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Location ID 391314  
Pit Facility 116525  
REM 8494  
Document 2313677

Ms Naomi Azulai  
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January 16, 2015

Dear Ms Azulai,

The purpose of this letter is to establish a path forward and a timeline regarding the future use of the Roan Creek Evaporation Pit. Maralex has basically two options:

- 1) Apply for a Centralized Exploration and Production (CE&P) Waste Management Facility Colorado Oil and Gas Conservation Commission (COGCC) permit to reuse the pit. Submit to the COGCC a Form 28 and upgrade the pit to comply with COGCC standards as described in the Rules (Rule 908).
- 2) Close the pit. Submit a Form 27 Pit Closure Plan which should include among other activities, the removal of the liner, sampling the bottom of the pit, remediation (if necessary), and reclamation of the pit.

It is the COGCC's understanding that Maralex is interested in re-using the pit as a CE&P Facility to store and evaporate produced water from their wells in the area. Nevertheless, Maralex may decide to re-evaluate its options and choose to close the pit.

## Conclusions, Conditions and Timeline

Based on Maralex' investigations, the Burns & McDonnell's (B&M) assessment and recommendations, and COGCCs observations, the COGCC has reached the following conclusions and established the following conditions and timeline:

### 1) Conclusions and Conditions:

Considering that at least 16 leaks (holes) have been identified and that in a number of places, the soil underneath the liner is soft (as observed by B&M) indicating soil moisture is near saturation, it is likely that historical releases have occurred and that

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the soil/material beneath the liner has been impacted. Therefore, sampling of the material and native soil beneath the liner shall be performed by Maralex.

**If Maralex decides to re-use the pit:**

- A. Additional investigations. Submit a Supplemental Site Assessment (via Form 04) to address the following points:
- a. Sample the bottom of the pit. Soil samples shall be taken mostly where leaks (holes) have been identified.
  - b. : Although the COGCC would prefer for Maralex not to use the existing 16 years old liner if the pit is to be converted to CE&P Facility, the following activities would be required for its approval as a secondary liner:
    - (1) The laboratory testing conducted by TSI was not comprehensive (it only tested the liner above the water line and was not conclusive ("...as the onset of degradation is likely in the next few months and years as the antioxidant package is completely consumed.")). Conduct further laboratory testing to demonstrate that the liner below the working water level is in good condition,
    - (2) An additional survey shall be conducted to evaluate the areas not covered with the first electrical survey,
    - (3) Repair of all existing holes (including those that have not been identified in previous surveys and observations), and
    - (4) Liner condition shall be certified by a Colorado licensed Professional Engineer (P.E.).
- B. Permit to re-use the pit. Submit a Form 28, Centralized E & P Waste Management Facility permit (See requirements in Rules 908).
- a. A key requirement will be the installation of a 60 mil primary liner (in addition to the existing liner).
  - b. It has been demonstrated that the Leak Detection System (LDS) is not reliable. The LDS has never indicated that there has been a leak, yet it has been confirmed that the liner leaks and that the soil below the liner is wet. A new LDS must be designed and installed as part of any Form 28 permit.



**If Maralex decides to close the pit:**

Maralex shall submit a Form 27 Pit Closure Plan describing removal of the liner, leak detection system and other equipment, sampling the bottom of the pit, remediation and reclamation.

**2) Timeline:**

By February 16, 2015, Maralex must notify COGCC in writing of their decision regarding the pit as to whether they will: 1) Complete site investigation and submit Form 28 permit for Centralized Facility; or 2) Proceed with pit closure

- **Re-use of the pit as a Centralized Facility**
  - March 16, 2015. Submit a plan via Form 04, as a follow-up of the Form 27 Site Assessment and Remediation Work Plan to sample the bottom of the pit, remediate (If needed), re-evaluate the liner and repair.
  - May 31, 2015. Complete activities proposed and approved in Form 04.
  - March 16, 2015, make arrangements with COGCC staff, Maralex, and Maralex's engineering firm to discuss the Form 28 requirements.
- **Pit Closure**
  - March 16, 2015. Submit supplemental Form 27 with plans to close the pit, including sampling the bottom of the pit.
  - July 31, 2015. Complete site investigation, remediation (if needed) and backfill. Final reclamation will follow in compliance with COGCC Rules and BLM directives.

Appreciatively,



Carlos Lujan, Ph.D.  
Environmental Protection Specialist  
Northwest Region



**ATTACHMENT**  
**Additional Information**

## 1. Background:

- In the 80's, Piute Energy built the evaporation pit on BLM land with BLM's approval (Right of Way);
- In 1999, Maralex (new owner) upgraded the pit with a 40 mil HDPE liner and got BLM's permission to operate the pit.
- In 2011, Maralex submitted a Form 28, Centralized E&P Waste Management Facility Application to COGCC. The Form did not comply with COGCC requirements and was not approved.

Note: In 2011, under the new Rules and the MOU between COGCC and BLM, Maralex was required to have a COGCC permit to operate the pit.

- The evaporation pit has been out of service at least since 2011 and to the present date has no COGCC permit to operate.
- On May 28, 2014, Maralex and COGCC met in Denver. It was agreed that Maralex would submit a comprehensive Form 27 by Monday, June 23, 2014. The Form 27 Investigation Work Plan would include soil sampling and a technical evaluation of the liner.
- On June 23, 2014, Maralex submitted a Form 27 Site Assessment and Remediation Work Plan with two objectives: Sample the East wall of the pit and surroundings to see if there was any soil impact from potential historical releases, and evaluate the liner conditions to see if it could be re-used. It was agreed that if liner testing demonstrated that there were no holes on the liner at the bottom of the pit, there would be no need to sample the bottom of the pit. An electrical survey was proposed by Maralex in-lieu of hydrostatic test to identify any potential leak from the liner at the bottom of the pit. The results of the investigation are presented in the next section.

## 2. Results of Site investigations:

### a) Soil sampling

On July 17, 2014, ESI sampled the soil on the East wall. Samples were taken in places where there was a patch or a hole in the liner. Other samples were taken near the Leak Detection Sump, near the tank and outside the fence, where lack of vegetation was observed. No hydrocarbon impact was identified in any of the samples. SAR concentrations above Table 910-1 were measured in samples outside of the fence suggesting that releases of produced water may have occurred in the past.

Remediation of areas with high SAR values, outside of the fence will have to be discussed with and approved by BLM.

**b) Liner quality testing**

- On February 21, 2014, TRI/Environmental, Inc. presented their final report for laboratory testing of the liner with the following conclusions:

*Both the exposed and trench geomembrane material appear to be in relatively good condition. Minimal OIT remains suggesting that, while the material is in good condition and does not need to be replaced currently, continued monitoring should be practiced as the onset of degradation is likely in the next few months and years as the antioxidant package is completely consumed. However, the existing material demonstrates good mechanical strength and ductility. Stress crack resistance testing was terminated shortly after 300 hour test duration and we note that this measurement demonstrates compliance with GRI GM 13 requirements for resistance to stress cracking. TRI recommends that this geomembrane material be monitored again in 5 years for continued performance.*

- On September 29, 2014, Leak Location Services, Inc. (LLSI) presented their report for the leak location survey of the pit geomembrane (liner). According to LLSI, fourteen (14) leaks(holes) were detected. Two panels were not surveyed because of lack of water, and some other areas had compacted salt.

- Excerpt from LLSI report: "The electrical leak location method detects electrical paths through the liner caused by water or moisture in holes through the liner.

- On November 7, 2014, Burns & McDonnell, Inc. submitted a report including a professional opinion based on the site documents and a site inspection conducted during the Leak Location Survey. Conclusions and recommendations included:

*In it's current state, due to the geomembrane age and the defects described above, the pond design and condition is not adequate to prevent releases of the pond contents to the underlying subgrade. This statement is made for the following reasons:*

- 1) *It is suspected that something in the pond contents, possibly hydrocarbons, may have leached the carbon black from the geomembrane and made the geomembrane more susceptible to ultraviolet ray deterioration, resulting in the brittleness and cracking beneath the high water mark. If this theory is*

*correct, all the panels are deteriorating - not just Panel 14. Panel 14, which is oriented with a southern aspect, receives the most sunlight and thus is just deteriorating at a faster pace than the other panels.*

- 2) TRI's cover letter to their test report also noted that the "onset of degradation is likely in the next few months and years as the antioxidant package is completely consumed." This means that geomembrane above the high water mark is already showing evidence of degradation.*
- 3) Geomembrane panel and seam samples from an area at or below the high water mark should be removed and sampled in the same manner as the previous samples taken above the high water mark. Preferably, these samples would be taken on the same panel and seam as the previous ones and tested for the same parameters as the original TRI tests to note any difference in values.*
- 4) There are 17 identified holes (15 by LLSI and two by Burns & McDonnell) and several additional locations that could not be leak tested or visually inspected.*

*Due to the design of the leak detection system (LDS), it is likely that only a very large release from the pond would be detected. It is also likely that a significant release occurring in areas not overlying the LDS trenches may never be detected. It is Burns & McDonnell's opinion, based on the data reviewed and observations described above, that Panel 14 cannot be simply replaced and the remaining identified holes repaired and the liner meet the requirements of its planned future use or life expectancy. This is exemplified by TRI's remark that "degradation is likely in the next few months and years". We do have the following recommendations:*

- 1. Before any repairs are made, the pond should be filled with more water to see if any water is collected in the existing LDS sump. If no water can be collected in the sump, then that will be demonstration that the existing LDS is inadequate.*
- 2. If the pond is filled as recommended in No. 1 above, then bring LLSI back to test the non-tested areas so that holes in those locations can be identified and repaired. All areas of the liner should either be cleaned enough to be thoroughly visually inspected or be covered with water and leak tested.*

3. *All holes need to be repaired to geosynthetics industry standards by professional HDPE geomembrane installers and the repairs documented by qualified CQA personnel.*
4. *Demonstrations should be made that the statements made by TRI in their cover letter are not valid or relevant to the performance of the liner over the desired permit length.*
5. *If the pond is to be put in service, consideration should be given into turning the existing liner into a secondary liner and installing a new LDS and primary geomembrane over the existing liner in accordance with industry standards. Note that it may be difficult to design a new LDS sump under this alternative as the existing pond liner is essentially flat.*