

Construction Permit
for
Red Leaf Resources Southwest #1 Oil Shale Mine
Issued in Association with Ground Water Discharge Permit No. 470002

Comment Response Summary

Utah Division of Water Quality

May, 2014

I. INTRODUCTION

A. Background

1. The Division of Water Quality (DWQ) requested comments on its intent to issue a construction permit¹ for an Early Production System (EPS) prototype capsule at the Southwest #1 Oil Shale Mine for the permittee, Red Leaf Resources (RLR), through the 30 day period ending May 1, 2014. On May 1, 2014 Western Resource Advocates (WRA) on behalf of a collection of entities, collectively known as “Living Rivers”, submitted comments on the noticed construction permit. Although there is a regulatory requirement for public comment prior to issuance of the related ground water discharge permit², no such requirement exists for issuance of a construction permit. DWQ has opted to receive comments regarding the issuance of the RLR EPS construction permit since it is of such heightened public awareness and scrutiny. WRA’s submittal incorporated the following as comments to the draft construction permit: Living Rivers’ January 21, 2014 Request for Agency Action on Ground Water Discharge Permit No. UGW470002 (“GW Permit”); Elliot Lips’ September 26, 2013 Expert Report filed as part of WRA’s comments on the GW Permit (Lips Initial); Lips January 14, 2014 Supplemental Expert Report (Lips Supplemental); James Kuipers’ September 23, 2013 Expert Report filed as part of WRA’s comments on the GW Permit (Kuipers’ Initial); and Kuipers April 21, 2014 Expert Report filed as part of WRA’s comments on the Construction Permit.

2. DWQ uses site-specific data on a case by case basis to issue construction permits for a wide variety of activities and industries (and their associated wastewater types) across the State which also varies greatly in its climatic factors, geology and hydrogeology³. Although there are generally recognized Best Available Technology (BAT) criteria for certain industries, e.g. double lined ponds with leak detection for the mining industry, they are a starting point and the BAT standard may be higher or lower depending on pertinent factors listed above and as described in DWQ’s comment response summary⁴ for UGW470002 (GW Response Summary).

3. DWQ provided extensive responses to the comments in the GW Comment Response Summary on December 20, 2013 when DWQ issued the GW Permit.

4. One specific GW Permit condition under the subheading “Best Available Technology Standard” provided that: “The authorized facilities will be constructed in accordance with the

¹ Related to the Ground Water Discharge Permit No. UGW470002 which permit Living Rivers has challenged by the filing of a Request for Agency Action on January 21, 2014, which action is pending before the Administrative Law Judge.

² UAC R317-6-6(6.5)

³ For a general description please See DWQ’s December 2006 permitting information and guidance document “Ground Water Quality Protection Permitting Information Document” on the DWQ website at: http://www.waterquality.utah.gov/GroundWater/documents/GWQP_PermitInfo.pdf

⁴ See DWQ GW Response Summary Part I(D) and (E).

engineering design plans and specifications approved by the Construction Permit issued by the Director.”

B. Applicable Rules

The rules applicable to the issuance of a construction permit are as follows.

UAC R317-1-2(2.2) states:

“Construction Permit. No person shall make or construction any device for treatment or discharge of wastewater without first receiving a permit to do so from the Director or its authorized representative, except as provided herein.”

UAC R317-1-1 states in part:

“Wastewater” means. . . industrial waste or other liquid substances which might cause pollution of waters of the state”

UAC R317-1-2(2.2)(C) states:

“Review of Plans. The Division shall review said plans and specifications as to the adequacy of their intended purpose and shall require such changes as are found necessary to assure compliance with the pertinent parts of these rules.”

UAC R317-6-1 states in part:

“Best Available Technology” means the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs.

C. Engineering Basis for Construction Permit Issuance

1. The basis for construction permit issuance is an engineering review of the plans and specifications. The determination of BAT was previously addressed in the public comment period for the GW permit.

2. DWQ reviewed the final design documents to ensure that construction of the EPS capsule would be consistent with the ground water discharge permit and standard engineering design practices and principles. For example, DWQ reviewed the BAS layer design for consistency with the same Quality Assurance/Quality Control (QA/QC) elements (compaction, moisture content, percentage of bentonite and kneading) of the test pad which was tested using a sealed double ring infiltrometer⁵.

⁵ Complying with American Society of Testing Materials (ASTM) standards such as D5093 page 4, D5039 page 10, D2216, D4318, D422 and D698 page 18 etc. from IGES “Field Scale Hydraulic Conductivity Evaluation of Compacted Bentonite Amended Soil by Sealed Double Ring Infiltration Testing” report in the construction permit application.

3. DWQ is satisfied that engineering plans and specifications for construction of the EPS capsule are consistent with the ground water discharge permit and standard engineering design practices. The Construction Permit may be issued as proposed by RLR with one minor change.

II. DWQ Response to WRA's Comments

DWQ will limit its response to those comments submitted by WRA which are within the scope of the agency's review on the Construction Permit. By WRA's own account, the purpose of the Lips' Supplemental Report is to reply to the GW Response Summary (responding to Lips' initial report relative to the issuance of the GW Permit). As a practical matter, to the extent that WRA's submittals are outside of the scope of the Construction Permit, but instead relate directly to comments that have already been submitted by WRA relative to the GW Permit, such submittals would constitute supplementing the administrative record on Living Rivers' pending Request for Agency Action. For those submittals to become part of the administrative record, the Administrative Law Judge in the pending challenge of the GW Permit would have to grant a motion to supplement the record with technical or factual information, which could be granted if the moving party proves good cause. See Utah Code Ann. § 19-1-301.5(8)(c).

Lips' Supplemental Report falls within such a category of a supplementation of the administrative record of the pending challenge to the GW Permit that can only come into that proceeding by motion and a showing of good cause or by stipulation. In addition, the DWQ rejects the incorporation of the pending request for agency challenging the GW Permit. The purpose of this public comment period was to obtain comments on the Construction Permit, not to re-open the comment period on the GW Permit. The request for agency action includes attachments that were not considered during the public comment on the GW Permit. Therefore the statutory procedures to supplement the record must be followed. See Utah Code Ann. § 19-1-301.5(8).

The text of the comments are restated verbatim in italics. Some of the comments are broken into subparts for purposes of the DWQ response.

Comment 1 (1.1)

Thank you for the opportunity to comment on the draft Construction Permit related to Red Leaf's Ground Water Discharge Permit No. UGW470002. These comments are submitted on behalf of Living Rivers, Grand Canyon Trust, Utah Chapter of Sierra Club, Southern Utah Wilderness Alliance, and Great Old Broads for Wilderness (Collectively Living Rivers).

Living Rivers hereby references, incorporates and attaches its January 21, 2014 Request for Agency Action (RAA). Exhibit A, attached. Living Rivers also references, incorporates and attaches Mr. Lips' September 26, 2013 Expert Report (Lips Initial), Mr. Lips' January 14, 2014 Supplemental Expert Report (Lips Supplemental), and Mr. Kuipers September 23, 2013 Expert Report (Kuipers Initial), which were exhibits to its January 21, 2014 Request for Agency Action. Exhibits B, C and D respectively, attached.

In issuing the Construction Permit associated with Red Leaf's Ground Water Discharge Permit, the Director was required to review the plans and specifications and ensure that Red Leaf's design would function as intended and in a manner that complied with the Ground Water Quality Protection regulations and the stated purposes of the Discharge Permit. See R317-1-2.2 (C).

Specifically, the Construction Permit must first ensure that the Early Production System (EPS) capsule, by itself, will not contaminate subsurface Waters of the State. Secondly, as the Director notes in the Statement of Basis (SOB) associated with the Discharge Permit, “the purpose of construction of the EPS capsule is to evaluate the capsule design for suitability in the construction of future capsules for commercial production.” SOB at 7. In line with that, the Director notes that “[t]he issuance of [the Discharge 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.” SOB at 7. As part of this evaluation, the results from the monitoring associated with the Discharge Permit will be used “to determine if any potential discharge to subsurface or waters of the State may result from large-scale production at the mine.” Discharge Permit at 2. Therefore, the Construction Permit must both ensure that Red Leaf’s EPS is constructed in a manner that protects Waters of the State and that provides the Director with the necessary information on which to evaluate the capsule design for commercial-scale production. However, as outlined in detail below, the Construction Permit does neither.

1.1 DWQ Response

The DWQ rejects the incorporation of the request for agency action and associated documents in Part I. The scope and purpose of the construction permit review is also discussed in Part I.

Comment 1 cont. (1.2)

Initially, and as Mr. Kuipers noted in his April 21, 2014 Expert Report related to this Construction Permit (Kuipers), Exhibit E, attached, the scarcity of details in the requirements for construction permits outlined in the R317-1-2 regulations makes it difficult to determine the standards that the Director of the Division of Water Quality (Director) applied in his review of Red Leaf’s Construction Permit Application. Further, the complete lack of written analysis of Red Leaf’s application on the part of the Director offers no insight into how he applied what standards do exist. To make matters worse, the number of details that have been withheld from disclosure to the public at Red Leaf’s request makes it next to impossible to meaningfully comment on the company’s proposal or the Construction Permit. Because the details associated with DWQ’s review of the application are either absent or are being withheld and because the Director offers no insight into how he applied the regulatory requirements with this permit, the Director has failed to provide sufficient justification for his approval of Red Leaf’s Construction Permit.

1.2 DWQ Response

As described in Part I, the construction permit is issued in connection with the ground water permit on a case by case basis evaluating a variety of factors. Extensive information and explanation has been provided for both the ground water and construction permits. Details are neither absent nor were withheld. In the submission of comments regarding the issuance of the ground water permit WRA and its experts were provided access to the business confidential materials. The construction permit documents that were available for public review indicated business confidential documents were not included. However, WRA did not request RLR or

DWQ to provide them similar access to the final business confidential construction permit documents.

DWQ notes that many of the comments provided are very similar or repetitive of those made in it September 27, 2013 comments. As such, DWQ refers to its response to those comments (GW Response Summary) throughout this response.

Comment 2

The Permit Fails to Address How the Design of the Capsule Serves as a Barrier to Prevent Liquids from Unintentionally Escaping.

In order to be considered adequate, the Construction Permit must certify that the construction of the EPS meets the first goal of the Discharge Permit, which is to ensure that contaminants emanating from the EPS do not contaminate subsurface Waters of the State. However, as Mr. Kuipers notes, the draft permit does not address the issue of unintentional release of solution from the capsule. Kuipers at 2. As he stated in his initial report, because of the significant chemical and physical demands placed on the BAS liner, there is a high likelihood of significant failures and the release of materials from the capsule. Kuipers Initial at 7. The failure to address the possibility that either the side or the bottom BAS liners may fail during the extreme and lengthy heating process, resulting in a release of liquid hydrocarbons into the environment and result in a discharge to ground water, is a fatal flaw in this permit. See RAA ¶¶ 59, 73-76. Therefore, because the Construction Permit is not adequate to support the intended goal of the Discharge Permit of ensuring that contaminants from the EPS will not contaminate subsurface Waters of the State, the Director's decision to approve the Construction Permit is arbitrary, capricious and a violation of the law.

2. DWQ Response

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see DWQ Response Summary page 16, DWQ response 3.2 as well as page 31, DWQ Response Summary to Kuipers 2 (Capsule Stability) incorporated by reference as if specifically set forth herein.

Comment 3 (3.1)

The Permit Fails to Require that the Capsule Be Constructed in a Manner that Provides Adequate Monitoring Beneath the Capsule

In line with the second purpose of the Discharge Permit – to gather the information needed to determine whether commercial-scale use of Red Leaf's capsules will be protective of ground water in a variety of geological formations – the Construction Permit must ensure that the capsule is designed and constructed in a manner that allows the Director to obtain the information he needs to make that determination. However, the Construction Permit fails to accomplish this.

3.1 DWQ Response

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see DWQ GW Response Summary page 15, Response 3.1 incorporated by reference as if specifically set forth herein. Also see DWQ Response 1.2 of this Construction Comment Response Summary.

Comment 3 cont. (3.2)

As Mr. Kuipers notes, the fluid collection pipe that provides for monitoring of fluids is limited to the area where other pipes protrude from the capsule. Kuipers at 3. Instead, the fluid collection pipe should extend beneath the entire capsule/bedrock interface. Id. This approach is standard industry practice and would allow the Director to properly monitor the entire capsule floor in order to determine whether there are unintended discharges from the bottom BAS liner. Id. As currently designed, this limited monitoring design fails to account for the very real possibility that the lower BAS will fail. See Kuipers Initial at 4 (“It is highly likely that the metal sheet will be affected by the heating and pressurization process as well as the weight and settling of the material and will cause warping and weld failures in the metal sheet which will result in the sheet allowing solution to pass through the sheet and in turn result in increased reliance on the BAS liner to accomplish capture and to prevent solution discharge.”).

Further, this limited monitoring design does not consider the probability that the lower liner will also fail, resulting in a direct release of liquid hydrocarbons into the environment and in a discharge to ground water. See RAA ¶ 75; see also Kuipers Initial at 7 (“My best professional judgment is that because this is a novel concept involving significant chemical and physical demands upon the proposed BAS containment system there is a high likelihood there will be significant failures resulting in release of deleterious materials.”).

3.2 DWQ Response

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see DWQ GW Response Summary pages 15-18 and pages 32-33 incorporated by reference as if specifically set forth herein.

Comment 3 cont.(3.3)

The Director’s statement in his response to comments associated with the Ground Water Discharge Permit (Response) that “[m]onitoring beneath the capsule is not critical to insure control of discharge” shows that he is ignoring the possibility of a BAS liner failure and is disregarding his stated purposes for conducting monitoring. Response at 15. The Construction Permit reflects the Director’s focus on only the “very unlikely event that leachate builds up within the closed capsule,” id., and thus fails to require the monitoring necessary to address the probability that a BAS failure will result in the direct discharge of liquid hydrocarbons into the environment and ground water. See also RAA ¶ 77.

In addition to not requiring that the drainage system be extended to cover the entire capsule, the Construction Permit also does not contain a requirement that the company construct separate sample monitoring points which would provide the data for unintended discharges from the

capsule. Kuipers at 3. To that end, the Director must prohibit the company from combining the drain for the bedrock and the lower containment layers. Id. The way the drainage system is currently designed, such a combined discharge would not allow a determination of whether the lower BAS layer has failed. Id.

Because the Construction Permit does not require that a sufficient monitoring system be installed to support the stated goals of ensuring that discharges from the EPS will not contaminate subsurface Waters of the State and of gathering the information necessary to determine whether commercial-scale use of Red Leaf's capsules will be protective of ground water in a variety of geological formations, the Director's decision to approve the Construction Permit is arbitrary, capricious and a violation of the law.

3.3 DWQ Response

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see pages 5-9 Part I(D and E), and pages 13 and 15 of the GW Response Summary incorporated by reference as if specifically set forth herein.

WRA Comment 4 (4.1)

The Construction Permit Fails to Require the Construction of a Redundant Liner and Leak Detection System

While the EPS is being proposed as a zero-discharge operation that will contain primary and secondary containment, Ground Water Discharge Permit Application at 10, because the drain pipes do not extend beneath the entire area of the capsule, they do not constitute a secondary containment system sufficient to capture unintended drainage from the bottom BAS liner. Kuipers at 4. Therefore, the permit does not require the capsule to be constructed in such a way that any unintentional discharge can be controlled as required by R317-6-6.3(G) and R317-6-6.4.

As Mr. Kuipers notes, "it is highly likely that unexpected forces will be exerted in terms of liquid head or saturation within the pile resulting in the additional potential for loss of liquid products containing deleterious materials outside the capsule" and that "because this is a novel concept involving significant chemical and physical demands upon the proposed BAS containment system there is a high likelihood there will be significant failures resulting in the release of deleterious materials." Kuipers Initial at 7. Because of this, Mr. Kuipers recommends that the Director require installation and monitoring of a secondary leachate collection system in order to determine how the BAS liner has performed. Id.

4.1 DWQ Response

DWQ previously responded to this comment with the issuance of the ground water permit. For instance see pages 16, 29 (Kuipers 1 Heap Leach), pages 32-33 (Kuipers 3 Process Solution and Post-Retort Draindown and Leachate Collection) of DWQ's GW Response Summary incorporated by reference as if specifically set forth herein.

Comment 4 cont. (4.2)

Given the likelihood of failure of the BAS, in order to fulfill these regulatory obligations, and in order to adequately monitor for leakage through the BAS liner, the Director must require Red Leaf to install a geomembrane liner overlain by a geogrid draining to a collection point, under the entire area of the EPS capsule. Kuipers at 4. As Mr. Kuipers notes, the reliance on bedrock as an impervious containment layer is flawed because bedrock is subject to fracturing and cracking and can exhibit significant porosity. Id.

Mr. Kuipers also notes there is the potential for differential settling over a longer period of time – years versus months – than is predicted. Kuipers Initial at 5. This differential settling would mean that some areas of the capsule would settle more than others, id., and that this settling would likely result in significant gaps in the upper BAS layer that would allow moisture from precipitation to enter the capsule relatively unimpeded. Lips Initial at 7. Because the settling may occur over an extended period of time – in excess of five years and possibly as many as 25 years, Kuipers Initial at 5 – the Construction Permit must account for the possibility that the resulting settling of the pile will make long-term effectiveness of the containment questionable and short-term reclamation of the surface difficult. Id. at 7.

Because there is a strong possibility that the BAS liner will fail due to heat and pressure, that the metal sheet could fail to perform as expected, and that differential settling will make the long-term effectiveness of the containment questionable thus allowing a significant amount of precipitation to infiltrate through the upper – and ultimately lower – BAS layers, and because the Director is not requiring the company to construct the EPS on a liner system that incorporates a leak detection system, his approval of the Construction Permit is arbitrary, capricious and a violation of the law.

4.2 DWQ Response

Except for the comment on fracturing and porosity, which is new, DWQ previously responded to this comment with the issuance of the ground water permit. For instance see pages 31-35 of the GW Response Summary incorporated by reference as if specifically set forth herein. The comment on fracturing and porosity should have been raised in the comment period for the ground water permit and is outside of the scope of the construction permit comment period which calls for comments on the final design documents. Therefore DWQ is not providing a response, see Part I.

End of DWQ Responses to WRA Comments

III.
DWQ RESPONSE TO ATTACHED EXHIBIT E TO WRA COMMENTS
Excerpts from the exhibit are restated verbatim in italics

DWQ Response to Excerpts from Kuipers (April, 2014) Exhibit E

Kuipers Comment 1 (1.1)

Draft Construction Permit Letter

According to the letter the construction permit is for the Early Production System (EPS) Capsule. The letter also says a construction permit for the EPS is required in addition to the Utah Ground Water Discharge Permit (UGWDP) issued in December, 2013. Further, the letter says a Construction Permit Application was submitted on February 18, 2014.

I am unable to locate a “Construction Permit” application form or any other information related to the requirement for a construction permit in addition to an UGWDP on the Utah Department of Environmental Quality (UDEQ) website or by other means. Therefore no specific information or requirements are available to compare the information contained in the Construction Permit other than based on commonly recognized professional standards.

1.1 DWQ Response to Kuipers

See Part I of this comment summary. The draft construction permit in the public notice states:

“The EPS Construction Permit Application was submitted on Feb. 18, 2014. That application was reviewed and a meeting was held on February 27, 2014 to discuss additional specifications that were required before a construction permit could be issued. An amended construction permit application was subsequently received March 6, 2014...”

DWQ does not have a construction permit application form, instead DWQ reviews engineering plans and specification submitted by a Utah Certified Professional Engineer on behalf of the permittee. Construction permits are issued in connection with a ground water discharge permit and determined on a case by case basis as described in Part I.

Kuipers Comment cont. 1 (1.2)

The construction permit is subject to requirements that any revisions or modifications be submitted to DWQ for approval. In addition an operations and maintenance manual, containing a description of the functioning of the facilities, an outline or routine maintenance procedures, and all checklists and maintenance logs needed for proper operation of the system, must be submitted and approved before final inspection and operation of the system. Finally, the approved facilities are not to be placed into operation until DWQ has conducted a final inspection, reviewed and approved the As-Built Construction Certification report and provided authorization to place the facilities into operation.

These additional requirements are relatively standard prior to facilities being placed into operation. The degree to which the requirements are effective depends upon original design, the level of additional detail provided, the conduct of meaningful inspections, and knowledge, as well as qualifications of the reviewer/inspector. Similar requirements at other mine sites dealing with containment systems for facilities such as heap leach and tailings facilities have not proven to be effective in many cases.

1.2 DWQ Response to Kuipers

Please see DWQ Response 4.2 herein.

Kuipers Comment 2 (2.1)

Draft Construction Permit

The Draft Construction Permit is actually a cover letter from Red Leaf Resources, Inc., dated March 6, 2014, together with an application for a Utah Ground Water Discharge Construction Permit Application. The application consists of construction drawings, specifications, graphics and a “discussion” section. The drawings of the project containment system overview, cross sections, details and monitoring bulkhead & sampling overview are marked “confidential” and are not provided in the draft construction permit. Portions of the specifications are similarly marked confidential and are not provided. The graphics provide highly conceptual views of the containment and proposed leak detection systems.

According to the brief discussion section, the “Bentonite amended soil (BAS) is the primary barrier to prevent water from infiltrating into the capsule (underline added).” “The geotextile, geogrid, and geomembrane are included to ensure geotechnical performance of the BAS...(underline added).” “Insulation materials are placed as thermal insulation to protect the BAS during operation (underline added).”

From this information it appears the BAS has not been intentionally designed as a barrier to prevent solution from unintentionally escaping from the capsule. Additional features have similarly been incorporated for geotechnical performance reasons or to serve as protective insulation, but not to serve as a barrier to prevent accidental discharge from the capsule. While to some extent it is fair to assume a barrier to infiltration might also serve as a barrier to discharge, the design should intentionally be to serve as a barrier to discharge as well as a barrier to infiltration.

2.1 DWQ Response to Kuipers

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see pages 16 and 17 of DWQ’s GW Response Summary incorporated by reference as if specifically set forth herein.

Additionally, the EPS capsule is designed specifically to contain liquids and prevent any loss of product (liquid kerogen). RLR is undertaking this activity as an economic enterprise to capture the liquid kerogen. RLR has every economic incentive to minimize any loss of liquid. However

in the unlikely event of accidental discharge of liquid kerogen, DWQ is satisfied that the highly protective geology at the proposed EPS site and the 3 feet of 1×10^{-7} barrier to infiltration are protective of the ground water. The design satisfies the BAT criteria based upon the factors set forth in the BAT definition as, “*the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs.*”

Kuipers Comment cont. 2 (2.2)

The discussion also identifies the following monitoring approaches as part of the EPS capsule:

- *Collection Pan*
- *Lower Containment Layer*
- *Bedrock Under Capsule*

The only additional information provided states that “A drain that is used during operation to collect oil will be used following operations for liquids that infiltrate to the collection pan. For the Lower Containment Layer monitoring, piping is placed to convey liquids that infiltrate to the lower BAS liner that flow to the bulkhead. For monitoring Bedrock Under Capsule, a drain provides for monitoring of fluids which collect above the bedrock. The drain for the bedrock and for the Lower Containment layer may be combined.”

This is extremely limited information on monitoring and it is difficult to ascertain what is planned to allow for actual monitoring activities to take place, much less to ascertain as to whether the proposed means of monitoring are adequate. A more detailed description of the monitoring approaches should be provided including drawings and dimensions of the sampling locations, means of actual sampling (e.g. in-stream sampler, port, etc.), planned frequency of sampling, custody and analytical requirements, quality assurance/quality control considerations, and any operations or maintenance requirements.

2.2 DWQ Response to Kuipers

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see pages 10-15 and page 31 of DWQ’s GW Response Summary incorporated by reference as if specifically set forth herein.

Kuipers Comment 3.

Draft Drawings

The draft drawings are actually the three “Graphics” identified in the permit application. The first graphic titled “Capsule Cross Section” shows a cut-away view of the EPS Capsule and identifies the oil shale surrounded by gravel, clay and fill on the sides, and an oil collection pan beneath the oil shale in relation to bedrock. No dimensions or other additional information is provided.

The second graphic titled “Bulkhead Cross Section” shows the same cut-away view but enlarged to show the bulkhead monitoring, fluid collection pipe, and perforated drain pipes sample points in addition to suggesting their relationship to each other. An unspecified distance is indicated between the bulkhead monitoring and fluid collection pipe, while an even greater unspecified distance is indicated between the fluid collection pipe and the perforated drain pipes. It also appears that the pipes would be buried in gravel with the bottom pipe located immediately above bedrock. The drawing also appears to suggest that the perforated drain pipes would only extend below the bulkhead and fluid collection pipes and not beneath the entire EPS Capsule.

The third graphic titled “Alternative Bulkhead Cross Section” shows the same cut-away view as the second graphic however it indicates that a “clay surface monitoring” sampling point would be used instead of the bulkhead monitoring indicated on the prior graphic. In addition it indicates no distance separating the three sampling/monitoring points.

The graphics provide very limited information from an engineering design or regulatory performance standpoint other than to suggest potential concepts. Two obvious technical flaws exist in the concepts presented. First, consistent with the description that the drain “...provides for monitoring of fluids which collect above the bedrock” in the discussion section of the permit, the fluid collection pipe in all designs should extend beneath the entire capsule/bedrock interface rather than just under the area where other pipes protrude from the cell. This approach is consistent with “leak detection” systems used elsewhere in the mining, oil and gas industry and would allow the operator and DEQ to ascertain the integrity of the BAS as well as other aspects of the EPS Capsule design relative to potential unintended discharges. Second, for the obvious reason that separate sample monitoring points would provide distinct data for each intended or unintended discharge of solution from the EPS Capsule, it is highly inadvisable to combine the drain for the bedrock and lower containment layers. In the event a discharge is detected, a combined discharge would not allow for determination of whether the lower containment layer had failed.

3. DWQ Response to Kuipers

RLR has agreed to separate sampling monitoring points as suggested in the comment.

Kuipers Comment 4 (4.1)

Conclusions

In general it is unclear what the intended purpose of the construction permit is in terms of regulatory or technical requirements. This is compounded by the paucity of information contained in the permit as well as the detailed drawings redacted for reasons of confidentiality. Given these facts it is unclear to what extent if any meaningful public review and comment is anticipated or invited by Red Leaf and UDEQ.

4.1 DWQ Response to Kuipers

See Part I herein.

Kuipers Comment cont. 4 (4.2)

The UDWQ has not entirely addressed the nature of a prototype engineering design in terms of the relatively high risk of failure of major systems, including that of the proposed containment system for the EPS Capsule. The situation warrants a very conservative approach and the prototype installation offers an opportunity to explore potential defects in the design. However, failure to detect, monitor and evaluate those defects would be considered by most technological developers to be a flawed approach likely to lead to unexpected future consequences. UDWQ also acknowledged in the Statement of Basis (p. 7) for Red Leaf's ground water discharge permit that the purpose for constructing the EPS "is to evaluate the capsule design for suitability in the construction of future capsules for commercial production." Therefore, a failure to properly monitor the EPS capsule performance will completely undermine UDWQ's ability "to determine if any potential discharge to subsurface or waters of the State may result from large-scale production at the mine" as stated in the Ground Water Permit (p. 2).

Because the proposed "perforated drain pipes" do not extend beneath the entire area of the EPS Capsule as indicated in the graphics they do not constitute a secondary containment such as a drainage and capture network below the BAS as has been proposed previously by the proponent. The operation is proposed as a zero-discharge operation that will include primary and secondary containment (JBR, 2013 p. 10). Given the likelihood of failure of the BAS, a true zero-discharge design would incorporate an additional redundant liner and leak detection system, such as a geomembrane liner overlain by a geogrid draining to a collection point, over the entire area of the EPS Capsule. The current reliance on bedrock as an impervious containment layer is similarly flawed as bedrock is subject to fracturing and cracking and can exhibit significant porosity.

Given similar technological developments it is likely that the proposed prototype efforts with respect to the EPS Capsule to capture and contain liquid petroleum containing products will not be successful as it is highly likely that unexpected forces will be exerted in terms of liquid head or saturation within the pile resulting in the additional potential for loss of liquid products containing deleterious materials outside the capsule. The degree to which the retorting process might result in deformation or reaction with the capsule materials as well as the resulting settling of the pile makes long-term effectiveness of the containment questionable.

The capsule proposal is without precedence from an engineering standpoint and therefore has inherent risks. It is not known how a three-foot thick bentonite liner will perform under the proposed conditions. We do know how a six or twelve inch liner used for heap leaching or municipal waste disposal (e.g. landfill) might behave under much less rigorous conditions and know that failures are typically very site or incident specific. Failure modes analysis has since shown that manufacturing, construction and operational failures are the most common mechanisms leading to containment failures. This means when dealing with a completely new technology such as the EPS Capsule, reliance on preliminary analysis rather than site-specific data is likely to lead to underestimation of failures. Given that the EPS Capsule process will exert more demands, such as those involving heat and pressure, it therefore would be more likely to result in similar failures. How a three-foot thick liner used in retort conditions with heat and

pressure might behave in terms of fluid containment over the short or long-term, is as much dependent on the oil and gas retorting process, which is also novel in this case, as it is on the novel liner itself in this specific application.

4.2 DWQ Response to Kuipers

DWQ previously responded to this comment with the issuance of the ground water permit. For instance, see pages 15-17 of DWQ's GW Response Summary incorporated by reference as if specifically set forth herein.

End of DWQ Responses Kuipers Attached Exhibit E to WRA Comments