

**From:** [Yu, Olivia, EMNRD](#)  
**To:** ["Buddy Richardson"](#)  
**Cc:** [Darrell Pennington](#)  
**Subject:** RE: RAM - WDQSU Sat 3  
**Date:** Friday, March 9, 2018 10:46:00 AM  
**Attachments:** image003.png  
approved\_1RP4599\_22Feb2018\_WP.pdf  
RP4599\_reviewed\_RAM Dollarhide OCD Workplan 3-2017.pdf

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Good morning Mr. Richardson:

Thank you for your detailed comments. Much appreciated. Based on the information provided, NMOCD approves of the proposed delineation plan for 1RP-4599. Apologies for the missing document from March 2017. It is attached for your reference. Please remember to submit soil bore logs in the next report.

Thanks,  
Olivia

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**From:** Buddy Richardson [mailto:Buddy.Richardson@eccgrp.com]  
**Sent:** Thursday, February 22, 2018 2:44 PM  
**To:** Yu, Olivia, EMNRD <Olivia.Yu@state.nm.us>  
**Cc:** Darrell Pennington <dpennington@ramenergy.net>  
**Subject:** RAM - WDQSU Sat 3

### **NMOCD Incident Case No. 1RP-4599**

Dear Ms. Yu,

I apologize for the delay in responding to your comments on our workplan of March 16, 2017 (see your email below). The Enviro Clean Cardinal, LLC (ECC) Project Manager that was assigned to the RAM Energy Resources (RAM) West Dollarhide Queen Sand Unit (WDQSU) Satellite 3 site, Mr. Bill Green, left ECC on April 21, 2017, and the project team was under the impression Bill had discussed with you your comments during a phone call and had also responded to you in an email on or about March 17. I will be managing this project going forward on behalf of RAM. On March 10, 2017, ECC submitted to the NMOCD a Remediation Workplan to address the soil impacts at this site. On March 16, 2017, you provided the following comments on this workplan (NMOCD's comments shown in blue font). Your comments are followed by ECC's responses on behalf of RAM.

[NMOCD requests that a modified delineation workplan for 1RP-4599 be submitted addressing the below concerns. Remediation actions proposed in the workplan will be discussed at a later stage.](#)

Response: ECC will prepare a Release Characterization Work Plan immediately following submittal of this response document, if required.

[Comment 1\): According to the NMOSE water rights database, using a radius of 2000 m \(approximate length of a section\) around the release location, the average depth to water table is 86 ft. This changes the permissible levels of contaminants to 10 mg/kg Benzene, 50](#)

mg/kg BTEX, 1000 mg/kg TPH. Permissible chloride levels are 600 mg/kg.

Response: Please be advised that the section number and quarter-quarter unit letter shown on RAM's C-141 Form for the location of the release are incorrect. The point of release is located in the NE/4 of the SE/4 (Unit Letter I) of Section 31, Township 24 South, Range 38 East. This information was correct on the Remediation Workplan, but not on the C-141 Form. Within the Remediation Workplan ECC had relied upon the ChevronTexaco Lea County Depth to Water Map (Johnson, W., 2005) for the depth to groundwater. This map shows a depth to groundwater of approximately 225 feet. ECC has now conducted a water column search on the NMOSE website using a 2,000 meter search radius (report attached). This report indicates that the average depth to water is 92 feet. This is substantially more shallow than is indicated on the ChevronTexaco map. Using a depth to groundwater of 92 feet does change the NMOCD assessment ranking score from 0 to 10 and, therefore, the applicable Recommended Remediation Action Levels for soil at this site are benzene = 10 mg/kg, BTEX = 50 mg/kg, and TPH = 1,000 mg/kg. The NMOCD has also established the permissible chloride level in soil of 600 mg/kg. ECC has attached our NMOCD assessment criteria ranking worksheet for this site.

Comment 2): Provide the correct conversion units. mmhos/m used to report EM results are not standard electrical conductivity units. Although EM survey maps are typically reported in mmhos/cm, all values need to be in either mg/kg or ppm to facilitate interpretation and to comply with standards set forth in the regulations.

Response: The units of ground conductivity used by ECC in the Remediation Workplan are the correct units of measurement for this instrument and for ground conductivities. The results of an EM survey provide valuable guidance as to where a brine (or other highly conductive liquid) has been released to surface and near surface soils. ECC has proposed within the Remediation Workplan soil sampling and laboratory analyses within the areas affected by this release to provide a means to correlate between ground conductivities and chloride concentrations in soils. ECC has not yet collected these samples. The maps provided within the Remediation Workplan are preliminary to the lateral delineation activities, but are necessary to better target sample locations. The mapped data will be "calibrated" with laboratory data to aid in the physical delineation.

Comment 3): Provide the raw data, instrument parameters, and manual for the EM meter.

Response: The EM38 ground conductivity field measurements are provided on the attached spreadsheet. The instrument used was an EM38-MK2 ground conductivity meter manufactured by Geonics Limited. The operating manual for this meter is attached. During this survey the meter was operated in the following two configurations: EM38/0.5mVD and EM38/1mVD (VD denotes vertical dipole). When operated in these configurations the meter has maximum depths of investigation of approximately 2.5 and 5 feet below ground surface, respectively. The meter was connected to a TX-6000 hand-held field computer manufactured by Juniper Systems. A Hemisphere backpack GPS was also connected to the field computer and provided constant latitude and longitude coordinates. The field computer was set up to record ground conductivities (both 0.5m and 1m VD) and GPS locations at a rate of two readings per second. During this survey the field computer captured this information at 6,369 locations as the operator traversed the site.

Comment 4): Tabulate the different soil types/changes in soil texture detected in the

release area, if present, and their respective calibration coefficients.

Response: This cannot be provided until the soil characterization samples, that are proposed within the Remediation Workplan, are collected and analyzed for chloride.

Comment 4b): Broadly, the delineation workplan needs to demonstrate complete vertical delineation across the release area until permissible level of chlorides (600 mg/kg) is obtained and maintained for an additional 10 ft. bgs. The same 600 mg/kg level is applied for horizontal delineation.

Response: Based upon site reconnaissance immediately following the release and a review of the results of the EM survey, the release initially flowed south of the point of release and pooled in an area that is approximately 165 feet north-to-south and 90 feet west-to-east. This is the area most effected by the release. The remaining areas of impact to the south and southwest are very narrow and appear to have low-level impacts. For this reason ECC is proposing to install a single boring located approximately 70 feet south of the point of release and in the center of the highest ground conductivity measurements. This boring will be used to demonstrate vertical delineation.

Comment 5): Based on the EM survey map, the northwestern edge of the release, yellow polygon bordering the pasture, indicates that horizontal delineation has not been completed.

Response: Based upon site topography and site reconnaissance immediately following the release all of the released fluids flowed from the header towards the south. None of the fluids flowed north of the point of release. This northwest edge of the EM survey area was included in the survey to capture background conditions. Unfortunately, this area is congested with metallic objects that include a metal barbed wire fencing and numerous pipelines. Metallic objects such as these cause interference in the conductivity measurements that must be recognized and filtered out of any meaningful interpretation of an EM survey. These sources of interference are also intentionally avoided to the extent possible when conducting the field surveys.

Comment 6): Further vertical delineation is required at the point of release based on the orange color representing higher concentrations of chlorides present in the soil profile at 5m (depth of EM survey).

Response: As stated above in response to Comment 4b, ECC is proposing a vertical delineation boring in the center of the area that appears to have been most impacted by the release (based upon the EM survey results). Please note that the EM survey did not assess the soil profile to a depth of 5 meters. The spacing distance between the meter's transmitter and receiver coils are expressed in meters. On this EM38 meter the coils are spaced 0.5 meters and 1 meter apart.

Comment 7): A few more chloride calibration sample locations are requested to fully capture the extent of the chloride plume. These additional locations are demarcated on page 12 of the reviewed attachment.

Response: No attachment was provided with NMOCD's comments showing the locations of additional soil sample locations. Please provide. The sample locations proposed by

ECC were intended to provide a means to correlate between the EM ground conductivities and the laboratory chloride levels in soil. Additional soil samples will be added outside the EM impact areas to confirm and demonstrate that these areas were not significantly affected by the release.

Comment 8): Background samples are collected typically outside of the release area. One suggested location is marked on page 12 to the west of the yellow edge of the release. However, the location of this background sample would be relocated, closer to the road, should the western edge of the release expands laterally.

Response: No marked-up map was returned by NMOCD. ECC's general practice is to collect background samples, when required, from a location with similar soil, but in the upslope, and if at depth, the anticipated upgradient direction from the release affected area. As stated in our response to Comment 7 above, ECC will collect soil samples at several locations outside the areas shown to be impacted by the EM survey to confirm and demonstrate that these areas were not significantly affected by the release.

Comment 9): Clarify that analytical samples for TPH and BTEX will be collected not only in the upper pool.

Response: The lateral and vertical extent of BTEX, TPH and chloride impacts in soil will be determined by the following protocol. Within the upper pooled area, the narrow flow channel to the south-southwest, and the side flow channel, ECC will install a boring at the 14 locations shown on the figure attached called "Del Sample Locations." These borings will be drilled to a depth of 5 feet to below grade. Soil samples will be collected on 1-foot depth intervals from surface to 5 feet. From each boring, the two soil samples collected from the upper 2 feet (i.e., from 0-1 feet and 1-2 feet) will be submitted to the laboratory for BTEX, TPH and chloride analyses. The deeper soil samples (i.e., from 2-3 feet, 3-4 feet and 4-5 feet) will only be analyzed for chloride unless field observations indicate that deeper hydrocarbon impacts below 2 feet may be present. Background soil samples will be collected from a single borehole located west of the affected area. This background boring will be drilled to a depth of 5 feet and soil samples will be collected on 1-foot depth intervals. These soil samples will be submitted to the laboratory for chloride analyses only.

If you have any questions regarding this site, please do not hesitate to contact Mr. Darrell Pennington at 918-947-6304, or myself at 918-794-7828. Thanks.

Buddy Richardson



George H. (Buddy) Richardson, P.G.

Manager Hydrogeology | Enviro Clean Cardinal

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**From:** Yu, Olivia, EMNRD [<mailto:Olivia.Yu@state.nm.us>]

**Sent:** Thursday, March 16, 2017 5:11 PM

**To:** Bill Green <[Bill.Green@eccgrp.com](mailto:Bill.Green@eccgrp.com)>

**Cc:** Matt Patterson <[mpatterson@ramenergy.net](mailto:mpatterson@ramenergy.net)>; Darrell Pennington <[dpennington@ramenergy.net](mailto:dpennington@ramenergy.net)>

**Subject:** RE: NMOCD Case No. 1RP-4599, RAM West Dollarhide Queen Sand Unit Satellite No 3 OCD Workplan

Dear Mr. Green:

NMOCD requests that a modified delineation workplan for 1RP-4599 be submitted addressing the below concerns. Remediation actions proposed in the workplan will be discussed at a later stage.

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- 2) Provide the correct conversion units. mmhos/m used to report EM results are not standard electrical conductivity units. Although EM survey maps are typically reported in mmhos/cm, all values need to be in either mg/kg or ppm to facilitate interpretation and to comply with standards set forth in the regulations.
- 3) Provide the raw data, instrument parameters, and manual for the EM meter.
- 4) Tabulate the different soil types/changes in soil texture detected in the release area, if present, and their respective calibration coefficients.

Broadly, the delineation workplan needs to demonstrate complete vertical delineation across the release area until permissible level of chlorides (600 mg/kg) is obtained and maintained for an additional 10 ft. bgs. The same 600 mg/kg level is applied for horizontal delineation.

5. Based on the EM survey map, the northwestern edge of the release, yellow polygon bordering the pasture, indicates that horizontal delineation has not been completed.
6. Further vertical delineation is required at the point of release based on the orange color representing higher concentrations of chlorides present in the soil profile at 5m (depth of EM survey).
7. A few more chloride calibration sample locations are requested to fully capture the extent of the chloride plume. These additional locations are demarcated on page 12 of the reviewed attachment.
8. Background samples are collected typically outside of the release area. One suggested location is marked on page 12 to the west of the yellow edge of the release. However, the location of this background sample would be relocated, closer to the road, should the western edge of the release expands laterally.
9. Clarify that analytical samples for TPH and BTEX will be collected not only in the upper pool.

Please let me know if you have questions or would like to request a meeting.

Thanks,

Olivia Yu  
Environmental Specialist  
NMOCD, District I  
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OCD approval does not relieve the operator of liability should their operations fail to adequately investigate and remediate contamination that may pose a threat to ground water, surface water, human health or the environment. In addition, OCD approval does not relieve the operator of responsibility for compliance with any other federal, state, local laws and/or regulations.

**From:** Bill Green [<mailto:Bill.Green@eccgrp.com>]  
**Sent:** Friday, March 10, 2017 10:01 AM  
**To:** Yu, Olivia, EMNRD <[Olivia.Yu@state.nm.us](mailto:Olivia.Yu@state.nm.us)>  
**Cc:** [mpatterson@ramenergy.net](mailto:mpatterson@ramenergy.net); Darrell Pennington <[dpennington@ramenergy.net](mailto:dpennington@ramenergy.net)>  
**Subject:** NMOCD Case No. 1RP-4599, RAM West Dollarhide Queen Sand Unit Satellite No 3 OCD Workplan

Good Morning Ms. Yu,

Attached please find the remediation workplan for the Satellite #3 release response. Please review the data and let us know your questions, comments, or concerns, if any, and approval to proceed with the activities.

Sincerely,



William "Bill" Green, PG 136, CPM  
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