

U.S. Army Corps of Engineers
New Orleans District

Hydraulic Assessment of the Vermilion River

Operations and Maintenance Program

February 2020

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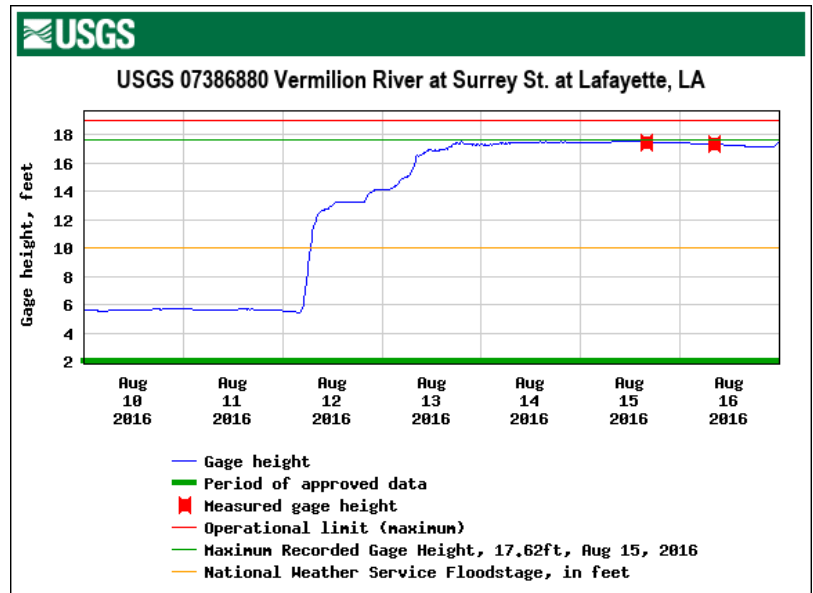
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1.0 Summary

A 2-day low level pressure system brought heavy rainfall to parts of the Acadiana parishes of Lafayette, Iberia, St. Martin and Vermilion in August 2016. During the event, the Vermilion River in Lafayette experienced a rise from 6 feet at the Surrey Street gage on August 12 to a record 17.62 feet on August 15, 2016. Overall, more than 7,000 structures located within these four parishes experienced flood damage as a result of this historic weather event.

Subsequent to this event, the U.S. Army Corps of Engineers modeled the Vermilion River to determine if dredging were to occur, would there be any associated impacts, both positive or negative, upstream and downstream along the Vermilion River. Once the New Orleans District became aware of an existing modeling effort that could support the District's own assessment, the U.S. Army Corps of Engineers contracted the University of Louisiana-Lafayette and entered into a contract to conduct the hydraulic assessment.



USGS 07386880: Vermilion River at Surrey St. at Lafayette, LA . Gage reading from August 10 to August 16, 2016. Source: <http://nwis.waterdata.usgs.gov/usa/nwis/uv/>

2.0 Assessment Overview

Authorized by the Flood Control Act of 18 August 1941, the Bayou Teche and Vermilion River Operations and Maintenance project provides for a -8 ft by 80 ft channel from the Vermilion Bay to the Gulf Intracoastal Waterway (GIWW); a -9 ft by 100 ft channel from the GIWW to mile 52 in Lafayette, La.; for navigation and flood control improvement of the non-navigable channels of Vermilion River and Bayou Fusilier from Lafayette, La. to Bayou Teche at mile 79; and channel enlargement in Bayou Teche from two miles below Arnaudville to Port Barre, La.

The last funded dredging effort for this project took place in 1998. In the aftermath of the 2016 floods, U.S. Army Corps of Engineers received numerous requests both to dredge the Vermilion and requests to not dredge the Vermilion due to perceived benefits or impacts. In 2019, the U.S. Army Corps of Engineers began to model the Vermilion river to determine whether there were positive or negative impacts associated with any dredging action. The modeling effort would evaluate two approaches to dredging:

1. Dredge the Vermilion River to project dimensions as authorized by the 1941 Flood Control Act.
2. Undertake a partial dredging approach to address specific sites, to include 15 miles of river located within Lafayette.

For the purpose of this evaluation, these approaches would be compared to the existing conditions using two weather events: a heavy rainfall modeled from the August 2016 event (large-scale) and a smaller, more frequent rain event (10-year) modeled after rainfall that occurred in 2014.

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3.0 Modeling

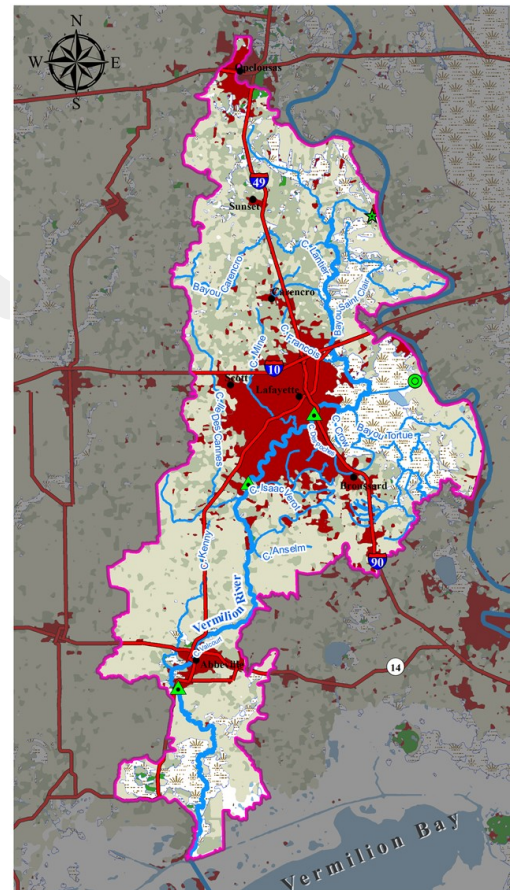
The authorized purpose of this hydraulic assessment was to evaluate what stage lowerings, if any, could result from either of the dredging scenarios referenced in section 2.0. The modeling effort was undertaken by the University of Louisiana-Lafayette (ULL) in close partnership with the U.S. Army Corps of Engineers, New Orleans District.

The model is a Hydrologic Engineering Center's (CEIWR-HEC) River Analysis System (HEC-RAS). HEC-RAS is designed to perform one and two-dimensional hydraulic calculations for a full network of natural and constructed channels. For this particular model, a drainage area of 601 miles² was modeled. The total river length modeled was approximately 69.2 miles. An interesting feature of the topography of the Vermilion Watershed is the relative flatness of the slope of the Vermilion river, which has an average slope of 1 foot for every 10 river miles.

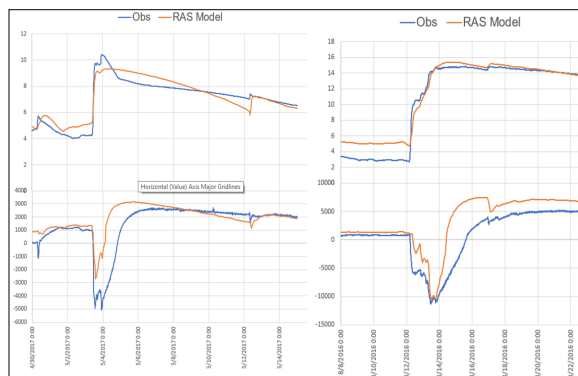
The model utilizes 2,168 surveyed river cross section and over 500,000 individually mapped points along both the Vermilion River and its tributaries. ULL utilized bathymetry and survey maps provided by the New Orleans District to aid in the development of the model grid. In addition to a well configured channel geometry, the model also includes a number of key hydraulic structures such as Fusilier Weir and Ruth Canal Structure, as well as 12 major bridge crossings along the Vermilion River. The model also includes the latest LiDAR topographical data from the State of Louisiana with 5m resolution.

The model is fully calibrated and validated to a number of observed events. The model was able to effectively recreate observed phenomena on the Vermilion such as reverse flow and even flow into and out of the adjacent Bayou Tortue swamp area. The results of the validation indicate this is a highly credible model that can accurately represent changes along the Vermilion river under multiple scenarios.

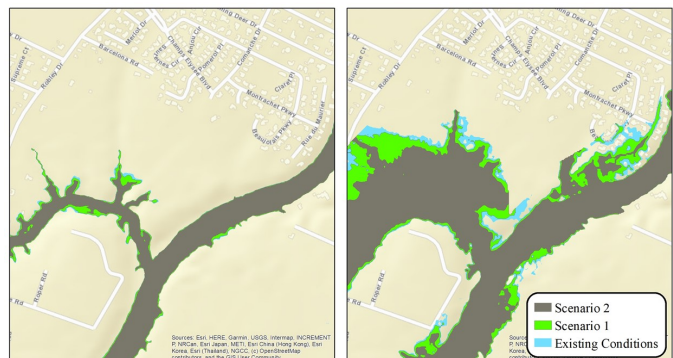
In conjunction with the New Orleans District, ULL ran a number of scenarios including a partially dredged Vermilion channel, mainly through downtown Lafayette, and another scenario where the channel was returned to its fully authorized Congressional dimensions (9' x 100' from river mile 52 to the GIWW).



Vermilion Watershed captured in ULL's HEC-RAS model



Model calibration/validation from ULL's model



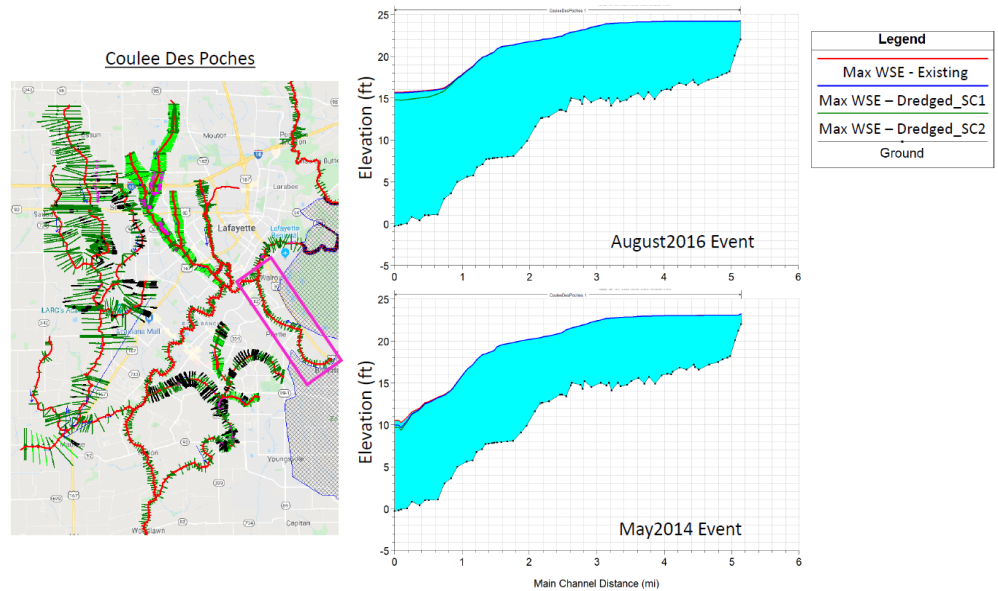
Model output data along the Vermilion for multiple scenarios

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4.0 Results

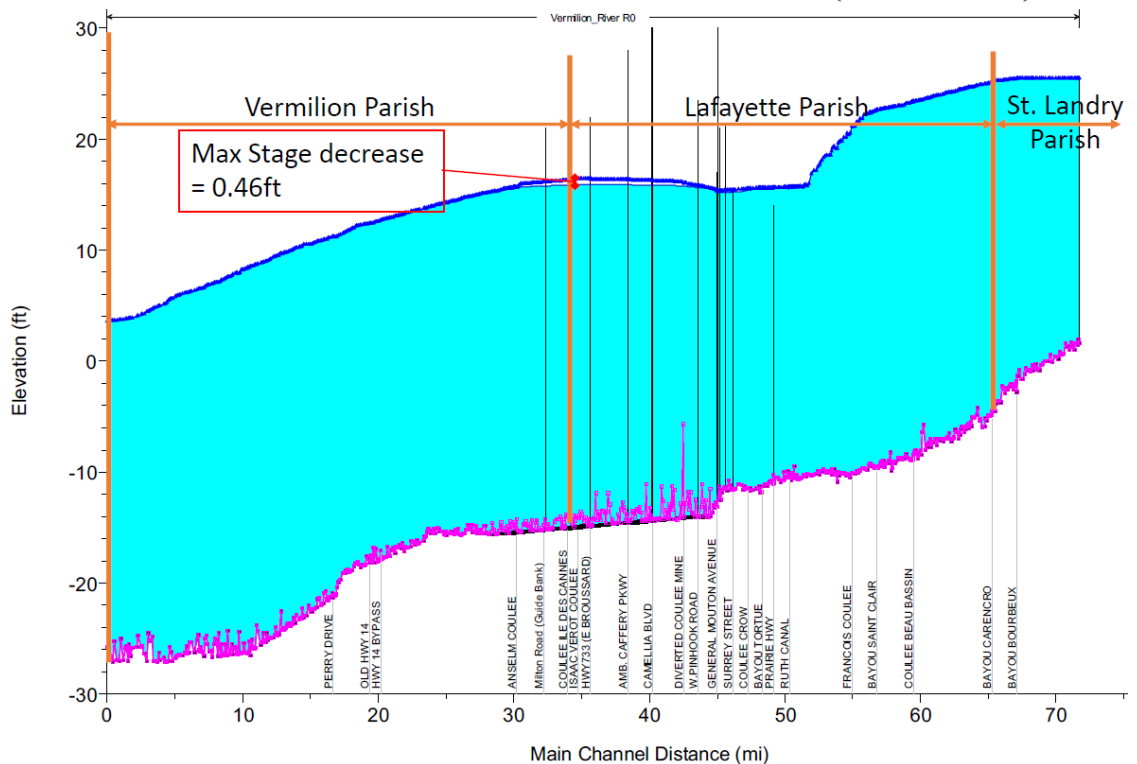
4.1 Partial Dredging

The hydraulic modeling indicated that the partial dredging approach would require removal of approximately 1 to 1.5 million cubic yards of sediment at an estimated cost of approximately \$75 million. These costs were derived from similar work in the New Orleans District and are rough orders of magnitude. This work would result in an average stage reduction between two to three inches with a maximum of roughly a half foot in a relatively small portion of the Vermilion River. However, the modeling also indicates that the partial dredging approach could result in a stage increase of between two and three inches along the lower river in Vermilion Parish during a higher frequency event such as one that occurred in 2014 (10 year event). While it was outside the scope of this assessment, a very preliminary GIS analysis determined that less than 100 structures were removed from flooding via dredging activities.



Output of stage lowering along Coulee Des Poches from the RAS Model; a very limited effect upstream occurs during a higher frequency event such as one that occurred in 2014 (10 year event). While it was outside the scope of this assessment, a very preliminary GIS analysis determined that less than 100 structures were removed from flooding via dredging activities.

Water Surface Profile based on First Scenario (2016 event):

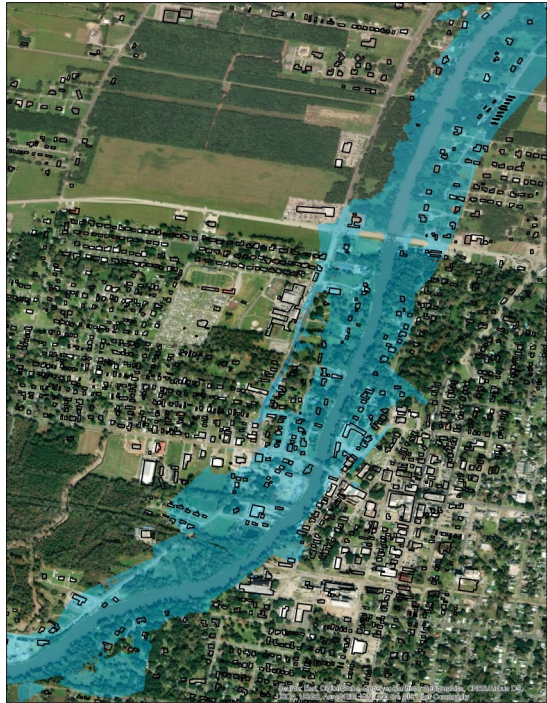


A very limited stage lowering occurs on the Vermilion River during the modeled 2016 event with partial dredging

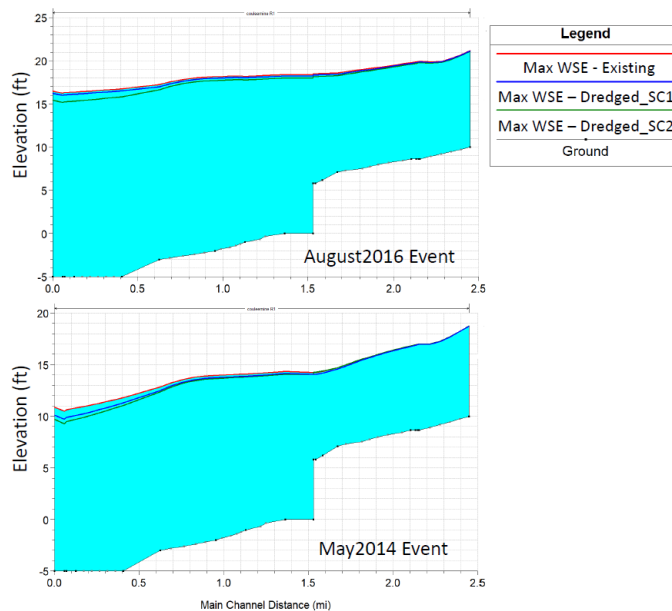
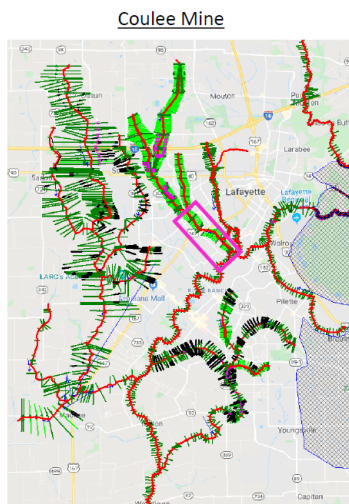
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4.2 Fully Dredging the River to Authorized Project Dimensions

Fully restoring the Vermilion River to its 1941 authorized dimensions would require a significant investment on behalf of both federal and local partners. Approximately 4 million cubic yards of sediment would have to be removed to reach project dimensions. This effort is estimated to cost approximately \$100-150 million and would require substantial environmentally approved-disposal areas. Again, these costs were derived from similar work in the New Orleans District and are rough orders of magnitude. A very preliminary GIS analysis suggests that approximately 250 structures would be removed from flooding were the channel returned to authorized dimensions.



Illustrated comparison of structural impacts related to the 2016 rain event under existing conditions (Left) and with a fully dredged river (Right).



Above: Similar to the partial dredge scenario, limited upstream effects were observed for the full dredging scenario (green line in the blue shaded region above)

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5.0 Conclusion

5.1 Considerations

In the aftermath of 2016, there was a great call to dredge the Vermilion. As the agency authorized to dredge the River under its operations and maintenance program, it was important for the U.S. Army Corps of Engineers to conduct this hydraulic assessment to ascertain whether or not there would be any negative impacts either upstream or downstream. The results of this analysis show that there are limited positive and negative impacts on water stages. Additionally, while not part of the original scope of the hydraulic assessment, a cursory investigation into what effect dredging either a partial or full portion of the authorized Vermilion River was also completed. The results of that limited analysis is that very few structures would be removed from flooding by dredging, approximately 100 due to the partial dredging and approximately 250 structures due to the full dredging of the river.

5.2 Path Forward

The process for evaluating, identifying and implementing flood risk management strategies in South Louisiana must be undertaken using the best science, data and engineering available. This USACE-ULL modeling effort was conducted with a very specific purpose: does dredging the Vermilion create any positive or negative impacts upstream or downstream? The results of this analysis are clear: there is very limited stage reductions associated with dredging the Vermilion River and thus there are limited impacts associated with dredging.

However, despite not yielding the results anticipated or hoped for by many citizens, the data and lessons learned from this work has real value in helping move forward the overall local, state and federal mission of identifying the best approach, or combination of approaches, for delivering much needed flood damage risk reduction to the people of Lafayette, Iberia, St. Martin and Vermilion parishes.

The U.S. Army Corps of Engineers is committed to working with its local and state partners in seeking floodplain management alternatives for this region. We are moving to enter into a Memorandum of Understanding (MOU) with the Louisiana Watershed Initiative (LWI), a task-force convened by Governor John Bel Edwards to serve as the program through which floodplain management responsibilities are coordinated across federal, state and local agencies. In addition, LWI is intended to be supported by experts who serve as advisors in building a foundation of data, projects, policies, standards and guidance. The MOU that the New Orleans District intends to enter into will codify our involvement in future modeling and planning activities that the State undertakes in the coming years as regional level watershed models are developed and utilized.

The results of the analysis will be shared with Acadiana Planning Commission (APC) and LWI to advance future efforts at a State/Regional level with support from the U.S. Army Corps of Engineers. In the next near term, APC will be convening a public meeting where the results of ULL and U.S. Army Corps of Engineers modeling efforts on the Vermilion will be discussed. Additionally, APC intends to invite modelers involved with the LWI-led state-wide regional modeling initiative. More information will be forthcoming on this public meeting in the coming weeks.