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S. L.
Review

ARABIE ENVIRONMENTAL SOLUTIONS

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May 5, 2016

Via FedEx and Hand

Office of Conservation

MAY 06 2016

Environmental Division

Mr. Gary W. Snellgrove, Director
Office of Conservation – Environmental Division
Louisiana Department of Natural Resources
P.O. Box 94275
Baton Rouge, LA 70804-9275

RE: Review of SITE INVESTIGATION AND REVISED RECAP REPORT
Betty D. Blanchard et al Lease
COMPLIANCE ORDER No. E-I&E-05-0233
OC Legacy Project No. 023-007-001

Dear Mr. Snellgrove:

Arabie Environmental Solutions, LLC, (Arabie Environmental) has prepared this submittal on behalf of the land owner, Ms. Nancy Blanchard, concerning the oil field contamination on her property. The purpose of this letter is to comment on the December 18, 2015, report prepared by Hydro-Environmental Technology, Inc. (HET) titled "SITE INVESTIGATION AND REVISED RECAP REPORT" (Report) to, hopefully, aid the Office of Conservation's review.

Previous correspondence from the landowner or on behalf of the landowner provided comments with regards to the site investigation and risk evaluation conducted by the responsible party, Tortuga Operating Company. Most of the issues and deficiencies documented in the previous correspondence apply to the Report. For that reason, copies of some of the previous correspondence are attached to this letter for your convenience. Additional comments, specific to the Report, are presented in the remainder of this letter.

The Report repeatedly noted the conservative nature of assumptions built into the RECAP scenarios, attempting to convince the reader that the risk evaluation presented here is overly protective of the environment. It should be noted that although many of the assumptions used in development of RECAP tiers are moderately cautious, they are not conservative when site conditions are miss-represented, or are not adequately documented. Some examples are pointed out in this letter.

On a positive note, the Report contains a wetlands delineation study, which identifies the majority of the site as upland areas. This allows the application of the appropriate

Chapter 3 standards, rather than the previously proposed standards for elevated, freshwater wetland areas.

Discussion of New and Previous Information Regarding Site Hydrogeology

The Report documents a boring which reveals new information important in (1) understanding the site hydrogeology; (2) the Groundwater Classification of the shallow water-bearing zone where oil field impacts have been documented; and (3) understanding the movement of contaminants at the site. With this Report, the state of the site investigation continues to be incomplete and inadequate to properly characterize and assess the contamination. Boring logs and drillers logs previously presented in correspondence from the landowner indicated that the water-bearing unit screened by the site monitor well network was connected to the Atchafalaya/Chicot Aquifer (direct hydraulic connection). However, no borings installed on the site documented the presence of the shallow water-bearing strata to a depth that overlapped with the confirmed top of the main aquifer, even though contamination was not delineated vertically. **The connection of the shallow, water-bearing strata to the Atchafalaya Aquifer on the property has now been confirmed.**

A relatively deep boring, JAB-1E-R, has been installed near the JAB Pit as part of the recent site investigation activities. The log for this boring indicates water-bearing silts were encountered from a depth of 38 feet to the total depth of the boring at 64 feet below ground surface. The drillers log for the rig supply wells registered as "101-5920z" and "101-5365z" located on the property indicate sand from a depth of 60 feet to the well total depth of 200 feet below ground surface and 67 feet to the well total depth of 167 feet below ground surface, respectively. A copy of the log for JAB-1E-R and water well registration forms with driller's logs for 101-5920z and 101-5365z are attached to this letter for your convenience. The registration forms were submitted and discussed in a letter by the landowner to LDNR dated August 9, 2011. A copy of that letter is included in the attached correspondence.

The information contained in the log for boring JAB-1E-R conflicts with the description of the site on page 17 of the Report where it is stated that, "surface lithology indicates the presence of clay with alternating layers of silt layers (sic) on-site to a depth of at least sixty-four (64) feet below land surface that would not be indicative of the Atchafalaya aquifer." Figure 10 of the Report is a cross section traversing this boring and represents all sediments from about 38 feet to boring total depth as "SILT".

Contrary to the pages of arguments relying on regional literature and data from five miles away to insist that the water-bearing units screened by the site monitor well network was isolated and separated from the main aquifer, the site specific information now unquestionably confirms that the depth interval of the "alternating and discontinuous silt zone" where the site monitor wells are screened, overlaps with the Atchafalaya Aquifer. The JAB-1E-R boring indicates that the top of the Atchafalaya Aquifer is no deeper than 38 feet below the surface at the heavily impacted JAB Pit, where the vertical extent of

impacts remains undocumented. However, site impacts are documented to 64 feet: soil sample ON150-S3-R (62-64') from March 2013 had an EC of 7.1.

Impacted Media Do Not Comply With Both Order 29-B and RECAP
In the Report, soil COC's found to exceed 29-B standards are further evaluated under RECAP. The Department has established that responsible parties must demonstrate compliance with both 29-B regulations and RECAP.

Site Investigation Deficiencies (RECAP Appendix B) and LDNR Instructions
"*A sufficient number of sample locations shall be selected to completely define the vertical and horizontal extent of all impacted media and to adequately characterize the AOC or AOI.*" (RECAP B2.5.1)

"Where analytical results indicate soils have been impacted by E&P Waste, samples must be tested for all applicable Chapter 3 parameters and must be delineated both horizontally and vertically for all parameters." (Office of Conservation Letter, March 4, 2015)

The submitter of the RECAP evaluation argues that, for groundwater, "*The chloride concentrations are more likely than not more concentrated than the extent indicated due to the discontinuous nature of the water bearing silts combined with the different potential sources from separate exploration and production sites.*" This statement acknowledges the lack of lateral delineation in the site investigation. Additionally, groundwater monitoring reports for the site, as well has the Report, contain potentiometric maps presenting and contouring groundwater elevations for all wells on one figure per gauging event. Thus, the authors consider all monitor wells to be screened within a hydraulically connected, single groundwater zone.

The Report text and figures do not specifically identify all sources of impacts. The Ecological Checklist in Appendix H of the submitted Site Investigation lists 5 AOI's: "Allain, JAB Pit, ON-150, OFF-150, 11-Acre Tract." Previous investigations by others identified impacts exceeding 29-B soil standards at areas including, but not necessarily limited to the "JAB Pit", "JAB Tank Battery", "P-1", "ON 150", "OFF 150", "AL", "Blanchard #15", "Blanchard #32." In fact, the DNR's instructions in an October 2014 letter specifically listed the areas to be investigated.

The Report tabulates the data labeled as "Shinteaux," yet does not include it in the dataset to evaluate site conditions and provides only general reasoning for the exclusion. The Department's letter dated January 4, 2015, stated that, unless it could be PROVEN that the data was not representative, it must be used in the evaluation and/or remediation plan.

General Data Requirements for Evaluation Using MO-1 Scenario

Among the inadequacies of the Report in fulfilling the general data requirements for applying RECAP Management Option 1 (RECAP page 84), the following points are noted:

- The horizontal and vertical boundaries of the AOI are not defined. Areas of Investigation (AOI) are not identified on any Report figure.
- The site investigation did not sample and delineate all parameters in all AOI's laterally.
- The Site Investigation did not sample and delineate all parameters in all AOI's vertically.
- The assertion that the area of impacted soil is less than 0.5 acre is not supported. The submittal does not specifically identify the extents of any AOI. The complete dataset documents impacts at multiple source areas without defining the extents of impacts. The footprint of just one of these source areas, JAB-1 Pit, appears to encompass an area in excess of 0.5 acre.
- The distributions of the parameter concentrations present within the AOI(s) are not presented. An AOI is bound by the extents of the constituent concentrations exceeding the applicable standards prior to implementing MO-1.
- The report does not present data to support or locations of the proposed Point of Compliance (POC) and Point of Exposure (POE). The POC to POE for soil evaluation is 0 feet because the responsible party does not own the property and the property owner has not granted consent to implement the Chapter 3 exception.

Additional detail and other comments regarding the application of RECAP are presented below.

Page 19 of the Report discusses the methods used for evaluation of salt and refers to "Additional guidance published by LDEQ and approved in separate reports by both agencies…" The specific published guidance that has been approved by either LDEQ or LDNR is not identified.

Evaluation of the soil-to-groundwater pathway appears unnecessary because contamination of groundwater has been documented to be present and years of monitoring have demonstrated that groundwater is not in declining conditions: the impacted areas are an ongoing source of groundwater contamination.

The conclusions reached in the Report regarding the evaluation of the soil-to-groundwater pathway using SPLP results conflict with the lack of declining conditions observed in the groundwater. There are ongoing sources of groundwater contamination.

This may indicate that SPLP is an inappropriate method for evaluating this pathway for some parameters, including chloride and sodium. The submitter analyzed select samples by SPLP but did not use the method stipulated under 29-B for any samples.

As pointed out in Austin Arabie's January 6, 2016, correspondence, samples collected in the JAB Pit collected for the recent site investigation were not analyzed for salt parameters, including SPLP chlorides or sodium, even though that area is among the most impacted on the property. Arabie Environmental obtained and analyzed split soil samples for parameters including EC and Order 29-B method Leachate Chlorides. The results included an EC of 63.6 mmhos/cm and leachate concentrations as great as 6,910 mg/l chlorides.

Appendix H of RECAP states that the "*mixing of UNIMPACTED* (emphasis added) *groundwater with impacted infiltration and the resultant concentrations in groundwater are estimated using the Summers Model*" (H2.4). The application of a default $DF_{Summers}$ of 20 in evaluation of leachate data at this site may be inappropriate because it does not account for existing groundwater contamination concentrations, which already exceed permissible levels.

The applied dilution factor of 20 referenced in the text is misidentified as a "dilution and attenuation factor (DAF)". In the MO-1 scenario, in addition to a default $DF_{Summers}$ of 20, the DAF is applied depending on the groundwater classification of the impacted aquifer, and the distance from the POC to the nearest downgradient property boundary or POE. The appropriate Groundwater Classification is a GW1 and the POC to POE is 0 feet. The presence of either of these two conditions would make the application of a DAF inappropriate. Regardless of the above issues with the submitter's use of SPLP to demonstrate groundwater impacts will not occur, evaluation of groundwater monitoring results indicate an ongoing source continues to impact the groundwater, as documented in previous submittals and later in this letter.

Section 4.1.1 RECAP MO-1 General Criteria

Comments regarding responses to compliance with application of RECAP MO-1 General Criteria on page 25 of the Report prefaced with the RECAP section referenced in the Report:

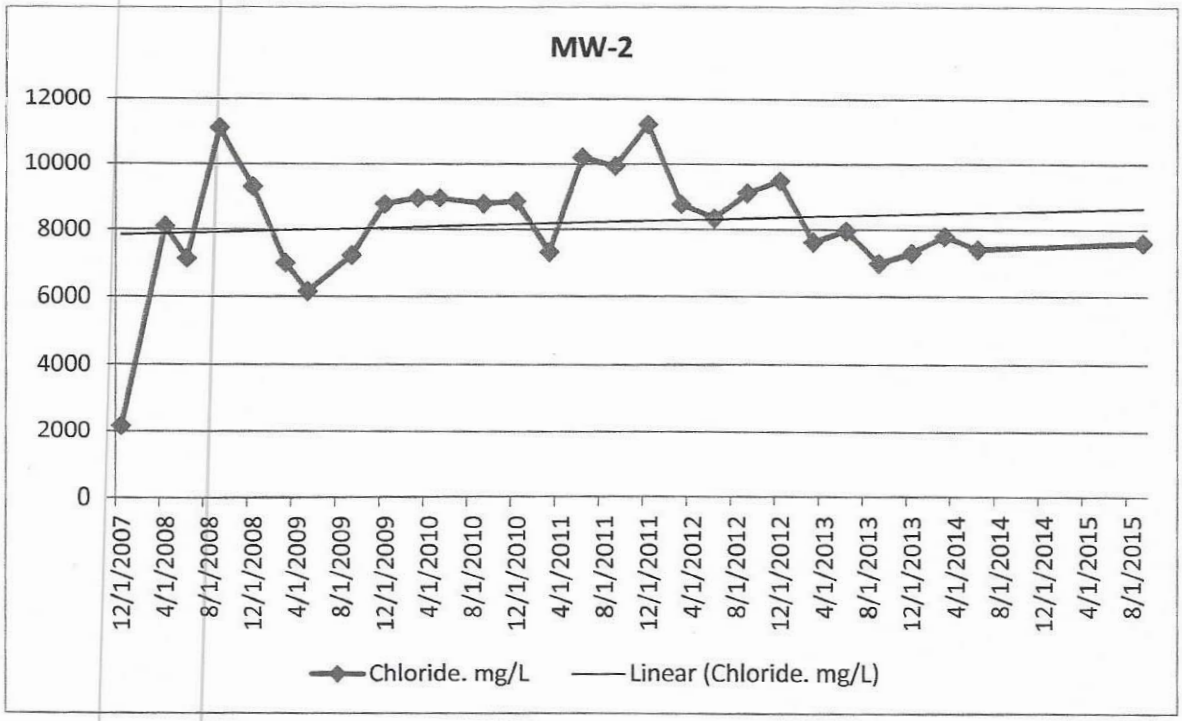
4.1.1.1 Both animals and plants are sensitive to COC's present at the investigated site. The Ecological Checklist does not recognize the presence of these receptors. Though the attached wetland delineation documents common species of plants growing on the tract, no evaluation of root zone or salt tolerance of specific species present was acknowledged or conducted. Likewise the report recognizes that the tract was previously sugarcane cropland, yet no evaluation of the suitability of the tract for this use was conducted. In short, the property should be evaluated and restored for unrestricted use.

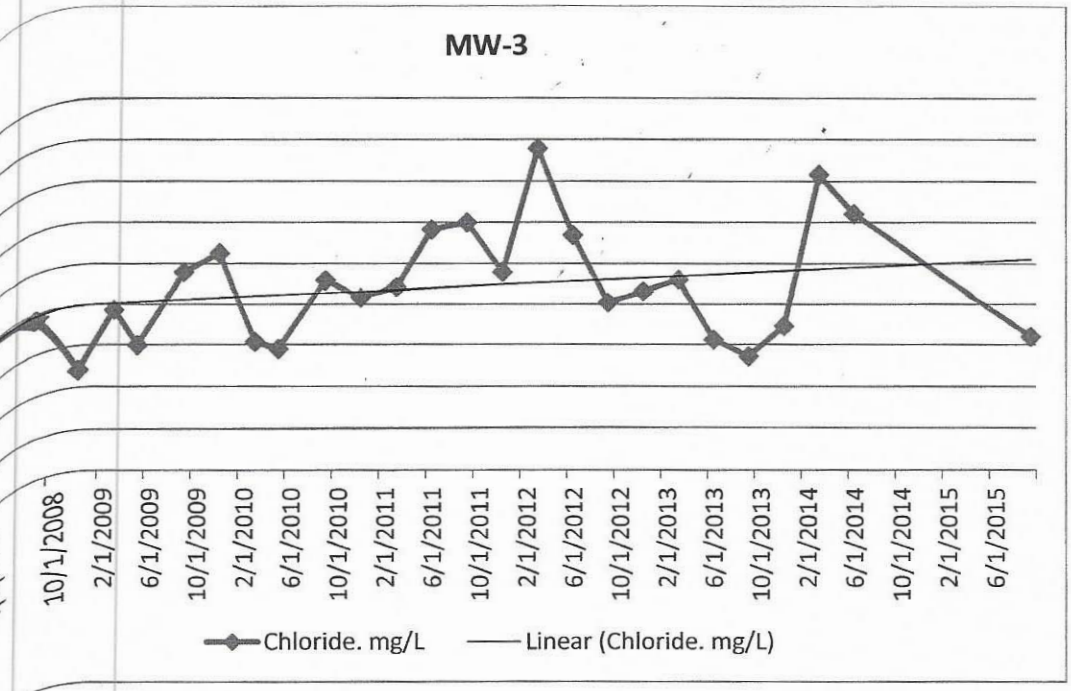
4.1.1.2 Bayou Choupique along with interconnecting canals are present on the property. No evaluation of surface water bodies has been presented, therefore, it is disingenuous to state that "no discharge from the shallow water bearing zones to a surface water body has been identified."

4.1.3.1 The extent of the groundwater impacts has not been delineated vertically or horizontally. No evaluation of the potential for surface water bodies to be impacted was presented.

4.1.3.2 The sum of the soil Areas of Investigation (AOI's) IS the "area of impacted soil" and is greater than 0.5 acre. The footprint of the JAB Pit impacted soil alone is greater than 0.5 acre.

4.1.3.3 Impacted groundwater is clearly NOT in declining conditions. A review of groundwater monitoring data for multiple monitoring wells demonstrates static or increasing chloride concentration trends since monitoring began in November 2006. The most impacted monitor wells, MW-2 and MW-3, exhibit increasing concentration trends and chloride concentrations have ranged between 2,000 mg/l and 11,100 mg/l between December 2007 and June 2015. Plots of chloride concentrations over time with trend lines for each of these two wells are presented below:





Contrary to what is stated in the Report, the groundwater data indicate that the potential sources have NOT been mitigated.

Regarding Section 5.3 of the report, as the basis for groundwater classification, the following conditions should be noted:

- As detailed at the beginning of this letter as well as in multiple previous landowner submittals, boring logs and drillers logs for boreholes on the property and nearby indicate that the water-bearing unit screened by the site monitor well network is the upper portion of the Atchafalaya/Chicot Aquifer: there is a direct hydraulic connection.
- The registered monitor wells for the site and active domestic water wells within a 1-mile radius of the site have been determined by the Department of Natural Resources to be completed in the same aquifer (Chicot Aquifer, Upper Sand Unit and Atchafalaya Aquifer).
- The Report documents the existence of 6 active domestic water wells in this aquifer within a 1-mile radius from the property (Report Figure 9).
- Aquifer test analysis conducted by HET for a site monitor well estimated a yield of 798 gallons per day, only 2 gallons or 0.25 percent less than the criteria for a GW2 aquifer.
- A short-duration pump test conducted by Arabie Environmental personnel indicated the aquifer in that location would easily yield 800 gpd. Whether or not a well can be pumped dry is not a criterion for Groundwater Classification. Slug

test results from shallow, low-yield wells were included in the Report calculations to create a low overall average aquifer yield.

The submitter of the Report continues to use regional literature over site specific data to justify a GW_{3NDW} groundwater classification. The appropriate groundwater classification is GW2A, at a minimum, due to the presence of nearby active domestic wells in the aquifer, and possibly, GW1. The GW2A classification is not based on aquifer yield.

With regards to Section 5.4, the Report states elsewhere that RECAP Management Option 1 was applied to the site and here applies an alternate method, apportionment, to adjust MO-1 Standards for additive health effects from exposure to multiple COC. Section G5.0 of RECAP states that this method is applicable to MO-2, not MO-1.

The following comments are in regards to the RECAP Standards calculations in section 5.5 of the Report:

- The appropriate Groundwater Classification is a GW1 or GW2 and the POC to POE is 0 feet. These items are addressed earlier in this letter.
- The POC and POE are not identified, nor are the AOIC or aquifer thickness used in the calculations.
- As documented in previous submittals and elsewhere within this correspondence,
  - application of a DAF is not appropriate for GW1 aquifers; and
  - application of a DAF is not appropriate with the POC to POE is 0 feet.

Finally, it is unclear what additional useful information an additional year of groundwater monitoring would provide. The existing groundwater monitoring dataset clearly indicates that the former pits continue to impact the groundwater and that the soil and groundwater require active remediation.

The above is not a complete review of the Report, but points out issues noted in reading the document. Please review the attached previous correspondence which provides additional detail to consider in evaluating the Report. If we can be of assistance, please contact us at 337-436-3248. We appreciate the efforts of the Office of Conservation in this matter.

Sincerely,

Austin R. Arabie

Duane A. Piranio, P.G.
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cc: Ms. Nancy Blanchard, Landowner