STATEMENT OF BASIS
RED LEAF RESOURCES SOUTHWEST #1 OIL SHALE MINE
Ground Water Discharge Permit No. UGW470002

I. Description of Facility

Red Leaf Resources, Inc. would eventually like to develop an oil shale mine and hydrocarbon (kerogen) extraction operation on a tract of State Institutional Trust Lands located in portions of Sections 19, 20, 29 and 30 of T. 13 S., R. 23 E., and portions of Sections 25 and 36 of T. 13 S., R. 22 E. (SLBM), in Uintah County, Utah (SOB Figure 1 Site Location Map). The mining operation would be a surface (open pit) mine, and mining would proceed concurrently with construction of lined and enclosed "capsules" for extraction of kerogen from oil shale ore using heat. This represents a new technology for extraction of kerogen from oil shale.

At this stage, Red Leaf proposes to construct one capsule of approximately three-fourths the size of the capsules envisioned for eventual commercial production of kerogen from the mine, to evaluate various technical, environmental and economic aspects of the capsule technology. This test capsule is hereinafter referred to as the Early Production System (EPS) capsule. The EPS capsule will cover an area of 695 feet by 385 feet; capsules for eventual commercial production are anticipated to be 900 by 500 feet in area. The EPS capsule will be 100 feet high on the sides and 160 feet high at a central peak. This permit covers construction, operation and closure of the one EPS capsule (SOB Figure 2 EPS Site Plan). Construction of additional capsules for commercial production will require a major modification to this permit. To issue the major modification, Red Leaf must report on findings of the EPS capsule test that relate to waste containment and monitoring, and the modified permit will be made available for public comment for thirty days, using the Division of Water Quality's standard public notice process for issuing permits.

II. Description of Site

Bedrock at the mine site is the Parachute Creek Member of the Eocene Green River Formation, which consists mostly of shale and oil shale, a dolomitic marlstone containing solid hydrocarbons (kerogen). Ore for the mining operation will be mined from the Mahogany Zone, a kerogen-rich stratigraphic interval approximately 70 feet thick. Strata at the mine site dip approximately 3 degrees in a direction a few degrees east of north. Depth to the Mahogany Marker, which identifies the top of the kerogen-rich Mahogany Zone, is between the surface and 160 feet below ground surface across the mine site (SOB Figure 3 Generalized Stratigraphic Column Green River Formation). The EPS capsule will be constructed near the southern end of the mine property (SE corner of Sec. 30, T13S, R23E), where the oil shale ore zones are close to the land surface. Mining for commercial production will also start in this area.

III. Capsule Design and Construction

The EPS capsule, and future capsules constructed for commercial production, will be constructed primarily from mined materials. It is Red Leaf's intent to use the EPS capsule to evaluate the functionality, constructability and economic aspects of various designs for the liner that will surround the ore on the top, bottom and sides of the capsule; however, in all cases the liner will be the functional equivalent of a three-foot thick layer of bentonite-amended shale (BAS) having a saturated hydraulic conductivity of 1×10^{-7} cm/sec. This permit allows some flexibility in the designs used for the EPS capsule liner, to allow Red Leaf to make this evaluation. Red Leaf must commit to a specific capsule design, or set of designs, to be used for commercial production. Some of the designs Red Leaf wishes to evaluate incorporate flexible membrane liners (FMLs) in order to contain liquid and gaseous hydrocarbons while the oil shale is being retorted. A primary function of the BAS/Capsule liner, however, is long-term, permanent containment of the spent shale after capsule closure. The Division of Water Quality (DWQ) does not consider FMLs to offer containment beyond the design life of the liner.

Once overburden and ore have been removed from the pit area to allow for capsule construction, a three-foot layer of BAS will be placed on the graded bedrock surface to act as a liner. A FML may be incorporated in the liner design to insure recoverability of product and to insure liquid product is not lost to the lower BAS layer. A layer of well-graded road-base material will be placed on top of the lower BAS liner, and a steel liquids-collection pan will be installed on top of this layer to collect liquids liberated from the oil shale during capsule operation and to prevent loss of oil to the underlying liner. Bulkheads will be installed at up to six places along the capsule floor on the north side of the capsule to allow for pipe penetrations of the lower BAS liner for inflow and outflow of hot air and collection of liquid and gaseous hydrocarbons from the steel pan. The bulkheads tie the heating and product recovery pipes in the capsule to as many as six conveyance channels dug into bedrock underneath the capsule and the engineered fill that buttresses the side of the capsule. A 13-foot layer of coarse-sized, run-of-mine overburden material will be placed on top of the metal pan to serve as insulation, to conserve heat and protect the BAS liner from thermal breakdown.

On top of the bottom insulating layer, liquids collection pan, road-base and lower BAS liner, 100 to 160 feet of oil shale ore will be stacked. As the ore is stacked, the sides of the capsule will be constructed to include a three-foot wide BAS side liner wall with 13 feet of insulating material immediately inside the capsule from the BAS wall. A FML may be used for product containment in the side walls, but will not be incorporated into the BAS wall. These layers will be buttressed on the outside by engineered fill for stability. This fill will have an outside slope of approximately 1.5H:1V. Corrugated steel heating pipes will be placed within the stacked ore. Vapor recovery pipes will be installed in the upper part of the capsule. Another 13-foot layer of insulating material will be placed on top of the stacked ore. A liner with the functional equivalent of a three-foot BAS layer with saturated hydraulic conductivity of 1×10^{-7} cm/sec will eventually be installed on top of the capsule. This BAS layer may be installed after capsule cooling and settlement. In this case, a FML sealed to the capsule side walls will provide product containment during retorting operations (SOB Figure 4 EPS Capsule Roof, Floor and Wall Details).

IV. Capsule Cover

During heating and product recovery, the oil shale ore will undergo significant settlement of perhaps 30 feet or so. (The exact amount of settling is unknown at this time.) Red Leaf may evaluate two different options for cover design to maintain liner integrity after settling. If no FML is used during retorting operations, the top BAS layer will be designed with a pitched cover surface, and will be joined to the side BAS walls with a sloped "knuckle" structure in the BAS liner. The knuckle and the adjoining roof surface will be covered with 4 to 15 feet of interburden/overburden material to maintain compressive stress on the BAS and gravel layers as settlement of the heated capsule occurs. This surface will be covered with 6 to 12 inches of topsoil or a topsoil substitute at this time to begin reclamation. If only a FML cover is used for product containment during retorting operations, a BAS liner and cover materials will be installed over the FML following capsule cooling and compaction.

Consolidation in the EPS capsule will be monitored carefully and assessed post-cooling to evaluate cover performance (see "Basis for Permit Issuance, #2", SOB pg. 8 and Section I, G(3)of the permit, permit pg. 6).

V. Characteristics of Leachate from Spent Shale

Red Leaf's capsule technology does not use process water and does not involve containment of wastewater. Discharge of contaminants to the subsurface related to the oil shale retorting process would only occur as a result of precipitation infiltrating into the closed capsules and reacting with the spent shale remaining after extraction of hydrocarbon liquids and gases. To evaluate potential contaminants which may be present in such leachate, Red Leaf collected samples of spent shale from bench scale testing of the oil shale retort process and tested them for leachability using the Synthetic Precipitation Leaching Procedure (SPLP, EPA SW846 Method 1312). This extraction uses 100 grams of sample and agitates them in 2000 grams of an extraction fluid of deionized water with pH adjusted to 5.0, intended to mimic precipitation in the western United States. Deionized water was used as an extraction fluid for Volatile Organic Compounds analysis. The resulting extract fluid was analyzed for the following parameters:

- General chemistry: pH, total dissolved solids (TDS), major ions (Na, K, Mg, Ca, Cl, SO_4, alkalinity), F, Sr, nitrate/nitrite (as N), oil and grease, total organic carbon (TOC)
- Volatile Organic Compounds (VOCs) and Semi-volatile Organic Compounds (SVOCs)
- Metals: Ag, As, B, Ba, Be, Cd, Cr, Fe, Hg, Li, Pb, Mn, Mo, Ni, Sb, Se, Sn, Tl, V, Zn
- While the SPLP testing cannot predict the exact chemistry of actual leachate formed under field conditions, it does give a measure of the content of leachable materials in the sample.

The complete results of these analyses are given in Appendix J of Red Leaf's June, 2013 Ground Water Discharge Permit application. Of the parameters tested, the three replicate samples showed levels of antimony (Sb) in the SPLP extract fluid that were slightly higher than the ground water standards, and detections of acetone, acrylonitrile and benzoic acid, for which there are no specific ground water standards. The SPLP extract fluid had high pH, around 10, in the three replicate samples.

VI Monitoring Requirements for Spent Shale

As a permit condition, Red Leaf will do additional testing on spent shale from the EPS cell, which is more likely to represent spent shale from the future production capsules. When the capsule is closed after heating and extraction of hydrocarbons, it is likely that some hydrocarbon product will remain, adhering to rock fragments and the metal collection pan. As part of the report on capsule performance that Red Leaf will submit before modification of this permit, the leachability of a representative sample of capsule contents, including any residual cooled hydrocarbon product, will be evaluated by SPLP testing. The Meteoric Water Mobility Procedure (MWMP) will also be performed on the samples. The fluid from both extractions will be analyzed for:

- General chemistry,
- Metals from Table 1 of the Ground Water Quality Protection Regulations; and

- Petroleum-related parameters BTEX (benzene, toluene, ethylbenzene, xylenes), naphthalene, total petroleum hydrocarbons- gasoline range organics, total petroleum hydrocarbons- diesel range organics, and total recoverable petroleum hydrocarbons.

It is anticipated that all overburden and other waste rock excavated from the mine will be used in capsule construction, but it will not be enclosed in a liner following capsule closure. There is a possibility that precipitation may react with this waste rock material and leach soluble constituents out of it, and because the waste rock is not contained in lined cells as the spent shale is, the resulting solution may discharge to waters of the state. To evaluate whether this may be a problem and, if necessary, help develop appropriate methods to manage storm water, as a permit condition Red Leaf will obtain a representative sample of waste rock and analyze it using the SPLP and MWMP extractions, for the same parameters to be used for the spent shale samples.

VII. Description of Hydrogeology

1. General Geology of the Mine Site

Bedrock at the mine site is the Eocene Green River Formation. These sedimentary rocks dip approximately 3 degrees in a generally northerly direction. Rocks exposed at the surface and in the strata to be mined are within the Parachute Creek Member, which consists mainly of oil shale, with minor interbedded amounts of siltstone, sandstone and altered volcanic tuff, and is approximately 1,100 feet thick. Oil shale is a dolomitic marlstone that contains solid hydrocarbon material known as kerogen. The Parachute Creek Member overlies the Douglas Creek Member which consist of (in decreasing order of abundance) sandstone, mudstone, siltstone, algal limestones, chalky limestones and dolomitic limestones. The contact between the Parachute Creek and Douglas Creek Members is gradational and has been placed at different locations in the sedimentary column by different workers, depending on whether the interpreted contact was based on field mapping or drill hole data. A detailed stratigraphic column showing the main ore zone, named the Mahogany Zone, as well as rocks above and below it and key stratigraphic horizons is shown in Figure 5 of Red Leaf's June, 2013 ground water discharge permit application. Immediately on top and on the bottom of the Mahogany Zone are two horizons known as the A Groove and the B Groove, respectively, which get their names from their appearance in outcrop, as slope formers above and below the cliff-forming Mahogany Zone. At this location, these horizons are marlstone.

The Green River Formation was deposited in a large ancient lake, referred to as Lake Uinta. Lake levels varied as the sediments were deposited. Coarse-grained clastic sediments were deposited around the ancient lake shores, while sediments deposited in the central, deeper part of the lake, far from the shores, were fine-grained carbonates, organic matter and clays that settled out of the water column. The transition from the sandy Douglas Creek Member to the fine-grained Parachute Creek Member, therefore, represents a time when the lake level was rising and as a result, near-shore sediments were overlain by sediments deposited in a deep-water environment, far from the shore. Because the Parachute Creek Member was deposited in deep, open water conditions far from the shore and land-derived clastic sediments, it is expected to be of fairly uniform lateral composition across the mine site. Sandstone strata in the Douglas Creek Member, representing deposition in beaches, stream channels and deltas, may not be laterally continuous.

2. Water-Bearing Characteristics of Rocks in the Subsurface

In general, the Parachute Creek Member consists of fine-grained and low-permeability sedimentary rock that behaves as an aquiclude (an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of groundwater); inhibiting infiltrating precipitation from recharging underlying rocks (Holmes and Kimball, 1987, p.35).

In order to define baseline hydrogeologic conditions at the mine site, Red Leaf investigated near-surface ground water by conducting a spring and seep inventory on 8562 acres including the mine lease area and surrounding land. (The report on the survey is contained in Appendix D of Red Leaf's June, 2013 ground water discharge permit application.) Red Leaf also investigated ground water conditions in the shallow subsurface in rocks above and including the ore zone with a drilling program and also aquifer testing and water quality sampling.

The seep and spring survey was conducted in October, 2012. Because this was a dry time of the year following a dry winter, Red Leaf revisited the survey area in May, 2013 to examine conditions following spring runoff. Few seeps and springs were found in the October 2012 survey, and no distinctly new springs or seeps were found in the May 2013 survey. Seeps and one spring that were found were at the bottom of stream channels, discharging from both alluvium and bedrock exposures. The spring's discharge was measured at 0.28 gallons per minute in October, 2012 and its discharge appeared slightly higher in May 2013. Electroconductivity and pH were measured in the field at two sites where there was enough accumulated water to measure them. The electroconductivity measurements imply a dissolved solids content of around 3000 mg/l (a more precise estimate is not possible with this level of data collection) and pH was measured at 8.11 and 9.0. Considering the nature of ground water in the shallow subsurface as described below, the seeps and springs seen at the ground surface seem to represent very shallow, localized zones of saturation recharged by precipitation. Water from the seeps and springs has much lower dissolved solids content and lower pH than ground water from rocks in the shallow subsurface, indicating it has not been in contact with the rocks for as long a time, or possibly that soluble salts have been leached from rocks in the permeable zones near the ground surface.

To investigate ground water conditions in the ore zone and the rocks above it, Red Leaf drilled six rotary holes designed to be completed as monitor wells. Each boring was drilled to an unnamed sandstone unit that occurs beneath the B Groove. Locations of these borings are shown on Figure 7 of Red Leaf's June, 2013 ground water discharge permit application. Five of these six monitor wells displayed evidence of water in the upper and lower parts of the bore hole. To evaluate possible ground water occurrences in the horizons penetrated in the upper parts of the bore holes, a shallower boring was drilled adjacent to each of these five deeper monitor wells, resulting in a total of eleven monitor wells with five pairs of shallow and deep wells completed at the same sites.

After drilling, water levels in the wells were allowed to stabilize, and aquifer tests were conducted on those wells with stabilized water levels within the screened interval. A recovery test was conducted in suitable wells by rapid pumping and evacuation of water from the wells, with recovery monitored by pressure transducers. Hydraulic conductivities of the surrounding rocks were estimated from this data and in the six wells tested ranged from 1.42×10^{-7} to 9.52×10^{-7} cm/sec. It should be noted that all wells tested were shallow completions, screened within stratigraphic intervals corresponding to ore layers and overburden.

Water samples were collected during evacuation of the wells. The samples were analyzed for bulk parameters, major ions, metals and selected organic constituents, and stable isotope analysis. Analytical results are reported in Appendix F of Red Leaf's June, 2013 ground water discharge permit application. Total dissolved solids (TDS) content of water from shallow well completions ranged from 9,020 to 58,600 mg/l. TDS levels from deep well completions ranged from 30,300 to 53,700 mg/l. Water from shallow wells had pH ranging from 10.4 to 9.1; deeper wells showed pH values ranging from 9.9 to 9.0. Trace levels of petroleum constituents were reported from most wells. Ground water immediately underlying the mine site is Class IV (R317-6-3(3.7) Total Dissolved Solids (TDS) greater than 10,000 mg/L).

Analyses of the stable isotope composition of the ground water from these wells indicates that it is isotopically heavier than precipitation at the mine site, suggesting that it may have been recharged at a time when there was a different climate at the site, or that the ground water may contain formation (or connate) water remaining from the time when the sediments were deposited.

Available information, then, indicates that the Parachute Creek Member at this site has very low permeability and acts as a barrier to ground water flow, an aquiclude. Ground water that exists in the Parachute Creek is of low volume, flows sluggishly and seems to have a long residence time in the formation as indicated by its high content of dissolved solids and other constituents and different isotopic composition from local meteoric water. Comparison of the chemistry of water from springs and seeps with that of ground water in the shallow subsurface and comparison of the isotopic composition of subsurface water with precipitation indicates that precipitation does not infiltrate very deeply under the ground surface.

Any wastewater discharged to the subsurface from Red Leaf's planned facilities would have to pass through the rocks underlying the Mahogany Zone oil shale strata before it affected any aquifer under the site. To evaluate whether these strata can transmit water or contain aquifers, staff from DWQ examined them in the field in July, 2012, accompanied by Mike Vanden Berg of the Utah Geological survey. Results of this field reconnaissance are reported in Novak (2012). Rocks underlying the Mahogany Zone, beginning with the B Groove strata, consist of dolomitic mudstone and oil shale. The oil shale is near-white in color on weathered surfaces, but immediately below the weathered rind the rock is black on freshly-exposed surfaces; demonstrating its low permeability. Deeper in the section, the transition to the sandier strata of the Douglas Creek member begins. Because there are gradually more and more sandy beds interbedded with shales deeper in the section below the Mahogany Zone, picking a contact between the two members is somewhat arbitrary; however, 450 to 600 feet below the Mahogany Zone the strata may be sandy enough to transmit water and contain an aquifer. Strata in the B Groove and lower Parachute Creek Member seen in outcrop near the mine site are fine-grained with only localized fracturing, and are of very low permeability.

The uppermost aquifer under the mine site is tapped by Red Leaf's water supply well, located 2202 feet north and 2431 feet west from the southeast corner of Sec. 30, T. 13 S., R. 23 E. This well was drilled through 240 feet of shale before it encountered the first significant sandstone unit. After drilling through shale and sandstone layers, ground water was encountered at 630 feet and 830 feet below ground surface (bgs). Static water levels stabilized at 600 feet bgs. A water sample from this well had a TDS content of 660 mg/l. (Driller's log and water analysis, Red Leaf Resources, 2010)

This well taps an aquifer contained in sandstones of the Douglas Creek Member. The fact that the water level rose above the elevation of the strata where ground water was first encountered indicates it is under artesian pressure. The aquifer is recharged in the area to the south of the mine site where the Douglas Creek Member crops out (Holmes and Kimball 1987, p. 34). Ground water flows in a northerly direction from this recharge zone, down the dip of the strata, and the artesian pressure is a result of the recharge zone being at a higher elevation than the underground location where the well encountered the water-bearing stratigraphic interval. Upward hydraulic pressure indicates that this aquifer is protected from contaminants that may be introduced from above. The fact that ground water at this depth has a TDS content that is so much lower than ground water encountered in shallow wells at the mine site also indicates that the shallow ground water does not flow into the deeper sandstone aquifer.

VIII. Basis for Permit Issuance

The issuance of this permit is part of an evaluation phase that will be used to test assumptions and factors related to ground water protection and capsule performance that are still not completely known. Red Leaf's proposed capsule technology for extraction of hydrocarbons from oil shale, along with site conditions, however, lead DWQ to conclude that construction of the EPS capsule as presented in Red Leaf's ground water discharge application will not degrade beneficial uses of ground water.

Also factored in is that the ore does not use process water nor involve containment of wastewater. After heat extraction of kerogen, the spent shale will be dry and not have any significant water content, and it will also be completely enclosed in a three-foot thick liner of bentonite-amended shale (BAS), or its functional equivalent. As part of site reclamation, a vegetative cover will be established over the capsule that will promote evapotranspiration of water from the soil. Formation of leachate and its discharge to the subsurface would only occur when precipitation infiltrates the vegetative cover and upper BAS liner in sufficient quantities to bring the water content of the near 100-foot thick layer of dry spent shale and the "rind" of insulating waste rock to field capacity, and then this water breaks through the metal oil collection pan and builds up on the lower BAS liner and breaks through it. Available information suggests that such leachate would have levels of dissolved contaminants that are comparable to or less than the existing ground water in the underlying rocks. Also, rocks located immediately below the capsule are of very low permeability, and protect underlying aquifers from contaminants that may be introduced from the capsule.

The unlikely possibility that the capsule would cause a discharge of contaminants to the subsurface, in combination with the low permeability of the rocks underneath the capsule and the poor quality of ground water contained in them, lead DWQ to conclude that monitoring ground water quality at this site would not provide useful information to evaluate Red Leaf's compliance with the Ground Water Quality Protection Regulations. However, the purpose for construction of the EPS capsule is to evaluate the capsule design for suitability in the construction of future capsules for commercial production.
To better evaluate any potential discharge to the subsurface or to waters of the state that may result from large-scale commercial production at the mine, as permit conditions Red Leaf shall conduct the following investigations:

1. After closure and sufficient cooling of the EPS capsule, Red Leaf shall obtain representative samples of spent shale, including residual hydrocarbons, and also waste rock that will be left in place underneath the layer of topsoil or growth medium used for final site reclamation. SPLP and MWMP extracts from these samples shall be analyzed for:

- General Chemistry: pH, total dissolved solids (TDS), major ions (Na, K, Mg, Ca, Cl, SO_4, alkalinity), F, Sr, OH, nitrate/nitrite (as N), total organic carbon;
- Metals from Table 1 of UAC R317-6: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, selenium, silver, thallium and zinc; and
- Petroleum-related parameters: benzene, toluene, ethylbenzene, xylenes, naphthalene, total petroleum hydrocarbons- gasoline range organics, total petroleum hydrocarbons- diesel range organics and total recoverable petroleum hydrocarbons.

2. If the BAS cover layer is installed on top of the capsule prior to retorting operations, Red Leaf shall evaluate the post-settling hydraulic conductivity of the upper BAS liner, particularly in places that have experienced the most mechanical strain during compaction.

Red Leaf shall also investigate hydrologic properties of the spent shale, particularly initial water content and field capacity after retorting. Red Leaf shall then use the best estimates for values of hydraulic properties of the various capsule components, based on actual field observations, in an analysis using the Hydrologic Evaluation of Landfill Performance (HELP) model to estimate infiltration through the upper liner into the capsule. The report should compare the infiltration rate through the upper liner with the volume of water that would be needed to bring the spent shale to field capacity, in both the EPS and future production capsules.

3. Red Leaf shall monitor discharges from the EPS capsule after ore retorting operations have ended. The capsule is designed to collect liquid hydrocarbons on a metal pan at the base of the stacked crushed oil shale, as the shale is heated. The pan will remain in place after capsule closure. If any leachate is formed by contact of infiltrating precipitation with the spent shale, it will collect on the metal pan before it can discharge to the subsurface. After capsule closure, Red Leaf will be able to monitor drainage from the metal pan and also from the top of the BAS liner (below the metal pan) as well as drainage into the channels that lead from the bulkheads at the six liner penetrations on the capsule's north side, as described in Part 5.3.2 of the June, 2013 permit application. As a permit condition, following capsule closure Red Leaf will monitor the drains leading from these points twice a year for presence of any water or liquid hydrocarbons. If any water is present coming from the drains in quantities large enough to take a sample, Red Leaf will sample this water and analyze it for petroleum parameters, parameters of concern in the streams that drain the mine site, and other parameters that may be identified as potential pollutants in the SPLP and MWMP analyses of the spent shale. Any such water may not be discharged to surface water and disposal of the water shall be protective of other waters of the state. Beginning six months after shutdown of the capsule heating system, Red Leaf shall monitor discharges of liquid hydrocarbons from the capsule monitoring points every six months until such discharges have stopped. Red Leaf shall report the quantity of liquid hydrocarbons that have discharged from the capsule in the previous six months to DWQ. As a permit condition, Red Leaf will remove liquid hydrocarbons from the site for as long as they flow from the capsule drains.

Red Leaf shall submit reports on the results of these investigations to DWQ whether or not they decide to modify this permit to allow commercial production using the capsule technology. If Red Leaf decides to pursue commercial production of hydrocarbons using the capsule technology, DWQ will also take into account the results of monitoring required by this version of the permit in developing conditions for the modified permit. Similar to the process for issuing the new permit, the modified permit will be made available for public comment before permit issuance. The modified permit will be issued following resolution of any comments received from the public.

REFERENCES

Holmes, W. F. and Kimball, B. A., 1987, Ground Water in the Southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply Paper 2248

Novak, M., 2012, Field Reconnaissance of Rocks Underlying the Site of Proposed Southwest #1 Mine: DWQ files, DWQ-2012-002394

Red Leaf Resources, 2010, Driller's Log and Water Analysis: DWQ files, DWQ-2013-002988

Red Leaf Resources, 2013, Ground Water Discharge Permit Application for Red Leaf Resources, Inc. Southwest #1 Project, June, 2013: DWQ files, DWQ-2013-004903