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INNOVATIVE APPROACH FOR RESTORING COASTAL WETLANDS USING TREATED DRILL CUTTINGS

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ABSTRACT

The leading environmental problem facing coastal Louisiana regions is the loss of wetlands. Oil and gas exploration and production activities have contributed to wetland damage through erosion at numerous sites where canals have been cut through the marsh to access drilling sites. An independent oil and gas producer, working with Southeastern Louisiana University and two oil field service companies, developed a process to stabilize drill cuttings so that they could be used as a substrate to grow wetlands vegetation. The U.S. Department of Energy (DOE) funded a project under which the process would be validated through laboratory studies and field demonstrations. The laboratory studies demonstrated that treated drill cuttings support the growth of wetlands vegetation. However, neither the Army Corps of Engineers (COE) nor the U.S. Environmental Protection Agency (EPA) would grant regulatory approval for a field trial of the process.

Argonne National Laboratory was asked to join the project team to try to find alternative mechanisms for gaining regulatory approval. Argonne worked with EPA's Office of Reinvention and learned that EPA's Project XL would be the only regulatory program under which the proposed field trial could be done. One of the main criteria for an acceptable Project XL proposal is to have a formal project sponsor assume the responsibility and liability for the project. Because the proposed project involved access to private land areas, the team felt that an oil and gas company with coastal Louisiana land holdings would need to serve as sponsor. Despite extensive communication with oil and gas companies and industry associations, the project team was unable to find any organization willing to serve as sponsor. In September 1999, the Project XL proposal was withdrawn and the project was canceled.

INTRODUCTION

Much of the southern portion of Louisiana is covered with marshes. Over decades of offshore and coastal oil and gas exploration and production, numerous major and minor channels have been carved into the marsh. In many instances, drilling sites are located in blind drilling slips. As these passages are cut into the marsh, historical water flow patterns change and the rate of erosion and loss of wetlands increases. An estimated 25 to 35 square miles of wetlands acreage is currently lost in South Louisiana each year.

The process of drilling oil and gas wells generates a large volume of ground-up rock particles that are coated with drilling fluid. These particles are called drill cuttings and are considered a waste product. For most coastal Louisiana wells, the cuttings are collected and hauled to an onshore disposal facility. This process creates a cost for the operator through disposal fees, transportation, and clean up of vessels and containers and disposal of the resulting washwater. The total disposal cost is generally in the range of $20 to $30 per barrel of drill cuttings.

In the mid-1990s, Greenhill Petroleum Corporation, an independent oil and gas company, proposed a project to test the viability of using treated drill cuttings as a substrate to restore damaged wetlands. If feasible, this process would provide an excellent opportunity to practice pollution prevention while restoring valuable wetlands acreage at no cost to the State of Louisiana. By comparison, over $226 million of government money was spent on wetland creation and restoration in Louisiana between 1990 and 1997. The proposed process would also allow a waste product to be reused for environmental benefit.

The proposed project consisted of laboratory tests to be conducted by researchers at Southeastern Louisiana University (SELU) to determine how well wetland plants would grow in two types of treated drill cuttings and under three different hydrological regimes, followed by a field pilot study. The U.S. Department of Energy (DOE) provided funding for the project in 1996. The laboratory studies were completed in 1998 (see below for details on methods and results), but Greenhill was unable to obtain regulatory approval for the project. Much of the rest of this paper describes the variety of regulatory issues and complications that impeded conduct of the field studies.

LABORATORY STUDIES

Reference 1 describes the study design and the results of the SELU work.

Study Design

Researchers at SELU set up a mesocosm test facility on the SELU campus in Hammond, Louisiana. The facility incorporated one hundred forty-four 200-liter growth vessels that were linked to four 3,000-liter water supply reservoirs. This system allowed an experimental design of:

- three hydrological regimes (moist but not flooded, permanently flooded, and daily tidal cycle fluctuation);

- four substrates (cuttings treated by two different processes [referred to as A and B],[1] topsoil, and cuttings treated by process A capped by 40 cm of dredged material);

- six types of wetland plants; and

- two replicates of each set of conditions.

Results

The cuttings treated by process A showed a low toxicity and were capable of supporting several species of wetland plants at levels of biomass production comparable to that of the dredged material commonly used in wetlands restoration projects. The cuttings treated by process B did not support good plant growth. Much of the poor growth was attributed to the high pH of the cuttings. The authors of reference 1 concluded that "results from this mesocosm project indicate that a field demonstration project utilizing restored drill cuttings is safe and will likely result in the creation of healthy and stable wetlands."

DOE provided funding in mid-1999 to conduct additional studies on the use of treated drill cuttings for growing wetlands vegetation. These studies have not yet begun.

REGULATORY APPROVAL FOR THE FIELD STUDY

Initial Efforts

Greenhill applied to the U.S. Army Corps of Engineers (COE) on November 27, 1995, for a Clean Water Act Section 404 permit (dredge and fill activities) to fill in a former drilling slip in the marsh near Venice, Louisiana to create a new area of wetlands. Dredged material was to be used to create berms to form an isolated cell that would then be filled with a blend of dredged material and drill cuttings. As part of the Section 404 review process, various agencies are provided an opportunity to comment on the application. On December 19, 1995, the Louisiana Department of Environmental Quality (LADEQ) wrote to Greenhill and noted that the activity of discharging drill cuttings to wetlands areas is not permitted without an exception from the EPA's Region 6 office in Dallas.

EPA also had the opportunity to comment on the application. In a January 29, 1996, letter to the COE - New Orleans District, the Marine and Wetlands Section of EPA Region 6 stated: "Although the discharge may be permitted as the discharge of 'fill material' for the purpose of creating marsh, the EPA is concerned that there is not

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[1] Process A separates drilling fluids from drill cuttings. Process B separates fluids from cuttings and also stabilizes metal and organic contaminants in a silica matrix.

sufficient information to make a reasonable judgement as to whether or not the proposed discharge will comply with EPA's 404(b)(1) Guidelines." Greenhill and SELU then proceeded with mesocosm studies as described above to demonstrate that treated drill cuttings mixed with dredged materials could support plant growth.

The U.S. Department of the Interior, Fish and Wildlife Service (FWS) also submitted comments on the application. In a January 22, 1996, letter, the FWS objected to the placement of drill cuttings into marshland unless the permit required metals analysis of site sediments before fill emplacement and of drill cuttings before and after blending with sediments.

On March 5, 1996, the COE wrote to the EPA Region 6 National Pollution Discharge Elimination System (NPDES) Permits Branch, asking EPA to "determine if you concur with our assessment of the application being subject to Section 402 jurisdiction [NPDES program]." On March 13, 1996, the NPDES Permits Branch responded to the COE, noting that EPA concurred with the COE's position that Greenhill's proposed project "is subject to Section 402 jurisdiction." EPA further noted that "cuttings from wells adjacent to the site of the proposed project would be covered by NPDES General Permit LAG330000 which prohibits the discharge of drill cuttings to Waters of the U.S." On April 4, 1996, the COE wrote to Greenhill advising the company that "the portion of the project involving the discharge of drill cuttings will be under the jurisdiction of the EPA."

Having made that jurisdictional decision, the COE withdrew from the project. EPA's NPDES Permits Branch believes that the proposed activity must be covered under an NPDES permit. If permitting must be done through the NPDES program, the project will be impeded because both the current NPDES General Permit LAG330000 and the national EPA effluent guidelines prohibit discharge of drill cuttings to coastal waters; the marsh areas where the site is located are considered coastal waters.

The LADEQ received NPDES program delegation on August 27, 1996. Greenhill hoped that LADEQ would be more receptive to the Section 404 permit idea than EPA had been. LADEQ indicated that it supported the wetlands restoration project but that it would follow EPA's position. In a May 29, 1997, letter to LADEQ, the EPA reiterated its position that NPDES Permit LAG330000 prohibited the discharge of drill cuttings and that the proposed Greenhill project constituted a discharge of drill cuttings. On June 19, 1997, LADEQ notified Greenhill that the proposed discharge of drill cuttings could not be authorized by its office.

During 1997, several other noteworthy events took place. Greenhill was taken over by Pioneer Resources, and the Greenhill employee who headed the wetlands restoration project left the company. Pioneer Resources showed little interest in continuing the project.

Efforts to Revitalize the Project

In 1997, DOE asked Argonne National Laboratory to become involved to see if there were any opportunities to get past the regulatory barriers that had stalled the project. Argonne contacted EPA's Office of Reinvention to see if any relief could be found and

was directed to speak with the reinvention coordinator for EPA Region 6. The coordinator indicated that the only regulatory mechanism that could be used for this project was a program known as Project XL. Projects that would be approved by EPA under Project XL must meet the following criteria:

1. *Environmental results* - Projects that are chosen should be able to achieve environmental performance that is superior to what would be achieved through compliance with current and reasonably anticipated future regulation.

2. *Cost savings and paperwork reduction* - The project should produce cost savings or economic opportunity, and/or result in a decrease in paperwork burden.

3. *Stakeholder support* - The extent to which project proponents have sought and achieved the support of parties that have a stake in the environmental impacts of the project is an important factor. Stakeholders may include communities near the project, local or state governments, businesses, environmental and other public interest groups, or other similar entities.

4. *Innovation/Multi-Media Pollution Prevention* - EPA is looking for projects that test innovative strategies for achieving environmental results. These strategies may include processes, technologies, or management practices.

5. *Transferability* - The pilots are intended to test new approaches that could conceivably be incorporated into the Agency's programs or in other industries, or other facilities in the same industry. EPA is therefore most interested in pilot projects that test new approaches that could one day be applied more broadly.

6. *Feasibility* - The project should be technically and administratively feasible and the project proponents must have the financial capability to carry it out.

7. *Monitoring, reporting and evaluation* - The project proponents should identify how to make information about the project, including performance data, available to stakeholders in a form that is easily understandable. Projects should have clear objectives and requirements that will be measurable in order to allow EPA and the public to evaluate the success of the project and enforce its terms. Also, the project sponsor should be clear about the time frame within which results will be achievable.

8. *Shifting of risk burden* - The project must be consistent with Executive Order 12898 on Environmental Justice. It must protect worker safety and ensure that no one is subjected to unjust or disproportionate environmental impacts.

Argonne met with the SELU researchers in November 1998 to determine if they were still interested in resurrecting the project. The researchers stated that they believed the project still had great potential and indicated that SWACO, an oil field waste treatment services company, and Xplor Energy, an independent oil company, were also interested in participating. The former Greenhill employee who had headed the wetlands restoration efforts was now employed by Xplor Energy. These organizations, along with DOE, formed a new project team. Argonne arranged for the project team to meet with EPA in Dallas on January 20, 1999, to discuss how the project might fit under Project XL.

EPA brought together representatives from several offices at Region 6 as well as providing telephone links to several persons from EPA headquarters. In contrast to earlier discussions which had not offered much flexibility or hope, the assembled group of EPA officials seemed receptive to the proposal. EPA made suggestions at the meeting and agreed to subsequently provide a detailed set of comments and information gaps in writing. By March 1999, EPA was willing to verbally commit to approve the project under a Section 404 permit assuming that the project team could adequately meet all of the Project XL criteria.

One of EPA's most important comments was that an approved Project XL project must have an official project sponsor who would take responsibility and assume liability for the project in the event things did not go as planned. Each member of the project team was asked to consider assuming the sponsorship role. No team members believed they were able to take on the responsibility. The team concluded that, for a project of this nature, the sponsor should be an entity that held title or access to the land areas that would be restored in case the project did not work out as planned and to ensure that access to the site remained available throughout the project. The most likely candidate, therefore, would be an oil and gas operator with large land holdings in coastal Louisiana. During the spring and summer of 1999, Argonne contacted several operators to seek their support and sponsorship for the project. All of the operators expressed interest in the concept of the project, but none would accept the sponsorship role. On July 15, Argonne met with an Environmental Subcommittee of the Louisiana Mid-Continent Oil and Gas Association and made a presentation on the proposed project. The companies represented there stated that they were not willing to expose themselves to the liability of the project and noted that even if the project was successful, they did not have sufficient assurance that EPA would provide suitable regulatory relief at the end of the project. Although they thought the project was a good idea, they expressed doubt that any oil and gas operator would take on the sponsorship role.

In September 1999, DOE, which had been providing the majority of the funding for the project, decided that it was not fruitful to continue without any strong hope of finding a project sponsor. At that time EPA was advised that the proposal would be withdrawn and the project canceled.

CONCLUSIONS

The SELU mesocosm studies demonstrated that the concept of using treated drill cuttings for restoring wetlands was sound and that properly treated cuttings did support good vegetative growth. The second round of mesocosm studies that will begin in the next few months will add to that body of knowledge.

This project pointed out that sometimes it is very difficult to introduce innovative concepts and procedures into a rigid regulatory structure. Regulators in traditional programs may have no incentives to be flexible. EPA's Office of Reinvention has made progress in offering alternative ways of doing business. In this case, they were receptive and offered hope, although demonstrating compliance with their list of criteria was a rather daunting task.

Finally, it was obvious that there is a substantial lack of trust between the regulatory agencies and the regulated community. In the early years of this project, EPA was unwilling to show flexibility to the industry to conduct a project that offered great pollution prevention potential because it was perceived to be outside of the normal regulatory bounds. In the later stages of the project, when EPA was preparing to allow the project to proceed under Project XL, the industry assumed that the outcome of the project would not be favorable to the industry because it did not trust EPA. The industry declined to participate, and the project could not proceed.

We do not wish to assign blame or point fingers for the project's failure. We do note, however, that in another noteworthy regulatory effort involving EPA and the oil and gas industry (i.e., the ongoing expedited effluent guidelines rulemaking on synthetic-based drilling fluids for the offshore oil and gas industry), EPA and industry have worked closely together for several years for mutual benefit (2). This rulemaking process has moved forward much faster than a traditional effluent guidelines could have, and the barriers of mistrust have begun to diminish.

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