Maralex Resources, Inc.

WORK PLAN - USA 1-20 JC Well Site and Adjacent Affected Areas

Investigation, Remediation and Reclamation

REVISION, POST COGCC AND BLM REVIEW

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INTRODUCTION

This report addresses the release of produced water that occurred on the site of the USA 1-20JC well and the plan to remediate and reclaim the site. The site is located in the NWNE of Sec. 20 T9S R98W.

STATUS OF THE SITE

On Saturday December 14, 2013, Maralex Resources, Inc. (Maralex) was notified by a Black Hills Representative that gas and water were flowing up around the wellhead of the USA 1-20JC gas well. The water had flowed onto the site and off site to the North of the well pad down a rocky ravine and into a dry creek bed (ephemeral stream). A backhoe was called out immediately to dig a ditch from the wellhead to an earth pit to contain the release. The following day, the water was pulled from the pit and put into water production tanks on site to be hauled off site. Additionally, a cut off trench was excavated along the North and East (downslope) sides of the pad. On Monday 12/16, the soil on the pad was moved into an on-site temporary containment area and the wellhead was fitted with piping to flow the water directly to the earthen pit on site. To help prevent the movement of the release down the ravine into the ephemeral creek bed, a catch basin measuring approximately 8' by 4' deep was excavated about 50' upstream of the ravine. Twenty absorbent booms were installed in the ephemeral stream bed to aid in containing the downstream transportation of contaminants.

On 12/17/2014 and 12/19/2013 two soil samples and three water samples were taken to characterize the spill and help determine the extent. The samples were collected by Craig Heydenberk of ESI, Inc. (sub-consultant to Maralex) and were witnessed by representatives from the Bureau of Land Management (BLM) and the Colorado Oil and Gas Conservation Commission (COGCC). During this time, DIA (subcontractor to Maralex) was also working on the access road to the well and had stabilized the pad in preparation for plugging and abandoning the well. On 12/22/2013, DUCO moved in with Rig 3 to start operations to plug the well. Plugging operations were carried out under the supervision and approval of the BLM and COGCC. Ed Fancher and Bud Thompson of the BLM were onsite daily to witness operations and Chuck Browning was inspecting for the COGCC. The rig moved off site on 1/21/2014. Plugging procedures were concluded on 1/27/2014. Subsequent reports for abandoning the well have been submitted to the BLM and the COGCC. Further sampling, as required by the BLM was conducted on 1/21/2014 in the presence of Alan Kraus of the BLM and Carlos Lujan of the COGCC. Figures 1.a and 1.b show the locations of site features and the sampling locations are shown on Figure 2 – Sampling Sites.

FIGURE 1.a – Site Map

USA 1-20JC Well Pad

Site Location

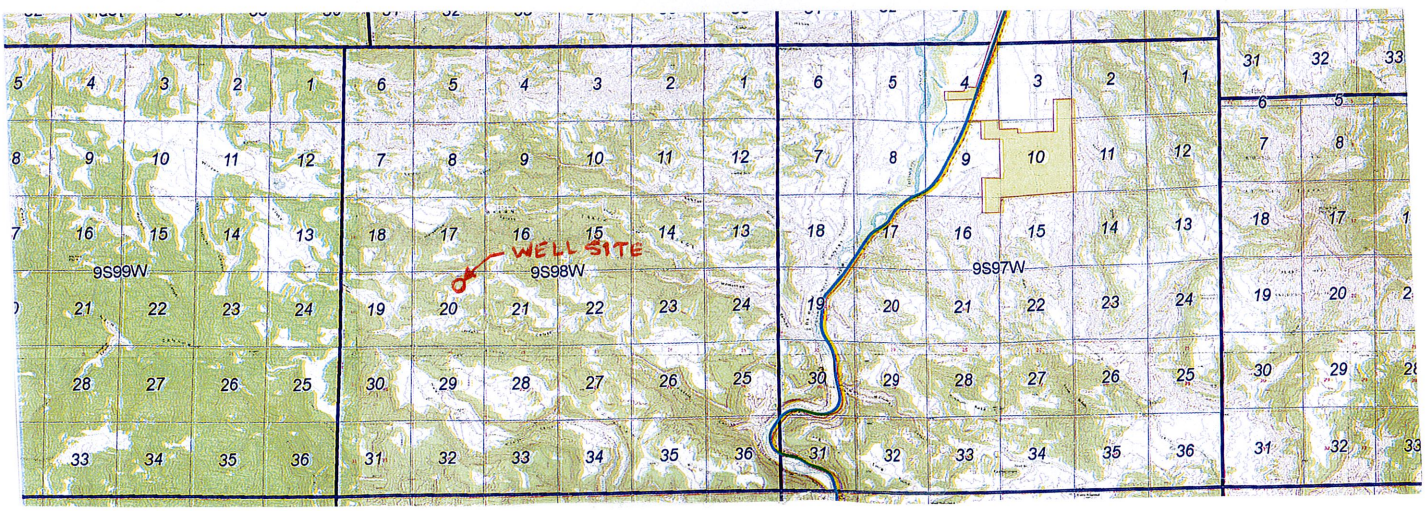

FIGURE 1.b – Vicinity Map

SAMPLING AND ANALYSIS

The reported laboratory analyses for the samples collected to date are provided in Appendix B. The data is summarized in five tables presented in Appendix A. Figure 2 – Sampling Sites, shows the collection points of samples collected to date by ESI on behalf of Maralex.

On December 17, 2013:

- An aqueous sample representative of the suspect production water was collected and analyzed for Total Resource Conservation Recovery Act (RCRA) Metals, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Total Dissolved Solids (TDS), Gasoline and Diesel Range Organics (GRO DRO), alkalinity, chlorides and sulfides. The fluid contains contaminants in GRO and DRO range including high concentrations of BTEX. This sample is labeled "Fluid". (TABLE 1)
- A soil sample was collected immediately adjacent to the well head. This sample was analyzed for COGCC Table 910-1 Soil Concentration Levels. A full characterization was ordered for this sample to gain an understanding of what contaminants and chemicals of concern were released. The exceedances generally include GRO, DRO and BTEX. This sample is labeled "Soil Characterization". (TABLE 2)
- A sample of frozen water was obtained at the south end of the ravine approximately 250 feet north of the well head. The material appeared to have been slightly impacted by the suspect produced water. The sample was analyzed for VOCs, and GRO. Concentrations of GRO and VOCs are, but COGCC standards are not published for water. Benzene exceeds the COGCC standards, but not at a concentration greater than 10 times. This sample is labeled "Waterfall". (TABLE 3)

On December 19, 2013:

The purpose of this site visit was to visually evaluate the horizontal extent of contamination north of the ravine in the ephemeral stream bed.

- A soil sample was obtained from the ephemeral stream bed and was analyzed for the COGCC Table 910-1 Soil Concentration Levels. A full characterization was ordered for this sample to gain an understanding of what contaminants and chemicals of concern were present and to evaluate the horizontal extent of contamination. The reported laboratory results indicate that the horizontal extent of contamination has been defined by this point since the Total Petroleum Hydrocarbon (TPH) concentrations do not exceed the COGCC's Table 910-1 soil concentration levels (500mg/Kg).

The COGCC defines TPH as the sum of DRO and GRO. This sample point is labeled "Horizontal Extent". (TABLE 2)

- An additional frozen water sample was obtained from the ravine. Additional sample volume was obtained sufficient for Metals S-VOC, TDS, Chloride, Sulfide, and alkalinity analyses. This sample point is labeled "Surface Water". (TABLE 3)

On January 21, 2014:

This round of sampling was mandated by the BLM in order to further understand the extent of the release. These samples were only analyzed for GRO, DRO and BTEX since it had already been determined that these were the contaminants of concern.

- The sample obtained in the ephemeral stream bed furthest from the source provides additional confirmation of the horizontal extent of the release. These reported laboratory results do not exceed COGCC limits. This sample point is labeled "Horizontal Extent #2". (TABLE 2)
- A soil sample was obtained at the upland area, as well as three more in the ephemeral stream bed to profile the concentration of the contaminants of concern in the stream bed and determine the extent of impact. These sample points are labeled "E.S. #1", "E.S. #2", "E.S. #3" and "Upland". (TABLE 4) Reported concentrations of TPH exceed the Table 910-1 standards in samples "Upland", "E.S. #2" and "E.S. #3", but not in sample "E.S. #1".
- One sample was taken outside the visually contaminated area for background values of arsenic and pH. (TABLE 5)

FIGURE 2 – SAMPLING SITES

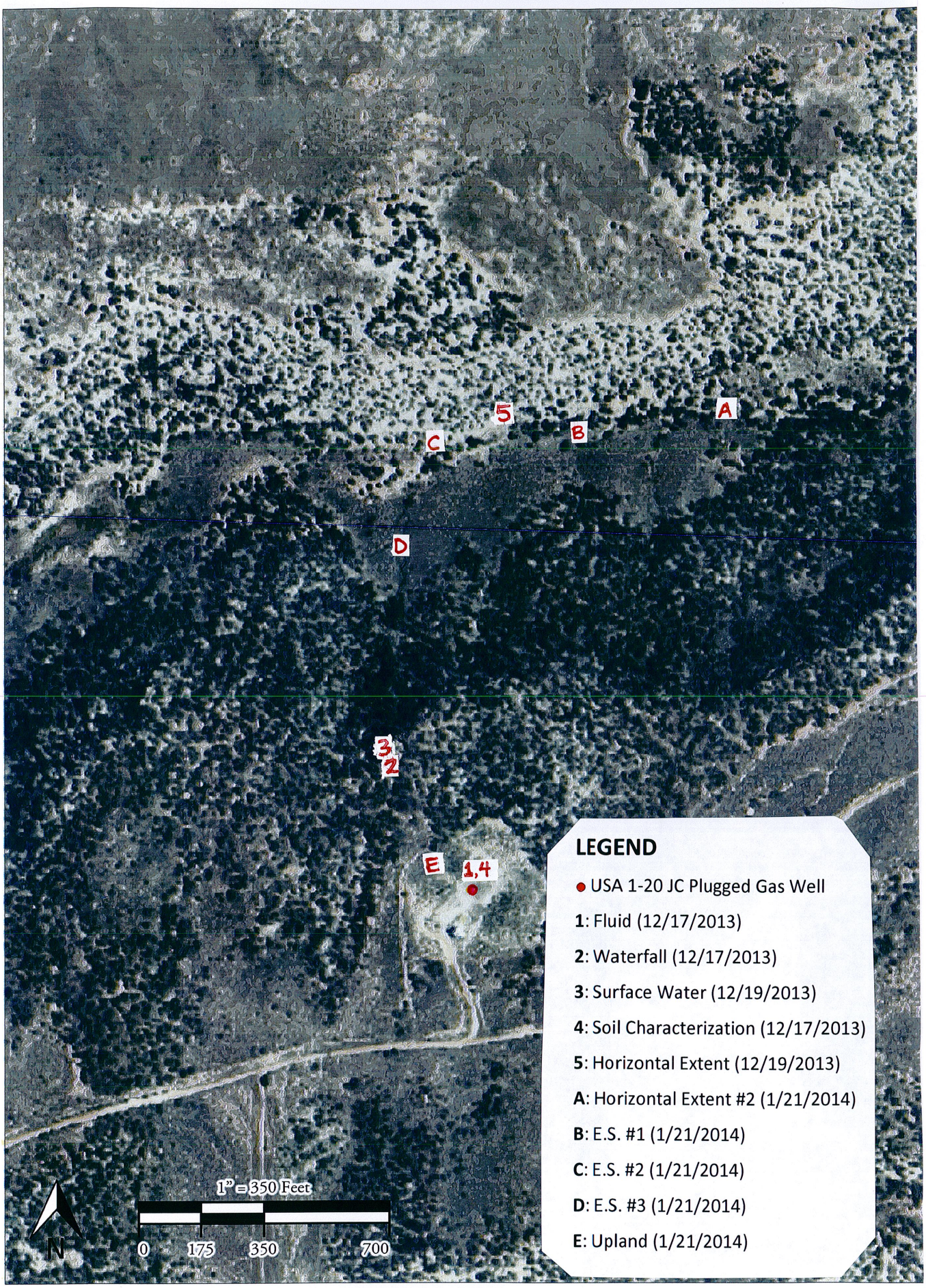

FIGURE 2 – SAMPLING SITES (CONTINUED)

GPS COORDINATES FOR SAMPLING LOCATIONS

● USA 1-20 JC Plugged Gas Well	39.26309 -108.351182
1: Fluid (12/17/2013)	Sampled at the wellhead
2: Waterfall (12/17/2013)	39.26405 -108.35210
3: Surface Water (12/19/2013)	39.26419 -108.35226
4: Soil Characterization (12/17/2013)	Sampled at the wellhead
5: Horizontal Extent (12/19/2013)	39.26669 -108.35099
A: Horizontal Extent #2 (1/21/2014)	39.26679 -108.34872
B: E.S. #1 (1/21/2014)	39.26678 -108.35023
C: E.S. #2 (1/21/2014)	39.26657 -108.35173
D: E.S. #3 (1/21/2014)	39.26577 -108.35200
E: Upland (1/21/2014)	39.26340 -108.35150

REMEDIATION

The source of the contamination has been removed by plugging and abandoning the well and removing approximately 12 cubic yards of soil from the pad to temporary on site containment.

Based on the results of analyses of all the sampling on the site, Maralex proposes the following remediation plan as discussed in a phone conference meeting with the BLM (Julia Christiansen, Wayne Werkmeister, Alan Kraus, Nate Dieterich), Craig Heydenberk of ESI and Naomi Azulai of Maralex on February 7, 2014. This section is broken down into areas that have been impacted and are shown on Figure 1 – Site Map. Remediation will commence when this plan is approved by both the BLM and the COGCC.

All confirmation soil samples will be analyzed for GRO, DRO and BTEX unless stated otherwise. These are the contaminants that were present in some of the initial soil samples. Each sampling location will be located using a Global Positioning System (GPS) and the North American Datum 83.

Three split spoon samples will be collected through 25'- 30' deep boreholes to evaluate if vertical communication of contamination due to fracturing has occurred near the well. A near surface sample will be collected at each of the boring locations. Per BLM direction, the location of the boreholes will be selected by a Maralex representative in consultation with the COGCC . The BLM and COGCC will be given 48 hour notice of borehole sampling so that they may have someone present to monitor the work.

No groundwater impact is anticipated at this time. If the sampling indicates that groundwater is present and contaminated, then a separate proposal, specific to this issue, will be submitted to the BLM and COGCC.

- **Abandoned Well Pad**

  A PID (photoionization detector – reads concentrations of VOCs) will be used to evaluate if further excavation is required on the pad. The equipment will be a Mini-Ray 2000 portable VOC monitor, model number PGM7600 PID. If field evaluation determines that concentrations of contaminates still appear high, then more soil will be removed from the pad until the PID meter readings show reduced soil contamination. Soil will be removed with a mini excavator and moved to the temporary stock pile for contaminated soil on site. Four discrete confirmation samples will be collected on the pad to be analyzed by the lab (in addition to the three samples taken adjacent to the boreholes). Results of the analysis will be provided to the BLM and COGCC upon receipt.

- **Upland Area**

The upland area is defined by the area between the cut off trench and the catch basin. Soil analysis in this area show levels of contaminants that exceed COGCC limits. A PID meter will be used at intervals during excavation to help define the area and depth of soil needed to be removed. Contaminated soil will be selectively removed with a mini excavator and moved to the temporary stock pile for contaminated soil on site using a low ground-pressure vehicle such as a tracked skid-steer. Larger vegetation, such as juniper trees, will remain in place while sagebrush will be removed only if deemed necessary during excavation operations.

Following excavation and field screening with the PID, two discrete soil samples will be collected for vertical confirmation (one on the North side of the upland area and one on the South side of the upland area). Four additional discrete soil samples will be collected along the extent of the excavation for horizontal confirmation that the sufficient quantities of soil have been removed. Results of the analysis will be provided to the BLM and COGCC upon receipt. To reduce the potential for erosion and sedimentation transport in the excavated area, straw wattles will be installed. The wattles will be certified weed free and installed per the manufactures requirements. BMPs will be inspected regularly and maintained or upgraded if conditions warrant.

Once the soil sample analysis shows that the area meets the COGCC standards then, at the BLM's discretion, clean, weed-free fill material will be used to further stabilize the excavated area and the wattles will be put back into place.

- **Ravine**

The ravine is the rocky, steep slope between the catch basin and the ephemeral stream. This area cannot be sampled without dislodging rocks and altering the terrain and putting people in harm's way. No sampling will be conducted in this area. Therefore, beginning at the "lip" of the drop off where fluids flowed off the upland, this area will be treated with the same bio-remediation application that will be used on the ephemeral stream (see description in next section – Ephemeral Stream).

- **Ephemeral Stream**

The ephemeral stream is the area defined by the dry creek bed, beginning at the point where the flow left the ravine. Based on the reported laboratory data, the horizontal extent of contamination

has been defined at least to Point C, but is not detected at Point B (see Figure 2 – Sampling Sites). The BLM continues to direct that the ephemeral stream be left undisturbed. There will be no excavation in the stream bed which has a very shallow layer of soil on top of bedrock. As an alternative to removal of contaminated soil resulting from drainage, BLM has requested that the area be treated instead with at least one application of a bio-remediation product to expedite the reduction in the contaminants found in the area. This will be a product that is sprayed or dripped on the area encompassing the ravine and the ephemeral stream down to Point C. Maralex is currently researching vendors to provide this product and will submit specifications to the BLM and COGCC for the product intended for use when available. Most likely, this application will start in the late spring or early summer (depending on product specifications), since lower temperatures are not conducive to enhancing micro-organism growth. The bio-remediation is a means of breaking down the unwanted compounds into benign components. Maralex intends on complying with the BLM's request to submit a GPS polygon outlining the treated area.

To verify the reduction of chemicals of concern beginning at the last sampling date of January 21, 2014, at two month intervals - one soil sample will be collected at Point D (see Figure 2 – Sampling Sites). During sampling, a PID will be used at both Point D and Point C to evaluate if concentrations of chemicals of concern appear to be decreasing. If there is any evidence that the concentrations are increasing, then an additional sample will be collected for laboratory analysis at Point C. Point C will be added to the sampling regimen if at any point the concentration of contaminants increases at Point D. Sampling will no longer be required when the bi-monthly analysis shows contaminant levels below applicable COGCC limits. The next sampling will take place on or before March 21, 2014. The BLM requires 48 hours advanced notice of sampling. COGCC will also be notified. Results of the analysis will be provided to the BLM and COGCC upon receipt.

BLM may require an additional bio-remediation treatment if soil contamination levels are not decreasing by the July 21 sampling date.

The absorbent booms will remain in place until reclamation. Until then, the absorbent booms will be monitored at least once a week and will be replaced as necessary.

- **Pit and Emergency Trench**

The pit on site was used to hold the released water before moving it into the tanks. The pit has also been used in the past for standard well operations. The emergency trench leading from the well

head to the pit will be included in testing and remediation. The soils in the pit and the trench that show evidence of contamination using the PID will be removed and temporarily stockpiled with the other contaminated soil on site. Then, four samples will be collected on the walls of the pit and two on the bottom of the pit. Two samples will be obtained from the trench. One of the pit bottom samples and one of the trench samples will be analyzed for a complete characterization of the soil. Results of the analysis will be provided to the BLM and COGCC upon receipt.

The closure of the pit will be conducted in accordance with COGCC's Rule 909 and specifically with Rule 909e.

- **Additional Requirements**

Inspecting for springs – The BLM is concerned that some springs that seep water may have been created or will be affected. During sampling, on a date determined by the BLM based on snowmelt and groundwater conditions, and with the BLM representative present, the rocky outcrop down gradient of the well shall be inspected for water seepage up to a quarter mile downstream. If such water is noted, then a water sample will be collected for analysis. Results of any analysis will be provided to the BLM and COGCC upon receipt. If the COGCC deems that additional inspections are necessary beyond what the BLM schedules, then the COGCC shall contact Maralex to schedule further inspections.

Tank battery – Testing the soil around the tank battery within the secondary containment area will be conducted in the field by excavating trenches or digging beneath gravel and lining if present. Then, using the PID, evaluate if there is concerning levels of contaminant in the tank vicinity. If PID values do not indicate elevated hydrocarbon levels, at least one confirmation sample will be taken and analyzed for BTEX, TPH, PAHs, EC, SAR and pH. If soil needs to be removed from the area then the tanks must be removed during excavation to avoid destabilizing the tanks during the reclamation operations. If soil removal is necessary then a soil sample will be analyzed for removal confirmation. The BLM and COGCC will be notified 48 hours in advance of PID testing and sampling so that they may have a monitor present.

Stockpiled soil removal/remediation* – The soil that has been removed from the contaminated areas has been temporarily stockpiled on site. Characterization soil samples will be collected at a rate consistent with Special Waste Acceptance Protocol. At this time, a specific landfill has not been

selected. Appropriate paperwork will be provided at the landfill's request. The manifest for the acceptance of the soil at the land fill will be provided at the BLM's request.

*Maralex is still seeking approval from the BLM to land-farm the soil on site. Once the soil shows contaminant levels below applicable COGCC limits then the soil will be used for reclamation of the site for back fill and contouring. The COGCC is in favor of this option. Maralex feels that this would have less impact on the environment than hauling soil offsite by trucks to dump in a landfill then trucking in non-native soil. To land-farm the affected soil on site, Maralex will construct a lined containment basin located approximately on the easternmost 2/3rds of the pad. The subgrade will be cleared of rocks and debris that could potentially compromise the liner. The subgrade soils and berms will be lined with six-mill secured plastic sheeting. As a storm water management best management practice, the soil berms will be constructed at a height of four feet. The soil material will be placed at a loose depth no greater than three feet. The facility will be regularly inspected for integrity by Maralex staff during routine Site visits.

The dimensions of the land-farming area will be dictated by the volume of impacted soil. The containment will be sized to accommodate temporary stockpiled soil as well as any soils that are removed from the site during remediation. During remediation process, the required area of the containment basin will be expanded as required to maintain a maximum depth of 3 feet of soil. The depth of the material will be indicated by using plastic traffic cones, or alternate device placed on the surface of the liner, to maximize cultivation and reduce the potential of damage to the liner. The material will be cultivated approximately once a month with a small tracked backhoe. Maralex is researching potential bio-remediation additives that can potentially accelerate degradation of the petroleum hydrocarbons during the later spring and summer months.

The reduction in concentration(s) of petroleum hydrocarbons will be evaluated through laboratory analyses of one composite soil sample per 250 cubic yards every three months. The progress of the land-farming can be evaluated from laboratory analyses consisting of diesel range Organics (DRO), gasoline range organics (GRO), and BTEX (benzene, toluene, ethylbenzene and xylenes). Collection and laboratory analyses of composite soil samples, analyzed for parameters included in the COGCC Table 910-1, will be needed once the total petroleum hydrocarbon (TPH) concentration is less than 500 mg/Kg and BTEX concentrations do not exceed the respective Table 910-1 Soil Concentration Values. The full reported laboratory results will also be compared to the Table 910-1 Soil

Concentration Values. Approval from the COGCC and BLM will be obtained prior to using the treated material on site for backfill and reclamation.

Cut Off Trenches – Material excavated from the cut off trenches was used to construct berms adjacent to the trenches on the down gradient side. This material includes potentially impacted soil from the surface of the pad. Maralex will segregate the soil and will treat any contaminated soil with the other contaminated soil from the site. Acceptable soil will be used for backfill.

RECLAMATION

An onsite meeting with the BLM will be held at the USA 1-20JC pad upon completion of remediation of the site and affected adjacent areas. At this point the reclamation plan will be agreed upon. Maralex shall submit a detailed reclamation plan to the BLM for approval following the onsite inspection.

Final reclamation must also comply with COGCC 1004 Series Rules, including a final reclamation inspection to be completed by COGCC inspection staff.

- All equipment, facilities, surfacing material and trash shall be removed from the site – except possibly the tanks (depending on permitting status). The absorbent booms from the ephemeral stream bed will be removed at this time.
- Clean, weed-free fill material and/or native materials on location shall be used to backfill all areas excavated during remediation.
- Clean, week-free fill material and/or native materials on location shall be used to contour area to blend with natural topography with no areas of depression where water may pool (other than intentional pitting/pocking for seeding).
- The topsoil shall be prepared for seeding by pitting, raking or harrowing no more than 24 hours prior to seeding.
- All disturbed areas will be seeded according to seed mixture specifications and BLM requirements. Application rate and certified weed free seed mix to be determined by BLM. BLM will be given at least 14 days to preapprove the seed mix. Seeding shall take place between September 15th and first frost. Reseeding will be repeated annually until vegetation takes hold.
- Storm water BMPs such as certified weed free straw wattles will be installed on site in areas that may be susceptible to erosion. These will be removed when vegetation has reduced the opportunity for erosion.
- The site shall be regularly monitored by operator until vegetation is comparable to surroundings. BLM requires monitoring reports on reclamation results every year by December 1 until the site is deemed reclaimed.