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July 30, 2015

Mr. Gary Snellgrove
Louisiana Department of Natural Resources
617 North Third Street, LaSalle Building
Baton Rouge, Louisiana 70802-5431

RE: Response to June 25, 2015 Austin R. Arabie Remediation Plan
DFU 125-1 Site (Saltwater Pipeline Release)
LDEQ AI#186776
Martha Zoe Moore, et al. vs. Denbury Onshore, LLC
Richland Parish, Louisiana

Dear Mr. Snellgrove:

Michael Pisani and Associates, Inc. (MP&A) has reviewed the June 25, 2015 Arabie Environmental Solutions (AES) Remediation Plan including the attachments to the plan. Based upon our review we offer the following opinions on the AES plan and supporting information.

Opinions

1. AES contends that the saltwater release has caused “contamination” as defined by the Louisiana Revised Statute 30:29. This statute provides the following definition for “contamination”:
“Contamination shall mean the introduction or presence of substances or contaminants into a usable groundwater aquifer, an underground source of drinking water (USDW) or soil in such quantities as to render them unsuitable for their reasonably intended purposes.” AES states that “the release site has been rendered unsuitable for reasonably intended purposes, such as cattle grazing, row crop agriculture, and timber production.” However, based on recent site observations made in July 2015, considerable revegetation has occurred at the site due to natural attenuation/restoration alone. Natural attenuation of residual salt levels in near surface soil is expected to continue. Since the majority of the former release area has been classified as a wetland it is unlikely to be used for row crop agriculture. There is no impediment to return cattle grazing to the property at this time. It is our understanding that the shallow groundwater in the very top of the Mississippi River Alluvial Aquifer (MRAA) could be used for irrigation purposes with the reported chloride concentrations; however, the yield of the shallow portion of the MRAA would be low as compared to the deeper portion. MRAA water supply wells for irrigation, rig supply, and other purposes are installed in the deeper, coarser-grained, higher yielding, and naturally better quality portion of the aquifer. We believe that the MP&A proposed future testing of the groundwater of the deeper portion of the MRAA will demonstrate the higher quality. However, as stated in MP&A’s May 26, 2015 Feasible Plan for Remediation, the MRAA groundwater underlying the site is not used for drinking water and it is reported to be very hard, high in iron, and treatment is necessary for domestic, public supply, and specific industrial uses. Furthermore, the area in the vicinity of the site is served by the River Road Water System public water supply system. Therefore, we believe the shallow soils and groundwater can be used for their intended purposes.

2. AES criticizes MP&A's Plan for proposing soil monitoring rather than "actual soil remediation." As detailed in the MP&A Plan, extensive soil sampling conducted at the site indicates that natural attenuation of Statewide Order 29-B salt parameters has already begun to take place. Field observations from our recent July 2015 inspection showed significant revegetation due to natural attenuation only, which demonstrates the effectiveness of this approach for the site. Furthermore, the Louisiana Department of Environmental Quality (LDEQ) has concurred with this approach in a wetlands environment (April 20, 2015 letter). Additional visual observations and soil sampling are proposed in the MP&A Plan to gather additional data to evaluate restoration of the vegetation/soil.
3. AES also criticized the MP&A Plan for applying Louisiana Department of Environmental Quality (LDEQ) Risk Evaluation Corrective Action Program (RECAP) evaluation methods and standards. However, it is clearly stated in the MP&A Plan that the release affected a LDEQ-regulated surface water body and the LDEQ was the regulatory agency that was initially in charge of the release response. For this reason, both Statewide Order 29-B and RECAP standards were utilized. The RECAP standards and methods were used to supplement the Statewide Order 29-B standards when there were no similar standards available [i.e. SPLP chloride, total petroleum hydrocarbons, and benzene, toluene, ethylbenzene, & xylenes (BTEX)], and were not used to supersede or circumvent those standards. It should be noted that AES reported that they used RECAP methods in both their Expert Report and Remediation Plan to calculate soil background values for EC, SAR, and chlorides.
4. In describing alleged impacts to shallow groundwater, AES cites reported chloride concentrations of up to 568 mg/L. The groundwater sample containing 568 mg/L chloride (B-1-GW) was collected from a temporary monitoring well by Cork Environmental Resources Group (Cork) on December 11, 2013. AES neglects to mention that they also collected a sample in the same area (M-MW01) approximately 10 months later (October 1, 2014) that contained only 298 mg/L of chloride. While we agree that groundwater monitoring should be conducted, the limited data available at this time suggest that groundwater conditions can be expected to improve and stabilize.
5. Both MP&A and AES proposed eight shallow wells for groundwater monitoring. Additionally, MP&A proposed one deep well in the portion of the deeper portion of the MRAA that is used for rig supply and irrigation purposes, while AES proposed three deep wells. AES did not provide proposed well locations or provide reasoning for proposing 3 deep wells. Based on the nature of the saltwater release and the existing soil and groundwater data, impacts to groundwater (if present) are expected to be primarily shallow. Furthermore, MP&A has proposed to install their one deep well in the immediate vicinity of the source of the release and the B-1-GW location referenced above. Therefore, we believe that one deep monitoring well is sufficient to evaluate deep groundwater conditions.
6. In the January 30, 2015 AES Expert Report, AES proposed a massive dig and haul remedy to remove soils to "restore the soil EC and chloride concentration to the natural condition" over a 22.56 acre area to a depth of up to approximately 13-feet at a cost of \$26,402,159 (357,583 CYS). In the June 25, 2015 AES Remediation Plan, AES proposed a dig and haul remedy to remove "soil exceeding 29-B standards for EC, ESP, and SAR" at a cost of \$2,204,083 (28,962 CYS), over 10 times less than their January 30, 2015 proposal. However, the AES Remediation Plan does not explain the reason for this drastic change in cost and no information regarding the depth of the proposed excavation is provided. The exact extent of AES's proposed dig and haul remedy in their Remediation Plan as well as the reasoning behind their proposal remains unclear.

7. A massive dig and haul remedy is not the most practical or reasonable approach for this site. The AES remedy would be potentially problematic for waste management facilities, damaging to the recovering vegetative wetlands located on the site, potentially detrimental to the environment, and very costly. The problems with a massive dig and haul remedy were discussed at length in the MP&A Feasible Plan.
8. AES cites the American Petroleum Institute's (API) Remediation of Salt-Affected Soils at Oil and Gas Production Facilities (1997) publication to criticize MP&A's contingency plan to treat the shallow soils with amendments, if the LDNR requires additional remediation activities. AES quotes the API report claiming that chemical amendments have a "high failure rate" and the need for "possible multiple treatments." However, the API publication also states that "in situ chemical amendment remediation is the option selected in the majority of salt-affected remediation projects" and that "when applied properly, gypsum has proven to be effective for treatment of many salt-affected soils." [Page 5-2] The effectiveness of chemical amendments varies from site to site. For this reason, the MP&A contingency plan included the initial application of soil amendments in test plots in order to determine their effectiveness at the site.

It should also be noted that the API publication cited by AES supports natural remediation as a viable option, especially in wetland environments such as those present on this site, as demonstrated in the following excerpt:

"Occasionally, situations occur in which any attempt to enhance remediation may cause greater environmental damage than the original salt effect. These situations often occur in wetland situations where the area typically will remediate rapidly even where high salt concentrations are present. Any attempt to bring large equipment into these areas to speed or improve remediation may cause significant habitat damage." (Page 5-2) [The AES Plan acknowledges that the majority of the impacted areas are considered elevated freshwater wetlands.]

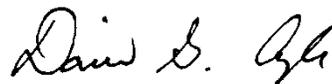
The API report also states that disposal remediation (e.g., dig and haul remedy, as proposed by AES) "tends to be the most expensive approach and is often considered the technique of last resort." [Pages 5-3 & 7-13]

Based on the available data gathered to date, LDEQ's April 20, 2015 letter to Denbury Onshore, LLC, our July 2015 site inspection findings, our review of AES's Expert Report and Remediation Plan, and the additional opinions presented above MP&A continues to recommend natural restoration of the shallow soil and a limited groundwater investigation and monitoring program as specified in the MP&A Feasible Plan.

Please contact us if you have any questions.

Sincerely,

MICHAEL PISANI AND ASSOCIATES, INC.



David G. Angle, P.G., CGWP

cc: Mr. Russell Holwadel, Adams, Hoefler, & Holwadel, LLC