed wire specification required for all cattle range fences.

2.1.15.5 Soils

Stewart would comply with standards identified in “The Surface Operating Standards for Oil and Gas Exploration and Development” (Gold Book) (BLM and USFS 2007)

Topsoil would be temporarily stockpiled and seeded to reduce erosion until interim reclamation is initiated. Topsoil stockpiles would also be designed to maximize surface area in order to reduce impacts to soil microorganisms. On reclaimed areas, topsoil depths would be distributed evenly unless conditions warrant a varying depth.

Areas used for spoil storage would be stripped of topsoil before spoil placement.

Appropriate erosion control and revegetation measures would be employed. In areas with unstable soils where seeding alone may not adequately control erosion, grading would be used to minimize slopes, and water bars would be installed on disturbed slopes. BMPs would be installed as specified in the SWMP.

These BMPs could include retention basins, infiltration basins, and vegetated filter strips. Erosion control efforts would be monitored by Stewart and necessary modifications made to control erosion.

Soils compacted during construction would be ripped and tilled as necessary prior to reseeding. Cut and fill sections on all roads and along pipelines would be revegetated with seed mixtures as defined in **Section 2.1.13**.

2.1.15.6 Vegetation

Removal and disturbance of vegetation would be kept to a minimum through construction site management (e.g., using previously disturbed areas and existing easements where feasible, placing pipelines adjacent to roads, limiting well pad size, etc.).

2.1.15.7 Water Resources

Stewart would inform their employees, contractors and subcontractors of the potential impacts that could result from accidental spills, as well as the appropriate actions to take if a spill does occur.

2.1.15.8 Wildlife

To minimize wildlife-vehicle collisions, Stewart would advise project personnel regarding appropriate speed limits in the Tumbleweed II Project Area. Employees and contractors would be educated about anti-poaching laws. If wildlife law violations are discovered, the offending employee would be subject to disciplinary action by Stewart and the violations would be reported to the UDWR.

Greater Sage-grouse

Prior to surface disturbance or drilling activity between March 1 and June 15, historic leks within a 2-mile radius of proposed surface disturbance would be surveyed during the breeding season to determine if they are being actively used by sage-grouse. If a lek is active, no surface-disturbing activities would occur within 2 miles of the active lek from March 1-June 15. Furthermore, if a lek is active, Stewart would limit all traffic (with the exception of traffic associated with emergency repairs or maintenance) within 2 miles of the active lek between 5:00am and 9:00am from March 1 to June 15.

No surface-disturbing activities would occur within ¼ mile of active sage-grouse leks year-round and no permanent facilities or structures would be allowed within 2 miles when possible.

Within ½ mile of known active leks, Stewart would use the best available technology such as installation of multi-cylinder pumps, hospital sound reducing mufflers, and placement of exhaust systems to reduce noise.

For active sage-grouse leks that are not visually screened from well pads by natural topography or vegetation, low-profile tanks will be used.

Raptors

Prior to any surface-disturbing activities associated with construction or drilling during the breeding season, a BLM-approved contractor would survey all areas within 1 mile of proposed surface disturbance, or as directed by the BLM, for the presence of raptor nests. If occupied/active raptor nests are found, construction or drilling would not occur during the nesting season for that species within the species-specific buffer described in the Approved RMP. In addition, as specified in these guidelines, modifications of these spatial and seasonal buffers for BLM-authorized actions would be permitted by the

AO, so long as protection of nesting raptors is ensured (BLM 2008). On SITLA-administered lands, raptor management would be coordinated with the appropriate AO.

Mexican Spotted Owl

No surface-disturbing activities would be allowed within “good” and “fair” Mexican Spotted Owl (MSO) habitat as defined by the BLM in SWCA (2005) until surveys have been conducted in accordance with USFWS protocol. If more than four years have elapsed since the last survey, another complete, two year, inventory would be required prior to any project-related surface-disturbing activities.⁵

In order to protect MSO and their habitat, the following survey and protection protocols would be put into effect for the proposed TUF #4-3, TUF #5-8, TUF #9-3, TUF #9-11, TUF #17-4, TUF #17-12, and TUF #18-9:

- No surface-disturbing activities would be allowed within “good” and “fair” habitat designations or within the ½-mile buffer of those designations until the two years of surveys have been completed.
- If MSO are documented during future surveys, the BLM would follow USFWS protocol for Protected Activity Center (PAC) establishment and raptor management protocol defined in “Best Management Practices for Raptors and their Associated Habitats in Utah.”
- If no owls have been detected at the completion of the two seasons of calling surveys, no additional mitigation or BMPs (including special or timing restrictions) would be implemented. However, if more than four years have elapsed between the end of the two seasons of survey and the initiation of surface-disturbing activities at any proposed location then another complete inventory would be required prior to any surface-disturbing activities.

2.1.15.9 Paleontology

Prior to any surface-disturbing activities, in sensitive fossil areas (Class 4a) where bedrock is exposed at or near the surface (generally less than three feet below the soil surface), a qualified and approved paleontologist would examine locations proposed for surface disturbance for paleontological resources and make recommendations regarding the disposition and methods for avoiding impact to fossil resources. The need for onsite monitoring would be addressed at the onsite review. If any paleontological resources are found during surface-disturbing operations, all operations that could further disturb such materials would be suspended until the Authorized Officer of the appropriate Surface Management Agency (SMA) is contacted, and a review of the situation is completed.

2.2 ALTERNATIVE B - NO ACTION ALTERNATIVE

Under the No Action Alternative, Stewart’s proposed exploratory drilling project would not be implemented. Current land use practices such as livestock grazing, wild horse management, hunting, and occasional recreation would continue.

⁵ As of August 2009, 2 years of MSO surveys have been completed according to USFWS protocol for Stewart’s proposed well pad locations (TUF #4-3, #5-8, #9-3, #9-11, #17-4, #17-12, and #18-9) and associated road and pipeline corridors in the Tumbleweed II Project Area. No MSO were seen or heard during any of the inventories conducted for this project (B&A 2009). Therefore, as of August 2009, Stewart’s proposed development locations in the Tumbleweed II Project Area are cleared until the 2013 breeding season.

2.3 ALTERNATIVE C – BURIED PIPELINES

Alternative C would be identical in scope to the Proposed Action. However, under Alternative C, all 10-inch outer-diameter (OD) pipelines would be buried.

2.3.1 PIPELINE CONSTRUCTION

Buried pipelines would be installed using one of the following general construction sequences:

In areas where sufficient soil is present such that blasting would not be required, the following techniques would be employed to bury pipelines:

- A pre-disturbance weed inventory of areas proposed for surface disturbance would be completed at the expense of the operator.
- As needed (e.g., where buried pipelines would disturb surface waters), Stewart would obtain appropriate permits from the USACE.
- A brush-hog would be used to remove shrubs and small trees from the ROW. As practicably feasible, topsoil removal would not occur except directly over the trench.
- A trench approximately 4 feet deep would be excavated using a track hoe and the soil stockpiled to one side, making sure the topsoil and spoil do not get mixed together.
- The pipeline would be installed using a side-boom, the trench backfilled to a depth of approximately 3 feet, and the spoil compacted in the trench.
- Stockpiled topsoil would be placed over the compacted spoil to facilitate reclamation.
- Scalped vegetation would be placed back on the ROW to reduce erosion potential and reduce visual impacts.
- The entire ROW would be reseeded in the first fall after disturbance.

In areas where compacted sandstone or bedrock occurs, the following techniques would be employed to bury pipelines.

- A brush-hog would be used to remove shrubs and small trees from the ROW. As practicably feasible, topsoil removal would not occur except directly over the trench.
- A track hoe-mounted air drill would drill detonation holes at an interval of approximately every 4 feet along the trench route to be blasted.
- An approved granular explosive would be placed in the holes with primers and then wired together for detonation.
- As needed, areas along roads to be blasted may temporarily be closed for safety purposes.
- The charges would be detonated in accordance with relevant safety regulations.
- Following detonation, a track hoe and cat would be used to remove large rock debris from the trench.
- Spoil would be used to pad the bottom of the trench. As needed, additional soil would be brought in from an approved borrow area and used to pad the bottom of the trench.

- The pipeline would be installed using a side-boom, the trench backfilled to a depth of approximately 3 feet, and the spoil compacted in the trench. As needed, additional soil would be brought in from an approved borrow area and used to pad the bottom of the trench.
- Stockpiled topsoil would be placed over the compacted spoil to facilitate reclamation.
- Scalped vegetation would be placed back on the ROW to reduce erosion potential and reduce visual impacts.
- The entire ROW would be reseeded in the first fall after disturbance.

In order to install buried pipeline, ROWs for the buried pipeline would require a 30-foot wide disturbance corridor.

2.3.2 SURFACE DISTURBANCE ESTIMATES

Construction of the proposed well pads and associated access road and pipeline ROWs would result in the initial disturbance of approximately 77.5 acres of vegetation and soils, as outlined in **Table 2-5**. Once the proposed wells and pipeline are completed, interim reclamation could reestablish approximately 62 acres of vegetation. Following interim reclamation, approximately 15.5 acres of vegetation and soils would remain disturbed for the life of the project.

Table 2-5. Initial and Long-Term Surface Disturbance Estimates – Alternative C

Proposed Surface Facility/Activity	Initial Size - Length/Width	Initial Surface Disturbance	Long-term Size - Length/Width	Long-term Surface Disturbance
Proposed Well Pads (7)	1.3 acres / pad	9.1 acres	0.35 acre	2.45 acres
Proposed Roads	4.2 miles/32-foot wide	16.3 acres	4.2 miles/16-foot	8.1 acres
Existing Roads Needing Upgrades/Improvement	1.9 miles/32-foot wide	7.4 acres	1.9 miles/16-foot	3.7 acres
Proposed Buried Pipeline	12.3 miles/30-foot wide	44.7 acres	12.3 miles/0.8 feet	1.2 acres
Total Surface Disturbance	NA	77.5 acres*	NA	15.5 acres

*The total estimated surface disturbance for the Proposed Action differs slightly from the additive acreage of the individual disturbance components as a result of GIS analysis (76.8 acres), which removes areas of overlapping development (0.7 acre).

2.4 ALTERNATIVE D – DIRECTIONAL DRILLING

Under Alternative D, Stewart would drill nine exploratory wells within the Tumbleweed II Project Area. Under Alternative D it is assumed that proposed bottom hole or target locations could be accessed from a combination of vertical and directional drilling from four well pads (see **Figure 2-2 - Appendix E**). The potential for expanded use of directional drilling is discussed below.

- 1) The proposed TUF #19-1 and TUF #18-8 wells would be directionally drilled from the existing TUF #18-9 well pad as described under the Proposed Action.
- 2) The proposed TUF #17-4 and TUF #9-11 well pads, access roads, and pipelines would be constructed as described under the Proposed Action. The proposed #TUF 17-4 and #9-11 wells would be then be vertically drilled, completed, and tested using procedures identical to those described in the Proposed Action.
- 3) Stewart would construct the TUF #4-11 well pad, from which up to two wells would be directionally drilled.

- 4) Through the above-described expanded use of directional drilling, the surface locations for the proposed TUF#17-12, TUF #9-3, TUF #5-8, and TUF #4-3 vertical wells, together with associated roads and pipelines, would be eliminated from the project.

Alternative D incorporates all other design features of the Proposed Action.

2.4.1 LIMITATIONS OF DIRECTIONAL DRILLING

Limitations in the utilization of directional drilling in the Project Area may exist. These could include but may not be limited to the following:

- 1) The wells included in the Proposed Action are exploratory, and the locations of these wells have been selected to test the area’s potential for commercial production of oil and gas. In the exploratory drilling phase, before Stewart’s engineers have obtained and analyzed results from a sufficient number of wells to determine what downhole conditions are likely to exist, the drilling of a well directionally could present potential problems of wellbore stability, stuck pipe, and potentially the inability to reach the well’s intended objective downhole. The probability of encountering such problems increases with the distance of the directional “reach” or distance between the surface location of the well and the downhole production zones targeted in the well.
- 2) The ability to drill directionally is dependent on knowledge of site specific geologic conditions. Without this specific knowledge, there is an increased risk of the following problems: extended drilling time, stuck pipe, lost circulation, wellbore stability problems, failure to reach the intended objective, production problems and uncertain production data in the event of a discovery. Encountering these problems could lead to the drilling of additional wells before it is clear whether economically recoverable quantities of hydrocarbons are present.

The selection of this alternative or another alternative does not preclude the use of additional directional drilling in the event of future development.

2.4.2 SURFACE DISTURBANCE

In order to provide a clear basis for choice amongst the alternatives being considered within this EA, for the purposes of analysis, it is assumed that the nine proposed exploratory wells could be reached from the four well pads shown in **Figure 2-2 – Appendix E**. Surface disturbance under Alternative D is outlined in **Table 2-6**. The use of four pads under Alternative D would result in 9.5 fewer acres of initial disturbance as compared to the Proposed Action. Following interim reclamation, Alternative D would result in approximately 2.8 fewer acres as compared to the Proposed Action. As previously mentioned, Alternative D incorporates all other design features of the Proposed Action.

Table 2-6. Initial and Long-Term Surface Disturbance Estimates – Alternative D

Proposed Surface Facility/Activity	Initial Size - Length/Width	Initial Surface Disturbance	Long-term Size - Length/Width	Long-term Surface Disturbance
Proposed Well Pads (4)	1.8 acres / pad	7.2 acres	0.7 acre	2.8 acres
Proposed Roads	2.7 miles/32-foot wide	10.5 acres	2.7 miles/16-foot	5.2 acres
Existing Roads Needing Upgrades/Improvement	1.9 miles/32-foot wide	7.4 acres	1.9 miles/16-foot	3.7 acres
Proposed Surface-laid Pipeline	10.8 miles/10-foot wide	13.1 acres	10.8 miles/0.8 feet	1 acre

Proposed Surface Facility/Activity	Initial Size - Length/Width	Initial Surface Disturbance	Long-term Size - Length/Width	Long-term Surface Disturbance
Total Surface Disturbance	NA	38.2 acres*	NA	12.7 acres

*The total estimated initial disturbance for Alternative D differs slightly from that calculated as a result of GIS analysis (37.8 acres), which removes areas of overlapping development (0.4 acre).

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The following sections describe alternatives to the Proposed Action that were considered but eliminated from detailed analysis within this EA.

2.5.1 ORIGINAL PROPOSED ACTION THAT WAS ELIMINATED TO ADDRESS THE BLM'S CONCERNS (ORIGINALLY PROPOSED ROAD LOCATIONS FOR THE TUF #4-3)

Stewart's original project proposal included alternate spur road locations to the TUF #4-3. The initially proposed road to the TUF #4-3 ran approximately 0.20 mile west of its current location. However, during field reconnaissance by the BLM, it was determined that the road intersected a small topographic depression that may accumulate water during storm events and spring runoff. To avoid impacts to this area, the BLM requested that Stewart move the proposed spur road to the east and outside of the depression area. Based on these BLM requests, the initially proposed spur road to the TUF #4-3 was eliminated from detailed consideration.

2.5.2 DIRECTIONAL DRILLING AS SUGGESTED DURING THE PUBLIC COMMENT PERIOD FOR EA UT-080-05-201

During the public comment period for the original *Tumbleweed Exploratory Drilling EA (UT-080-05-201)* (BLM 2007a), a comment letter was submitted by Mr. Ken Kreckel that suggested that the BLM had erred in rejecting consideration of a directional drilling alternative. Included within the referenced comments was a recommended directional drilling alternative. Under Mr. Kreckel's suggested alternative, three well pads would be constructed at the edge of the road. Five of the originally proposed six wells would then be directionally drilled north and/or west from these pads.

Mr. Kreckel's comment letter and suggested alternative was reviewed and considered by the BLM's Senior Petroleum Engineer. The BLM, in coordination with Stewart Petroleum's engineers determined that Mr. Kreckel's assumption that the additional proposed wells (i.e., those beyond the #18-9) within the Tumbleweed II Project Area can be directionally drilled from the locations suggested by the commenter largely because the nearby North Hill Creek (NHC) #8-13 well was directionally drilled is false and technically flawed. Due to drilling problems of individual wells (e.g., lost circulation zones and water flow intervals, over-pressured horizons) in the area, a deviated hole adds a significant mechanical risk to the operator's ability to complete and produce a well, and therefore could prevent the operator from meeting the purpose of the project. For example, because of potential lost circulation zones and water flow intervals in the Green River Formation, it is optimal to set surface casing through those intervals to a depth of about 2,200 - 3,000 feet. This casing depth requires the operator to drill a straight hole which is drilled by the surface casing rig. Using this example, the kick-off depth to begin drilling the angled section of the hole would start between 2,250 and 3,000 feet. This would require an angle of about 13 to 18 degrees in order to begin to bring the well back to vertical at the top of the Dakota Formation with dog leg severity of 2 to 4 degrees per 100 feet. This angle and these dog legs frequently cause problems

during completion and in setting and recovering downhole tools (i.e., packers, plugs and blanking tools). The angle and turns in the casing string also make it difficult to land the production tubing with enough tension to keep the tubing sufficiently straight to allow swabbing of the tubing and in some cases the ability to set blanking plugs in the tubing.

These are all undesirable conditions and could conceivably result in the ultimate loss of production from some individual horizons or, in the worst case, the loss of the well bore due to stuck tools in the hole and the inability to recover them or the targeted reserves. Additionally, the well pads as suggested by Mr. Kreckel would require the operator to drill a much longer horizontal displacement as compared to the well pads identified under Alternative D. The longer the horizontal displacement of the well bore the greater the probability of drilling and production problems that could result in the loss of the well bore. Because of these risks, the operator has to have considerable geologic data available to ensure successful directional drilling; data that's not usually available for exploratory wells such as those proposed in the Tumbleweed Unit.

In addition, the well pad locations as suggested by Mr. Ken Kreckel were proposed without the benefit of seismic data for the Tumbleweed Unit, and without information on the drilling results (and complications) of the TUF #18-9 drilling and completion; without the technical information needed to make an informed determination as to from where the wells could be drilled. Based on the preceding rationale, the directional drilling alternative as proposed by the commenter was eliminated from detailed analysis.

Based on the limitations discussed above, the BLM and Stewart Petroleum's engineers determined that the well pad locations recommended by Mr. Kreckel are not reasonable and would not meet the purpose and need for the project. However, the BLM and Stewart have determined that additional directional drilling from alternate well pad locations would be technically and economically feasible, and as suggested in Mr. Kreckel's comment letter, the BLM and operator have developed a similar directional alternative. The first exploratory well, TUF #18-9, was directionally drilled by Stewart in 2007. This well has been determined to be a "unit paying well". Based on this determination, the BLM Utah State Office concurred with economic feasibility for directional drilling in the Tumbleweed II Project Area. In reviewing Alternative D, the BLM Senior Petroleum Engineer in coordination with Stewart's engineers concluded that four proposed well pads with nine wells would meet the purpose and need for the project and is a reasonable alternative to Stewart's Proposed Action. The proposed well pads are described and illustrated under Alternative D. The locations of the well pads as proposed under **Section 2.4** are based on the operator's proprietary seismic data for the Tumbleweed Unit, as well as knowledge gained and lessons learned during the drilling and completion of the TUF #18-9.

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