



LOUISIANA NATURAL AND SCENIC RIVERS SYSTEM

# PERMIT APPLICATION

Permit # 891 (Assigned by Department)

The Louisiana Department of Wildlife and Fisheries' Scenic Rivers program is authorized by LRS title 56, Chapter 9 Part II. This law requires permits authorizing activities in or affecting rivers that have been designated by the Louisiana Legislature as Natural and Scenic. Information provided on this form will be used in evaluating the application for a permit. Information in this application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary, however, the data requested are necessary in order to communicate with the applicant and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

## APPLICANT INFORMATION

Name of Applicant	Southwestern Energy Production Co.	Name of Agent (if any)	Nixon Engineering Solutions, LLC
Address	2350 N Sam Houston Parkway E, Ste 125	Address	401 Hamilton Road, Ste 120
Address		Address	
City, State, Zip	Houston, TX 77032	City, State, Zip	Bossier City, LA 71111
Phone	(281) 618-2874	Phone	(318) 747-9669

## DESCRIPTION OF THE PROPOSED ACTIVITY

Brief summary of the description and purpose of the proposed activity (details to be attached as a separate document)
Water withdraw for hydraulic fracturing of oil and gas wells.
Is any portion of the activity complete? YES <input checked="" type="radio"/> NO (If yes indicate month and year of completion)

## LOCATION OF PROPOSED ACTIVITY

Stream Name	Bayou De Loutre	Names, Addresses, Phone Numbers of Adjacent Property Owners
Parish	Union Parish	
Section	28	
Township	T22N	
Range	R01E	
Latitude/Longitude	32 51' 40.6"N / 92 22' 10.8"W	

## ENVIRONMENTAL ASSESSMENT

Must be a separate document. See the attached instruction sheet for completing the assessment.

## CONFIRMATION OF INFORMATION ACCURACY

Application is hereby made for a Scenic River Use Permit to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that, to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities, or I am acting as the duly authorized agent of the applicant.
--

Rent M. Nixon  
Signature

01/22/2014  
Date

Louisiana Scenic River Permit Application for:  
**Water Withdraw on Bayou DeLoutre**  
**@ Patterson Lake**  
UNION PARISH, LA  
JANUARY 20, 2014



*Prepared for:*  
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550 GREENS PARKWAY  
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## State of Louisiana

BOBBY JINDAL  
GOVERNOR

DEPARTMENT OF WILDLIFE AND FISHERIES

ROBERT J. BARHAM  
SECRETARY

Dear Scenic River Permit Applicant:

Please review and concur on the following statement regarding the issuance of permits by the Louisiana Department of Wildlife and Fisheries. This agreement must be signed and returned before a Scenic River Permit can be issued.

"I have been advised and do understand that by applying for and accepting a Scenic Rivers permit issued by the Louisiana Department of Wildlife and Fisheries, I am being allowed to engage in an activity which would otherwise be prohibited by law or for which a permit is required. I understand that the permit is not a license and confers no property right upon me. I specifically agree to abide by all State and Federal fish and wildlife laws and regulations, and all State and Federal laws and regulations which relate to this permit or the permitted activity, and by all other terms and conditions of this permit. I understand that the permit for which I am applying may be suspended, annulled, withdrawn or revoked and that I may be assessed civil penalties, all in accordance with the provision of the Louisiana Administrative Procedure Act, and that I may be denied future permits as a consequence of my failure to fully and completely comply with the terms and conditions of the permit, as well as other laws and regulations pertinent thereto. If served with or notified of a cease and desist order signed by the Scenic Rivers Administrator, I agree to immediately and without delay cease all activities and operations which relate to the permitted activity or which are impacting the Scenic River, until such time as the matter can be resolved in an adjudicatory hearing pursuant to the Louisiana Administrative Procedure Act. I understand and agree that any permit issued to me by the Louisiana Department of Wildlife and Fisheries is in the nature of a privilege which is being voluntarily extended to me by the Department and the failure on my part to cooperate with the Department can result in the loss of the privilege conferred and the denial of future requests for permits. By accepting this permit, I evidence my agreement to be bound by all conditions and stipulations set forth herein."

*Wayne Shortle*

Authorized Signature

*21 JANUARY 2014*

Date

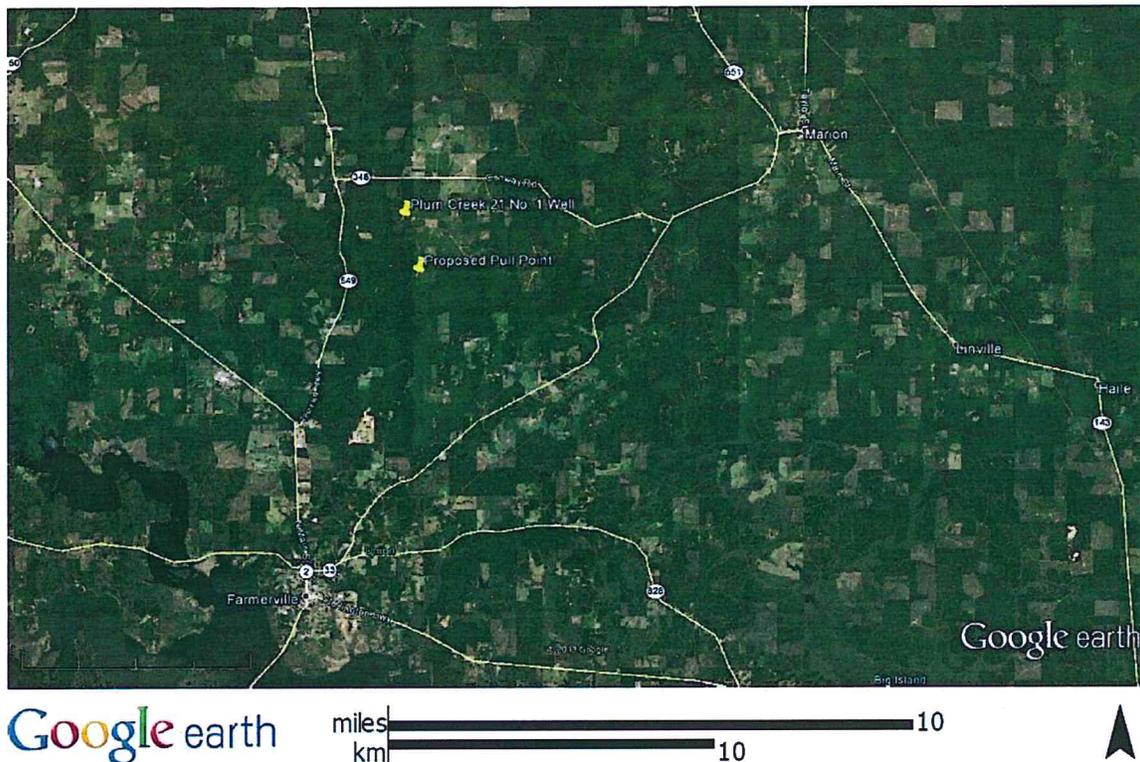
REV. 12/7/98

## **PROJECT DESCRIPTION**

Southwestern Energy Production Co. is working to develop the Brown Dense formation in Union Parish, LA. The current development and drilling schedule for this formation could consist of drilling one or more new wells per month for the next two years. The water needed for the hydraulic fracturing of these new wells is intended to come from Bayou DeLoutre. The approximate location of both the proposed well and the water withdraw location on Bayou DeLoutre are shown in the Vicinity Map (Figure 1).

As related to the Scenic Rivers Permit, the project will consist of the proposed water withdrawal at the following location on Bayou DeLoutre in Union Parish (Latitude 32°51'40.6" and Longitude 92°22'10.8"). The equipment for this withdraw will consist of a screened intake hose, a trailer mounted pump, and a temporary water line from the pump to the frac pit. The intake location is planned to be less than a mile from the well pad. It is anticipated that this withdraw location will be used for future wells over the next two years. It is expected that a single withdraw event will last 7-10 days.

**Figure 1 - Vicinity Map**

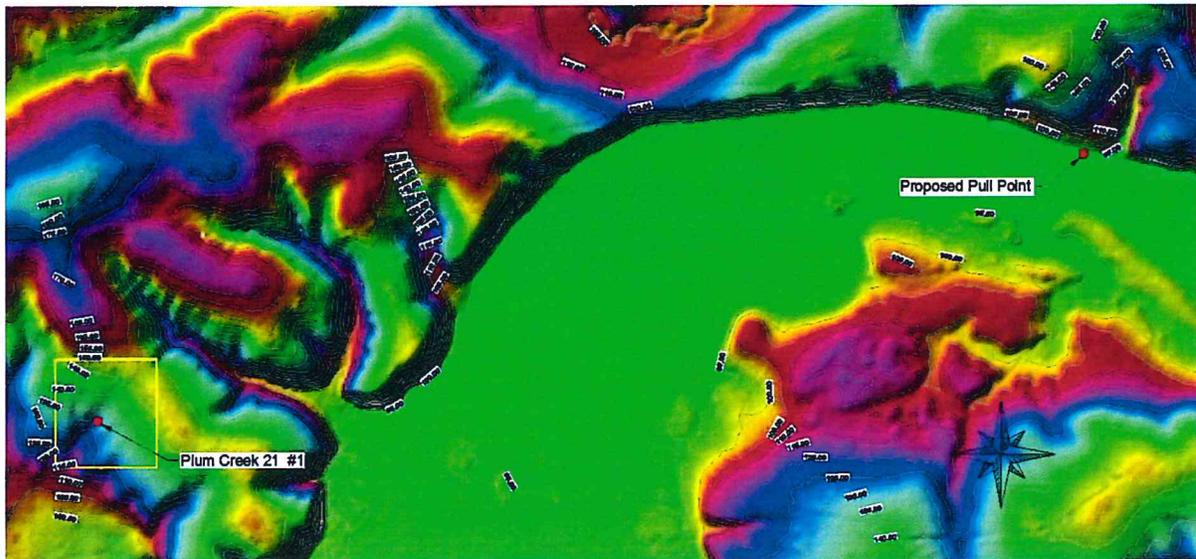


## **PROJECT LOCATION**

As mentioned in the project description the proposed withdrawal will be located on Bayou DeLoutre in Union Parish (Latitude 32°51'40.6" and Longitude 92°22'10.8"). This location is approximately 6.4 miles north of Farmerville, LA. Two additional location drawings are given in Figures 2 and 3. Figure 2 gives a

color coded representation of the ground topography. The topography data is taken from Louisiana 3m LIDAR data. Figure 3 gives an enlarged aerial photo with contour lines of the proposed project location.

**Figure 2 – LIDAR Elevation Data @ Withdraw Point**



**Figure 3 – Aerial Photo & Contours @ Withdraw Point**



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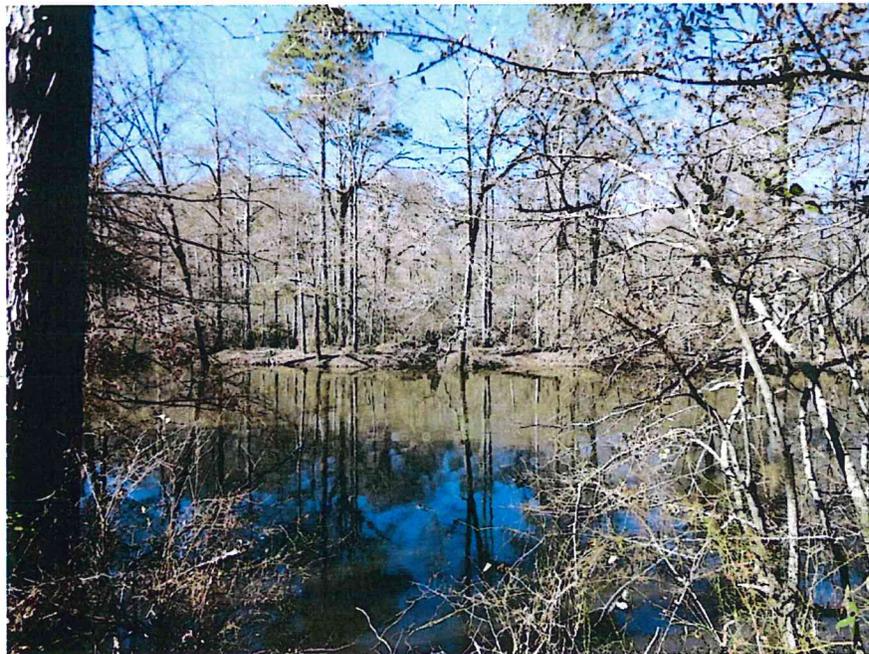
## **SITE PHOTOGRAPHS**

Photos of the project site were taken from the east side of the bayou.

**Figure 4 –East (Project Side) @ existing boat launch**



**Figure 5 – Project site looking west**



**Figure 6 – Looking east along the timber road and pine plantation**



### **OTHER REQUIRED PERMITS**

The following is a list of the other permits, which need to be acquired as part of the withdrawal and transportation of water from Bayou DeLoutre. This list is compiled based on our experience with similar projects, knowledge of the site, and the agencies involved. We reserve the right to amend this list if it is found there are other agencies or regulatory requirements which have been overlooked.

- Louisiana DNR – Running Surface Water Use CEA

### **ENVIROMENTAL ASSESSMENT**

#### ***Existing Land Use***

The proposed pull point is located on privately owned land. The surrounding area is predominately rural timber land.

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### ***Historical/Archeological Sites***

A search was conducted on the Louisiana State Register of Historic places. The nearest historic location is approximately 6.1 miles southwest of the project in Farmerville, LA. The project location is not a historical or archeological site according to the search.

### ***Economic Impact of the Project***

This is an exploratory well by Southwestern to assess the potential for their holdings in the Brown Dense/Lower Smackover formation. This single well will generate increases in tax revenue for Union Parish and the State of Louisiana through severance taxes, ad valorem taxes, sales tax and other taxing mechanisms. If the potential of the well is found to meet expectations, it could have further impacts in encouraging the development of the entire field across the northern Union Parish area.

### ***Wilderness/Rural Quality***

At the point of withdraw the natural wilderness quality along the east bank is minimal due to what appears to be a young pine plantation. Further a timber road comes down and runs along the east bank to rudimentary boat launch. The proposed pump will utilize this existing road and launch point.

### ***Scenic/Aesthetic Value***

The location of the withdraw point has natural scenic value both upstream and downstream. This value may temporarily suffer slightly with the addition of a trailer-mounted pump. However the temporary nature of the project should have no long term impact on the aesthetic value of the area.

### ***Recreational Use/ Opportunity***

There was no recreational use of this specific location occurring at the time of our visit. However the locals who drove us out to the site claim to regularly fish out of the bayou at this location.

### ***Ecological System Present***

The ecological system at the pull point appears to be typical for a section of natural bayou. The area within the channel banks is grass, dead leaves, and occasional trees. The east bank rises quickly into the pine plantation. While the west rises slower with more hardwood bottoms.

### ***Fish and Wildlife in the Area***

The pump is planned to be located on private land. This area appears to be regularly maintained by the land owner and the local hunting club. Due to the temporary nature of the pumps, no significant disruptions are anticipated to wildlife movements and habitats. Similarly the screened intake in the water for the short duration should have limited impact on any fish populations.

A review of the Department of Fish and Wildlife's rare species data base lists two endangered species for Union Parish they are the Red-Cockaded Woodpecker and the Bald Eagle. The habitats for these two endangered species are not found within the project limits and therefore should not be impacted by the planned temporary pumping. In addition, the database lists eleven species for Union Parish which have grades of S3 or less meaning their occurrence within Louisiana is rare to imperiled. Ten of these eleven

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species are fish or other aquatic life. Therefore care will be taken in adequate screening of the intake to limit uptake of aquatic life.

### ***Botanical Elements***

The vegetation on the banks of the stream is mostly dead leaves with occasional trees as can be seen in Figure 4. Opposite the main channel is a small strip of land that separates the channel and a much wider and shallow distributary of the bayou. In this distributary, there are cypress trees located throughout the channel.

### ***Geological Features***

There are no significant geological features visible from the surface.

### ***Hydrological Features***

The primary hydrological feature is Bayou DeLoutre and its associated floodplain. Bayou DeLoutre is a large bayou, which drains portions of Union Parish in Louisiana and Union County in Arkansas. The natural floodplain associated with this bayou is also fairly large at nearly a half mile wide as can be seen in Figure 2.

### ***Water Quality/Quantity***

The Louisiana 305 list published in March 22, 2012 by DEQ and approved by EPA does not list Bayou DeLoutre as an impaired water body.

The primary potential impact of this project deals with water quantity, as this project involves a large withdrawal. Therefore a detailed investigation was conducted to look at water quantity impacts. This investigation utilized two different methods determine if the existing bayou could support the proposed withdrawals without significant impact. Both methods show that the bayou can support water withdrawals.

### ***METHOD #1***

Velocity measurements were collected by Nixon Engineering Solutions, LLC (NES) using a Global Water FP211 velocity flow meter. Measurements were taken at points across the stream to determine an average velocity at the cross section. The cross section and current water surface elevation were surveyed by NES as well. The cross-section, measured field data, and calculated results are shown on the sheet titled "CEA X-Section" in *Appendix A: Maps and Figures*.

Using the cross section, water surface elevation, and velocity measurements the existing flow was calculated for Bayou DeLoutre as 151.7 cfs at the time of measurement with a current water surface of 90.2'. In addition, a series of calculations was performed to create a rating curve relating water surface elevations to flows values.

The proposed withdrawal data supplied by Southwestern Energy is shown in table 1.

**Table 1 – Proposed Withdrawals**

<b>Withdraw Characteristics</b>	<b>Minimum Allowable</b>
Max Pump Capacity	3.74 cfs
Total Monthly Withdrawal	3,500,000 gal

For the purposes of this report a minimum flow within the stream was established as a guide in determining adverse impacts to the stream. This minimum flow is such that the proposed withdraw will not utilize more than 5% of the total channel flow. It is quite possible that this stream will be able to support withdraws year round. Table 3 gives a summary of the minimum recommended flow conditions needed within Bayou DeLoutre to allow withdrawal.

**Table 2 – Minimum Stream Requirements for Withdrawal**

<b>Pump Capacity</b>		<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>100%</b>
10" Pump	Min Water Surface (NAVD 88)	87.9	88.5	89	89.4
	Daily Water Withdrawal	600,000	1,210,000	1,180,000	2,420,000
4" Pump	Min Water Surface (NAVD 88)	87.1	87.3	87.4	87.5
	Daily Water Withdrawal	90,000	180,000	270,000	360,000

As a practical application of verifying these minimum criteria it is recommended that a gage stick be placed at the proposed pull point with a mark at an elevation of 87.1 (NAVD 88). This mark will allow the proposed pumping operator to easily determine if it is safe to withdraw water at the proposed rate.

Estimated changes in the water surface due to a 3,500,000-gallon withdrawal were calculated assuming water was withdrawn at the calculated minimum stream requirements.

**Table 3 – Change in Water Surface Due to Proposed Withdrawal**

<b>Flow Conditions</b>	<b>Change in WS Elev</b>
Calculated Min WS	0.066 ft / 0.79 in

**METHOD #2**

The alternative calculation utilized low-flow data and pool surface area on Bayou DeLoutre at the pull point location. This analysis treated Bayou DeLoutre as a non-flowing body of water. The DEM data suggests that the bayou pools in this area and creates what is essentially a long lake. The locals referred to this section of the bayou as Patterson Lake. Using the approximate pool area of 39.1 acres, and the average monthly withdraw converted to acre-inches (128.9 ac-in) it was calculated that each monthly withdrawal would reduce the water surface elevation by 3.3" assuming no water is flowing into the lake.

Table 4 below gives a summary of the pertinent low flow data from Technical Report 70 "Low-Flow Characteristics of Louisiana Streams, 2003." The states low flow data suggests there is a flow rate of 4.7 cfs should be expected 99% of the year. If this were the only flow present for an entire month, then the

water being draining into Patterson Lake is approximately 91,130,676 gallons per month, or 26 times greater than the proposed withdraw volume.

**Table 4 – Low-Flow Characteristics of Bayou DeLoutre**

<b>Stream Characteristics</b>	<b>Value</b>
Drainage Area	141 mi <sup>2</sup>
7-day, 2-yr Low Flow	9.1 cfs
7-day, 10-yr Low Flow	3.2 cfs
Flow rate which is exceeded by 99% of days in a year	4.7 cfs

According to the published low-flow data and the pool analysis, the proposed withdrawal will not cause a significant impact to the bayou under even very low flow conditions. This location should support water withdraws all year. Monitoring and verification minimum of flows is still recommended.

### **LEGAL AGREEMENT**

See *Appendix B: Legal Agreement* for a copy of the signed legal agreement.

### **COMPLIANCE HISTORY**

The applicant has fully complied with the Scenic Rivers Act on previous projects in Louisiana.

### **STEPS TO MINIMIZE IMPACTS**

The following steps have been taken to minimize the impacts to Bayou DeLoutre due to the proposed water withdraw.

- Conducted study of existing flows in Bayou DeLoutre
- Established benchmark for when flow withdraw is allowable and when it will cause undue impacts on the bayou
- Screen intake to minimize uptake of aquatic life
- Utilize existing timber road and boat launch

### **PROJECT ALTERNATIVE**

In very broad general terms the projects has two options for acquiring the water it needs for the project, either surface water or ground water. The specific source can vary from municipal water systems, private ponds, private wells, public streams, or public lakes to name a few. However all of these will either use surface water or ground water. We agree with the Louisiana Water Resources Report dated March 15, 2012 which encouraged the use of Louisiana’s abundant surface water over the use of high quality groundwater for hydraulic fracturing. An addition variable is how the water is moved to the well site. It is our opinion that moving the water through the use of pumps and temporary waterlines produces much less impact on the surrounding environment than a steady stream of trucks hauling the water to the proposed well.

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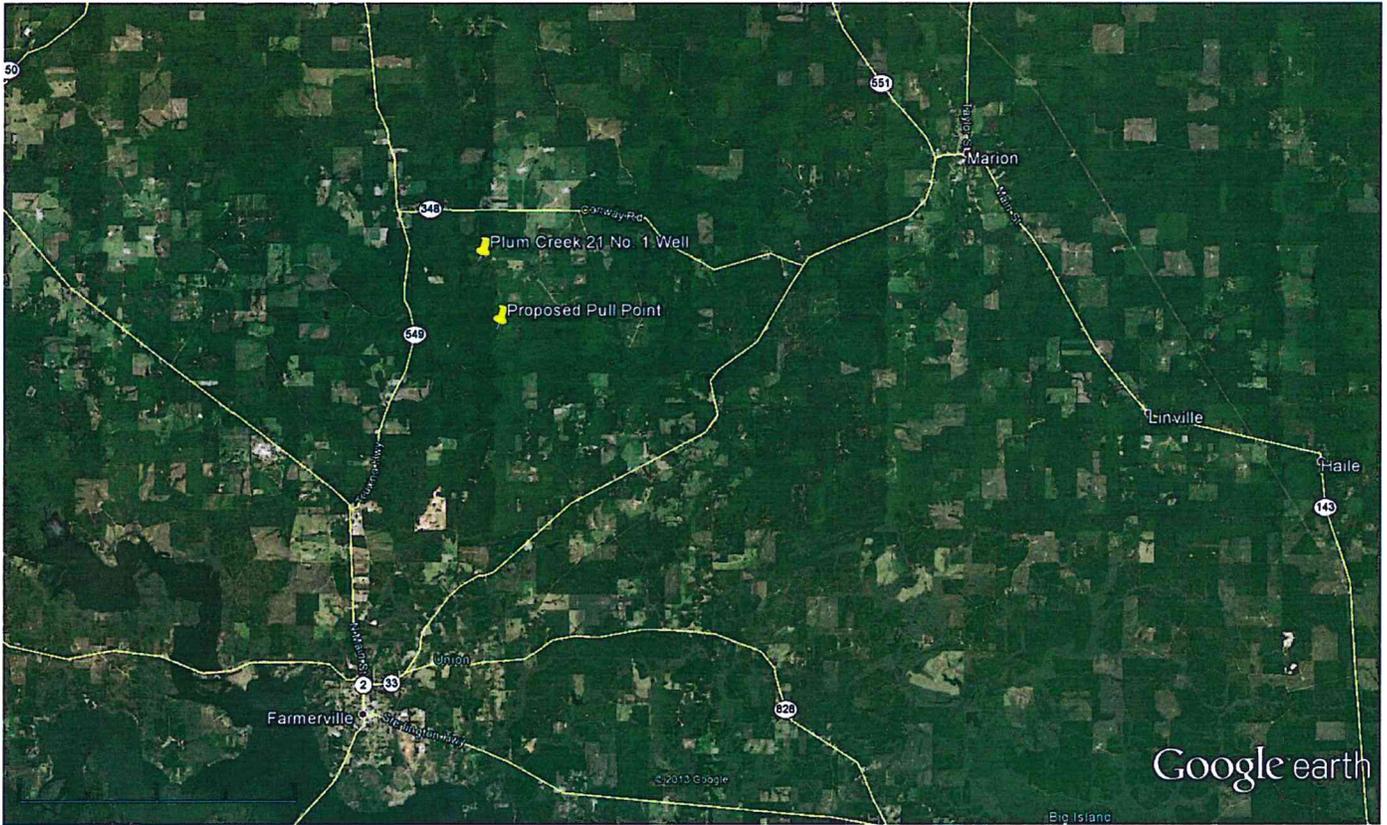
## **SUMMARY**

Overall the proposed project when following the stated withdraw guidelines, will not negatively impact the scenic or natural qualities of Bayou DeLoutre. This project is also in line with the findings of the Louisiana Water Resource Report to the State Legislature published in March 15, 2012 on water use for hydraulic fracturing.

## **MAPS & FIGURES**

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### Appendix A



Google earth



**FIELD MEASUREMENTS**

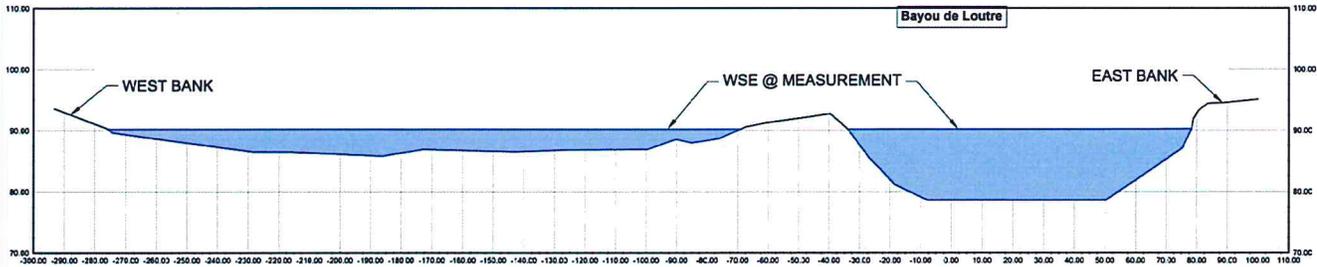
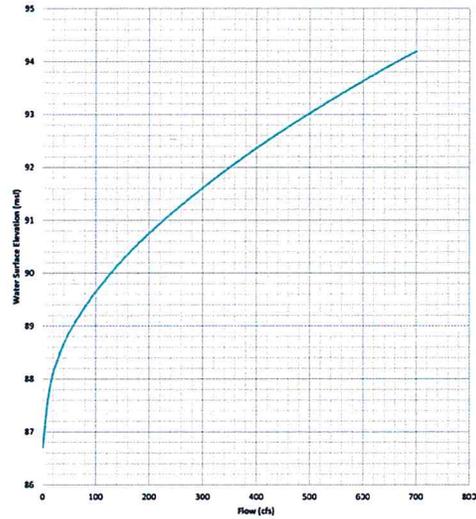
- Water Surface = 90.2 NAVD 88
- Average Velocity = 0.09 ft/s
- Cross Section Area = 1685.3 sq. ft
- Calc. Flow = 151.7 cfs

**PUMP WITHDRAWAL RATES**

- Total Monthly Withdrawal = 3,500,000 gallons = 4,678,819 cu. ft.
- 10" Pump
  - Max Pump Capacity = 1679 gpm = 3.74 cfs
  - 75% Pump Capacity = 1259 gpm = 2.81 cfs
  - 50% Pump Capacity = 839 gpm = 1.87 cfs
  - 25% Pump Capacity = 420 gpm = 0.94 cfs
- 4" Pump
  - Max Pump Capacity = 250 gpm = 0.557 cfs
  - 75% Pump Capacity = 283 gpm = 0.418 cfs
  - 50% Pump Capacity = 175 gpm = 0.279 cfs
  - 25% Pump Capacity = 88 gpm = 0.139 cfs

**MINIMUM STREAM REQUIREMENTS**

Pump Capacity	25%	50%	75%	100%
10" Pump				
Min Water Surface (NAVD88)	87.9	88.5	89.0	89.4
Daily Water Withdraw (gal)	600,000	1,210,000	1,810,000	2,420,000
4" Pump				
Min Water Surface (NAVD88)	87.1	87.3	87.4	87.5
Daily Water Withdraw (gal)	90,000	180,000	270,000	360,000



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**Bayou de Loutre @  
Patterson Lake**

Southwestern Energy  
Bayou de Loutre  
Union Parish

STATE OF LOUISIANA  
KURT M. NIXON  
LICENSE NO. 239  
CIVIL ENGINEERING  
01/20/2014

NO.	DATE	REVISION

**Cross  
Section**

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