

STATEMENT OF BASIS

**FINLEY RESOURCES, INC
DUCK CREEK 3-16 SWD
UINTAH COUNTY, UTAH**

EPA PERMIT NO. UT22343-11089

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This Statement of Basis gives the derivation of site-specific UIC permit conditions and reasons for them. Referenced sections and conditions correspond to sections and conditions in the Permit.

EPA UIC permits regulate the injection of fluids into underground injection wells so that the injection does not endanger underground sources of drinking water. The EPA UIC permit conditions are based upon the authorities set forth in regulatory provisions at 40 CFR Parts 144 and 146, and address potential impacts to underground sources of drinking water. Under 40 CFR 144.35 Issuance of this permit does not convey any property rights of any sort or any exclusive privilege, nor authorize injury to persons or property or invasion of other private rights, or any infringement of other federal, state or local laws or regulations. Under 40 CFR 144 Subpart D, certain conditions apply to all UIC permits and may be incorporated either expressly or by reference. General permit conditions for which the content is mandatory and not subject to site-specific differences (40 CFR Parts 144, 146 and 147) are not discussed in this document.

Upon the Effective Date when issued, the Permit authorizes the construction and operation of injection wells so that the injection does not endanger underground sources of drinking water, governed by the conditions specified in the Permit. The Permit is issued for the operating life of the injection well or project unless terminated for reasonable cause under 40 CFR 144.39, 144.40 and 144.41. The permit is subject to, an EPA review at least once every five (5) years to determine if action is required under 40 CFR 144.36(a).

PART I. General Information and Description of Facility

Finley Resources, Inc
P.O. Box 2200
1308 Lake Street
Fort Worth, Texas 76102

on

January 6, 2016

submitted an application for an Underground Injection Control (UIC) Program Permit or Permit Modification for the following injection well or wells:

Duck Creek 3-16 SWD
2094 FSL; 831 FEL, SENW S16, T9S, R20E
Uintah County, Utah

Regulations specific to Uintah-Ouray Indian Reservation injection wells are found at 40 CFR 147 Subpart TT.

The application, including the required information and data necessary to issue or modify a UIC permit in accordance with 40 CFR Parts 144, 146 and 147, was reviewed and determined by the EPA to be complete.

The Permit will expire upon delegation of primary enforcement responsibility (primacy) for applicable portions of the UIC Program to the Ute Indian Tribe or the State of Utah unless the delegated agency has the authority and chooses to adopt and enforce this Permit as a Tribal or state Permit.

TABLE 1.1 shows the status of the well or wells as "New," "Existing," or "Conversion" and for Existing shows the original date of injection operation. Well authorization "by rule" under 40 CFR Part 144 Subpart C expires automatically on the Effective Date of an issued UIC permit.

TABLE 1.1
WELL STATUS / DATE OF OPERATION

NEW WELLS

Well Name	Well Status	Date of Operation
Duck Creek 3-16 SWD	New	N/A

PART II. Permit Considerations (40 CFR 146.24) Hydrogeologic Setting

The Green River Formation (Eocene) is a complex mixture of clastics, carbonates and organic rich mudstones deposited in a fluvial to lacustrine depositional system. The Green River inter-fingers with both the overlying Uinta and underlying Wasatch Formations. The Green River Formation is subdivided into upper and lower members, which in ascending order are Douglas Creek Member and Parachute Creek Member.

The Douglas Creek Member consists of alternating beds of light gray, fine-grained calcareous sandstone, limestone, dolomite, and gray-brown brittle shale as well as organic rich black shale. The Parachute Creek Member directly overlies the Douglas Creek Member and is overlain by the Uinta Formation. The Parachute Creek Member was deposited as a complex sequence of lacustrine and marginal lacustrine sediments consisting of laminated carbonate mudstones interbedded with light gray-brown shale, siltstones, and sandstones. The most organic rich shales, including the Mahogany Oil Shale Zone, are located within the Parachute Creek Member with the top of the Mahogany zone estimated to be 2,496 feet below ground surface in the area of the Duck Creek 3-16. The Bird's Nest Aquifer was deposited near the top of the Green River Formation within the Parachute Creek Member. The Bird's Nest was deposited in the deeper part of Lake Uinta as the lake dried and became a restricted evaporitic basin. Sediments of the Bird's Nest are characterized as very fine-grained siltstones and mudstones interbedded with dark brown, laminated organic-rich carbonate mudstones and evaporate beds. The lake waters became concentrated with salts, primarily sodium bicarbonate, during this regressive phase. An important characteristic of the Bird's Nest is that large numbers of post depositional nahcolite crystals precipitated in the Bird's Nest sediments. Nahcolite crystals with diameters of up to one foot have been reported. Later dissolution of the nahcolite crystals and beds resulted in high-permeability vugular porosities.

Geologic Setting (TABLE 2.1)

The Uinta Formation overlies the Green River Formation. The Uinta consists mostly of alluvial plain sediments deposited after Lake Uinta and the Uinta Basin began to fill with sediments derived from surrounding uplands. Uinta sediments consist mostly of interbedded brown mudstones and siltstones with some interbedded light tan very fine grained fluvial sandstones. At the location of the Duck Creek 3-16 well, the Uinta Formation is approximately 1,303 feet thick and is present at the surface just below the Quaternary/Holocene surficial deposits.

**TABLE 2.1
GEOLOGIC SETTING
Duck Creek 3-16 SWD**

Formation Name	Top (ft)	Base (ft)	TDS (mg/l)	Lithology
Uinta	0	1,303	> 10,000	Mudstone, siltstone, and sandstone
Green River	1,303	5,262	> 10,000	Mudstone, siltstone, limestone, dolomite, and porous permeable

Proposed Injection Zone(s) (TABLE 2.2)

An injection zone is a geological formation, group of formations, or part of a formation that receives fluids through a well. The proposed injection zones are listed in TABLE 2.2.

Injection will occur into an injection zone that is separated from an Underground Source of Drinking Water (USDW) by a confining zone, which is free of known open faults or fractures within the Area of Review.

The proposed injection zones are between 1,845 to 2,190 feet located in the Birds Nest zone of the Parachute Creek Member of the Green River formation. These intervals are composed of porous and permeable carbonate oil shale with large vugular porosity connected through an extensive fracture network created by the process of precipitation and dissolution of carbonate minerals. The combined thickness of the proposed injection zones is 345 feet.

**TABLE 2.2
INJECTION ZONES
Duck Creek 3-16 SWD**

Formation Name	Top (ft.)	Base (ft.)	TDS (mg/l)	Fracture Gradient (psi/ft.)	Porosity	Exempted?*
Birds Nest zone of the Parachute Creek member of the Green River	1,845	2,190	> 10,000	Unknown		N/A

- * C - Currently Exempted
- E - Previously Exempted
- P - Proposed

Confining Zone(s) (TABLE 2.3)

A confining zone is a geological formation, part of a formation, or a group of formations that limits fluid movement above the injection zone. The confining zone or zones are listed in TABLE 2.3.

The upper confining zone is composed of very fine-grained organic lean oil shale and lacustrine marlstone in the Parachute Creek member of the Green River formation. The gross thickness of the upper confining zone averages between 100 and 150 feet. The average thickness of the upper confining zone in the area of the Duck Creek 3-16 is 140 feet. The lower confining zone is composed of very fine-grained organic lean oil shale and lacustrine marlstone in the Parachute Creek member of the Green River formation. The gross thickness of the lower confining zone averages between 85 and 100 feet. The average thickness of the lower confining zone in the area of the Duck Creek 3-16 is 90 feet.

**TABLE 2.3
CONFINING ZONES
Duck Creek 3-16 SWD**

Formation Name	Formation Lithology	Top (ft.)	Base (ft.)
Green River	Composed of very fine grained organic lean oil shale and lacustrine marlstone in the Parachute Creek member of the Green River formation.	1,705	1,845
Green River	Composed of very fine grained organic lean oil shale and lacustrine marlstone in the Parachute Creek member of the Green River.	2,190	2,280

Underground Sources of Drinking Water (USDWs) (TABLE 2.4)

Aquifers or the portions thereof which contain less than 10,000 mg/l total dissolved solids (TDS) and are being or could in the future be used as a source of drinking water are considered to be USDWs. The USDWs in the area of this facility are identified in TABLE 2.4.

The Base of Moderately Saline Water (BMSW) is the only known USDW within the Area of Review (AOR) and nearby region. The surveyed ground elevation at Duck Creek 3-16 is 4,790 feet above mean sea level. Based on the surveyed ground elevation; the BMSW occurs at a depth of approximately 290 feet at the Duck Creek 3-16 SWD location. The top of the uppermost-proposed injection interval is approximately 1,646 feet below the approximate BMSW depth. A search of Division of Water Rights records shows the closest known potential USDW to the proposed UIC well at approximately 2.3 miles to the north. These sources are entirely surface associated with the White River.

**TABLE 2.4
UNDERGROUND SOURCES OF DRINKING WATER (USDW)
Duck Creek 3-16 SWD**

Formation Name	Formation Lithology	Top (ft)	Base (ft)	TDS (mg/l)
Uinta	Interbedded brown mudstone and siltstone.	0	199	>10,000

PART III. Well Construction (40 CFR 146.22)

TABLE 3.1
WELL CONSTRUCTION REQUIREMENTS
Duck Creek 3-16 SWD

Casing Type	Hole Size (in)	Casing Size (in)	Cased Interval (ft)	Cemented Interval (ft)
Long String K-55	8.75	5.50	0 - 5,012	0 - 5,012
Surface K-55	13.00	9.63	0 - 210	0 - 210

The approved well completion plan will be incorporated into the permit as APPENDIX A and will be binding on the Permittee. Modification of the approved plan is allowed under 40 CFR 144.52(a)(1) provided written approval is obtained from the Director prior to actual modification.

Casing and Cementing (TABLE 3.1)

The well construction plan was evaluated and determined to be in conformance with standard practices and guidelines that ensure well injection does not result in the movement of fluids into USDWs. Well construction details for this "new" injection well are shown in TABLE 3.1.

Remedial cementing may be required if the casing cement is shown to be inadequate by cement bond log or other demonstration of Part II (External) mechanical integrity.

Tubing and Packer

Injection tubing is required to be installed from a packer up to the surface inside the well casing. The packer will be set above the uppermost perforation. The tubing and packer are designed to prevent injection fluid from coming into contact with the outermost casing.

Tubing-Casing Annulus (TCA)

The TCA allows the casing, tubing and packer to be pressure-tested periodically for mechanical integrity, and will allow for detection of leaks. The TCA will be filled with fresh water treated with a corrosion inhibitor or other fluid approved by the Director.

Monitoring Devices

The Permittee will be required to install and maintain wellhead equipment that allows for monitoring pressures and providing access for sampling the injected fluid. Required equipment may include but is not limited to: 1) shut-off valves located at the wellhead on the injection tubing and on the TCA; 2) a flow meter that measures the cumulative volume of injected fluid; 3) fittings or pressure gauges attached to the injection tubing and the TCA for monitoring the injection and TCA pressure; and 4) a tap on the injection line, isolated by shut-off valves, for sampling the injected fluid.

All sampling and measurement taken for monitoring must be representative of the monitored activity.

PART IV. Area of Review, Corrective Action Plan (40 CFR 144.55)

**TABLE 4.1
AOR AND CORRECTIVE ACTION**

Well Name	Type	Status (Abandoned Y/N)	Total Depth (ft)	TOC Depth (ft)	CAP Required (Y/N)
Duck Creek 16-16 GR	Producer	No	5,084	1,650	No
Duck Creek 17-16	Other	No	5,090	1,480	No
Natural Duck 6-15	Producer	No	5,060	1,470	No

TABLE 4.1 lists the wells in the Area of Review ("AOR") and shows the well type, operating status, depth, top of casing cement ("TOC") and whether a Corrective Action Plan ("CAP") is required for the well.

TOC of cement was determined by looking at the cement bond logs that were provided in the permit application.

Area Of Review

Applicants for Class I, II (other than "existing" wells) or III injection well permits are required to identify the location of all known wells within the injection well's Area of Review (AOR) which penetrate the injection zone, or in the case of Class II wells operating over the fracture pressure of the formation, all known wells within the area of review that penetrate formations which may be affected by increased pressure. Under 40 CFR 146.6 the AOR may be a fixed radius of not less than one-quarter (1/4) mile or a calculated zone of endangering influence.

Corrective Action Plan

For wells in the AOR, which are improperly sealed, completed, or abandoned, the applicant shall develop a Corrective Action Plan (CAP) consisting of the steps or modifications that are necessary to prevent movement of fluid into USDWs.

The CAP will be incorporated into the permit as APPENDIX F and become binding on the Permittee.

There are three (3) wells located within the AOR, two producing oil wells operated by Finley (Duck Creek 16-16 GR and Natural Duck 6-15) and one shut-in oil well operated by Tiger Energy Operating, LLC (Duck Creek 17-16 GR). The existing three oil production wells within a one-quarter mile radius of the proposed injection well have been reviewed in detail by their cement bond logs. No corrective actions have been identified reviewing the logs. A corrective action is not currently required for the proposed injection well and AOR wells, however, corrective actions may be required if the cement bond log shows less than 80% of cement bonding.

PART V. Well Operation Requirements (40 CFR 146.23)

TABLE 5.1
INJECTION ZONE PRESSURES
Duck Creek 3-16 SWD

Formation Name	Depth Used to Calculate MAIP (ft.)	Fracture Gradient (psi/ft.)	Initial MAIP (psi)
Birds Nest zone of the Parachute Creek member of the Green River	1,845	unknown	300

Approved Injection Fluid

The approved injection fluid is limited to Class II injection well fluids pursuant to 40 CFR § 144.6(b). For disposal wells injecting water brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production, the fluid may be commingled and the well used to inject other Class II wastes such as drilling fluids and spent well completion, treatment and stimulation fluid. Injection of non-exempt wastes, including unused fracturing fluids or acids, gas plant cooling tower cleaning wastes, service wastes, and vacuum truck and drum rinsate from trucks and drums transporting or containing non-exempt waste is prohibited.

Injection Pressure Limitation

Injection pressure, measured at the wellhead, shall not exceed 300 pound per square inch (psi) to assure that the pressure used during injection does not initiate new fractures or propagate existing fractures in the confining zones adjacent to the USDWs.

Standard practice in the EPA Region 8 has been to limit the Birds Nest Aquifer (BNA) salt water disposal (SWD) wells in the Uinta Basin to 300 psi surface pressure. The BNA is typically on a vacuum and to date, the 300 psi injection pressure limit has never been reported as a problem.

Injection Volume Limitation

Cumulative injected fluid volume limits are set to assure that injected fluids remain within the boundary of the exempted area. Cumulative injected fluid volume is limited when injection occurs into an aquifer that has been exempted from protection as a USDW.

Mechanical Integrity (40 CFR 146.8)

An injection well has mechanical integrity if:

1. there is no significant leak in the casing, tubing, or packer (Part I); and
2. there is no significant fluid movement into a USDW through vertical channels adjacent to the injection well bore (Part II).

The Permit prohibits injection into a well, which lacks mechanical integrity.

The Permit requires that the well demonstrate mechanical integrity prior to injection and periodically thereafter. A demonstration of mechanical integrity includes both internal (Part I) and external (Part II). The methods and frequency for demonstrating Part I and Part II mechanical integrity are dependent upon well-specific conditions as explained below.

PART VI. Monitoring, Recordkeeping and Reporting Requirements

Injection Well Monitoring Program

At least once a year the Permittee must analyze a sample of the injected fluid for total dissolved solids (TDS), specific conductivity, pH, and specific gravity. This analysis shall be reported to the EPA annually as part of the Annual Report to the Director. Any time a new source of injected fluid is added, a fluid analysis shall be made of the new source.

Instantaneous injection pressure, injection flow rate, cumulative fluid volume and TCA pressures must be observed and recorded on a weekly basis. A report summarizing each month's recorded values, at least once every thirty days, must be made of the injection pressure, annulus pressure, monthly injection flow rate and cumulative fluid volume. This information is required to be reported annually as part of the Annual Report to the Director.

PART VII. Plugging and Abandonment Requirements (40 CFR 146.10)

Plugging and Abandonment Plan

Prior to abandonment, the well shall be plugged in a manner that isolates the injection zone and prevents movement of fluid into or between USDWs, and in accordance with any applicable federal, state or local law or regulation. Tubing, packer and other downhole apparatus shall be removed. Cement with additives such as accelerators and retarders that control or enhance cement properties may be used for plugs; however, volume-extending additives and gel cements are not approved for plug use. Plug placement shall be verified by tagging. Plugging gel of at least 9.2 lb./gal shall be placed between all plugs. A minimum 50 feet surface plug shall be set inside and outside of the surface casing to seal pathways for fluid migration into the subsurface. Within sixty (60) days after plugging the owner or operator shall submit Plugging Record (EPA Form 7520 13) to the Director. The Plugging Record must be certified as accurate and complete by the person responsible for the plugging operation. The plugging and abandonment plan is described in Appendix E of the Permit.

PART VIII. Financial Responsibility (40 CFR 144.52)

Demonstration of Financial Responsibility

The Permittee is required to maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner prescribed by the Director. The Permittee shall show evidence of such financial responsibility to the Director by the submission of a surety bond or other adequate assurance such as financial statements or other materials acceptable to the Director. The Regional Administrator may, on a periodic basis, require the holder of a lifetime permit to submit a revised estimate of the resources needed to plug and abandon the well to reflect inflation of such costs, and a revised demonstration of financial responsibility if necessary. Initially, the operator has chosen to demonstrate financial responsibility with:

Bond Addendum Received March 18, 2016

Evidence of continuing financial responsibility is required to be submitted to the Director annually.

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