RBB
Consulting, LLC

4040 Desoto Street
Mandeville, LA 70471

P.O. Box 2108
Mandeville, LA 70470

Office: (985) 264-6464
Email: rbbray@bellsouth.net

February 14, 2022

Mr. Turner Brumby
Veron, Bice, Palermo & Wilson, LLC
721 Kirby Street
Lake Charles, Louisiana 70601

Dear Mr. Brumby:

Per our conversation, RBB Consulting, LLC (RBBC) has prepared a review of the Site Investigation Report & Closure Plan – Neumin Limited Admission for the H.C. Drew Estate vs Neumin Production Company, North Choupique Field, Calcasieu Parish, Louisiana dated November 10, 2021 and as supplemented on January 14, 2022 (Neumin Limited Admission Plan). The review is intended to evaluate compliance with Statewide Order 29-B and the requirements governing LDNR's limited admission proceedings and plans. These issues are discussed below.

I have attached a current copy of my curriculum vitae as Exhibit 1.

Depth Limitation of LDNR 29-B Soil Standards

The Neumin Limited Admission Plan finds that the maximum effective root zone is ten to twelve inches below ground surface for plants growing on the Drew Estate tract and concludes that the 29-B standards are only applicable to soils within the so-called effective root zone. Thus, the plan places a depth limit of approximately one foot for compliance with LDNR 29-B soil standards. In other words, the plan does not address any exceedances of the 29-B soil standards below a depth of approximately one foot.

On October 3, 2013, LDNR issued its "Written Reasons In Support of Most Feasible Plan as Required by LA. R.S 30:29" as a result of the limited admission hearing for Agri-South, LLC et al. v. Exxon Mobil Corporation, et al., (Docket No. 24,132, Seventh Judicial District Court, Parish of Catahoula) (attached as Exhibit 2). In this document, LDNR notes *"There is no depth limitation included in the 29-B salt standards. Salt parameter exceedances below three feet must meet the 29-B standards, unless there is an exception for good cause granted pursuant to LAC 43:XIX.319 which addresses LAC 43:XIX.313 soil conditions for salt parameters below three feet."*

The Neumin Limited Admission Plan only addresses 29-B exceedances to one-foot and ignores any such exceedances in the soils on the Drew Estate tract below that depth. The plan also neglects land use scenarios *other than* agriculture that could result in excavation and surface exposure of soil in excess of 29-B standards. To date, no exceptions have been granted that would allow soil contamination in excess of 29-B standards to remain on the Drew Estate tract. Thus, the Neumin Limited Admission Plan is not in compliance with LAC 43:XIX.611.F.1.

Groundwater Remediation Standard

The Neumin Limited Admission Plan also states *"There are no direct comparative groundwater standards provided in Statewide Order 29-B; therefore, the groundwater data have been evaluated in accordance with LDEQ's RECAP regulation."* LAC 43:XIX.303.C states that *"[c]ontamination of a groundwater aquifer or USDW with E and P waste is strictly prohibited."*

The February 25, 2011 LDNR/LDEQ Memorandum of Understanding ("MOU"), Item No. 2, indicates that LDNR and LDEQ consider Section 303.C to be a *"background concentration"* for groundwater under 29-B, and application of RECAP for evaluation or remediation of groundwater at E&P sites is considered an "exception" to Statewide Order 29-B. LDNR confirmed this in its written reasons in support of its most feasible plan in the Agri-South case mentioned above. (Exhibit 2, p. 15).

Under Statewide Order 29-B, groundwater standards for the Drew Estate tract are the background concentrations for individual indicator parameters. However, the Neumin Limited Admission Plan addresses groundwater contamination via LDEQ-RECAP. To date, no exceptions have been granted that would allow the use of RECAP instead of the background concentration standard required under 29-B. Thus, the Neumin Limited Admission Plan is not in compliance with LAC 43:XIX.611.F.1.

Appendix N – Hypothetical 29-B Plan

The Neumin Limited Admission Plan incorporates a "Hypothetical 29-B Plan", which is also not in compliance with LAC 43:XIX.611.B and F since the Hypothetical Plan:

- Excludes discussion of soil contamination on the Drew Estate tract in excess of LDNR 29-B standards below what Neumin concludes to be the "effective root zone",

- Does not propose to address or remediate any of the soil contamination on the Drew Estate tract in excess of 29-B standards below the "effective root zone",

- Fails to propose groundwater sampling in all potentially impacted areas on the Drew Estate tract, and

- Presents a scope of work which does not include the collection and analysis of background data for groundwater that is necessary to develop site-specific background concentrations for use as a comparative standard.

Actual and Potential Uses of the Drew Estate Tract

As noted above, the Neumin Limited Admission Plan fails to fully consider the potential future uses of the Drew Estate tract.

Although the current use of the Drew Estate tract is for agriculture and pasture land, other potential future uses of the property include industrial, commercial or residential development, restoration to original natural habitat, or some other unanticipated use. The restoration of soil and groundwater to background concentrations is the only way to ensure unrestricted future use of the Drew Estate tract.

A large portion of land which includes the Drew Estate tract was rezoned in 2018 to light industrial by Calcasieu Parish. Currently, there are plans to establish a Louisiana Economic Development (LED) Certified Site approximately one mile west of the Drew Estate tract. LED Certified Sites are development-ready industrial sites. Potential future development of this LED Certified Site must be considered in evaluating future use of the Drew Estate tract, including the former well location of LDNR Well SN 225207.

Land use in the area within several miles of the Drew Estate tract consists of agricultural, multi-acre single family residences or homesteads, commercial and some light industrial. Man-made ponds are present on many of these developed properties. The excavated material is often utilized as fill to raise the elevation of building pads.

The Calcasieu Parish Code of Ordinances contain requirements for new land development. Chapter 26, Article VII, of the Code of Ordinances requires all new residential subdivisions, commercial, and industrial site developments to prepare a Stormwater Runoff Management Plan (RMP). RMPs "*are intended to minimize the risk of flooding and watershed impacts resulting from a development and to preserve the floodplain storage capacity.*" Should the Drew Estate tract be developed, it is more likely than not that stormwater detention ponds would be required to achieve compliance with parish ordinances. Allowing impacted soil/groundwater within the Drew Estate tract to remain could limit future uses and development of the property.

Other potential future uses would be to return the Drew Estate tract to wetland/coastal prairie as part of the Wetlands Reserve Easement (WRE) Program or the Conservation Reserve Program (CRP). The WRE is a voluntary program offering landowners the opportunity to protect, restore and enhance wetlands on their property while establishing long-term land and wildlife conservation practices and protection. The CRP allows for conversion of cropland to forest for long-term conservation.

The Drew Estate could also be returned to coastal prairie for the purpose of establishing a Wetland Mitigation Bank to provide wetland mitigation credits for projects permitted by the U.S. Army Corps of Engineers. Such credits are currently being offered in Louisiana for $13,000-$20,000 per acre.

The Neumin Limited Admission Plan fails to fully consider all of these potential future uses of the Drew Estate tract.

If you have any questions, do not hesitate to contact me.

RBB CONSULTING, LLC

R. Brent Bray, PG

Exhibit 1

RBB
Consulting, LLC

4040 Desoto Street
Mandeville, LA 70471

P.O. Box 2108
Mandeville, LA 70470

Office: (985) 264-6464
Email: rbbray@bellsouth.net

Richard Brent Bray, P.G.

Title

Principal, RBB Consulting, LLC

Fields of Competence

Project management
Strategic planning
Geologic and hydrogeologic investigation
Groundwater monitoring and recovery systems
In-situ and ex-situ groundwater treatment systems
Soil remediation
RCRA and CERCLA compliance
Property redevelopment (Brownfields)
Risk assessment
Construction remediation/demolition
Litigation support

Professional Registrations & Affiliations

Registered Professional Geologist in the States of Louisiana (#400), Arkansas (#1722), Mississippi (#0375), and Tennessee (#TN1916, inactive)
National Ground Water Association

Academic Background

Louisiana State University, Baton Rouge, Louisiana, 1989
Master of Science in Geology, specializing in Hydrogeology
Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1985
Bachelor of Science in Geology, Cum Laude

Professional Employment History

March 2014-Present:	RBB Consulting, LLC, Principal
July 2006-March 2014:	Sigma Environmental, Inc., Sr. Geologist
Aug. 2005-July 2006:	Benoit, Bray and Associates, Inc., Principal
Jul. 2004-Aug. 2005:	Sigma Engineers and Constructors, Inc., Sr. Geologist
Feb. 2003-Jul. 2004:	Ranger Environmental, Inc., Consultant
Apr. 2001-Feb. 2003:	Sabbatical: Self-Employed
Jan. 1991-Apr. 2001:	Environmental Resources Management Sept. 2000-Mar. 2001: Managing Partner, Mexico Operations Jan. 1996-Mar. 2001: Partner Jan. 1991-Dec. 1995: Senior Geologist
May 1987-Jan. 1991:	Dames & Moore, Staff Hydrogeologist

Environmental Consulting Experience

Litigation Support

Primary investigator supporting plaintiffs and defendants in litigation involving oil/gas exploration and production, petroleum refining, and petrochemical/manufacturing industries. Litigation support projects include:

- Principal for assessment, investigation and remediation design of oil/gas exploration/production properties in southwest Louisiana. Developed strategic plan for compiling historical and technical data to assess the impact of site activities on soil and groundwater conditions. Strategic planning included interpretation of aerial photography, identification of areas of concern, utilization of a Geographic Information System, design

and implementation of field investigative programs, data analysis, and preparation of expert reports. Investigation results were compared to applicable regulatory standards as well as background conditions.

- Expert witness in geology, hydrogeology and site investigation to assess the impact of gas plant and separation station activities on soil, sediment and groundwater. Prepared expert report discussing geologic and hydrogeologic conditions including an assessment of the potential for contaminant migration into the Chicot Aquifer, a sole source drinking water aquifer in southwest Louisiana. Expert report also included a compilation of data regarding the installation and operation of two salt water disposal wells at the facility. Supervised field investigation activities and assisted in the preparation of a separate expert report addressing site investigation activities, delineation of contaminants (metals, petroleum hydrocarbon, chloride and Radium) in soil, groundwater, and sediment.

- Fact witness for a specialty chemical manufacturing facility in an insurance claim to recover investigation and remediation costs for chemical releases at a facility in Baton Rouge, Louisiana. Provided testimony in deposition regarding site conditions as well as current and historical remediation activities. Participation included presentation of soil, groundwater, and remediation data to corporate attorneys and legal staff to promote an understanding of technical strengths/weaknesses of datasets to be used in trial. Litigation resulted in a settlement in favor of the client.

- Designated expert witness for plaintiff in a claim regarding the extent and severity of environmental soil and groundwater contamination from historical railroad activities. Reviewed site investigation reports and risk assessment prepared by the defendants. Identified inconsistencies in site investigation techniques and reporting which led to inaccurate conclusions regarding site conditions.

- Prepared remediation scope of work and cost estimate as the designated expert for a property damage suit involving a former oil/gas pit and approximately 28 acres of canals containing contaminated sediment from oil/gas production activities. The remediation cost estimate included production pit excavation; dredging, dewatering, solidification, and off-site disposal of approximately 98,000 cubic yards of contaminated sediment and groundwater remediation to remove inorganic contaminants.

- Provided technical assistance to defendant counsel in assessing the adequacy of site investigation activities and remediation scoping/cost estimation for an oil/gas property containing production wells and storage facilities.

- Designated expert in litigation regarding property damage associated with the migration of groundwater contaminated with hazardous constituents (organic compounds) from a National Priorities List site onto the plaintiff's property as a result of a regulatory approved remediation program based on natural attenuation.

- Performed initial site inspections of 3 oil/gas properties in south Louisiana focused on documenting current site conditions, providing an inventory of the visible impacts to the property and collection of soil samples in areas potentially affected by site activities for comparison to regulatory standards. Prepared a preliminary site inspection report for each site and provided deposition on current conditions at one of the properties.

- Prepared remedial scope of work and cost estimate as the designated expert for property affected by petroleum spills from an adjacent fuel storage facility. The cost estimate included soil remediation of pastureland and residential properties as well as remediation of sediments within a pond affected by the petroleum spill.

- Provided technical support to a refinery in southeast Louisiana defending a suit claiming damage to adjacent properties as a result of historical waste disposal practices. Tasks included compilation/interpretation of historical aerial photographs documenting the growth of the refinery and adjacent neighborhoods over more than 50 years, assessment of plaintiff site characterization data and evaluation of supplemental data collected as part of the defense process.

- Litigation support and deposition for the former owner of a metal manufacturing facility in defense of a claim by a subsequent owner regarding the representation of environmental conditions at the time of purchase. Provided technical support regarding soil and groundwater investigation activities as well as remedial action planning for the facility maintenance shop which had been identified as a source of solvent contamination.

- Provided technical and environmental compliance support for corporate counsel of a shipyard/marine construction company in southeast Louisiana addressing violations of the Clean Water Act as well as solid and hazardous waste regulations.

Oil and Gas Industry

Provided environmental consulting, site investigation, and construction remediation services to clients involved in the exploration and production aspects of the petroleum industry. Projects included:

- Soil and groundwater investigation of an inactive brine pit associated with oil/gas production in Jennings, Louisiana. Investigation activities included the use of geophysics and cone penetrometer technology in conjunction with standard drilling techniques to define the limits and migration direction of brine contamination in soil and ground water.

- Investigation of a drilling fluid mixing facility in Dulac, Louisiana to assess the presence of site constituents in soil as part of a facility upgrade program. The project included identification of areas affected with organic (petroleum hydrocarbon) and inorganic (metals including hexavalent chromium) constituents. Developed a remediation plan to remove affected soil and concrete associated with mixing and storage areas.

- Assessment of an inactive pipe yard used for cleaning, maintenance and storage of drilling rods and pipe in Harvey, Louisiana. Investigation included completion of a survey for naturally occurring radioactive material (NORM) which was the primary constituent of concern at the facility as well as an assessment of soil affected with solvents, lubricants and petroleum hydrocarbons.

- Closure of a sunken barge associated with historical drilling fluid mixing activities in Dulac, Louisiana. Developed and implemented a closure plan including demolition and disposal of the overlying concrete pad contaminated by historical use of hexavalent chromium, removal of the barge deck, decontamination of the hull, backfilling of the barge hull, and construction of a concrete pavement over the barge to provide additional equipment and material storage area for the facility.

- Preparation of SPCC plans for drilling fluid mixing facilities in Louisiana and Alabama. Plans were submitted to the U.S. Coast Guard and when necessary, USEPA for approval.

- Performed an evaluation of air emissions from drilling fluid mixing facilities in Louisiana and Alabama to determine the necessity for obtaining air permits/exemptions for each facility.

Petroleum Refining Industry

Principal-in-Charge for environmental consulting, site investigation, risk assessment and construction remediation to clients involved in the refining aspects of the petroleum industry. Projects in southeast Louisiana have included:

- Inspection and upgrade of the facility ground water monitoring network including well replacement and repair to achieve compliance with well construction regulations. Prepared and obtained regulatory approval of ground water monitoring plans for solid and hazardous waste units. Implemented the ground water monitoring program in accordance with the facility solid waste permit, hazardous waste regulations, and facility monitoring plans.

- Performed investigations to evaluate the historical affect of site operations on soil and ground water quality prior to construction activities. At required locations, a remedial plan involving removal of affected soil, confirmation sampling, and ground water monitoring was prepared and approved by the regulatory agency. Supervised all remediation operations and prepared reports for submittal to the regulating agency.

- Completed soil, sludge and groundwater characterization activities within and surrounding a wastewater basin as well as performed a leachability study of lead affected soil stockpiled within the facility. A risk-based closure plan utilizing the stockpiled soil as backfill material was prepared and approved by the regulatory agency. Implementation of the plan saved more than $1,000,000 in waste disposal fees.

- Designed and implemented a sludge, soil and ground water investigation program at the inactive hazardous waste land treatment unit to evaluate waste depth/degradation, underlying soil conditions and shallow ground water quality. Once completed, a risk based closure plan was prepared focusing on relocating waste material to a single unit. This allowed re-use of the remediated area for future refinery construction. In addition, the plan included the installation of a cap over the new waste area that would be in compliance with applicable regulations and allow re-use of the area once the project was complete.

- Sludge sampling of a non-contact cooling water pond to evaluate the regulatory status of the unit and development of construction plans/costs for sludge removal and disposal.

Petrochemical Industry

Principal-in-Charge for strategic assessment of remediation activities at a specialty chemical facility in Baton Rouge, Louisiana which was utilizing pump & treat technology and aerobic wastewater treatment to address multi-aquifer organic contamination. Developed an aggressive plan to refocus the remediation program and bring activities to a cost effective conclusion via risk-based closure. Tasks completed in this project included:

- Successful negotiation with state regulatory agency to reduce the groundwater monitoring program by 80%. This resulted in a cost savings of approximately $100,000/year.

- Assessment of historical remediation actions and the existing ground water monitoring database for use in a risk-based closure of the facility.

- Design and implementation of a soil and groundwater investigative program to collect additional data for evaluating current site conditions and supplementing the database for risk based closure.

- Successful negotiation with the regulating agency to shutdown the groundwater recovery system and wastewater treatment plant to evaluate groundwater quality and flow under natural conditions. System was subsequently decommissioned which resulted in project savings of more than $100,000/year.

- Supplemental soil and groundwater investigation activities to delineate areas of elevated contaminant concentrations ("hotspots") and address an off-site area of affected groundwater identified in the initial investigation.

- Design and implementation of a pilot study utilizing in-situ aerobic biodegradation to address hotspots. The pilot study was based on air sparging techniques and utilized piping associated with the historical ground water recovery system to reduce costs by more than 85%. Successful completion of the pilot study resulted in full deployment of two air sparge systems with one system addressing multi-aquifer contamination and utilizing fractures within the soil to increase the degradation rate of site constituents. Remediation costs associated with full system deployment were significantly reduced by re-conditioning the existing groundwater recovery system for use in the air sparge system. The success of the in-situ treatment system resulted in the development of a risk-based closure for the facility.

- Interfaced with the regulatory agency to obtain approval of the revised remedial program. Maintained open communications with updates on current results and upcoming activities. Successfully maintained voluntary action status for the remedial program and avoided any administrative actions.

Principal-in-Charge for site assessment activities at a lubricant blending facility in Mexico City, Mexico. Assessment activities included investigation and delineation of soil and groundwater affected with petroleum hydrocarbons, identification of source areas, and risk assessment to evaluate the potential risk to human health and the environment.

Site supervisor of closure construction activities for solid waste impoundments at an inactive plastics manufacturing facility in Baton Rouge, Louisiana. Remediation activities included dewatering and solidification of sludge with subsequent on-site landfilling, monitoring of stormwater/wastewater quality prior to discharge, and final grading of impoundments encompassing more than fifteen acres.

Property Redevelopment (Brownfields)

Provided senior consulting services to identify and resolve environmental issues associated with Brownfield redevelopment of commercial/industrial properties. Redevelopment projects have included:

- Senior technical manager responsible for addressing environmental and construction issues associated with the commercial redevelopment of a former battery recycling facility within the Central Business District of New Orleans, Louisiana. Responsibilities included strategic planning using risk based programs, management of investigation/remediation activities, interaction with client and regulatory representatives, and quality assurance/quality control.

- Project manager for investigation, risk assessment, remediation, and closure of a former metals recycling facility affected with inorganic and organic constituents including PCBs. The facility encompassed three city blocks adjacent to the Central Business District of New Orleans, Louisiana with the project focused on commercial redevelopment of the area by a Fortune 500 Company.

- Project manager for evaluating soil and groundwater contamination associated with historical underground storage tanks beneath a new commercial building constructed as part of a property redevelopment program in Metairie, Louisiana. Regulatory agency concerns regarding the affect of soil and groundwater contamination on indoor air quality prohibited the facility opening. Supplemental sampling confirmed the lack of risk to customers and employees and identified an adjacent auto service station as the off-site source for petroleum contamination. The facility subsequently received approval from the regulatory agency to open.

- Project manager for assessing the impact of redeveloping property formerly used as an auto service center with known soil and groundwater contamination from underground storage tanks. Because petroleum hydrocarbon concentrations were sufficient to warrant groundwater and indoor air quality concerns, construction had been stopped by the regulatory agency. The project involved the re-design of the building foundation to include an impermeable barrier beneath the new structure as an engineered control to prevent hydrocarbon vapors from entering the building. The plan was approved by the regulatory agency allowing construction to continue.

- Project manager for assessment of property formerly containing underground storage tanks and being redeveloped for commercial use. Designed and implemented a soil investigation to evaluate current site conditions. Interfaced with the regulatory agency to address residual contamination which could not be removed due to the proximity of the contamination to a state highway and utilities. Obtained LDEQ RECAP closure with no further action at this time.

CERCLA Sites

Principal-in-Charge for investigation, risk assessment, closure and post-closure design, and compliance monitoring of the Alsco Anaconda NPL site in Gnadenhutten, Ohio, a former aluminum recycling facility affected by metals and PCB contamination. Activities included:

- Design and implementation of an investigative program to identify site constituents in soil, groundwater, sludge, and the adjacent Tuscarawas River. Activities included preparation of project documents such as the Field Sampling Plan, Health and Safety Plan, Quality Assurance Program Plans, etc. for U.S. EPA Region V review and approval. Investigation results provided a basis for risk-based closure of the site.

- Completion and EPA approval of a human and ecological risk assessment in order to establish clean-up standards.

- Design and implementation of a geophysical investigation to identify buried drums within a portion of the site which had been used for waste disposal. Developed and implemented a drum handling program for the excavation, overpacking, characterization, and off-site disposal of buried drums.

- Design and regulatory approval of a Remedial Action Program including all supporting documentation such as construction specifications, construction bid documents, Remedial Work Plan, Field Sampling Plan, Health and Safety Plan, Quality Assurance Plan, and Post-Closure Monitoring Plan.

- Implementation of the approved remedial action which included:

    - Excavation, dewatering, solidification and off-site disposal of more than 49,200 tons of hazardous and solid waste,
    - Treatment and discharge of 360,000 gallons of wastewater,
    - Excavation, characterization and disposal of more than 90 drums,
    - Confirmation sampling,
    - Placement and compaction of almost 11,000 cubic yards of backfill and
    - Final grading and seeding of the site for use as a wildlife area.

- Prepared and received regulatory approval of the Closure Certification Report documenting the successful completion of the risk-based closure.

- Designed and implemented a post-closure monitoring program for installation/sampling of monitor wells and ecological monitoring of the Tuscarawas River.

Staff hydrogeologist performing site investigation and data management for investigation/remediation activities at the Petro Processors NPL Site in Scotlandville, Louisiana.

Biomedical Research Facility

Senior manager for investigation and remediation of former waste disposal areas. Activities included identification, classification, and disposal of surface material composed of office and laboratory equipment including primate cages which were handled as potentially infectious biomedical waste. Subsurface investigation activities utilized geophysics and test trenching to identify locations where laboratory waste was buried on-site. Waste was excavated, sorted and either disposed off-site as potentially infectious biomedical waste or disinfected on-site following state health regulations and disposed off-site as solid waste.

Project manager for investigation, characterization, and remediation of incinerator ash commingled with office, laboratory, and building demolition debris in an area designated for future construction activities. Debris was located on a river bank and immediately adjacent to structures currently in use at the facility. Investigation included waste delineation and characterization for disposal. Remediation included plan development and implementation to remove waste material without endangering the structural integrity of adjacent buildings.

Assisted in the preparation of facility LPDES Permit addressing wastewater outfalls associated with research facility operation as well as stormwater discharges from a primate breeding facility with a population in excess of 3,000 primates. To achieve LPDES requirements, identified alternative disposal methods for liquids generated by the research facility and worked with facility personnel and state regulators in the characterization and classification of wastewater impoundments.

Project manager developing the scope of work and estimated cost for maintenance of the primary wastewater sump and three wastewater ponds within the wastewater treatment system. The primary focus of sump maintenance was to inspect the integrity of the sump and associated piping as well as removal of sludge and any medical sharps (i.e. needles, scalpels, etc.) which accumulated in the bottom of the structure. Pond maintenance focused on sludge removal including the excavation, disinfection and dewatering of approximately 2,500 cubic yards of sludge while controlling sludge odor to limit the impact on adjacent property owners including an elementary and secondary school.

Project manager for repair and assessment of historical water supply wells discovered during facility expansion. Repaired well heads to eliminate leakage resulting from artesian conditions and upgraded surface completions to comply with state regulatory standards. Performed flow testing to determine well discharge under artesian conditions, sampling to determine water quality, identified the water supply aquifer, and evaluated suitability of the wells for integration into the facility water supply system.

Project manager of initial assessment activities for demolition of a radiation building associated with nuclear research activities. Assessment activities included review of historical aerial photography and site walkover to identify/inspect the radiation building and remaining support structures. Developed scope of work with subcontractors licensed to dismantle and handle radiation affected waste materials.

Shipyard/Marine Construction

Senior manager providing permitting and compliance monitoring to a shipyard/marine construction company. Activities include development of Spill Prevention Control and Countermeasure, Facility Response and Storm Water Pollution Prevention Plans, implementation and documentation of LPDES monitoring activities, preparation of site investigation plans, preparation of air permits, and interaction with the regulatory agency.

Manufacturing Industry

Principal-in-Charge for demolition of a transite manufacturing facility in New Orleans, Louisiana. Activities included asbestos removal/disposal, building demolition, steel recycling, PCB/petroleum hydrocarbon affected soil remediation, air monitoring, remediation of an off-site asbestos waste disposal area and successful negotiation with state and federal agencies to expedite project implementation and completion.

Project manager for soil/groundwater investigation and remedial action planning of solvent contamination associated with maintenance shop activities at a metal fabricating facility in Shreveport, Louisiana.

Principal-in-Charge for assessment of site investigation and facility decommissioning activities at a former battery manufacturing facility in Naucalpan, Mexico. Activities included a review of historical investigation activities, soil and groundwater sampling, confirmation sampling after building decontamination and delineation of remaining remediation activities in order to complete facility closure.

Project manager for soil and groundwater assessment of a forklift maintenance/repair facility in Metairie, Louisiana to evaluate the accuracy of historical investigation results and assess the limits of affected soil and groundwater using risk based standards identified in the Louisiana Department of Environmental Quality Risk Evaluation Corrective Action Program.

Project manager for groundwater monitoring program at a paper products facility in north Louisiana. Project was implemented as part of the facility solid waste permit and included groundwater sampling, historical data review and statistical data analysis.

Site project manager for the installation of a groundwater recovery system in northern Illinois. Responsibilities included characterization of the glacial aquifer affected by facility operations, recovery well design, air rotary drilling and well construction.

Commercial Airline Industry

Site manager for field operations at an aircraft maintenance facility in Tulsa, Oklahoma. Responsibilities included the planning and implementation of a soil and groundwater investigation for an inactive metal plating and hazardous waste facility as well as completion of a facility wastewater study. Performed assessment of existing facility ground water monitoring network including data management and interpretation of historical groundwater quality records.

Publications:

Hanor, J.S., Bray, R.B. and Nunn, J.A., 2007 *"Interaction Between Topographic, Thermohaline, and Overpressured Flow Regimes in the South Louisiana Gulf Coast"* Geological Society of America Abstracts with Programs, Vol. 39, No. 6, p. 267.

"Spatial Variations in Subsurface Pore Fluid Properties in a Portion of Southeast Louisiana: Implications for Fluid Migration and Solute Transport", Gulf Coast Association of Geological Societies, 1990, p. 53-64.

Cambro-Ordivician Passive Margin for the U.S. Appalachians Isopach Map Illustrations, Geology of North America, Appalachian – Ouachita Orogen of the United States, Volume F2.

Exhibit 2

STATE OF LOUISIANA
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF CONSERVATION

IN RE: **DOCKET NO. ENV-L-2013-02**

Agri-South, L.L.C., et al. v.
Exxon Mobil Corporation, et al.
Docket No. 24,132,
Seventh Judicial District Court,
Parish of Catahoula

LOUISIANA DEPARTMENT OF NATURAL RESOURCES, OFFICE OF CONSERVATION'S WRITTEN REASONS IN SUPPORT OF MOST FEASIBLE PLAN AS REQUIRED BY LA. R.S. 30:29

I. INTRODUCTION

On January 25, 2013, Tensas Delta Exploration Company, L.L.C. ("Tensas Delta") admitted responsibility for certain environmental damage, and accepted responsibility for that damage under Louisiana Code of Civil Procedure Article 1563.[1] In its Limited Admission, "Tensas Delta admitted that 'environmental damage'... exists with respect to the soil and shallow groundwater, as delineated in [its] attached plan." (Limited Admission, ¶4). It further stated that "*Tensas Delta's admission of liability is limited to the 'responsibility for implementing the most feasible plan to evaluate, and if necessary, remediate' the soil and shallow groundwater* in the area associated with the operation of SN 164189 and SN 159595 to regulatory standards." (Limited

[1] La. C. Civ. Proc. Art. 1563 (A)(1), enacted in 2012 by Act No. 754 (H.B. No. 618), in pertinent part, provides—

> If any party admits liability for environmental damage pursuant to R.S. 30:29, **that party may elect to limit this admission of liability for environmental damage to responsibility for implementing the most feasible plan to evaluate, and if necessary, remediate all or a portion of the contamination that is the subject of the litigation to applicable regulatory standards**,

(hereinafter referred to as a "Limited Admission").

Admission, ¶5) (Emphasis in italics added). On the same date, Tensas Delta submitted a plan of remediation to the Louisiana Department of Natural Resources, Office of Conservation (hereinafter "**LDNR**", "**Conservation**", and/or "**Agency**").[2] The Court, on February 27, 2013, ordered any interested party to provide to LDNR any alternative plan, comments, or response to the Tensas Delta plan by April 30, 2013. An alternative plan was timely submitted by Plaintiff, Plug Road, LLC ("Plug Road") on April 29, 2013.[3]

Pursuant to La. R.S. 30:29 (C) (2) (2012), LDNR/Conservation/Agency held a public hearing spanning nine hearing days, Monday through Friday, August 5-9, 2013, and Tuesday through Friday, August 13-16, 2013. LDNR employees with relevant technical backgrounds[4] sat as a panel and considered the evidence. The evidence consisted of testimony from experts, eight offered by Tensas Delta and three offered by Plug Road,[5] and numerous exhibits including data, maps, and historical studies.[6] After the hearing, both sides submitted post-hearing briefs.

LDNR/Conservation/Agency has decided neither plan is acceptable as presented. It has structured its own plan which it is submitting to the Court. Its plan is a "feasible plan" within the

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[2] The "Tensas Delta Site Investigation Report and Remediation Plan A-1 Area Plug Road Property, South Shoe Bayou Field Catahoula Parish, Louisiana," dated January 24, 2013, and submitted to LDNR on January 25, 2013, was introduced at the public hearing on August 5, 2013 as **TD-DNR Exhibit 1** (hereinafter "TD Plan"). An Addendum to that plan, dated July 10, 2013, was introduced at the hearing on August 5 as **TD-DNR Exhibit 2**. (hereinafter "TD Addendum").

[3] The "Agri-South Group, LLC Investigative and Corrective Action Plan Plug Road Tract, South Shoe Bayou Field," dated April 29, 2013, and submitted to LDNR on that date, was introduced at the hearing as **AGS 1** (hereinafter AGS Plan").

[4] See **Exhibit 1 to Written Reasons (Panelists and Their Backgrounds)** attached hereto.

[5] See **Exhibit 2 to Written Reasons (Expert Witnesses who Testified)** attached hereto. The exhibit summarizes academic training, current employer, and area tendered and accepted.

[6] Tensas Delta introduced thirty-five (35) exhibits (exclusive of its final list of exhibits, which is **TD-DNR Exhibit 36**), and Plug Road introduced seventy-three (73) exhibits (exclusive of its final list of exhibits, which is **AGS 74**).

meaning of La. R.S. 30:29 (I)(3) and LAC 43:XIX.603, and the "most feasible plan" within the meaning of La. R.S. 30:29 (C)(2)(a), (3)(a) & (3)(b)(ii) and LAC 43:XIX.627.A.

These written reasons are issued in compliance with La. R.S. 30:29 (C)(2) & (3) and LAC 43:XIX.627.A.

II. BURDEN OF PROOF AS TO THE ALLUVIAL AQUIFER

The issue of who has the burden of proof as to alleged contamination in the Red River Alluvial aquifer was raised in closing arguments and in post-hearing briefs because Tensas Delta ***has not admitted responsibility for elevated chloride levels detected in the Red River Alluvial aquifer*** beneath the Plug Road property.[7]

LDNR does not believe that burden of proof is a consideration in its selection or structuring of the most feasible plan.[8] The most feasible plan can, and does, address the alluvial aquifer

[7] Plug Road challenged LDNR's authority to even hear evidence as to environmental damage to the alluvial aquifer groundwater in a motion in limine filed prior to the start of the hearing. It contended that since the Tensas Delta Limited Admission was **only** for environmental damage to soil and shallow groundwater, LDNR had no authority to take evidence on this point. The motion was denied in a written ruling before the hearing began. This point was taken up, and arguments heard, at the start of the hearing; and, it again has been raised in Plug Road's post-hearing brief, contending that any ruling by LDNR/Agency would be an improper advisory opinion. LDNR does not view La. C. Civ. Proc. Art. 1563 (A)(1) (the "limited admission" provision) as constraining it from considering whatever evidence it deems relevant in arriving at the most feasible plan, and that is particularly so where, as here, the shallow groundwater is admittedly contaminated and is admittedly in direct hydraulic communication with the alluvial aquifer. *See* argument, constituting an admission, of Mr. Buatt on this issue at the start of the hearing, 8/5/13, @ Vol.1, pp. 12-13. *See also* TD Plan, n. 2, *supra*, Section 6.2.3.1 ("No Action"), stating "the shallow groundwater is hydraulically connected to the RRVA." *See also* Stover testimony, 8/5/13, @ Vol. 1, pp. 121, 187, where Mr. Stover states that "the shallow groundwater's in direct communication with the lower aquifer." Both parties agreed that the alluvial aquifer (the Red River Alluvial aquifer, referred to sometimes as the "RRVA") has elevated chloride levels beneath Plug Road, but Tensas Delta contends that the source of that elevated chlorides is "natural", coming up from below, from a tertiary aquifer known as the Williamson Creek aquifer. Plug Road contends that a clay layer completely separates the RRVA from the Williamson Creek aquifer, so E&P activities had to have caused the high chlorides in the RRVA.

[8] The panel appreciates, and has considered, both sides' positions on burden of proof, which are ably set forth in their post-trial briefs. See **Post –Hearing Brief on Behalf of Tensas Delta Exploration Company, LLC**, served on

issue, and it does not constitute an improper advisory opinion merely because Tensas Delta has chosen not to admit responsibility as to the alluvial aquifer. Tensas Delta included the alluvial aquifer issue for LDNR/Agency's consideration. Its plan includes a groundwater monitoring proposal that provides for some monitoring in the alluvial aquifer.[9] In addition, many of the Tensas Delta witnesses were testifying specifically to establish that the elevated chlorides in the alluvial aquifer were not from E&P activities.[10]

In any event, the evidence on the issue of the source of elevated salt in the alluvial aquifer was neither comprehensive nor conclusive for either side, and the most feasible plan requires further sampling and monitoring.

III. SOIL REMEDIATION

The TD Plan and AGS Plan identify two AOIs where E&P activities were conducted from about 1978 to 1985.[11] The information provided to LDNR at the hearing clearly established that

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August 23, 2013, Section II, at pp. 2-4; and the **Landowner's Post-Trial Brief**, served on August 23, 2013, at pp. 1-2.

[9] In the TD Plan, n. 2, *supra*, Section 7.3 ("Groundwater Monitoring Plan"), it states: A groundwater monitoring network will be established to determine groundwater condition over a five-year time period. The groundwater monitoring network will also aid in determining the effectiveness of the soil removal and treatment as protection of the shallow groundwater and the RRVA. *Groundwater monitoring wells will be installed in specific locations to monitor source areas in* both the shallow groundwater stratum and *the RRVA*." (Emphasis in italics added). *See* Mr. Stover testified at the hearing about this proposed groundwater monitoring in the alluvial aquifer. Stover testimony, 8/5/13, Vol. 1, at pp. 190-95.

[10] That was the sole purpose of the testimony of Mr. Stover, Dr. Reynolds, and Dr. Kueper. It was in part the purpose of Mr. Bazer's and Dr. Warner's testimony. While not a major part of Mr. Upthegrove's testimony, he compiled the work of all TD experts into the TD plan put together by Michael Pisani & Associates, Inc., and he mentioned the issue. Mr. Austin's testimony also touched on the issue. The only Tensas Delta witness that did not touch on the alluvial aquifer issue in any way was Mr. Daigle, whose testimony was confined to soil contamination entirely.

[11] The two Areas of Investigation ("AOIs") are referred by the parties as AOI South and AOI North. **AOI South** is located in the vicinity of SN159595 (T-125), Spud date 6/12/1978, Producer, P&A 11/12/1985. **AOI North** is

soil in, around, and below these former exploration and production locations at the Plug Road property exceeds applicable salt parameters— most notably, electrical conductivity ("EC"), the most commonly referenced salt standard for soils under Statewide Order 29-B, of 4 mmhos/cm for upland areas [12]—in the soil to a depth of at least 30 feet below ground surface.[13]

The TD Plan proposes to remediate the salt-impacted soil as follows:

1) excavate and dispose of soil with electrical conductivity (EC) exceeding 10 mmhos/cm to a depth of three (3) feet below ground surface;

2) treat salt-impacted soil with gypsum, hay, and nitrogen fertilizer in one foot layers to a depth of three (3) feet below ground surface where the EC results >4 mmhos/cm and <10 mmhos/cm and return the treated layers to the same soil horizon;

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located in the vicinity of SN164189 (T-133), Spud date 8/2/1979, Dry hole, converted to SWD 10/1/1979, and P&A 11/12/1985. *See* TD Plan, n. 2, *supra*, Section 2.3.1 ("Oil & Gas Wells") and Section 3.0 (Site Investigation Activities"); and AGS Plan, n. 3, *supra*, Section 2.0 ("Site Description and History"). The wells can be seen on Figure 4, the 2010 Aerial Oil and Gas Well Location Map attached to the AGS Plan. According to the TD Plan, two pits are associated with SN159595 (AOI South) and can be seen in aerial photographs in the early 1980s, but both appear to be closed by September 1985. According to the TD Plan, no pits associated with SN164189 (AOI North) are readily discernible on the aerials. *See* TD Plan, n.2, *supra*, Section 2.3.2 ("Surface Facilities"). But, this "dry hole" well was converted to a salt water disposal well, and "produced water" from E&P operations was injected downhole through this period before it was ultimately plugged and abandoned in 1985.

[12] LAC 43:XIX.313.D.3.

[13] *See* AGS Plan, n. 3, *supra*, Section 4.2.2 ("Electrical Conductivity Profiling"), stating that "[e]xamination of the conductivity probe profiles indicates salt impacts extend to depths exceeding 30 feet below ground surface near the former pit." *See also* Arabie testimony, 8/15/13, @ Vol. 8, pp. 160-61 & associated slide, **AGS 68**, PowerPoint slide 18, depicting elevated EC values at AOI South to a depth greater than thirty (30) feet. TD experts acknowledge excessive salt to depths far greater than three feet, which is the depth to which TD proposes to remediate the soil. *See* Upthegrove testimony, 8/8/13, @ Vol. 4, pp. 206-07, where he acknowledges salt impacts of the soil down to (20) feet; and Daigle testimony, 8/9/13, @ Vol. 5, pp. 164, where he also acknowledges that salt contamination in the soil extends to "around twenty feet in some spots" based on data collected by Tensas Delta experts. Mr. Daigle, the primary soil expert for Tensas Delta, acknowledged that he didn't have any reason to believe Mr. Arabie's and Mr. Bray's test results were incorrect. *Id. See also* TD Plan, n. 2, *supra*, Section 3.2 ("AES Investigation"), 3.2.1 ("Electromagnetic Conductivity Survey and EC Probing"), stating that the AES advanced conductivity probe logs "indicate elevated conductivity results in EC probe 19040502 to a depth of just greater than 30 bls." Mr. Upthegrove responded to questioning about TD Plan, Section 3.2, and said he did not have any reason to believe that the results of AES were wrong or inaccurate. *See* Upthegrove testimony, 8/9/13, Vol. 5, @ p. 13.

3) place a gypsum layer and then a six-inch thick continuous capillary break below the treated soil (three feet below ground surface);

4) leave soil below the capillary break undisturbed;

5) backfill any excavated areas with Sharkey clay;

6) re-vegetate surface of remediated area;

7) collect confirmation samples of treated material during and one (1) year following completion of soil remediation activities, and additional soil samples as needed;

8) establish groundwater monitoring network to aid in determining the effectiveness of the soil removal and treatment; and

9) within sixty (60) days from completion of a two-year post-remediation monitoring/vegetative recovery, provide detailed report to LDNR for review.[14]

The AGS Plan, on the other hand, suggests that complete removal of salt-impacted soil down to the first continuously saturated zone or twenty (20) feet, whichever is shallower, may be necessary,[15] but the plan actually indicates that the salt parameter exceedances under 29-B are only to average depths of eleven (11) feet at the South AOI and seven (7) feet at the North AOI respectively.[16] The AGS Plan presents a table in Section 12.3.1 that only proposes cleanup to these eleven (11) and seven (7) foot depths.[17] The AGS Plan is a classic "dig and haul", and

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[14] *See* TD Plan, n. 2, *supra*, Section 7.2 ("Soil Remediation"). This section of the plan details all of the items listed.

[15] *See* AGS Plan, n. 3, *supra*, Section 10.2.1 ("Section 313.-Land Treatment"). This Plan refers to literature documenting plant roots of various species, most of which substantially exceed three feet, and some of which are grown on the Plug Road property.

[16] *See* AGS Plan, n. 3, *supra*, Section 10.3 ("Comparison of Soil Data to LDNR 29-B Soil Standard"), and Section 12.3.1 ("Soil"). Section 12.3.1 proposes remediation of A1 South to a depth of 11 feet (larger area) and 10 feet (smaller area), and proposes remediation of A1 North to a depth of seven (7) feet.

[17] *Id.*, Sections 12.3 ("Remediation to Meet the Requirements of LDNR 29-B") & 12.3.1 ("Soil").

would transport the excavated soil offsite for disposal. Most of the estimated soil cleanup cost is for transportation and disposal.[18]

As indicated, the TD Plan proposes only remediating soil to applicable salt standards to a depth of three (3) feet below ground surface.[19] This is because, according to the TD experts, the roots (or root zone) for crops at Agri-South do not extend past a depth of three feet.[20] In other words, the TD Plan leaves soil that exceeds the applicable salt standards below three feet "as is".[21]

There is no depth limitation included in the 29-B salt standards. Salt parameter exceedances below three feet must meet the 29-B standards, unless there is an exception for good cause granted pursuant to LAC 43:XIX.319 which addresses LAC 43:XIX.313 soil conditions for salt parameters below three feet. Prior to the hearing, no exception pursuant to LAC 43:XIX.319

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[18] *See* AGS Plan, n. 3, *supra*, Section 10.4 ("Summary") & Sections 12.2.1("Soil") & 12.3.1 ("Soil). The costs per ton to excavate, load, haul, and dispose is estimated at $62.00 per ton. The estimated total cost for soil cleanup is $6,887,023. Most of this—84% ($52.00 of the $62.00 per ton) is for transportation and disposal. *See also* Arabie Testimony, 8/15/13, @ Vol. 8, pp. 170-71 & associated slide, **AGS 68**, PowerPoint slide 27.

[19] *See* TD Plan, n. 2, *supra*, Sections 4.3 ("Soil Remediation Goal"), 5.1 ("Discussion of and Comparison to 29-B Soil Standards") & 5.2.1 ("Identification of AOIs"). Read together, these provisions define TD's area of soil remediation as the "root zone", the zero to 3-foot depth interval. Further, Section 5.1 notes that the only "contaminated" soils that are salt-affected soils within the root zone are in a 0.49-acre area at the South AOI and a 0.38-acre area at the North AOI. According to Mr. Upthegrove, the lateral area was determined by looking at the zero to three-foot interval. *See* Upthegrove testimony, 8/8/13, @ Vol. 4, p. 136.

[20] *See* Upthegrove testimony, 8/8/13, @ Vol. 4, p. 179 & Vol. 5, pp. 22-23 ("The experts on our team don't believe ...the roots on crops at Agri-South and the surrounding area extend past the depth of three feet."); *see also* Daigle testimony, 8/9/13, @ Vol. 5, pp. 110, 152, 163 ("In our opinion, the definition of contamination is based on the intended use of the land which we believe goes no deeper than three feet.").

[21] Mr. Upthegrove testified that for elevated salts deeper than three (3) feet, TD sampled for chloride and for sodium by the Synthetic Precipitation Leaching Procedure ("SPLP") under RECAP, and concluded that there were no exceedances of the most conservative standard using this method. *See* Upthegrove testimony, 8/8/13, @ Vol. 4, p. 136. *See also* TD Plan, n. 2, *supra*, Section 3.1.1 ("Soil Investigation and Results") & Section 3.1.1.3 ("Analytical Results"), stating that "SPLP chloride and SPLP sodium collected by MP&A and HET have maximum values of 592 mg/L and 414 mg/L, respectively, and are below the applicable RECAP Standards."

was requested by Tensas Delta, and none was granted. Instead of costing out a plan which remediated salt-impacted soil below three feet, Tensas Delta relied upon the definition of "contamination" in LAC 43:XIX.301 contending that there was no contamination below three feet because the root zone only went down to three feet.[22] That is one of the reasons a pre-hearing ruling was issued finding the TD Plan not in compliance with LAC 43:XIX.611.F.1.

Mr. Upthegrove, who compiled the TD Plan, conceded that "there are commonly crop roots that go below a depth of five to six feet," but then said "that's not what I understand to be the case...on the Plug Road property."[23] Mr. Daigle, Tensas Delta's primary soil expert, offered a photograph of corn roots from corn at another location in Catahoula Parish, not this site, and testified that the solum for this particular soil was about twenty-seven inches, but also indicated the roots in the photograph may go down to thirty-five to forty inches. He indicated that he felt that "three feet was a comfortable zone" that would "cover the root zone plus have a cushion."[24]

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[22] On June 14, 2013, counsel for Tensas Delta sent a letter on the Section 611.F.1 issue. In that letter, counsel stated in pertinent part:

> The 29-B salt parameters, which are agronomy-based standards, were evaluated and are proposed to be addressed within the root zone of the soils for this site (0-3 feet). Not applying the specific numerical standards for salt parameters provided for in LAC 43:XIX.313.D below the root zone (greater than 3 feet) would have no adverse impact on the reasonably anticipated future use of the property and would not qualify as 'contamination' as that term is defined under section 301.

Letter of June 14, 2013 from Louis E. Buatt to Thomas E. Balhoff, p. 3. The letter is Attachment 1 to Tensas Delta's Post-Hearing Brief, referred to in n. 8, *supra*. Mr. Daigle, in his testimony to the panel, essentially said the same thing: "In our opinion, the definition of contamination is based on the intended use of the land which we believe to be no deeper than three feet." *See* Daigle testimony, 8/9/13, @ Vol. 5, p. 163. *See also* Daigle testimony, 8/9/13, @ Vol. 5, p. 107.

[23] *See* Upthegrove testimony, 8/8/13, @ Vol. 4, p. 232. The TD Plan, n. 2, supra, Section 2.2 ("Land Use"), states that "soybeans, corn, milo (grain sorghum), wheat and cotton" have all been grown on the property. *See* Upthegrove testimony, 8/8/13, @ Vol. 4, p. 244.

[24] *See* Daigle testimony, 8/9/13, @ Vol. 5, pp. 108-10 & associated slide, **TD DNR Exhibit 24**, PowerPoint slide 15; *see also* Daigle testimony, 8/9/13, @ Vol. 5, pp. 187-88.

Dr. Provin was Plug Road's primary soil expert. The thrust of his testimony was that the soil at this site, Sharkey clay with shrink/swell properties which causes cracks in the soil, slickensides, macropores (which fill with water quickly) and micropores (which he said are tiny tubes that don't fill with water readily),[25] makes the zone for plant-available water deeper than just the root depth of a particular crop. According to Dr. Provin, rooting depths of cotton will generally be three to five feet; sorghum and soybeans will be two to four feet, as shown on his slide 19, and corn shown with root depth of three to five feet on his slide.[26] He testified that the very small, deeper, hair-like roots are actually the roots that pick up the moisture and nutrients from the soil.[27] He described how these roots draw moisture from plant-available water located in micropores at distances of as much as three to four feet through capillary action. In the absence of regular rainfall, he testified that this additional water from these distances is needed. He described adverse effects that high salinity of plant-available water has on the plants, and indicated it could result in desiccation of the plant.[28]

Dr. Provin stated he would remove the entire soil down to at least ten feet, analyzing salinity in one-foot increments through a grid sampling system, which would allow soil to be put back in place if it was not contaminated.[29] In cross-examination, he did admit to earlier deposition

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[25] *See* Provin testimony, 8/13/13, @ Vol. 6, pp. 29-36, 38, 41-42.

[26] *Id.*, pp. 54-55, and associated slide, **AGS 49**, PowerPoint slide 19.

[27] *Id.*, pp. 59-60.

[28] *Id.*, pp. 59-66. *See also Id.*, p. 179 (Dr. Provin's response to Mr. Delmar: "We could expect a drawing of, at the bottom of the roots,...up to another four feet would be reasonable.").

[29] *Id.*, pp. 119-20.

testimony where he said he would excavate only to six to eight feet in depth to get to an EC of less than 2.[30] During panel questions, Mr. Snellgrove asked Dr. Provin:

> Q. ....[I]s there some depth from the surface that you would feel would not need to be disturbed in order to support the intended uses that were identified earlier on your PowerPoint, the crop growth?
>
> A. As we look at a number of publications that I believe have actually been submitted here, one of the API documents, they refer to *six foot as often the minimum level. I'm in that six-to-eight foot area*, unless we have an area that is hypersaline immediately below that.[31]

(Emphasis in italics added).

All of the evidence supports the need to remediate **this particular Sharkey clay salt-impacted soil** to a depth greater than the three feet. The Agency agrees with the testimony as to the characteristics of Sharkey clay soil, including the potential distance from crop roots to plant-available water, and finds that the most feasible plan for protection of the natural resources and environment must remediate the soil at the Plug Road property to a depth of eight (8) feet.[32] Whether remediation to a depth greater than eight feet may be required at some future time will depend on whether the shallow groundwater monitoring results, field inspections, and analytical results from soils indicate the elevated salt levels have failed to come down within limits after the initial remediation.

As far as the horizontal extent of soil remediation needed in the AOIs, the TD Plan proposed to remediate 0.49 acres at the South AOI and 0.38 acres at the North AOI. The AGS Plan

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[30] *Id.*, p. 135.

[31] *Id.*, p. 172 (Dr. Provin's response to Mr. Snellgrove.).

[32] *Id.* The Agency has chosen the more conservative depth in Dr. Provin's response to Mr. Snellgrove, and believes that it is supported by all of the testimony concerning the properties of the Sharkey clay soil at the site, and the crops that have been grown, or foreseeably could be grown at the site.

proposed larger remediation areas, but totaling less than five acres. The AGS Plan would remediate 2.47 acres and 1.64 acres more at the South AOI and North AOI, respectively.[33] The difference may be, in part, related to depth of contamination. AES may have included acreage for remediation where below surface contamination migrated from the sources and remained below three feet, and would not have been included by Tensas Delta in its proposal since its proposal was only down to three feet. Also, the difference may in part be due to the fact that an EM31 meter was used by AES to gather conductivity data.[34] The EM31 meter is not as precise as actual analytical sampling. Where AES relied on a conductivity meter and not actual sampling, Tensas Delta (and AES) should conduct actual sampling to confirm the horizontal extent of the soil remediation.

Mr. Daigle, Tensas Delta's soil expert, explained the concept of the soil continuum, and he testified that the soil remediation should minimize, to the extent possible, any disturbance of the natural soil profile or continuum.[35] The Agency agrees with this objective. That is the reason that

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[33] The AGS Plan, n. 3, *supra*, Section 12.3.1 ("Soil"), indicates that the horizontal area that needs to be remediated at the South AOI are two areas of 2.47 acres and 0.49 acres, while the TD Plan, n. 2, *supra*, Section 5.1 ("Discussion of and Comparison to 29-B Soil Standards"), indicates that the total horizontal area that needs to be remediated for the two former pit areas, is 0.49 acres, or a difference between the two plans of 2.47 acres. *See also*, Upthegrove testimony, 8/8/13, @ Vol. 4, pp. 138, 143-44 (as to two pits at South AOI). The same figures for the North AOI are 2.02 acres (AGS), 0.38 (TD), and 1.64 acres (difference).

[34]The AGS Plan, n. 3, *supra*, Section 4.2.1 ("Terrain Conductivity Surveys"), states that AES used a "Geonics, Ltd., model EM-31 MK II terrain conductivity meter to collect conductivity data from investigated areas." Mr. Upthegrove stated that "within...about the upper most five meters, so about six [sic] feet below land surface....[w]e've seen that to be a good screening tool to just help determine where there's absence, presence, and relative concentration of salt....Mr. Arabie's team did that work. We weren't out there for the work, but we looked at that data...." Upthegrove testimony, 8/8/13, @ Vol. 4, pp. 126-27.

[35] *See* Daigle testimony, 8/9/13, @ Vol. 5, pp. 93, 114, 141-43, explaining that excavation interrupts the [physical soil] continuum and that "breaks it, severs it," but that the proposed gypsum, hay and nitrogen process is aimed at restoring "the chemical component" of the continuum, with the goal to "maintain the continuum while interrupting the continuum;" the proposed remedy seeks to "minimize the impact to the soil continuum." In connection with his testimony, Mr. Daigle's slide presentation, **TD DNR Exhibit 24**, PowerPoint slide 17, addressed this issue, stating that under the proposed method of chemical and mechanical treatment, "the soil is being...reconstructed as closely

Tensas Delta has proposed treating salt-impacted soil where the EC results >4 mmhos/cm and <10 mmhos/cm with gypsum, hay, and nitrogen fertilizer in one foot layers and **returning the treated layers to the same soil horizon**, on top of a gypsum layer and a six inch thick continuous capillary break. Both Tensas Delta experts, Mr. Daigle and by Mr. Upthegrove,[36] testified that they believe this method can be used effectively to remediate the soil at the Plug Road property. But, they were not able to confirm with any specific examples where this method had been used successfully in similar Sharkey clay soil structure, although there was some discussion about several fields, including a Jennings Field, and one panelist, Mr. Snellgrove, questioned Mr. Upthegrove about the similarity of the Jennings Field.[37]

Mr. Daigle testified that while the Sharkey clay soil is a heavy smectitic clay soil that is poorly drained and fairly impermeable, adding the gypsum will increase the soil porosity, and adding organic matter will increase pore volume even more.[38] He testified if the gypsum amendment doesn't work, they can always go back and excavate more, but under the Arabie plan, once you have "dug it all up" there is no going back.[39]

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as possible to its former layer orientation...[t]his will maintain, as closely as possible the 'soil continuum' that is so important to proper soil function." *See also* Provin testimony, 8/13/13, @ Vol. 6, pp. 167-68. Dr. Provin for Plug Road, while saying he would take the AES Plan over the TD Plan, acknowledged any soil backfilled should have "soil texture... somewhat similar" down to the bottom of the excavation.

[36] *See* Daigle testimony, 8/9/13, @ Vol. 5, pp. 110-14 & associated slide, **TD DNR Exhibit 24**, PowerPoint slide 16 ("Tensas Delta Soil Treatment Plan"). See also Upthegrove testimony, 8/8/13, @ Vol. 4, pp. 143-51 & associated slide **TD DNR Exhibit 19**, PowerPoint slide 30 ("Tensas Delta Soil Remedy").

[37] *See* Upthegrove testimony, 8/9/13, @ Vol. 5, pp. 49-52 (responding to Mr. Snellgrove's questions about Jennings field).

[38] *See* Daigle testimony, 8/9/13, @ Vol. 5, pp. 111-12.

[39] *Id.*, p. 144.

Dr. Provin, Plug Road's soil expert, testified he has used gypsum to remediate salt-affected soils numerous times, but he said it is necessary to look at this Sharkey clay soil differently than a silt loam soil, which he indicated was the soil type in the Jennings Field discussed above.[40] He testified about what he considered limitations to the chemical amendment process with gypsum proposed, and with the capillary break concept.[41] But, he admitted the "Arabie plan...pretty invasive," relying "on digging and hauling and then replacing that soil."[42] He did state, as noted earlier, he would remove the soil down to at least ten feet, analyzing salinity in one-foot increments through a grid sampling system, which would allow soil to be put back in place if it was not contaminated.[43]

It is unclear to the Agency from all of the testimony whether the Tensas Delta-proposed method of chemical amendment with gypsum, with a capillary break, will actually work in the Sharkey clay soil at this site. It is for this reason that the Agency considers the most feasible plan as including a site specific treatability study to determine the feasibility and effectiveness of the proposed gypsum treatment method in this Sharkey clay soil, and in reducing the EC levels to LAC 43:XIX.313D.3 criteria of 4 mmhos/cm or less throughout the vertical and horizontal salt - impacted soil areas at the Plug Road property to a depth of eight (8) feet. If the treatability study demonstrates that there will be compliance with the soil EC criteria of 4 mmhos/cm or less, then

[40] *See* Provin testimony, 8/13/13, @ Vol. 6, pp., pp. 91, 121-22.

[41] *Id.*, pp. 92-108.

[42] *Id.*, pp. 110-11.

[43] *Id.*, pp. 119-120.

Tensas Delta can proceed to implement the treatment method. If not, then the most feasible plan should excavate and dispose of all of this soil to a depth of eight (8) feet.

Tensas Delta may elect to implement a site specific and comprehensive groundwater evaluation, to the Agency's satisfaction, that includes at a minimum all additional monitor well installations and data specified in the Agency's most feasible plan for groundwater evaluation and, based on the conclusions derived from the additional groundwater evaluation results, propose an alternative soil and groundwater remediation plan in accordance with LAC 43:XIX.Subpart 1.Chapter 3, including the exceptions provisions of LAC 43:XIX.319 and LAC 43:XIX.313, as necessary.

IV. GROUNDWATER EVALUATION

The information provided to LDNR/Agency before and during the hearing clearly established that groundwater below and surrounding the former exploration and production pit locations at the Plug Road property exceeds applicable salt parameters.[44] Tensas Delta's plan proposed monitoring the shallow groundwater, which admittedly exceeds RECAP standards,[45] and

[44] *See* TD Plan, n. 2, *supra,* Executive Summary, no. 5: "Shallow groundwater within a limited area immediately beneath the former small pits exceeds RECAP standards as a result of historical E&P activities, but do not pose a threat to the water quality observed in the RRVA beneath the site due to the naturally poor water quality of the RRVA and an upward groundwater flow from the RRVA to the shallow zone." *See also* TD Plan, Section 4.2.1 ("LDEQ Groundwater Standards"), using SMCL of 250 mg/L ("ppm") as standard for chlorides and EPA drinking water advisory limit of 60 mg/L ("ppm") as standard for sodium; and TD Plan, Section 5.2.6.2 ("Comparison of Groundwater Data to RECAP Screening Standards"), Tables 3.7, 3.9 & 5.2 reporting shallow wells with chlorides as high as 12,700 ppm and sodium as high as 7,380 ppm. *See also* AGS Plan, n. 3, *supra,* Section 11.2 ("Recommendations for Corrective Action based on RECAP Findings"), using RECAP Standard for chlorides of 70 ppm (background chlorides according to AGS) and RECAP Standard for sodium of 60 ppm, Table reporting shallow groundwater with 13,100 ppm chlorides and 7,380 ppm sodium.

[45] *See* n. 44, *supra.*

proposed periodic reporting of the monitoring results to LDNR.[46] This "shallow groundwater strategy" required an exception for good cause pursuant to LAC 43:XIX.319 since it does not bring the groundwater to "background concentration" as set forth in LAC 43:XIX.303.C.[47] The plan did not include a separate plan complying with Statewide Order 29-B exclusive of §319 as required by LAC 43:XIX.611.F.1, and, did not include "sufficient proof that there is good cause to grant an exception or exceptions sought under §319" as required by LAC 43:XIX.611.F.2. This is the second reason that the TD Plan was deemed not in compliance with LAC 43:XIX.Subpart 1.Chapter 6.[48]

Plug Road's (AGS/AES) groundwater strategy included remediating the shallow groundwater **and** the RRVA, using a reverse osmosis groundwater recovery system estimated by Mr. Arabie at a cost in excess of $865 million, and would take fifty-six (56) years to complete.[49]

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[46] As to TD's provision for monitoring, *see* TD Plan, n. 2, *supra*, Section 4.4 ("Groundwater Assessment and Monitoring Goal"): "The objective of the groundwater assessment and monitoring program is to identify and monitor the water quality in the area of the shallow groundwater zone that appears to have been impaired by a historic produced water impact, while ensuring that the RRVA beneath the site is protected consistent with its current uses and reasonably-anticipated future uses and in consideration of its natural water quality." As discussed at the outset, Tensas Delta did **not** admit responsibility for elevated salt levels in the Red River Alluvial aquifer, but in fact proposed some monitoring in the RRVA.

[47] LAC 43:XIX.303.C provides in pertinent part: "Contamination of a groundwater aquifer or a USDW with E and P Waste is strictly prohibited." The February 25, 2011 LDNR/LDEQ Memorandum of Understanding ("MOU"), Item No. 2, indicates that LDNR and LDEQ consider Section 303.C to be a "background concentration" requirement for groundwater under 29-B, and that application of RECAP procedures for evaluation or remediation of groundwater at E&P sites is considered to be an "exception" to Statewide Order 29-B. While Mr. Stover categorized the shallow groundwater as Groundwater 3 classification, *see* Stover testimony, 8/6/13, @ Vol. 2, p. 191, he also testified that the shallow groundwater is in direct hydraulic communication with the alluvial aquifer. *See* Stover testimony. 8/5/13, @ Vol. 1, p. 187.

[48] *See* pages 7-8 of text, *supra*, as to the first reason that the plan was not in compliance.

[49] *See* AGS Plan, n. 3, *supra*, Section 12.2.2 ("Groundwater"), with cost of installation, maintenance, and reverse osmosis, estimated at $865,801,454. *See* Arabie testimony, 8/15/13, @ Vol. 8, p. 184 & associated slide, **AGS 68**, PowerPoint slide 48.

Most of the cost, ninety percent or more, is for transportation and offsite disposal.[50] At this time, particularly where the Agency does not have sufficient information about the alluvial aquifer and the source of the chlorides, as discussed below, the Agency considers this groundwater plan excessive, and not feasible.

There is evidence of elevated chloride levels in the RRVA beneath the Plug Road property,[51] but there it is not clear evidence as to whether the elevated chloride levels are being caused by former E&P operations, or are naturally occurring. Three witnesses (Mr. Stover, Dr. Reynolds, and Dr. Keuper) testified on behalf of Tensas Delta that the elevated salt in the alluvial aquifer was not from E&P operations, and two of those, Mr. Stover and Dr. Keuper, testified that the chlorides were naturally occurring and coming from the underlying Williamson Creek aquifer, but all of the evidence they offered was circumstantial and inconclusive. Mr. Stover, based principally on his review of historical information (geological articles, studies, and reports related to Catahoula Parish, or the surrounding region), concluded there was direct hydraulic contact between the alluvial aquifer and the underlying Williamson Creek aquifer, which he said was naturally salty.[52] Although he believed there was a sample taken from Williamson Creek which established this,[53] Mr. Bray, an expert hydrogeologist for Plug Road, disputed some of the interpretations and conclusions that Mr. Stover drew from the historical articles, studies and

[50] *See* Arabie testimony, 8/15/13, @ Vol. 8, p. 222.

[51] The AGS Plan, n. 3, *supra*, Section 11.2 ("Recommendations for Corrective Action based on RECAP Findings"), reports chloride levels of 5680 ppm in the alluvial aquifer. The AES Alluvial Aquifer Chloride Map, *see* **TD DNR Exhibit 14**, PowerPoint slide 28, used by Mr. Stover during his testimony, shows elevated chloride levels as high as 5380 ppm, and generally in the 4000 to 5000 ppm range throughout the vicinity of the AOIs.

[52] *See* Stover testimony, 8/6/13, @ Vol. 2, pp. 182-83 & associated slide, **TD DNR Exhibit 14**, PowerPoint slides 52- 53.

[53] *See* Stover testimony, 8/5/13, @ Vol. 1, pp. 134-35, 146.

reports, notably, the interpretation that there is an incision from a side channel of an old river bed underlying Plug Road that results in hydraulic connection between the alluvial aquifer and Williamson Creek, and disputed that there was any sample of water which came from Williamson Creek beneath Plug Road. He provided a soil core during his testimony which suggested the water sample Mr. Stover relied on was really taken from the alluvial aquifer, not from Williamson Creek. He also testified that "all borings that have been installed have encountered clay...and there's not a hydraulic connection between the sand of the alluvial aquifer and the Williamson Creek."[54] Dr. Keuper, who testified on behalf of Tensas Delta that there was upward gradient in the alluvial aquifer which he said would prevent contamination from the shallow groundwater from moving downward into the alluvial aquifer, admitted that there have been no water samples of Williamson Creek taken:

> Q. Now just so the panel is clear, regarding this opinion that there are chlorides in the Williamson Creek aquifer that have migrated into the alluvial aquifer, neither you nor any of the oil company's other experts ever took any water samples from the Williamson Creek formation beneath the Plug Road property; right?
>
> A. Not from beneath the Plug Road property, that's correct.[55]

This means that there was no direct sampling evidence at the hearing that established Williamson Creek is salty beneath Plug Road, and thus no direct evidence that the salty conditions in the alluvial aquifer are coming from Williamson Creek below as opposed to from the contaminated soil and shallow groundwater above. The Agency does not feel that Dr. Reynolds' isotope analysis, relying as it did on only two alluvial aquiver water samples and only one "unimpacted" sample, selected in a way that they do not appear to have been based on any statistical or other

[54] *See* Bray testimony, 8/14/13, @ Vol. 7, pp. 282-84.

[55] *See* Keufer testimony, 8/14/13, @ Vol. 7, p. 131.

methodology that would ensure that they were truly representative of what they purported to be, in relation to Wilcox formation water, is sufficient proof that the source of chlorides in the alluvial aquifer was something other than E&P operations. Simply put, the analysis did not appear to be based on representative, or on statistically sufficient, data.

The dispute as to alluvial aquifer groundwater is simple to understand. Tensas Delta claims that 1) Williamson Creek is salty, and 2) is hydraulically connected to the alluvial aquifer beneath Plug Road, so that 3) Williamson Creek is the source of the elevated salt in the alluvial aquifer. Plug Road disputes Tensas Delta's claim, and says that that there is a confining layer of clay in place beneath Plug Road that separates the two aquifers and prevents whatever is in the Williamson Creek aquifer from getting into the alluvial aquifer.

But neither side provided any direct evidence to support or refute No. 1, and **Tensas Delta did not present any direct evidence to support No. 2**, and **Plug Road's boring, B-14, evidence is not sufficient evidence to establish that there is a complete clay layer between the two aquifers beneath Plug Road**. In addition, on the collateral issue of leakage from plugged and abandoned wells, despite the testimony of Mr. Bazer and Dr. Warner on behalf of Tensas Delta, there is simply not enough direct evidence to decide whether one or more of the plugged and abandoned wells, (SN 159595) (T-125) & (SN 164189) (T-133), particularly the salt water disposal well, T-133, has leaked and caused any adverse salt impact to the surrounding soil and/or groundwater.

Based on all applicable information provided to the Agency before, during and after the hearing, it has been determined that conclusive, comprehensive sound and objective site specific lithology and aquifer information or data does not exist at this time to make a reasonable

assessment of whether either of the parties' proposed groundwater strategies would be effective or even necessary.

Additional geologic, hydrogeologic, lithologic, shallow aquifer, Red River Alluvial aquifer and Williamson Creek aquifer site specific data is necessary for the Agency to complete its review and assessment of the vertical and horizontal extent of impact to groundwater resulting from past exploration and production activities at the Plug Road property.

The groundwater evaluation plan is set forth in detail in the Most Feasible Plan, including estimated cost, and is designed to provide Agency staff with additional information that has been determined to be necessary at this time to determine the source of elevated chlorides (naturally occurring or E&P Waste) in the Red River Alluvial aquifer and to consider and evaluate the feasibility of regulatory-appropriate groundwater remediation options that may be implemented in the shallow aquifer and, if necessary, the Red River Alluvial aquifer below the Plug Road property. It is anticipated that the information derived from installation and quarterly sampling of the wells included in this plan coupled with the previously installed wells at the Plug Road property will be beneficial in evaluating groundwater conditions around the former production well (SN 159595) (T-125) and salt water disposal well (SN 164189) (T-133) locations to determine if one or both well bores are contributing to the presence of elevated chlorides in the shallow or alluvial aquifer at the site.

V. CONCLUSION

In consideration of, and based on, all the evidence, the Agency's Most Feasible Plan is the most reasonable plan which addresses the admitted environmental damage to soil and shallow

groundwater, and also addresses the alluvial aquifer issue, in conformity with the Louisiana Constitution, Article IX, Section 1 to protect the environment, public health, safety and welfare, and is in compliance with the specific relevant and applicable standards and regulations as mandated by La. R.S. 30:29.

James H. Welsh
Commissioner of Conservation

Date 10/3/2013

STATE OF LOUISIANA
DEPARTMENT OF NATURAL RESOURCES
OFFICE OF CONSERVATION

IN RE: **DOCKET NO. ENV-L-2013-02**

Agri-South, L.L.C., et al. v.
Exxon Mobil Corporation, et al.
Docket No. 24,132,
Seventh Judicial District Court,
Parish of Catahoula

EXHIBIT 1 TO WRITTEN REASONS (PANELISTS AND THEIR BACKGROUNDS)

The seven panelists who served for the public hearing in the captioned case from August 5-16, 2013 are:

1. **Mr. Gary W. Snellgrove**. Mr. Snellgrove has a Bachelor of general studies from LSU in 1988, and an M.S. in environmental science from McNeese State University in 1993. His training at McNeese concentrated in environmental technology, environmental remediation, and environmental cleanups, and included courses in solid waste, hazardous waste, and groundwater issues. After working in the petrochemical industry in environmental matters for the next five years, including as a project manager for the Citgo Refinery in industrial hygiene and filtration services, he joined LDNR in 1998. He started as an environmental impact manager working with the injection and mining division in the E & P waste management program. In 2007, he became the Environmental Division Director at LDNR with responsibility for the legacy site remediation program and groundwater resources management. He is currently in that position today. He previously served on the LDNR panels for Public Hearings held pursuant to Act 312 in the Tensas Poppadoc (2009), Savoie (2012), and Avahoula Resources (2013) cases.

2. **Mr. Stephen Pennington**. Mr. Pennington has a B.S. in renewable natural resources from Texas A&M University in 1981. He worked in a variety of jobs that required technical training, including lab technician at Dow Chemical, quality assurance in the analytical chemistry lab at Ciba-Geigy, wetland delineations and endangered species surveys at HNTB Corporation, paralegal work on environmental cases for the Kean

Miller law firm, naturalist interpretative work for the Office of State Parks, and then, in 1999, he joined LDNR as a coastal resource scientist in the Coastal Management Group. In 2007, he transferred to LDNR's Office of Conservation to join the legacy group. In 2010/2011, his title became environmental impact manager, and he was involved with above ground issues, mainly soils and vegetation, but his duties also included looking at groundwater data to compare it to screening standards under RECAP. He reported directly to Mr. Gary Snellgrove. He is currently in that position today and continues to report directly to Mr. Snellgrove. He previously served on the LDNR panels for Public Hearings held pursuant to Act 312 in the Tensas Poppadoc (2009), Reese (2012), Savoie (2012), and Avahoula Resources (2013) cases.

3. **Mr. Christopher M. Delmar**. Mr. Delmar has a B.S. in geology from Louisiana Tech University in 2002, and attended LSU for two years in the Masters program for geology with specialization in hydrogeology. He completed all of the Masters work with the exception of completing his thesis. He joined LDEQ in 2005 as an Environmental Program Analyst, and then moved to an Environmental Scientist in the chemical accident prevention program. In 2008, he joined LDNR as a geologist working in the legacy group and groundwater resources group. He is currently in this position today. In connection with legacy work, he reports to Mr. Stephen Pennington. He previously served on the LDNR panels for Public Hearings held pursuant to Act 312 in the Savoie (2012) and Avahoula Resources (2013) cases.

4. **Ms. Sabrina Vutera**. Ms. Vutera received a B.S. in zoology from Southeastern Louisiana University in 1999. In January of 2000, she began her career as an Environmental Scientist at Louisiana Department of Environmental Quality in the Office of Environmental Compliance, Enforcement Division. She performed technical reviews of multi-media referrals for regulatory comprehensiveness and consistency to support violations and drafted appropriate enforcement actions for the following media: Solid Waste, Hazardous Waste, Underground Storage Tanks, Radiation, and Water Quality. She continued within the LDEQ for over thirteen years. In January of 2013, she joined the Louisiana Department of Natural Resources in the Office of Conservation as an Environmental Impact Specialist working in the legacy group. She is currently in this position today and reports directly to Mr. Stephen Pennington. She previously served on the LDNR panel for Public Hearing held pursuant to Act 312 in the Avahoula Resources (2013) case.

5. **Mr. Travis Williams**. Mr. Williams has a B.S. in geology from Western Kentucky University in 1999 and an M.S. in geology from the University of South Carolina in

2001. He worked as a hydrogeologist for the South Carolina Department of Health and Environmental Control, (SCDHEC) regulating the assessment and remediation of underground storage tank (UST) sites under a risk-based program. He then joined the Louisiana Department of Environmental Quality in 2003, as a geologist regulating the assessment and remediation of UST, solid, and hazardous waste facilities under RECAP as well as geological support for solid and hazardous waste permits. In 2007, he worked as a geologist in a private consulting firm in Grand Rapids, Michigan and in 2011 as a hazardous waste and safety specialist in the chemical and radiation safety sections at the University of Houston in Houston, Texas. Recently, Mr. Williams joined the Louisiana Department of Natural Resources and holds the title of Associate Scientist in the Environmental Division working on legacy sites and special projects, reporting directly to Mr. Gary Snellgrove. He previously served on the LDNR panel for Public Hearing held pursuant to Act 312 in the Avahoula Resources (2013) case.

6. **Mr. J. Brent Campbell, P.E.** Mr. Campbell has a B.S. in petroleum engineering from LSU in 1984. He joined Pipeline Division at LDNR as a staff engineer in 1984 and worked in that position until 1989 at which time he moved into the Engineering Division/Inspection and Enforcement Section at LDNR at the same level. His responsibilities in that section included addressing compliance issues at oil and gas facilities such as abandonment of wells and associated site restoration, closure of oilfield pits, remediation of onsite spills, and remediation of groundwater. In 1996, he became manager of the section and continued in that position until 2006. In 2006, he became the Director of Pipeline Division of Conservation until early 2013. In April of 2013, he became the director of the Engineering Regulatory Division at LDNR with responsibility over the Inspection and Enforcement Section, Oilfield Site Restoration Section, and the three District Offices. He is currently in that position today. He previously served on the LDNR panel for Public Hearing held pursuant to Act 312 in the Avahoula Resources (2013) case.

7. **Brandon Breaux.** Mr. Breaux is currently an Engineer Intern with the Office of Conservation. He graduated from LSU in December 2010 with a B.S. in biological engineering. He has been with Louisiana Department of Natural Resources since January 2011 working in the Environmental Division. He is primarily assisting in the regulatory oversight and groundwater resource management. Duties include implementation and enforcement of regulations under LAC56:I Chapters 1-7 for water well registration, construction, plugging and abandonment and database management. This case is Mr. Breaux's first service on an Act 312 panel.

Mr. Williams is employed by LDNR, but not within the "Office of Conservation." The other six panelists are employed by LDNR within the Office of Conservation.

STATE OF LOUISIANA
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EXHIBIT 2 TO WRITTEN REASONS
(EXPERT WITNESSES WHO TESTIFIED)

The expert witnesses who testified at the Agri-South Public Hearing held August 5-16, 2013:

Expert witnesses who testified on behalf of Tensas Delta:

1. **Mr. Stewart Stover**. He has a B.S. in geology and an M.S. in geosciences, both from University of Louisiana Monroe (formerly Northeast Louisiana). He is the principal hydrogeologist for Hydro-Environmental Technology located in Scott, Louisiana. He has been with HET for 23 years. He was tendered and accepted as an expert in areas of geology, hydrogeology, site groundwater investigation and remediation in accordance with 29-B and RECAP. 8/5/13, @ Vol.1, pp. 66-67, 70 and 73.

2. **Mr. Joseph Austin**. He has a B.S. in business from Trinity University in Texas. He is the president of Earth Measurement Corp. located in the Houston, Texas area, which is a company he formed in 1990. EMC specializes in near surface geophysical measurements. He was tendered and accepted as an expert in the interpretation of geophysical surveys and geophysical data interpretation data. 8/6/13, @ Vol. 2, pp. 218, 221, 227, 233-34.

3. **Dr. David Reynolds**. He has a B.S. in applied science (geological engineering) from the University of Waterloo, Ontario, Canada. He has an M.S. and a Ph.D. in civil/ environmental engineering from Queen's University, Kingston, Ontario, Canada. He works for Geosyntec Consultants located in Kingston, Ontario, Canada. He was tendered

as an expert in hydrogeology, geochemistry and stable isotopic analysis, but only accepted for hydrogeology and stable isotopic analysis. 8/7/13, @ Vol.3, pp. 91-92, 104, and 109.

4. **Mr. Donald Bazer**. He has a B.S. in petroleum engineering from LSU. He has 50 years experience in the upstream oil and gas industry, including with Amerada Hess. He has been a consulting engineer since 1990, and presently works as a consulting petroleum engineer through DOR Lease Service in Lafayette, Louisiana. He was tendered and accepted as an expert in the field of petroleum engineering. 8/7/13, @ Vol.3, pp. 212-14, 218 and 219.

5. **Mr. David Upthegrove**. He has a B.S. in geology from the University of Oklahoma, and postgraduate work in geology and hydrogeology from the University of Louisiana Lafayette, Georgia State University, and the University of New Orleans. He works for Michael Pisani & Associates, an environmental consulting firm, and is located in Sugarland, Texas. He was tendered and accepted as an expert in geologist, hydrogeology and site assessment. 8/8/15, @ Vol. 4, pp. 112-15.

6. **Mr. Jerry Daigle**. He has a B.S. in agronomy with an emphasis in soil science from LSU. He did graduate work toward his M.S. at LSU, and during that time, did agriculture research for two years at the LSU agriculture experiment station. He spent 38 years with the United States Department of Agriculture ("USDA"), and while there he was the state soil scientist for Louisiana for 17 years. He presently works as a private consultant for a company he started, Blue Frog Environmental, Soils & Wetland Services. He was tendered and accepted as an expert in the areas of soil science, soil investigation, soil interpretation, soil classification and soil remediation. 8/9/13, @ Vol. 5, pp. 64, 75, 81 and 87.

7. **Dr. Don Warner**. He has a B.S. and an M.S. in geological engineering from the Colorado School of Mines. He has a Ph.D. in engineering science with a major in geological engineering, geology, and civil engineering from the University of California at Berkley. He was on the faculty in geological engineering at University of Missouri at Rolla, and then was chairman of the department for 12 years, and then dean of the School of Mines and Metallurgy for another 12 years. After retiring from University of Missouri at Rolla, he now lives near Austin, Texas and works in private consulting. He was tendered and accepted as an expert in the field of geological engineering and an expert in injection well technology. 8/13/13, @ Vol. 6, pp. 182-84, 188 and 189.

8. **Dr. Bernie Kueper**. He has a B.S. in civil engineering from the University of Waterloo, and a Ph.D. in contaminant hydrogeology from the Department of Earth Sciences of the University of Waterloo. He is on the faculty of Queens University in Kingston, Ontario, Canada, and has been on the faculty there for 23 years. He teaches undergraduate and graduate courses in groundwater flow, solute transport and remediation of contaminants. He was tendered and accepted in the fields of hydrogeology, fate and transport, site characterization, groundwater flow and groundwater remediation. 8/14/13, @ Vol. 7, pp. 8-9, 19 and 20.

Expert witnesses who testified on behalf of Plug Road:

1. **Dr. Tony Provin**. He has a B.S. in agricultural science, with a sequence in agronomy, from Illinois State University. He has an M.S. in soil fertility from Iowa State University. He has a Ph.D. in soil chemistry from Purdue University. He is employed by Texas A&M Agri-Life Extension Services as a professor and soil chemist. He has run the public service soil science laboratory at Texas A&M for 17 years. He was tendered and accepted as an expert in soil science, agronomy, soil chemistry, soil fertility, fate and transport of materials within soil, plant development, and remediation of salt-affected soils. 8/13/13, @ Vol. 6, pp. 12-14, 20 and 22.

2. **Mr. Brent Bray**. He has a B.S. in geology from Virginia Tech. He has an M.S. in geology, with an interest in hydrogeology, from LSU. He is employed by Sigma Environmental Inc. in Covington, Louisiana. He is a geologist, with emphasis in hydrogeology, and has been in environmental consulting in this field for 25 years. He was tendered and accepted as a geologist with a specialty in hydrogeology, including site investigation, contamination of soil and groundwater by oilfield products, and remediation of property contaminated by oilfield waste. 8/14/13, @ Vol. 7, pp. 252-53, 262 and 264.

3. **Mr. Austin Arabie**. He has an M.S. in environmental science from McNeese State University in 1973. He has been involved in environmental cleanup operations in Louisiana since 1984. He has been the principal in his own environmental consulting firm located near Deridder, Louisiana since 1989. He was tendered and accepted as an environmental scientist with a specialty in soil and groundwater sciences, including contamination of soil and groundwater by oilfield products and remediation of property contaminated by oilfield waste. 8/15/13, @ Vol. 8, pp. 138-42, 144-45, 150.