Appendix A
Site Photographs
Looking west at Bayou Bonfouca. Note the earthen levee dam between the pump station and Bayou Bonfouca. City of Slidell flows from Bayou Patassat are pumped into Bayou Bonfouca, which flows into Lake Ponchartrain.

Looking west at Bayou Bonfouca while crossing the levee. Note the outfall pipe under the surface of the water.
Looking north from the levee at Bayou Patassat, at the sheet pile and bar screen and ramp on the pump station.

Series of Photos Taken During Site Visit on May 25, 2016

Bayou Pattasat taken from access ramp to bar screen mechanism facing southeast showing the northern bank line with the sheet metal piling retaining wall on the left, the southern bank line on the right, the access ramp on the left in the foreground, and the bar screen mechanism in the foreground on the right.
Overview of pumping station area.

Bar screen mechanism and access ramp with roof covering pumping station in background.
Appendix B

90% Design Drawings
LIST OF DRAWINGS

COVER SHEET
G0-1 COVER SHEET

GENERAL
G1 LIST OF DRAWINGS
G2 GENERAL NOTES & PROJECT CONTACTS
G3 GENERAL NOTES & SPECIFICATIONS
G4 DRAWING STANDARDS & SYMBOLS
G5 ABBREVIATONS
G6 SYMBOLS GO/NO GO
G7 PROJECT OVERVIEW/PLAN

DEMOLITION
D1-D1 PUMP STATION DEMOLITION PLAN
D1-D2 PUMP STATION DEMOLITION ELEVATION
D1-D3 PUMP STATION DEMOLITION SECTION
D1-D4 DEMOLITION PHOTO

CIVIL
C1 OVERALL SITE PLAN
C2 CIVIL DETAILS
C3-C7 EXCAVATION PLAN AND SECTION

MECHANICAL
M1 EQUIPMENT DATA TABLES
M2 MECHANICAL DETAILS
M3 PUMP STATION MECHANICAL PLAN
M4-M8 PUMP STATION MECHANICAL ELEVATION
M9-M10 PUMP STATION MECHANICAL SECTION

STRUCTURAL
S1 STRUCTURAL DETAILS
S1-S1 PUMP STATION STRUCTURAL PLAN
S1-S2 PUMP STATION STRUCTURAL ELEVATION AND SECTION
S1-S3 CATWALK STRUCTURAL PLAN
S1-S4 CATWALK STRUCTURAL SECTIONS
S2-S1 DIESEL STORAGE FACILITY PLAIN ELEVATION & SECTION

ELECTRICAL
E1 ELECTRICAL SITE PLAN
E2 MAIN POWER ONE LINE DIAGRAM
E3 EXISTING & PROPOSED PUMP STATION P&ID

SUPPLEMENTAL
- TOPOGRAPHIC SURVEY PREPARED BY SFM CORPORATION INC., MARCH 2014
- TOPOGRAPHIC SURVEY PREPARED BY ALL SOUTH CONSULTING ENGINEERS, LLC, MARCH 2014

PROJECT AREA INDEX (FOR SHEET IDENTIFICATION)
D1 - PUMP STATION
D2 - DIESEL STORAGE FACILITY
### MATERIAL SCHEDULE

<table>
<thead>
<tr>
<th>Material</th>
<th>Material No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>Concrete</td>
<td>C4D</td>
<td>200×200×200 mm, Grade M15, Sand: 2:1, Water: 0.55:1, Curing for 28 days</td>
</tr>
</tbody>
</table>

### REINFORCING STEEL

- **Grade**: 60
- **Diameter**: 8 mm
- **Yield Strength**: 540 MPa
- **Tensile Strength**: 600 MPa

### REINFORCEMENT AND CONCRETE

- **Concreting**: Use a 1:2:4 mix ratio
- **Curing**: Allow to cure for at least 28 days

### EPOXY COATING

- **Application**: Apply two coats of epoxy
- ** Thickness**: 2 mm

### Epoxy Grout

- **Application**: Use a 1:3 mix ratio
- **Curing**: Allow to cure for at least 28 days

### WATERPROOFING

- **Type**: Polyurethane
- **Application**: Apply in layers of 1 mm

### JOINT SEALANT

- **Type**: Silicone
- **Application**: Apply to all expansion joints

### FIRE PROTECTIONS

- **Type**: Fire-rated steel
- **Application**: Use in areas requiring fireproofing

### ELECTRICAL INSTALLATION

- **Conduit**: Use Schedule 40 PVC
- **Wiring**: Use 14 AWG copper wire

### PLUMBING INSTALLATION

- **Pipes**: Use 1.5-inch Schedule 40 PVC
- **Fittings**: Use brass compression fittings

### MECHANICAL INSTALLATION

- **Hvac**: Use centrifugal fan
- **Pumps**: Use centrifugal pumps

### SAFETY EQUIPMENT

- **Emergency Exit Signs**: Use LED lights
- **Fire Extinguishers**: Use CO2 fire extinguishers

### ACCESSORIES

- **Door Hardware**: Use stainless steel
- **Window Screens**: Use mesh

### REFERENCES

- ASCE 31-03: Guide for Structural Concrete
- AASHTO LRFD Bridge Design Specifications

### ACKNOWLEDGEMENTS

- Thanks to the team for their contributions.

---

**Note**: This is a sample representation of the document. The actual content may vary.
<table>
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<tr>
<th>Pipe Group</th>
<th>Pipe Size (In.)</th>
<th>Material Group Number</th>
<th>Notes</th>
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**NOTES:**
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- **NOTES 26:**
- **NOTES 27:**
- **NOTES 28:**
- **NOTES 29:**
PUMP STATION DEMOLITION ELEVATION

LEGEND

DEMOLISH AND DISPOSE OF AS INDICATED BELOW AND IN ACCORDANCE WITH SECTION 02303 - DEMOLITION AND REMOVAL.

SCOPE OF DEMOLITION:

DE

- REMOVE AND DELIVER EXISTING DIESEL DRIVEN MIXED FLOW PUMP AND BASE PLATE TO CITY SPECIFIED LOCATION, TBD.

DE

- REMOVE AND DELIVER EXISTING DIESEL DRIVE #3 TO CITY SPECIFIED LOCATION, TBD. (NOT SHOWN ON THIS SHEET).

DE

- REMOVE AND DELIVER EXISTING 36" DISCHARGE PIPING TO CITY SPECIFIED LOCATION, TBD. (NOT SHOWN ON THIS SHEET).

DE

- DEMOLISH AND DISPOSE OF EXISTING CHAIN LINK FENCE PER SECTION 02303.

DE

- REMOVE AND DELIVER EXISTING SUCTION PIPING TO CITY SPECIFIED LOCATION, TBD.

DE

- REMOVE DELIVER EXISTING DRAIN TENDER TO CITY SPECIFIED LOCATION, TBD.

DE

- REMOVE AND DELIVER EXISTING AIR RELEASE VALVE TO CITY SPECIFIED LOCATION, TBD. (NOT SHOWN ON THIS SHEET).

DE

- DEMOLISH AND DISPOSE OF EXISTING CONCRETE SUMP BOTTOM PER SECTION 02303.

DEE

- DIESEL DRIVEN MIXED FLOW PUMP NO. 1

DEE

- TOP OF EXISTING SUMP AND SHEET PILE = EL. -4.0

DEE

- EXISTING DIESEL ENGINE DRIVERS OPTICALLY FOR CLEAN CY

DEE

- EXISTING 4-PIECE LINK FENCING (BEHIND)

DEE

- EXISTING PRECAST CONCRETE WORKING DECK

DEE

- EXISTING CAPSELL

DEE

- DIESEL DRIVEN MIXED FLOW PUMP NO. 2

DEE

- BOTTOM OF EXISTING SUMP = EL. -12.0

DEE

- EXISTING CHANNEL DIVIDER PLATE (TOP OF PLATE = EL. +2.00)

DEE

- DIESEL DRIVEN MIXED FLOW PUMP NO. 3

DEE

- EXISTING PRECAST CONCRETE PILE
LEGEND:

- DEMOLISH AND DISPOSE OF AS INDICATED BELOW AND IN ACCORDANCE WITH SECTION 02200 - DEMOLITION AND REMOVAL.

SCOPE OF DEMOLITION:

- REMOVE AND DELIVER EXISTING DIESEL DRIVEN FLOW PUMP AND MIST PLATE TO CITY SPECIFIED LOCATION, TBD.
- REMOVE AND DELIVER EXISTING DIESEL DRIVE #3 TO CITY SPECIFIED LOCATION, TBD.
- REMOVE AND DELIVER EXISTING 3" DISCHARGE Piping TO CITY SPECIFIED LOCATION, TBD.
- DEMOLISH AND DISPOSE OF EXISTING CHAIN LINK FENCE FOR SECTION 02200 (NOT SHOWN ON THIS SHEET).
- REMOVE AND DELIVER EXISTING SUCTION Piping TO CITY SPECIFIED LOCATION, TBD.
- REMOVE DELIVER EXISTING BATTERY RENDEZ TO CITY SPECIFIED LOCATION, TBD. (NOT SHOWN ON THIS SHEET)
- REMOVE AND DELIVER EXISTING AIR RELEASE VALVE TO CITY SPECIFIED LOCATION, TBD.
- DEMOLISH AND DISPOSE OF EXISTING CONCRETE BUMP BOTTOM PER SECTION 02200.

EXISTING LEVEE BULKHEAD (SUPPORTED BY EXISTING SHEET PILE WALL)

PUMP STATION DEMOLITION SECTION
SCALE: 1/8" = 1'-0" (25 MM = 1 METER)
### VALVE TABLE

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<tr>
<th>VALVE DESIGNATION</th>
<th>DESCRIPTION</th>
<th>AREA</th>
<th>QUANTITY</th>
<th>DIAMETER</th>
<th>SPECIFICATIONS SECTION</th>
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<td>C3000-3030</td>
<td>Combination Air Release Valve</td>
<td>CITY BARN DP5</td>
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**NOTES**

1. See specifications for additional requirements.

### PUMP DATA TABLE

| EQUIPMENT ID | ID | AREA        | QUANTITY REQUIRED | PUMP TYPE                  | DUTY       | DRIVE  | MAX SIZE SPHERES TO PASS, INCHES | MAXIMUM SHUT-OFF HEAD, FEET | FLOW CAPACITY, GPM (PER PUMP) | FLOWPUMP HEAD, PSI, PRIMARY OPERATING POINT | DECENTRIFUGAL PUMP EFFICIENCY | MAX. PERCENT | FLOW CAPACITY, GPM (PER PUMP) | FLOWPUMP HEAD, PSI, SECONDARY OPERATING POINT | MINIMUM SUB-SURF.FLOW PUMP CAPACITY, HP | MAX MOTOR SPEED, RPM | MINIMUM MOTOR SIZE, HP | SPECIFICATIONS SECTION |
|--------------|----|-------------|--------------------|----------------------------|------------|--------|----------------------------------|-----------------------------|----------------------------------|-------------------------------|----------------|----------------------------|-----------------------------------------------|-----------------------------|------------------------|---------------------|------------------------|
| 01-04        |    | CITY BARN DP5 | 1                  |                           |            |        |                                  |                             |                                  |                              |                |                            |                                |                             |                        |                     |                       |

**EQUIPMENT TABLE**

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<th>AREA</th>
<th>QUANTITY</th>
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<td>Diesel Dryer Mixed Flow Pump</td>
<td>CITY BARN DP5</td>
<td>1</td>
<td>11131</td>
<td>SEE PUMP DATA TABLE, THIS PAGE</td>
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**NOTES**

1. See specifications for additional requirements.
Appendix C
External Agency Correspondence
Regarding the City of Slidell City Barn proposed additional drainage improvement project shown below, which was sent to you on March 30, 2018. Please see the attached new 90% drawings. FEMA received these updated documents on April 10, 2018, and wanted to ensure they were provided to you for your review. To date, FEMA/EHP has not received a response from your offices regarding this project. Please provide a response to this drainage improvement proposal by April 30, 2018. If further information is needed or if there are any questions/issues, please let us know. Your assistance is greatly appreciated.

U.S. Department of Homeland Security

Federal Emergency Management Agency

FEMA-DR 1603 LA

1500 Main St

Baton Rouge, LA 70802

March 30, 2018

MEMORANDUM TO: See Distribution

SUBJECT: Scoping Notification/Solicitation of Views

To Whom It May Concern:

The Department of Homeland Security’s Federal Emergency Management Agency (FEMA) is mandated by the U.S. Congress to administer Federal disaster assistance pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), PL 93-288, as amended. FEMA’s Hazard Mitigation Grant Program (HMGp) to provide funds to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. FEMA is considering providing Hazard Mitigation Grant Program funding for the attached project in relation to Hurricanes Katrina and
The City of Slidell at their City Barn location has proposed an additional drainage improvement project. The purpose of the project is twofold:

1) to provide increased reliability for the drainage pumping station by:
   a. removal of an existing 67 cubic feet per second drainage pump along with its 36-inch discharge piping, and
   b. installation of a new 133 cubic feet per second drainage pump and upgraded 48-inch discharge piping outfall through the levee between Bayou Patasat into Bayou Bonfouca, to mitigate flooding in Old Town, Slidell.

2) to provide increased capacity and function of the pump station with the construction of a new diesel storage facility to house (1) 2,000 gallon diesel storage tank, along with lowering of the pump sump (only in the area beneath the proposed 133 cfs pump).

The proposed project scope of work and the considered alternative is included in the attached 65% Typical Drawings, Response to FEMA’s Request for Information, Coastal Use Permit Application and Public Notice, along with the Proposed Schedule and Scope of Work.

Please respond within 30 calendar days of the date of this scoping notification. If our office receives no comments at the close of this period, we will assume that your agency does not object to the project as proposed.

Comments may be emailed to Merina.Christoffersen@fema.dhs.gov or mailed to the attention of Merina Christoffersen, Environmental Department, at the address above.

For questions regarding this matter, please contact Merina Christoffersen, Environmental Specialist, at (504) 491-0621.

Thanks,

Tiffany Spann-Winfield
Deputy Environmental Liaison Officer
Region VI – LRO
(504) 218 - 6800 (bb)
Tiffany.spann@fema.dhs.gov

Distribution: USEPA, USFWS, LDWF, LDEQ

Merina Christoffersen
Environmental Protection Specialist
FEMA Region VI
Louisiana Recovery Office
1500 Main St., Baton Rouge, LA 70802
(504) 491-0621 (iphone)
Merina.christoffersen@fema.dhs.gov
MEMORANDUM TO: See Distribution

SUBJECT: Scoping Notification/Solicitation of Views

To Whom It May Concern:

The Department of Homeland Security’s Federal Emergency Management Agency (FEMA) is mandated by the U.S. Congress to administer Federal disaster assistance pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), PL 93-288, as amended. FEMA’s Hazard Mitigation Grant Program (HMGP) to provide funds to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. FEMA is considering providing Hazard Mitigation Grant Program funding for the attached project in relation to Hurricanes Katrina and Rita (FEMA-1603/1607-DR-LA).

The City of Slidell at their City Barn location has proposed an additional drainage improvement project. The purpose of the project is twofold:

1) to provide increased reliability for the drainage pumping station by:
   a. removal of an existing 67 cubic feet per second drainage pump along with its 36-inch discharge piping, and
b. installation of a new 133 cubic feet per second drainage pump and upgraded 48-inch discharge piping outfall through the levee between Bayou Patasat into Bayou Bonfouca, to mitigate flooding in Old Town, Slidell.

2) to provide increased capacity and function of the pump station with the construction of a new diesel storage facility to house (1) 2,000 gallon diesel storage tank, along with lowering of the pump sump (only in the area beneath the proposed 133 cfs pump).

The proposed project scope of work and the considered alternative is included in the attached 65% Typical Drawings, Response to FEMA’s Request for Information, Coastal Use Permit Application and Public Notice, along with the Proposed Schedule and Scope of Work.

Please respond within 30 calendar days of the date of this scoping notification. If our office receives no comments at the close of this period, we will assume that your agency does not object to the project as proposed.

Comments may be emailed to Merina.Christoffersen@fema.dhs.gov or mailed to the attention of Merina Christoffersen, Environmental Department, at the address above.

For questions regarding this matter, please contact Merina Christoffersen, Environmental Specialist, at (504) 491-0621. Thanks,

Tiffany Spann-Winfield
Deputy Environmental Liaison Officer
Region VI – LRO
(504) 218 - 6800 (bb)
Tiffany.spann@fema.dhs.gov

Distribution: USEPA, USFWS, LDWF, LDEQ

Merina Christoffersen
Environmental Protection Specialist
FEMA Region VI
Louisiana Recovery Office
1500 Main St., Baton Rouge, LA 70802
(504) 491-0621 (iphone)
Merina.christoffersen@fema.dhs.gov
May 3, 2018

Tiffany Spann-Winfield
Deputy Environmental Liaison Officer
FEMA LRO
1500 Main St
Baton Rouge, LA 70802
Merina.Christoffersen@fema.dhs.gov

RE: 180412/0485 City Barn Phase III Drainage Improvements Project
GOHSEP and FEMA Funding
St. Tammany Parish

Dear Ms. Spann-Winfield:

The Department of Environmental Quality (LDEQ), Business and Community Outreach Division has received your request for comments on the above referenced project.

After reviewing your request, the Department has no objections based on the information provided in your submittal. However, for your information, the following general comments have been included. Please be advised that if you should encounter a problem during the implementation of this project, you should immediately notify LDEQ’s Single-Point-of-contact (SPOC) at (225) 219-3640.

- Please take any necessary steps to obtain and/or update all necessary approvals and environmental permits regarding this proposed project.
- If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System (LPDES) application may be necessary.
- If the project results in a discharge of wastewater to an existing wastewater treatment system, that wastewater treatment system may need to modify its LPDES permit before accepting the additional wastewater.
- All precautions should be observed to control nonpoint source pollution from construction activities. LDEQ has stormwater general permits for construction areas equal to or greater than one acre. It is recommended that you contact the LDEQ Water Permits Division at (225) 219-9371 to determine if your proposed project requires a permit.
- If your project will include a sanitary wastewater treatment facility, a Sewage Sludge and Biosolids Use or Disposal Permit is required. An application or Notice of Intent will be required if the sludge management practice includes preparing biosolids for land application or preparing sewage sludge to be hauled to a landfill. Additional information may be obtained on the LDEQ website at http://www.deq.louisiana.gov/portal/tabid/2296/Default.aspx or by contacting the LDEQ Water Permits Division at (225) 219-9371.
- If any of the proposed work is located in wetlands or other areas subject to the jurisdiction of the U.S. Army Corps of Engineers, you should contact the Corps directly regarding permitting issues. If a Corps permit is required, part of the application process may involve a water quality certification from LDEQ.
- All precautions should be observed to protect the groundwater of the region.
- Please be advised that water softeners generate wastewaters that may require special limitations depending on local water quality considerations. Therefore if your water system improvements include water softeners, you are advised to contact the LDEQ Water Permits to determine if special water quality-based limitations will be necessary.
- Any renovation or remodeling must comply with LAC 33:II.Chapter 28, Lead-Based Paint Activities; LAC 33:II.Chapter 27, Asbestos-Containing Materials in Schools and State Buildings (includes all training and accreditation); and LAC 33:III.5151, Emission Standard for Asbestos for any renovations or demolitions.
- If any solid or hazardous wastes, or soils and/or groundwater contaminated with hazardous constituents are encountered during the project, notification to LDEQ’s Single-Point-of-Contact (SPOC) at (225) 219-3640 is required. Additionally, precautions should be taken to protect workers from these hazardous constituents.

Currently, St. Tammany Parish is classified as attainment with the National Ambient Air Quality Standards and has no general conformity determination obligations.

Please send all future requests to my attention. If you have any questions, please feel free to contact me at (225) 219-3954 or by email at linda.piper@la.gov.
Sincerely,

Linda (Brown) Piper
Louisiana Dept. of Environmental Quality
Office of the Secretary
P.O. Box 4301
Baton Rouge, LA 70821-4301
Phone: (225) 219-3954
Fax: (225) 219-3971
Email: linda.piper@la.gov
Date: April 19, 2018

Name: Merina Christoffersen
Company: FEMA
Street Address: 1500 Main Street
City, State, Zip: Baton Rouge, La 70802

Project: City Barn Drainage Pump Station
Project ID: 18041904

Personnel of the Coastal & Nongame Resources Division have reviewed the preliminary data for the captioned project. After careful review of our database, no impacts to rare, threatened, or endangered species or critical habitats are anticipated for the proposed project. No state or federal wildlife refuges, wildlife management areas, or scenic streams are known to occur at the specified site within Louisiana’s boundaries.

The Louisiana Natural Heritage Program (LNHP) has compiled data on rare, endangered, or otherwise significant plant and animal species, plant communities, and other natural features throughout the state of Louisiana. Heritage reports summarize the existing information known at the time of the request regarding the location in question. The quantity and quality of data collected by the LNHP are dependent on the research and observations of many individuals. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Louisiana have not been surveyed. This report does not address the occurrence of wetlands at the site in question. Heritage reports should not be considered final statements on the biological elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. LNHP requires that this office be acknowledged in all reports as the source of all data provided here. If at any time Heritage tracked species are encountered within the project area, please contact the LNHP Data Manager at 225-765-2645. If you have any questions, or need additional information, please call 225-765-2357.

Sincerely,

[Signature]

Casey Lynn Perry, Program Manager
Natural Heritage Program
COASTAL USE PERMIT/CONSISTENCY DETERMINATION

C.U.P. No.: P20150247 (Revised)
C.O.E. No.: MVN 2012-0958-El
NAME: CITY OF SLIDELL, LOUISIANA
c/o H. DAVIS COLE & ASSOCIATES, LLC (HDCA)
1340 POYDRAS STREET SUITE 1850
NEW ORLEANS, LA 70112
Attn: David Martin

LOCATION: Saint Tammany Parish, LA
Lat. 30-16-24.02N, Long. 89-47-17.94W; Bayou Pattosat; 2200 Bayou Lane (approximate), Slidell, LA

DESCRIPTION: Improvements at the existing City Barn Drainage Pump Station which will include the construction of a new pre-cast concrete pump station work platform, installation of a new drainage pump and sheet piling, excavation for a new drainage pump sump and outfall pipe (including temporary dewatering) as well as excavation within the inlet channel to provide for additional storage capacity within Bayou Pattosat. Approx. 491 cu. yds. of native material will be displaced and approx. 14 cu. yds. of concrete will be required for project activities.

REVISION 1: Proposed replacement of an existing drainage pump and 36" discharge piping with a pumping capacity of 67 cubic feet per second with a new drainage pump and 48" discharge piping with a pumping capacity of 133 cubic feet per second as well as the lowering of the pump sump. Also, proposed construction of a new diesel storage facility to house a 2,000 gallon diesel storage tank. An additional 223 cu. yds. of native material will be displaced and 32 cu. yds. of concrete will be required for project activities.

This revised permit supersedes the original permit which was issued September 9, 2015.

In accordance with the rules and regulations of the Louisiana Coastal Resources Program and Louisiana R.S. 49, Sections 214.21 to 214.41, the State and Local Coastal Resources Management Act of 1978, as amended, the permittee agrees to:

1. Carry out, perform, and/or operate the use in accordance with the permit conditions, plans and specifications approved by the Department of Natural Resources.
2. Comply with any permit conditions imposed by the Department of Natural Resources.
3. Adjust, alter or remove any structure or other physical evidence of the permitted use if, in the opinion of the Department of Natural Resources, it proves to be beyond the scope of the use as approved or is abandoned.
4. Provide, if required by the Department of Natural Resources, an acceptable surety bond in an appropriate amount to ensure adjustment, alteration, or removal should the Department of Natural Resources determine it necessary.
5. Hold and save the State of Louisiana, the local government, the department, and their officers and employees harmless from any damage to persons or property which might result from the use, including the work, activity, or structure permitted.
6. Certify that the use has been completed in an acceptable and satisfactory manner and in accordance with the plans and specifications approved by the Department of Natural Resources. The Department of Natural Resources may, when appropriate, require such certification to be given by a registered professional engineer.
7. All terms of the permit shall be subject to all applicable federal and state laws and regulations.
8. This revised permit, or a copy thereof, shall be available for inspection at the site of work at all times during operations.
9. The applicant will notify the Office of Coastal Management of the date on which initiation of the permitted activity described under the "Coastal Use Description" began. The applicant shall notify the Office of Coastal Management by entering a commencement date through the online system, or by mailing said information to OCM.
10. Unless specified elsewhere in this revised permit, this revised permit authorizes the initiation of the coastal use described under "Coastal Use Description" for two (2) years from the date of the signature of the Secretary or his designee on the original permit which was September 9, 2015. If the coastal use is not initiated within this two (2) year period, then this revised permit will expire and the applicant will be required to submit a new application. Initiation of the coastal use, for the purposes of this permit, means the actual physical beginning of the use of activity for which the permit is required. Initiation does not include preparatory activities, such as movement of equipment onto the coastal use site, expenditure of funds, contracting out of work, or performing activities which by themselves do not require a permit. In addition, the permittee must, in good faith, and with due diligence, reasonably progress toward completion of the project once the coastal use has been initiated.
11. The following special conditions must also be met in order for the use to meet the guidelines of the Coastal Resources Program:

DETERMINATION

BATON ROUGE, LOUISIANA 70804-4487
(225)342-7591
1-800-267-4019
a. This revised permit does not convey any property rights, mineral rights, or exclusive privileges; nor does it authorize injury to property.

b. All fill/spoil material to be hauled off-site shall be disposed of at a State approved facility.

c. Structures must be marked/lighted in accordance with U. S. Coast Guard regulations.

d. All logs, stumps and other debris encountered during dredging activities shall be removed from the site during or immediately after the activity and disposed of in accordance with all applicable laws and regulations.

e. All structures built under the authorization and conditions of this permit shall be removed from the site within 120 days of abandonment of the facilities for the herein permitted use, or when these structures fall into a state of disrepair such that they can no longer function as intended. This condition does not preclude the necessity for revising the current permit or obtaining a separate Coastal Use Permit, should one be required, for such removal activities.

f. That permittee shall insure that all sanitary sewage and/or related domestic wastes generated during the subject project activity and at the site, thereafter, as may become necessary shall receive the equivalent of secondary treatment (30 mg/l BOD5) with disinfection prior to discharge into any of the streams or adjacent waters of the area or, in the case of total containment, shall be disposed of in approved sewerage and sewage treatment facilities, as is required by the State Sanitary Code. Such opinion as may be served by those comments offered herein shall not be construed to suffice as any more formal approval(s) which may be required of possible sanitary details (i.e. provisions) scheduled to be associated with the subject activity. Such shall generally require that appropriate plans and specifications be submitted to the Department of Health and Hospitals for purpose of review and approval prior to any utilization of such provisions.

g. Permittee is subject to all applicable state laws related to damages which are demonstrated to have been caused by this action.

h. Permittee shall allow representatives of the Office of Coastal Management or authorized agents to make periodic, unannounced inspections to assure the activity being performed is in accordance with the conditions of this permit.

i. Permittee shall comply with all applicable state laws regarding the need to contact the Louisiana One Call (LOC) system (1-800-272-3020) to locate any buried cables and pipelines.

j. This revised permit authorizes the initiation of the Coastal Use described under "Coastal Use Description" for two (2) years from the date of the signature of the Secretary or his designee on the original permit which was September 9, 2015. Initiation of the Coastal Use, for purposes of this revised permit, means the actual physical beginning of the use or activity for which the permit is required. Initiation does not include preparatory activities, such as movement of equipment onto the Coastal Use site, expenditure of funds, contracting out of work, or performing activities which by themselves do not require a permit. In addition, Permittee must, in good faith and with due diligence, reasonably progress toward completion of the project once the Coastal Use has been initiated. If the Coastal Use is not initiated within this two (2) year period, an extension may be granted pursuant to the requirements contained in the Rules and Procedures for Coastal Use Permits (Title 43:I.723.D.). Please note that a request for permit extension MUST be made no sooner than one hundred eighty (180) days and no later than sixty (60) days prior to the expiration of the permit.

The expiration date of this revised permit is five (5) years from the date of the signature of the Secretary or his designee on the original permit which was September 9, 2015. If the Coastal Use is not completed within this five (5) year period, an extension may be granted pursuant to the requirements contained in the Rules and Procedures for Coastal Use Permits (LAC 43:I.723(D)).
Upon expiration of this revised permit, a new Coastal Use Permit will be required for completion of any unfinished or uncommenced work items and for any maintenance activities involving dredging or fill that may become necessary. Other types of maintenance activities may also require a new Coastal Use Permit.

k. This determination does not eliminate the need to obtain a permit from the United States Army, Corps of Engineers or any other Federal, state or local approval that may be required by law. The drawings submitted with your referenced application are attached hereto and made a part of the record.

************************** End of Conditions **************************

By accepting this revised permit the applicant agrees to its terms and conditions.
I affix my signature and issue this revised permit this 21st day of May, 2018.

THE DEPARTMENT OF NATURAL RESOURCES

[Signature]

Keith Lovell, For Karl L. Morgan, Administrator
Office of Coastal Management

This agreement becomes binding when signed by Administrator of the Office of Coastal Management Permits/Mitigation Division, Department of Natural Resources.

Attachments
Final Plats:

1) P20150247 Final Plats 05/10/2018

cc: Martin Mayer, COE w/attachments
    Dave Butler, LDWF w/attachments
    Johan Forsman, DHH w/attachments
    Jessica Diez, OCM w/attachments
    Craig Leblanc, OCM/FI w/attachments
    Saint Tammany Parish w/attachments

    CITY OF SLIDELL, LOUISIANA w/attachments
May 18, 2015

Pam Breaux
State Historic Preservation Officer
Department of Culture, Recreation & Tourism
P.O. Box 44247
Baton Rouge LA 70804

RE: Section 106 Review Consultation, Hurricane Katrina, FEMA-1603-DR-LA

Applicant: City of Slidell, Louisiana
Undertakings: City Barn Drainage Improvements Project, Latitude 30.273241 and Longitude -89.788288, Eastwood Drainage Improvements Project, Latitude 30.277724 and Longitude -89.760399, and Markham-Peachtree Storm Drain Line Improvements Project, Latitude 30.253132 and Longitude -89.784820, Slidell, Louisiana in St. Tammany Parish (HMGP Project# 1603-0321)

Determination: No Effect to Historic Properties

Dear Ms. Breaux:

The Federal Emergency Management Agency (FEMA) will be providing funds authorized under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended, in response to the following major Disaster Declarations:


FEMA, through its 404 Hazard Mitigation Grant Program (HMGP) proposes to fund Drainage Improvement (Undertaking) as requested by the City of Slidell (Applicant) (see Figure 1 for project locations). FEMA is initiating Section 106 review for the above referenced properties in accordance with the Louisiana State-Specific Programmatic Agreement among FEMA, the Louisiana Governor’s Office of Homeland Security and Emergency Preparedness (GOHSEP), the Louisiana State Historic Preservation Office of the Department of Culture Recreation and Tourism (SHPO), the Alabama-Coushatta Tribe of Texas (ACTT), the Chitimacha Tribe of Louisiana (CTL), the Choctaw Nation of Oklahoma (CNO), the Jena Band of Choctaw Indians (JBCI), the Mississippi Band of Choctaw Indians (MBCI), the Seminole Tribe of Florida (STF), and the Advisory Council on Historic Preservation (ACHP) regarding FEMA’s Hazard Mitigation Grant Program (2011 LA HMGP PA) dated January 31st, 2011 and providing the State Historic Preservation Office with the opportunity to consult on the proposed Undertaking. Documentation in this letter is consistent with the requirements in 36 CFR §800.11(d).

Description of the Undertaking

The undertaking is intended to improve drainage infrastructure in three (3) separate areas of the City of Slidell. The locations referenced include: 1) the City Barn Drainage Improvements Project, 2) the Eastwood Drainage Improvements Project, and 3) the Markham-Peachtree Storm Drain Line Improvements Project.
Figure 1 showing locations and Right-of-Ways (ROW) and/or Areas of Potential Effect (APE) for the proposed projects.

The City Barn Drainage Pump
The City Barn Drainage Pump Station is located near the historic area of Slidell between the railroad and Bayou Bonfouca. The Scope of Work (SOW) for the City Barn Drainage Improvements Project APE at the station calls for removing and reconstructing an access ramp from a parking area to a pumping station situated on the confluence of Bayous Pattosat and Bonfouca, expanding the size of the station from approximately 8.5 x 14 meters (28 x 45 feet) to 8.5 x 20 meters (28 x 65 feet) by adding a precast working deck measuring approximately 6 x 8.5 meters (20 x 28 feet) to the existing deck, installing a new diesel driven vertical-type drainage pump, dredging the channel bottom of the Bayou Pattosat to allow for the installation of the new pump, installing an outlet pipe from the new pump through a levee and into Bayou Bonfouca, and excavating an area measuring approximately 12 x 61 meter (40 x 200 feet) along the western side of Bayou Pattosat in order to expand the width of the inlet channel. See Figures 2-3, details for the design plans for details of the SOW.

Eastwood Storm Drain Line
The St. Tammany Parish Eastwood Storm Drain Line Improvements Project is located in Lakewood Subdivision in Slidell. The existing drainage system is composed of reinforced concrete pipe and box culverts buried along the back yards of properties between Fremaux Avenue and Eastwood Drive and storm water enters the system through curb and grate inlets along the roadways of the subdivision. The SOW for this project includes the filling and plugging of the existing 36 inch reinforced concrete pipe and 32 by 36 inch box culvert and replacing the drain system with a four by six feet precast reinforced concrete box culvert along the southern side Fremaux Avenue. An extension of the existing box culvert with dual five by eight feet reinforced concrete box culverts is also required. As part of the project, the southern part of the asphalt street, some sidewalks and driveways, and drainage inlets along Fremaux Avenue will be removed and replaced. The SOW meets allowances defined in the Louisiana State-Specific Programmatic Agreement Regarding FEMA’s Hazard Mitigation Grant Program dated January 31, 2011 (2011 LA HMGP PA), Appendix C: Programmatic Allowances, Items I.A., II.B.1, V.D., and V.G. Due to this, FEMA will not be developing an APE nor will we be consulting further on this portion of the Undertaking.

Markham-Peachtree Storm Drain Line
The SOW for the Markham-Peachtree Storm Drain Line Improvement Project APE calls for re-grading and shaping 55 meters (180 feet) of a drainage ditch from an existing box culvert to an existing bridge located on Olive Drive, removing 103 meters (337 feet) of existing underground box culvert which is to be replaced with an open ditch, and removing 286 meters (939 feet) of existing box culvert which is to be replaced with an open top flume structure measuring six feet in height by ten feet in width. Additional ground disturbing activities will include clearing vegetation and debris; removing trees and obstructions such as two metal sheds, two frame sheds, two aboveground swimming pools, and fences from the utility easement or servitude; excavation and embankment; scarification and compaction that will include undercutting and replacing unsuitable soils; building storm drains; rerouting pool drainage; construction of erosion control systems using granular material as backfill; relocating and adjusting water distribution systems; removing materials for building retaining walls and foundations; and sheet piling driving for flume walls and wing walls. Additionally, a wooded area adjacent to the ROW, on property owned by the Lakeside Swim Club, will be used during construction as a staging and/or parking area.

Areas of Potential Effect (APE)

In accordance with Stipulation VII.B.1 of the 2011 LA HMGP PA, the APE for both the standing structures and archaeology is defined as the individual facility when an undertaking is limited to retrofit as defined in
36 CFR 68.2(b) of an individual facility’s interior or exterior as defined in 44 CFR 206.201(c) with associated ground disturbance.

The City Barn Drainage Pump: APE
The APE for the City Barn Drainage Improvements Project consists of two areas where excavating will be done and an area that will be used as a staging area. A plan view encompassing all the areas is shown in Figure 2. Photos of the area attached (Figures 4-8).

The first area is situated on the levee containing outlet pipes extending west from the pumps into Bayou Bonfouca and the Bayou Pattosat channel adjacent to the levee. The a section of levee that will be excavated in order for a new outlet pipe to be set in measures approximately eight meters (26 feet) from north to south by 14 meters (46 feet) from west to east encompassing a total of 112 square meters (0.03 acres). Figure 3 is profile view of new pump and outlet pipe running through the levee and Figure 4, 5 and 6 are photographs of the existing pumping station and levee between Bayous Pattosat and Bonfouca. The second area is located on the southern bankline of Bayou Pattosat where soil will be dredged from the bayou and hauled away along a road situated between the bayou and the neighboring Textron facility (Figure 7). The bankline that will be removed measures approximately 28 meters (92 feet) from north to south by 127 meters (417 feet) from west to east encompassing a total of 3,556 square meters (0.36 acres). The area to be used for staging purposes is situated within an open area northwest of the pumping station and is presently being used for storing pipes and other drainage maintenance type materials (Figure 8). The area measures approximately 72 meters (236 feet) from northwest to southeast by 83 meters (272 feet) from southwest to northeast including areas that are presently being used for storage purposes. The area equals 5,976 square meters (1.48 acres).

Markham-Peachtree Storm Drain Line: APE
The APE for the Markham-Peachtree Improvements Project consists of the construction Right-of-Way (ROW) and the wooded area to the north of the Lakeside Swim Club, located at 497 Cumberland Street. The location of the APE is shown in Figure 9. The APE encompasses all construction work and staging for this project and is approximately 1.69 acres in size.

Identification and Evaluation

Historic Properties within the APE were identified based on FEMA’s review of the National Register of Historic Places (NRHP) database, the Louisiana Cultural Resources Map, historic map research conducted on March 4, 2015, and a site visit conducted on November 1, 2009 and March 17, 2015 by FEMA Historic Preservation staff. This data was evaluated by FEMA using the National Register (NR) Criteria.

The City Barn Drainage Pump
Based on data provided by the LA SHPO’s Office, FEMA learned that Sites 16ST145, 16ST152, 16ST205, and 16ST228 were located within one half of a mile of the APE of the City Barn Drainage Improvements Project and Site 16ST225 was located within one mile of the APE (Figure 10 and Figure 11). Site 16ST145 is the presently used Our Lady of Lourdes Catholic Cemetery with the earliest grave marker dating to 1835 and the eligibility status of the site being listed on the National Register of Historic Places (NRHP) has not been determined. Site 16ST152, the Salmen Brick Factory or Salmen Brothers Brick and Lumber Company was reported as a brick and lumber yard with remains of multiple brick floors, a foundation, and four machinery piers (Williams et al 1996; Hunter and Duay 1998; Ryan and Duplantis 2001; Eberwine et al. 2007) and had previously been determined as being eligible for listing on the NRHP, Site 16ST205, Brock Elementary Locus 1, was an historic artifact scatter dating from the early to mid-20th century and lacking in depositional integrity to consider it eligible for listing on the NRHP (Eberwine et al. 2007). Site 16ST228 was the former Our Lady of Lourdes Catholic Church Compound which consisted of late 19th to early 20th century features representing a brick facade foundation footing, brick pier footings, and a concrete swimming pool and had been determined as being ineligible for listing on the (NRHP) (Martin and Wolke 2010). Site
16ST225 was an historic artifact scatter representing a circa 1900 dump that had been determined as being ineligible for listing on the NRHP.

Additionally, FEMA reviewed a series of aerial images and historic topographic maps for this location provided via NETR Online (www.historicalaerials.com). Aerial Images and USGS Topo maps reflect the current landscape from the present to c. 1980, when the current drainage way is photo revised on to the location. Prior to 1980, land form to be removed is either non-existent as represented through the 1969 aerial image or partially non-existent as demonstrated on the USGS quad maps that date from 1964 to 1935. Generally speaking, the drainage area is larger and towards the south. The earliest available 7.5’ USGS map of this location is the Slidell Quad from 1935. On this map the location appears to be an extension of Bayou Bonfouca into a turning basin to support the Salmen Brick Factor (Figure 13).

Because of the APE’s close proximity to Bayou Bonfouca and the former location of the Salmen Brick Factory, Site 16ST152 two visits to the APE were conducted. The first visit was done on October 1, 2009 by Jason Emery, FEMA’s SHPO liaison, and Pamela Pyatt, an HMGP Specialist/Archaeologist for FEMA. During the visit, three shovel tests were excavated along the section of property on the west side of the bayou. No intact cultural deposits were identified and the soils appeared to mottled mixture of sediments deposited during the last few decades of the twentieth century (Figure 12). FEMA Archaeologists Jason Emery and Maria Tavaszi revisited the APE on March 17, 2006 and confirmed that the newly proposed ground disturbing activities would be confined to previously disturbed or recently deposited areas.

Markham-Peachtree Storm Drain Line

FEMA Archaeologists Jason Emery and Maria Tavaszi revisited the APE on March 17, 2006 and confirmed that the newly proposed ground disturbing activities appeared to be confined to previously disturbed areas and found no indication of archaeological deposits within the linear APE or the Staging APE.

Records review indicate that two archaeological sites: 16ST153, the Guzman site, and 16ST225 are within approximately 1.15 miles and 0.90 miles of the Markham-Peachtree project (Figure 13) and (Figure 14). Site 16ST153, the Guzman site, was a sparse brick and artifact scatter most likely representing an early 20th century house or camp and had been determined as being ineligible for listing on the NRHP and a stated before, Site 16ST225 was an historic artifact scatter representing a circa 1900 dump that had been determined as being ineligible for listing on the NRHP.

As noted in the undertaking, obstructions such as two metal sheds, two frame sheds, two above-ground swimming pools, and fences will be removed from the utility easement or servitude. All of these were built in the last 20 years and none of them meet the NRHP-eligibility criteria.

Additionally, FEMA archaeologists investigated the triangular Staging APE on May 1, 2015. The area was predominantly inundated with water (Figure 15) and contained shrubs and saplings (Figure 16), testing of the soils was limited to two shovel tests excavated in areas that were higher in elevation and dry enough to be tested. The first shovel test was dug near the westernmost extent of the property and the second was dug near the southeastern side of the property. See Figure 9 for locations of the shovel tests (STP1 and STP2). Soils in both tests were a mottled mixture of recently deposited sediments (Figure 17) most likely associated with the construction of the buried box culvert adjacent to the wooded area and no intact cultural deposits were identified.

Based on the available evidence, it is unlikely that intact NRHP-eligible archaeological deposits would encountered during the implementation of this undertaking, as the Slidell City Barn APE is either man-made berm, heavily utilized industrial area, or not containing archaeological deposits; and the Markham-Peachtree APE is either heavily disturbed by earlier drainage activities or not void of archaeological deposits as demonstrated through limited shovel testing.
Assessment of Effects

Based on the aforementioned identification and evaluation, FEMA has determined that there are no historic properties as defined in 36 CFR 800.16(l) within the APEs of the City Barn Drainage Improvements Project, the Eastwood Drainage Improvements Project, or the Markham-Peachtree Storm Drain Line Improvement Project. Therefore, FEMA has determined a finding of **No Historic Properties Affected** for this Undertaking and is submitting this Undertaking to you for your review and comment. FEMA requests your comments within 15 days.

We look forward to your concurrence with this determination. Should you have any questions or need additional information regarding this Undertaking, please contact me at (504) 247-7771 or jerame.cramer@fema.dhs.gov, or Kathryn Wollan, Lead Historic Preservation Specialist at (504) 289-1941 or kathryn.wollan@fema.dhs.gov Jason Emery, Lead Historic Preservation Specialist at (504) 570-7292 or jason.emery@fema.dhs.gov.

Sincerely,

TIFFANY R
SPAN
WINFIELD

Jeramé J. Cramer
Environmental Liaison Officer
FEMA-DR-1603-LA, FEMA-DR-1607-LA

References

Eberwine, James E, George Abry and William P. Athens

Hunter, Don G. and Sylvia Duay

Martin, Robert W. and Dale Wolke

Ryan, Joanne and Brad Duplantis

Williams, Luis, Katherine Grandine, Kevin Hymel, Thomas Fenn, and William P. Athens

CC: File
State Historic Preservation Office

Enclosures
Figure 1. Aerial Image showing the proposed locations of the City Barn, Eastwood, and Markham-Peachtree Drainage Improvements Projects in Slidell, Louisiana.
Figure 2. H. Davis Cole & Associates Consulting Engineers plan view for the City Barn Drainage Improvements Project in Slidell.

Figure 3. H. Davis Cole & Associates Consulting Engineers profile view of new pump and outlet pipe running through levee for the City Barn Drainage Improvements Project in Slidell.
Figure 4. View of outlet pipes from pumping station for City Barn Drainage on Bayou Pattosat through earthen embankment facing southwest.

Figure 5. City Barn Drainage: Northwest facing view of earthen embankment (overlooking Bayou Bonfouca) that will be impacted during construction.
Figure 6. **City Barn Drainage**: Northwest facing view of an existing outlet pipe on the Bayou Bonfouca side of the earthen embankment.

Figure 7. **City Barn Drainage**: Land along Bayou Pattosat facing south and road between the land along Bayou Pattosat and the Textron facility facing south.
Figure 8. **City Barn Drainage**: Area east of the pumping station proposed to be used as a staging area for the City Barn Drainage Improvements Project in Slidell.

Figure 9. **Markham-Peachtree Drainage Way**: Staging Area APE shown in relation to the construction Right-of-Way (adapted from Volkert Engineering Services’ construction plan).
Figure 10. Markham-Peachtree Drainage Way: Detail of how the current drainage way will be typically altered to increase the drainage capacity. The dashed line is the existing ditch profile and the dark-hashed line is the intended final profile. Also, shows how the project addresses pipeline crossings.
Figure 11. Markham-Peachtree Drain Line: Photograph of the Staging APE for the Drain Line Improvements Project shown on the left in relation to the construction Right-of-Way shown in the center.
Figure 14. Detail of the 1935 15’ Slidell Map, Note the interpreted turning basin outlined in red.

Figure 15. Shovel test along Bayou Pattosat showing the mottled mixture of sediments.
Figure 18. Photograph showing an example of areas inundated with water in the APE of the Markham-Peachtree Drainage Improvements Project APE facing northwest.

Figure 19. Photograph showing dense shrubs and saplings in the APE of the Markham-Peachtree Drainage Improvements Project APE facing northwest.
Figure 20. Photograph of STP2 in the APE of the Markham-Peachtree Drainage Improvements Project facing east.
Operations Division
Eastern Evaluation Section

Subject: MVN 2012-0958-E11

City of Slidell Louisiana
Post Office Box 828
Slidell, Louisiana 70459

Gentlemen:

The proposed work (installation and maintenance of a new drainage pump at 2200 Bayou Lane in Slidell in St. Tammany Parish), as shown on the enclosed drawings, is authorized under Category I of the Programmatic General Permit provided that all conditions of the permit are met.

This authorization has a blanket water quality certification from the Louisiana Department of Environmental Quality; therefore, no additional authorization from DEQ is required.

However, prior to commencing work on your project, you must obtain approvals from state and local agencies as required by law and by terms of this permit. These approvals include, but are not limited to, a permit, consistency determination or determination of “no direct or significant impact (NDSI) on coastal waters” from the Louisiana Department of Natural Resources, Office of Coastal Management.

This approval to perform work is valid for 5 years from the date of this letter.

Permittee is aware that this office may reevaluate its decision on this permit at any time the circumstances warrant.

Should you have any further questions concerning this matter, please call Ed Wrublinski of this office at (504) 862-2822.

Sincerely,

[Signature]

Martin S. Mayer
Chief, Regulatory Branch

Enclosures
CITY BARN DRAINAGE IMPROVEMENTS PROJECT
CITY OF SLIDELL, LOUISIANA
PLAT 10: CROSS SECTIONS

LEGEND:
- EXCAVATION AND STOCKPILE OFF-SITE

H. Davis Cols & Associates, LLC
Consulting Engineers
NEW ORLEANS OFFICE
240 Poydras Street, Suite 1850
New Orleans, Louisiana 70112
Telephone: 504.836.2920
Fax: 504.836.2910
LOADING DOCK PLAN VIEW
SCALE: 1" = 10'-0"

SECTION A
SCALE: N.T.S.

SECTION B
SCALE: 1" = 10'-0"

CITY BARN DRAINAGE IMPROVEMENTS PROJECT
CITY OF SLIDELL, LOUISIANA
PLAT 12: LOADING DOCK FILL AREA
**EXPLANATION OF QUANTITIES:**

- **ITEM (1): EXCAVATION FOR PROPOSED BAR SCREEN STRUCTURE**
  - Total for Item (1): 405 cubic yards (excavated and stockpiled off site)

- **ITEM (2): CONCRETE FILL FOR PROPOSED BAR SCREEN SUPPORT STRUCTURE**
  - Total for Item (1): 65 cubic yards (concrete fill)

- **ITEM (3): EXCAVATION FOR PROPOSED LOADING DOCK**
  - Total for Item (3): 65 cubic yards (excavated and stockpiled off site)

- **ITEM (4): MODULAR RETAINING WALL FOR PROPOSED LOADING DOCK**
  - Total for Item (4): 75 linear feet

- **ITEM (5): CONCRETE PAVEMENT FOR PROPOSED LOADING DOCK**
  - Total for Item (5): 12 cubic yards (concrete fill)

- **ITEM (6): CHANNEL EXCAVATION**
  - Channel excavation quantities were determined using cross sections and average end area method per table
  - Total for Item (6): 1315 cubic yards cut (excavated and stockpiled off site)

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**CUT & FILL QUANTITIES FOR CHANNEL EXCAVATION**

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CITY BARN DRAINAGE IMPROVEMENTS PROJECT
CITY OF SLIDELL, LOUISIANA
PLAT 13: EXPLANATION OF QUANTITIES

H. Davis Cole & Associates, LLC
Consulting Engineers
NEW ORLEANS OFFICE
1340 Prytania Street, Suite 1830
New Orleans, Louisiana 70112
Telephone: 504-899-2020
Facsimile: 504-836-7210
1. Activities authorized under this general permit shall not be used for piecemeal work and shall be applied to single and complete projects. All components of a single and complete project shall be treated together as constituting one single and complete project. All planned phases of multi-phased projects shall be treated together as constituting one single and complete project. This general permit shall not be used for any activity that is part of an overall project for which an individual permit is required.

2. No activity is authorized under this general permit which may adversely affect significant cultural resources listed or eligible for listing in the National Register of Historic Places until the requirements for Section 106 of the National Historic Preservation Act are met. Upon discovery of the presence of previously unknown historic and/or prehistoric cultural resources, all work must cease and the permittee must notify the State Historic Preservation Office and the Corps of Engineers. The authorization is suspended until it is determined whether or not the activity will have an adverse effect on cultural resources. The authorization may be reactivated or modified through specific conditions if necessary, if it is determined that the activity will have no adverse effect on cultural resources. The CEMVN-PGP authorization will be revoked if it is determined that cultural resources would be adversely affected, and an individual permit may be necessary.

3. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein. The permittee will, at his or her expense, install and maintain any safety lights, signals, and signs prescribed by the United States Coast Guard, through regulations or otherwise, on authorized facilities or on equipment used in performing work under the authorization.

4. No activity may substantially disrupt the movement of those species of aquatic life indigenous to the water body, including those species which normally migrate through the area, unless the activity's primary purpose is to block or impound water.

5. If the proposed activity involves the installation of aerial transmission lines, submerged cable, or submerged pipelines across navigable waters of the United States the following is applicable:

The National Ocean Service (NOS) has been notified of this authorization. You must notify NOS and this office in writing, at least two weeks before you begin work and upon completion of the activity authorized by this permit. Your notification of completion must include a drawing which certifies the location and configuration of the completed activity (a certified permit drawing may be used). Notification to NOS will be sent to the following address: National Ocean Service, Office of Coast Survey, NICS261, 1315 East West Highway, Silver Springs, Maryland 20910-3282.
6. For pipelines under an anchorage or a designated fairway in the Gulf of Mexico the following is applicable: The NOS has been notified of this authorization. You must notify NOS and this office in writing, at least two weeks before you begin work and upon completion of the activity authorized by this permit. Within 30 days of completion of the pipeline, 'as built' drawings certified by a professional engineer registered in Louisiana or by a registered surveyor shall be furnished to this office, the Commander (dpw), Eighth Coast Guard District, Hale Boggs Federal Building, 500 Poydras Street, Room 1230, New Orleans, Louisiana 70130, and to the Director, National Ocean Service, Office of Coast Survey, N/CSSB1, 1315 East-West Highway, Silver Springs, Maryland 20910-3282. The plans must include the location, configuration and actual burial depth of the completed pipeline project.

7. If the proposed project, or future maintenance work, involves the use of floating construction equipment (barge mounted cranes, barge mounted pile driving equipment, floating dredge equipment, dredge discharge pipelines, etc.) in the waterway, you are advised to notify the Eighth Coast Guard District so that a Notice to Mariners, if required, may be prepared. Notification with a copy of your permit approval and drawings should be mailed to the Commander (dpw), Eighth Coast Guard District, Hale Boggs Federal Building, 500 Poydras Street, Room 1230, New Orleans, Louisiana 70130, about 1 month before you plan to start work. Telephone inquiries can be directed to the Eighth Coast Guard District, Waterways Management at (504) 671-2107.

8. All activities authorized herein shall, if they involve, during their construction or operation, any discharge of pollutants into waters of the United States, be at all times consistent with applicable water quality standards, effluent limitations and standards of performance, prohibitions, pretreatment standards and management practices established pursuant to the Clean Water Act (PL 92-500:86 Stat 816), or pursuant to applicable state and local laws.

9. Substantive changes to the Louisiana Coastal Resources Program may require immediate suspension and revocation of this permit in accordance with 33 CFR 325.7

10. Irrespective of whether a project meets the other conditions of this permit, the Corps of Engineers retains discretionary authority to require an individual Department of the Army permit when circumstances of the proposal warrant this requirement.

11. Any individual authorization granted under this permit may be modified, suspended, or revoked in whole or in part if the Secretary of the Army or his authorized representative determines that there has been a violation of any of the terms or conditions of this permit or that such action would otherwise be in the public interest.

12. The Corps of Engineers may suspend, modify, or revoke this general permit if it is found in the public interest to do so.

13. Activities proposed for authorization under the PGP must comply with all other necessary federal, state, and/or local permits, licenses, or approvals. Failure to do so would result in a violation of the terms and conditions of CEMVN-PGP.

14. The permittee shall permit the District Commander or his authorized representative(s) or designee(s) to make periodic inspections of the project site(s) and disposal site(s) if different from the project site(s) at any time deemed necessary in order to assure that the activity being performed under authority of this permit is in accordance with the terms and conditions prescribed herein.
15. This general permit does not convey any property rights, either in real estate or material, or any exclusive privileges; and it does not authorize any injury to property or invasion of rights or any infringement of federal, state, or local laws or regulations nor does it obviate the requirements to obtain state or local assent required by law for the activity authorized herein.

16. In issuing authorizations under this permit, the federal government will rely upon information and data supplied by the applicant. If, subsequent to the issuance of an authorization, such information and data prove to be false, incomplete, or inaccurate, the authorization may be modified, suspended, or revoked, in whole or in part.

17. For activities resulting in sewage generation at the project site, such sewage shall be processed through a municipal sewage treatment system or, in areas where tie-in to a municipal system is not practical, the on-site sewerage system must be approved by the local parish sanitary before construction.

18. Any modification, suspension, or revocation of CEMVN-PGP, or any individual authorization granted under this permit, will not be the basis for any claim for damages against the United States.

19. Additional conditions deemed necessary to protect the public interest may be added to the general permit by the District Commander at any time. If additional conditions are added, the public will be advised by public notice. Individual authorizations under CEMVN-PGP may include special conditions deemed necessary to ensure minimal impact and compliance with CEMVN-PGP.

20. CEMVN-PGP is subject to periodic formal review by CEMVN and OCM in coordination with the Environmental Protection Agency, US Fish and Wildlife Service, the National Marine Fisheries Service, and the Louisiana Department of Wildlife and Fisheries. Comments from reviewing agencies will be considered in determination as to whether modifications to the general permit are needed. Should the District Commander make a determination not to incorporate a change proposed by a reviewing agency, after normal negotiations between the respective agencies, the District Commander will explain in writing to the reviewing agency the basis and rationale for his decision.

21. CEMVN retains discretion to review CEMVN-PGP, its terms, conditions, and processing procedures, and decide whether to modify, reissue, or revoke the permit. If CEMVN-PGP is not modified or reissued within 5 years of its effective date, it automatically expires and becomes null and void.

22. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.
23. You must maintain the activity authorized by this permit in good condition and in conformity with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party as described in Special Condition 26 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

24. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

25. If you sell the property associated with this permit, you must provide this office with a copy of the permit and a letter noting your agreement to transfer the permit to the new owner and the new owner’s agreement to accept the permit and abide by all conditions of the permit. This letter must be signed by both parties.

26. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

27. Many local governing bodies have instituted laws and/or ordinances in order to regulate dredge and/or fill activities in floodplains to assure maintenance of floodwater storage capacity and avoid disruption of drainage patterns that may affect surrounding properties. Your project involves dredging and/or placement of fill; therefore, you must contact the local municipal and/or parish governing body regarding potential impacts to floodplains and compliance of your proposed activities with local floodplain ordinances, regulations or permits.

28. In issuing authorizations under this permit, the federal government does not assume any liability for: damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest; damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit, and; design or construction deficiencies associated with the permitted work.
Programs and Project Management Division
Protection and Restoration Office

Merina Christoffersen
Environmental Protection Specialist
Federal Emergency Management Agency
Louisiana Recovery Office
1500 Main Street
Baton Rouge, Louisiana 70802

Dear Ms. Christoffersen:

This letter is in reference to Tiffany Spann-Winfeld’s Solicitation of Views request dated May 22, 2018 concerning the proposed City Barn Drainage Improvements Project in Slidell, Louisiana.

Information and signatures obtained from recent maps, aerial photography, and local soil surveys concerning this site are indicative with the occurrence of Waters of the US (WOUS). Department of the Army (DA) permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act are required prior to the deposition and/or redistribution of dredge or fill material into waters subject to Corps’ jurisdiction.

This preliminary determination is advisory in nature. The fact that a field wetland delineation/determination has not been completed does not alleviate your responsibility to obtain the proper DA permits prior to working in WOUS occurring on this site.

Please contact Mr. Jon Barmore of our Regulatory Branch by telephone at (504) 862-1704, or by e-mail jonathan.g.barmore@usace.army.mil for questions concerning wetlands determinations or need for on-site evaluations. Questions concerning regulatory permit requirements may be addressed to Mr. Michael Farabee by telephone at (504) 862-2292 or by email: michael.v.farabee@usace.army.mil.
Future correspondence concerning this matter should reference account number MVN-2012-01166-1-SG. This will allow us to more easily locate records of previous correspondence, and thus provide a quicker response.

Sincerely,

[Signature]

Brett Herr
Chief
Lake Pontchartrain and Vicinity Branch
Appendix D

2016 and 2018 Hydrologic and Hydraulic Studies
HYDROLOGIC AND HYDRAULIC STUDY

FOR

CITY BARN DRAINAGE IMPROVEMENTS
REMOVAL AND REPLACEMENT OF 67 – CFS DRAINAGE PUMP

CITY OF SLIDELL, LOUISIANA
DEPARTMENT OF ENGINEERING

CITY OF SLIDELL PROJECT NO. 100-118 (PHASE III)

HDCA PROJECT NO. 2018-05

Prepared by:

H. DAVIS COLE & ASSOCIATES, LLC
1340 POYDRAS STREET, SUITE 1850
NEW ORLEANS, LA 70112
Phone (504) 836-2020
Fax (504) 836-2010

APRIL 2018
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- **Appendix A** - Previous Study – Bayou Pattasat Drainage Study, Prepared by J.V. Burkes & Associates
- **Appendix B** - Flood Insurance Study for the City of Slidell, 1999
- **Appendix C** - Calculations
- **Appendix D** - Inundation Maps Depicting Downstream Effects of Previous and Proposed Improvements
SECTION 1 – PROJECT BACKGROUND
SECTION 1 – PROJECT BACKGROUND

INTRODUCTION

The City of Slidell, Louisiana (COS), has applied for funding under the Hazard Mitigation Grant Program (HMGP), a program funded through the Federal Emergency Management Agency (FEMA), to improve existing drainage systems within the City. Part of these ongoing efforts have included various improvements to the City Barn Drainage Pump Station (CBDPS) and associated drainage system. The goal of this series of projects is to further improve the performance of the existing drainage system located along the US 11 (Front Street) Highway Route near Bayou Pattasat and Bayou Bonfouca in Slidell, Louisiana and to further reduce the recurring flooding throughout the drainage basin by reducing maximum water surface elevations within the area.

Previous projects funded under this program have included the following:

- Installation of a fourth drainage pump, which increased the station capacity from 400 CFS to 575 CFS (completed);
- Construction of a fourth mechanical bar screen cleaner (nearing completion)

Proposed further improvements at CBDPS include the removal of the existing 67 – CFS drainage pump and replacement with a 133 CFS drainage pump, which will bring the pumping capacity of CBDPS to 641 cubic feet per second.

PURPOSE

The focus and purpose of this Hydrologic and Hydraulic (H&H) Study is to detail the effects of the in progress capacity improvements to the pump station on the performance of the drainage system. Additionally, this study reviews the downstream effects of the previous capacity expansion as well as the proposed capacity expansion.

PROJECT AUTHORIZATION

COS entered into an agreement with H. Davis Cole & Associates, LLC (HDCA) to provide engineering consulting services for the City Barn Drainage Pump Station Capacity Improvements. These services included development of a study describing the existing drainage basin and the development of recommendations to improve the conveyance of water within the basin and through the CBDPS.

STUDY LOCATION AND AREA

The general study area includes the full length of Bayou Pattasat, northwest of US 11 through the CBDPS and where it intersects with Bayou Bonfouca and Southeast of US 11 where it branches off into two reaches, one extending to the W-14 Canal and the other extending to 3rd Street (Sgt. Alfred Drive). The entire drainage basin consists of over 350 acres including commercial, industrial, and residential properties.
The length of Bayou Pattasat from the CBDPS and where it crosses US 11 is approximately 950 feet. Once crossing under US 11 the bayou continues on for approximately 850 feet until splitting off into the northern reach with a length of approximately 4200 feet and ending at the W-14 canal and the southern reach with a length of approximately 2200 feet and ending at 3rd Street (Sgt. Alfred Drive).

All of the storm water collected in the basin described above flows downstream through Bayou Pattasat until it reaches the CBDPS. The water is then pumped up and over the existing berm and into Bayou Bonfouca where it flows south to its eventual outfall into Lake Pontchartrain. The general study area is depicted below in the following figure.

![Figure 1.1 – Vicinity Map and General Study Area](image)

The existing CBDPS, located at the most downstream point of Bayou Pattasat has a current pumping capacity of 575 cfs.

**PREVIOUS WORK AND STUDIES BY OTHERS**

The following list of studies and/or works done by others were utilized by HDCA in order to develop the basis for this H&H Study of the described project area:

- Bayou Patassat (City Barn) Drainage Study Addendum 1 by J.V. Burkes & Associates, Inc.
- Flood Insurance Study for the City of Slidell prepared by the Federal Emergency Management Agency
Copies of these references are included as Appendix “A” and “B”, respectively, to this study.

Additionally, this H&H study builds upon work previously completed by HDCA for the City of Slidell which is documented within the report titled "Hydraulic and Hydrologic Study for City Barn Drainage Improvements", prepared by HDCA and dated April 12, 2016. A copy of this report is not reproduced herein, but is cited within this report as a reference.

The observations and recommendations related to areas upstream of the City Barn Drainage Pumping Station contained within this H&H Study are generally based upon the unsteady – state existing drainage model provided to HDCA by COS. It is HDCA’s understanding that the drainage model was originally developed by the United States Army Corps of Engineers and utilized in previous studies of the project area. The model is assumed to be a true and accurate representation of the geometry of the drainage basin, drainage features, and prevailing hydrologic conditions.

The observations and recommendations related to areas downstream of the City Barn Drainage Pumping Station contained within this H&H study are generally based upon the unsteady – state drainage model prepared for this study by GAEA Consultants, LLC (a sub – consultant to HDCA). The model was created in HEC – RAS 5.0.4 Beta2 (March 2018) and is assumed to be a true and accurate representation of the geometry of the drainage basin, drainage features, and prevailing hydrologic conditions.

**STUDY ORGANIZATION**

This H&H Study for the CBDPS is divided into three sections and two appendices as described below:

- **Section 1 – Project Background**
- **Section 2 – Study Procedures and General Hydrologic and Hydraulic Findings**
- **Section 3 – Recommended Improvements**
- **Appendix A – Previous Study – Bayou Pattasat Drainage Study, Prepared by J.V. Burkes and Associates**
- **Appendix B – Flood Insurance Study for the City of Slidell, 1999**
- **Appendix C – Calculations**
- **Appendix D – Inundation Maps Depicting Downstream Effects of Previous and Proposed Improvements**
SECTION 2 – STUDY PROCEDURES AND GENERAL HYDROLOGIC AND HYDRAULIC FINDINGS
SECTION 2 – STUDY PROCEDURES AND GENERAL HYDROLOGIC AND HYDRAULIC FINDINGS

GENERAL

The work documented within this H&H Study builds upon work previously completed by our firm and others as indicated in Section 1. As such, a description of the study area, drainage characteristics, climate, soils and land use, and study assumptions and procedures can be found in previous reports and reference documents as indicated herein.

DETERMINATION OF UPSTREAM EFFECTS OF PROPOSED IMPROVEMENTS

The upstream effects for various configurations of the drainage pumping station have been extensively modeled by HDCA and others as detailed in previous reports and reference documents. These models have included detailed scenarios of pumping capacities of 400, 575, 601, and 801 CFS. As such, HDCA utilized a polynomial regression analysis to determine the upstream effects of the proposed increase in capacity of CBDPS from 575 CFS to 641 CFS. Results of this analysis are included in Section 3 of this H&H Study.

Copies of calculations prepared are included as Appendix C to this H&H Study.

DETERMINATION OF DOWNSTREAM EFFECTS OF PROPOSED IMPROVEMENTS

Over the course of the construction of improvements at CBDPS, an area of concern has been the potential for effects of increased peak water surface elevations in Bayou Bonfouca downstream of the drainage pumping station.

HDCA consulted with GAEA Consultants of New Orleans, Louisiana (GAEA) in the preparation of a two – dimensional model of the Bayou Bonfouca watershed. The purpose of the model was to map the 10, 25, 50, and 100 – year storm events with corresponding City Barn Drainage Pump Station Inflows. The model was created using HEC – RAS 5.0.4, terrain data from the U.S. Geological Survey, and FEMA Flood Insurance Studies. The 2 – D model is constructed with a mesh size of 40 feet by 40 feet.

Results related to this model are included in Section 3 of this H&H Study.
SECTION 3 – GENERAL HYDRAULIC FINDINGS AND RECOMMENDATIONS

Prepared By:

H. Davis Cole & Associates, LLC
Consulting Engineers
SECTION 3 - GENERAL HYDRAULIC FINDINGS AND RECOMMENDATIONS FOR IMPROVEMENTS

GENERAL FINDINGS

The analysis of the drainage basin modeling data indicated that the maximum water surface elevations for the Bayou Pattasat drainage basin are indeed reduced by previous and proposed improvements. Further, modeling indicated that the downstream effects of the previously constructed improvements and proposed future improvements are small.

As a basis of comparison, HDCA compared the previous modeling results prepared by others with modeling work done by our firm. Results of that comparison are detailed below.

10 YEAR STORM EVENT

Table 3.1 below illustrates the average water surface elevations for the Phase I, Phase II, and Phase III projects for the ten - year storm event. These are compared against the previous existing conditions model for comparison.

<table>
<thead>
<tr>
<th>Average WSE, Previous Existing Conditions Model</th>
<th>Average WSE, HDCA Existing Conditions Model</th>
<th>Average WSE Elevation after Installation of 175 CFS Pump (City Project 100-118A &quot;Phase I&quot;)</th>
<th>Average WSE Elevation after Installation of 4th Mechanical Bar Screen (City Project 100-118A &quot;Phase II&quot;)</th>
<th>Average WSE Elevation after Removal of 67 CFS Pump and Replacement with 133 CFS Pump (City Project 100-118B &quot;Phase III&quot;)</th>
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</thead>
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<td>6.21</td>
<td>6.19</td>
<td>5.69</td>
<td>5.69</td>
<td>5.67</td>
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</table>

Analysis of the modeling data indicates that the proposed increase in capacity of CBDPS from 575 CFS to 641 CFS will reduce the average peak water surface elevation in the basin by 0.02 feet (0.24 inches) for the ten - year storm event. Overall, modeling data indicates that the entire suite of improvements yields a total reduction of 0.54 feet (64.8 inches) in the average peak water surface elevation in the basin for the ten - year storm event.

25 YEAR STORM EVENT

Table 3.2 below illustrates the average water surface elevations for the Phase I, Phase II, and Phase III projects for the ten - year storm event. These are compared against the previous existing conditions model for comparison.
Table 3.2 – 25 Year Storm Event – Average WSE

<table>
<thead>
<tr>
<th>Average WSE, Previous Existing Conditions Model</th>
<th>Average WSE, HDCA Existing Conditions Model</th>
<th>Average WSE Elevation after Installation of 175 CFS Pump (City Project 100-118A “Phase I”)</th>
<th>Average WSE Elevation after Installation of 4th Mechanical Bar Screen (City Project 100-118A “Phase II”)</th>
<th>Average WSE Elevation after Removal of 67 CFS Pump and Replacement with 133 CFS Pump (City Project 100-118B “Phase III”)</th>
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<td>6.70</td>
<td>6.69</td>
<td>6.16</td>
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Analysis of the modeling data indicates that the proposed increase in capacity of CBDPS from 575 CFS to 641 CFS will reduce the average peak water surface elevation in the basin by 0.13 feet (1.56 inches) for the twenty-five-year storm event. Overall, modeling data indicates that the entire suite of improvements yields a total reduction of 0.54 feet (6.48 inches) in the average peak water surface elevation in the basin for the twenty-five-year storm event.

**50 - YEAR STORM EVENT**

Table 3.3 below illustrates the average water surface elevations for the Phase I, Phase II, and Phase III projects for the fifty-year storm event. These are compared against the previous existing conditions model for comparison.
Table 3.3 – 50 Year Storm Event – Average WSE

<table>
<thead>
<tr>
<th>Maximum WSE, Previous Existing Conditions Model</th>
<th>Maximum WSE, HDCA Existing Conditions Model</th>
<th>Elevation after Installation of 175 CFS Pump (City Project 100-118A “Phase I”)</th>
<th>Elevation after Installation of 4th Mechanical Bar Screen (City Project 100-118A “Phase II”)</th>
<th>Elevation after Removal of 67 CFS Pump and Replacement with 133 CFS Pump (City Project 100-118B “Phase III”)</th>
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<tbody>
<tr>
<td>6.94</td>
<td>6.93</td>
<td>6.38</td>
<td>6.39</td>
<td>6.27</td>
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</table>

Analysis of the modeling data indicates that the proposed increase in capacity of CBDPS from 575 CFS to 641 CFS will reduce the average peak water surface elevation in the basin by 0.12 feet (1.44 inches) for the fifty-year storm event. Overall, modeling data indicates that the entire suite of improvements yields a total reduction of 0.67 feet (8.04 inches) in the average peak water surface elevation in the basin for the fifty-year storm event.

**100-YEAR STORM EVENT**

Table 3.4 below illustrates the average water surface elevations for the Phase I, Phase II, and Phase III projects for the one hundred-year storm event. These are compared against the previous existing conditions model for comparison.
Table 3.4 – 100 Year Storm Event – Average WSE

<table>
<thead>
<tr>
<th></th>
<th>Average Maximum WSE, Previous Existing Conditions Model</th>
<th>Average WSE Elevation after Installation of 175 CFS Pump (City Project 100-118A “Phase I”)</th>
<th>Average WSE Elevation after Installation of 4th Mechanical Bar Screen (City Project 100-118A “Phase II”)</th>
<th>Average WSE Elevation after Removal of 67 CFS Pump and Replacement with 133 CFS Pump (City Project 100-118B “Phase III”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average WSE, HDCA Existing Conditions Model</td>
<td>7.38</td>
<td>6.82</td>
<td>6.81</td>
<td>6.59</td>
</tr>
</tbody>
</table>

Analysis of the modeling data indicates that the proposed increase in capacity of the CBDPS from 575 CFS to 641 CFS will reduce the average peak water surface elevation in the basin by 0.22 feet (2.64 inches) for the one-hundred-year storm event. Overall, modeling data indicates that the entire suite of improvements yields a total reduction of 0.79 feet (9.48 inches) in the average peak water surface elevation in the basin for the one-hundred-year storm event.

**DOWNSTREAM EFFECTS**

Analysis of the modeling data indicates that the proposed improvements will have small effects on the peak water surface elevation within Bayou Bonfouca downstream of the drainage pump station due to the influence of Lake Pontchartrain. Results indicate that the increase in water surface elevation will be small (on the order of 0.01 to 0.08 feet) near the pumping station outfall.

Inundation maps depicting the effects of previous and proposed improvements at CBDPS on the water surface elevations of Bayou Bonfouca are included in Appendix D to this H&H Study.

**GENERAL CONCLUSIONS AND RECOMMENDATIONS**

In general, it was found that the previous and proposed improvements will reduce the water surface elevations within the Bayou Pattasat Drainage Basin and yield hydraulic benefits which will enhance efficiency and service life of the mechanical components of the station with very small impacts to the receiving waters of Bayou Bonfouca.
APPENDIX A – PREVIOUS STUDY – BAYOU PATTASAT DRAINAGE STUDY, PREPARED BY J.V. BURKES AND ASSOCIATES
EXCERPTED SUPPORTING DOCUMENTATION FROM
Bayou Pattasat (City Barn)
Drainage Study ADDENDUM 1

For a full version of this report, the general public can send a request to:
email: FEMA-NOMA@dhs.gov,
telephone: 225-267-2962
fax: 225-346-5848

Regular mail:
DEPARTMENT OF HOMELAND SECURITY-FEMA
ATTN: SLIDELL CITY BARN PUMP STATION DRAINAGE IMPROVEMENTS
1500 MAIN STREET
BATON ROUGE, LOUISIANA 70802.
Bayou Pattasat (City Barn)

Drainage Study ADDENDUM#1 - June 2014

For the
CITY OF SLIDELL

J.V. Burkes & Associates, Inc.
1805 Shortcut Hwy
Slidell, LA 70458
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APPENDIX

Geotechnical Report A
Survey B
Hydraulic Analysis C
Cost Estimate D
Executive Summary

This report was commissioned by GOHSEP to provide an analysis and evaluation of the current and prospective improvements for Bayou Pattasat within the City of Slidell. Methods of analysis include modifying an existing Corps HEC-RAS unsteady model of Eastern St. Tammany Parish by adding the Bayou Pattasat sub-basin, and performing soil borings. A summary of the calculations can be found in the appendix. Results of the analysis show that water levels can drop basin wide approximately 4"-5" for a total project cost of approximately $1,556,113.38. Recommendation includes a swapping out a 200 cfs pump for an old 67 cfs pump, straightening out a small section of Bayou and installing sheet piling in an existing problem area.
Introduction

The Bayou Pattasat (City Barn) channel improvement project is located in the old Town of Slidell area. The boundary is delineated to the west by Bayou Bonfouca, to the east by Hwy 11 (Front Street), to the south by property owned by Robin Goldsmith, et.al (leased by Textron), and to the north by property owned by the City of Slidell. A prior study was completed reviewing adding storage to the basin in the vicinity of the project area as shown below.

Figure 1. Vicinity Map - Bayou Pattasat/City Barn

It was determined that a conveyance issue occurred further upstream and an unknown factor with regard to the W-14 Drainage Canal flow spilling into this basin for any solutions that would be determined.

As a result of those questions, this updated model and analysis was authorized as addendum #1 to the original contract. The main scope was to look at a HEC-RAS unsteady model of the intermixing of the W-14, Bayou Bonfouca and Bayou Pattasat basins, look at proposed improvements and see what the basin wide benefits would be. In order to accomplish these tasks, additional survey work and geotechnical work was authorized to help this study and to reduce uncertainty of cost estimates for the solutions. The unsteady model created by the Corps and modified by adding this subbasin gives a more realistic example of the elevations encountered during large rain events with the natural intermixing of the water from each of these basins.
The Bayou Pattasat basin has an estimate 2000 residences within the basin. From 1995 to 2005 several flooding events have occurred within the Bayou Pattasat basin with an estimated $12,276,666 in damages reported by the City of Slidell. Also on 8/28/2012 Hurricane Isaac caused backwater flooding from Lake Pontchartrain through Bayou Bonfouca into Patassat that caused an additional 129 homes to be flooded and approximate 447 acres of flooding in the basin.

The intent of the City Barn Channel Improvement Project is to increase conveyance in the basin, reduce the propensity for vegetation to clog the bayou, reduce backwater effects from Hurricane Surges and ultimately, reduce flooding within the entire basin. The HEC-RAS unsteady model was performed under existing conditions and four proposed solutions were investigated further for benefits derived.

Existing Conditions – the City of Slidell placed a temporary berm around the City Barn property to prevent hurricane backwater effects from entering into the Pattasat basin as what occurred during Hurricane Isaac in 2012. This change occurred after our original model in this study previously. A model was created to analyze the effects of the basin for the ten, twenty five and one hundred year storm events.

Option #1 – A 200 cfs pump was added to the existing pump station configuration and corresponding water surface elevations were determined for the ten, twenty five, fifty and one hundred year storm events.

Option #2 – Two – 200cfs pumps were added to the existing pump station configuration and corresponding water surface elevations were determined for the ten, twenty five, fifty and one hundred year storm events.

Option #3 – A floodgate with a 400sf opening was added at the pump station and corresponding water surface elevations were determined for the ten, twenty five, fifty and one hundred year storm events.

Option #4 - The 36" lo-lift (67 cfs) pump will be replaced with another 200 cfs pump, and a 5 acre retention pond was constructed, and corresponding water surface elevations were determined for the ten, twenty five, fifty and one hundred year storm events. This was a City requested additional option.

Site Description and History

The project area is located within the old Town of Slidell between Textron and City Barn (a City of Slidell Public Operations facility). Most structures within the entire basin were built prior to the first FEMA Flood Insurance Rate Maps initialized November 16, 1973. These subdivisions include Town of Slidell (1903), Prevost Addition (1907), Dittmar Addition (1927), Robert Addition (1927), Terrace Park (1928), Spanish Trail Highlands (1931), Greenwood Cemetery (prior to 1936), Cousin Addition(before 1936), Park Place (1954), Lincoln Park (1959), and Pine Park Place (1962).
The land use within the drainage basin includes industrial, commercial and residential. The majority of the land is already developed; however some vacant and wooded areas exist within this basin. Performing work on the banks of the bayou near the pump station require coordination with the adjacent landowner, Textron in order to gain access and maintain the sensitive nature and security of its production facility. Also previous storms in the area have highlighted a problem of storm debris collecting in the bends and blocking the flows.

**Drainage Basin**

The drainage area for the Bayou Pattasat (City Barn) area is 351.7 acres. The area was determined by using LiDAR mapping and Burk & Associates Master Drainage Plan (part of Bayou Bonfouca Drainage Area).

Bayou Pattasat empties into Bayou Bonfouca and runs east upstream under the Norfolk Southern Railroad (approx. 800’ upstream), Highway 11 – Front Street (approx. 1000’ upstream) – SEGMENT A to a fork at approximately 1870’ upstream of Bayou Bonfouca. This area is characterized by commercial and institutional area to the north including a shopping center and Brock Elementary School. South of this Bayou is mainly residential. The Bayou forks to a north reach and a south reach.

The south reach, SEGMENT C, extends approximately 2150 linear feet and has crossings at Carey Street, runs through Greenwood Cemetery and then across Bryan Street, Cleveland Avenue and then 3rd Street (aka Sgt Alfred Drive). The area is comprised of a Cemetery, residential area and a housing complex for the mentally handicapped.

Another reach forks from the southern reach at 3rd Street eastward for approximately 1540 linear feet that runs at the rear of residential homes.

The north reach, SEGMENT B, extends approximately 4000 linear feet and has crossings at Carey Street, 2nd Street, 3rd Street (aka Sgt Alfred Drive), Cousin Street, 6th Street and ends at 10th Street. The area is comprised of a residential area with a wooded buffer along the banks of the Bayou to Cousin Street. North of Cousin Street the Bayou is split by the Courthouse and the Boys and Girls Club and then runs east through a residential area to its terminus just east of 11th Street.

Bayou Pattasat has a very close proximity to the W-14 Drainage Canal in several locations near Park Place Subdivision. There has been a history of flooding within this subdivision. There is a potential for flow between the W-14 Basin and the Bayou Pattasat Basin in this vicinity.

The drainage basin has many repetitive loss structures within the area. These home elevations range from a 4.8 foot to a 6.5 foot elevation. They appear to occur mainly in the old town area as well as the uppermost reaches of the Bayou as shown in figure 2 below.
Soils

Additional soil borings were used to look at long term design solutions for the entire basin. These borings included analyzing the possibility of using existing soils at berm around city barn pump station for the permanent berm to existing soils around the existing channels to see about future widening projects if so warranted. Please see appendix A for geotechnical report.

Bayou Pattasat Outfall

Bayou Pattasat's entrance into Bayou Bonfouca is controlled by two outfalls: 1) by gravity through a mechanical gate that can be closed off during tropical storm events, and 2) through its pump station that has three pumps. The existing pump flows are shown below:

Table 1. Existing Pump Flows at City Barn Pumpstation

<table>
<thead>
<tr>
<th>Description</th>
<th>Flow (gpm)</th>
<th>Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot; Vertical Axial Flow</td>
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<tr>
<td>54&quot;x54&quot; Vertical Axial Flow</td>
<td>90,000</td>
<td>200</td>
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<tr>
<td>36&quot; Lolift</td>
<td>30,000</td>
<td>67</td>
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</table>
APPENDIX B – FLOOD INSURANCE STUDY FOR CITY OF SLIDELL, 1999
FLOOD INSURANCE STUDY

CITY OF SLIDELL, LOUISIANA
ST. TAMMANY PARISH

REVISED: APRIL 21, 1999

Federal Emergency Management Agency
COMMUNITY NUMBER - 220204
NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for flood plain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

This preliminary revised Flood Insurance Study contains only profiles added or revised as part of the restudy. These profiles are presented in a reduced scale to minimize reproduction costs. All profiles will be included and printed at full scale in the final published report.
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<tr>
<td>West Diversion Canal</td>
<td>05P</td>
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<tr>
<td>Reine Canal West</td>
<td>06P</td>
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<tr>
<td>Reine Canal East</td>
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</table>

Exhibit 2 - Flood Insurance Rate Map
1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Slidell, St. Tammany Parish, Louisiana, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Slidell to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments


The hydrologic and hydraulic analyses for this study were performed by the New Orleans District, U.S. Army Corps of Engineers (COE), for the FIA, under Interagency Agreement No. (IAA)-H-7-76, Project Order No. 10. This study was completed in February 1979.

1.3 Coordination

Community base map selection and identification of potential flooding sources requiring detailed study were determined in meetings attended by personnel of the COE, FIA, and officials of the City of Slidell in January 1976. On December 11, 1979, the results of the work by the COE were reviewed at a final coordination meeting attended by personnel of the COE, FIA and city officials.
2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Slidell, St. Tammany Parish, Louisiana. The area of study is shown on the Vicinity Map (Figure 1).

This area is subject to overflows from Bayou Bonfouca-Bayou Vincent (W-13), the Diversion Canal (W-14 main) and hurricane surges from Lake Pontchartrain. The entire area of the City of Slidell was studied in detail.

2.2 Community Description

The City of Slidell is located near the northeast shores of Lake Pontchartrain, approximately 33 miles north of New Orleans, Louisiana. The total land area within the city limits is about 6.7 square miles. According to U.S. Census Bureau figures, the city's population for 1970 is 16,101, an increase of 9,745 from the 1960 census (Reference 1). Major transportation routes traverse the study area in many directions. Interstate Route 12 and 10 generally form the north and east boundary of the study area. Other transportation routes which pass through the area are U.S. Route 190, 11, and State Route 433.

Due to the close proximity of the area to metropolitan New Orleans, ease of transportation and the availability of the developable land, the Slidell area offers good potential for commercial and residential development.

Three major streams originating in the relatively flat rural areas flow through the study area in a southerly direction and discharge into Lake Pontchartrain. These streams are Bayou Bonfouca-Bayou Vincent (W-13 main), and the Diversion Canal (W-14 main). The Doublon-French Branch (W-15) which generally flows outside the incorporated city limits has no impact on the flooding situation in Slidell.

Bayou Vincent, which flows about 3.6 miles from Interstate 12 to the junction of Bayou Bonfouca, traverses through the swampy area southwest of Slidell and empties into Lake Pontchartrain. The average slope of the stream is 0.001 foot per foot and its flood plain is relatively flat.

The Diversion Canal (W-14) spans about 6 miles from the northern boundary of the study area at I-12 to the flat marshy area in the south. The average slope of this stream is about 0.0005 foot per foot. The flood plain of W-14 is relatively flat particularly on the western bank of the stream, where the principal commercial and residential developments of the city are located. The ground elevation in this area is generally lower than the top of the stream banks.

The study area has several small industries such as ship yards, lumber companies, fabricated metal products, food processing, roofing, concrete products and industrial gases. Most of the study area is urban in nature comprised of shopping centers, small commercial establishments and residential areas.
The climate of the area is generally influenced by the Gulf of Mexico, giving it a semitropical marine character. Major rainfall can occur due to tropical storms moving inland, intense convective storms triggered by southerly gulf winds and frontal storms resulting from the interaction of warm moist air with cold dry air. Annual average rainfall for the study area is 62 inches. The average annual temperature ranges from 52 degrees F in the winter and 82 degrees F in the summer.

2.3 Principal Flood Problems

Flooding in the City of Slidell and vicinity is relatively frequent. It is caused by both headwater flooding due to intense rainfall in the upper reaches of the streams as well as high stages in Lake Pontchartrain caused by hurricanes.

The principal causes of flooding are the inadequacy of the existing channel system to convey the storm runoff, relatively low flat flood plain areas which are easily inundated, and high stages in Lake Pontchartrain created by hurricane.

One of the critical flood prone areas is the residential and commercial areas concentrated between the west bank of W-14 Diversion Canal and U.S. Route 11. Much of this area is below W-14's west bank elevation and slopes west towards U.S. Route 11. In addition to the overflow from W-14, local storm runoff from this residential and business district between East Hall Avenue and Route 433 drains westerly through a small drainage channel, which passes under U.S. Route 11 and is pumped into W-13 main. This pumping station is presently inadequate to handle high intensity runoff and causes water to backup in the channel. This backup further adds to the flooding problems of this area.

The residential area on the eastern bank of W-14 is relatively high (varying in elevation from 15 to 20 feet) and is safer from headwater or hurricane flooding.

The flooding problem along W-13 is less severe. Much of the channel upstream from Route 433, however, is inadequate to carry a 100-year discharge. Residential and commercial areas on both sides of W-13 around West Hall Avenue are susceptible to flooding.

In the lower reaches of both W-13 and W-14 Mains, high lake stages and the flat terrain are responsible for flooding problems. A rise of stage in Lake Pontchartrain is rapidly experienced in the lower reaches of these canals and in the southern portion of the City of Slidell.

The flooding problem in the study area is compounded when high lake stages are accompanied by intense rainfall.
The greatest flood of record for Slidell, Louisiana, and vicinity occurred on Sunday, May 18, 1958, when 13.2 inches of rainfall in a 24-hour period was recorded at the Central Fire Station in Slidell. At Bayou Liberty (a stream west of Slidell), 10.85 inches of rainfall was recorded. A high water stage of 7.1 feet above the National Geodetic Vertical Datum of 1929 (NGVD) was recorded in the center of Slidell. Flood waters caused considerable damage to the stocks of merchandise in the commercial areas. More than 40 families were forced to evacuate their homes while flooding in outlying areas caused highways and streets to be closed. Assuming that this storm was distributed over the entire drainage area of Slidell, it is estimated that it would be equivalent to a 100-year flood for headwater discharges.

Another large flood occurred on January 3-5, 1966. It was associated with a 3-day rainfall of 4.87 inches recorded at the Slidell Central Fire Station and caused a stage of 7.4 feet NGVD at Bayou Vincent, just upstream of U.S. Highway 190. In recent years, the flood of March 25, 1973 with a rainfall of 4.35 inches crested to 7.0 feet NGVD at Bayou Vincent upstream of Highway 190. The May 21-22, 1974 flood, a rainfall of 7.9 inches caused a stage of 8.0 feet NGVD at this gage location.

Other significant floods in the study area were those of July 22-23, 1946; June 12-13, 1956; September 23-24, 1956; September 30 and October 1, 1956; July 21-22, 1958; and March 17-18, 1961.

Flooding in the lower part of the study area has resulted from high stages in Lake Pontchartrain caused by hurricanes. Some of the significant hurricanes in recent times affecting Slidell are as follows: September-October 1915; "Hurricane Flossy" September 1956; "Hurricane Hilda" October 1964; "Hurricane Betsy" September 1965; "Hurricane Camille" August 1969; and "Hurricane Carmen" September 1974.

2.4 Flood Protection Measures

There are no Federal projects to provide flood protection measures for the City of Slidell.

Several drainage improvement projects are being undertaken by the City of Slidell. The projects consist of the expansion and improvement of the Diversion Canal (W-14) in the lower reaches; increasing pumping capacity of the main pump station at the W-13 main and providing a new pump station at Lee Street.

The Diversion Canal channel improvement project calls for the enlargement and deepening the channel from the marshy area south of Slidell to the Daney Street Bridge. This project is expected to be completed within the next two years.
3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

The City of Slidell lies within a coastal area and is subject to flooding from two natural causes: all-season rainfall and hurricanes accompanied by above normal high tides with rainfall. To properly evaluate the flooding problem, consideration was given to both rainfall and hurricane criteria. The frequency of flooding, regardless of the source of flood, was considered as the basis for final selection of the base flood. Detailed investigations were made of each of the two types of flood conditions and the flood which caused the greater crest height was selected as the flood to be used for the delineation of the flood plain limits.

Headwater discharges due to intense rainfalls are more critical in the upper reaches of the study area while the high lake stages resulting from hurricane surges cause critical flooding problems in the lower reaches of both W-13 and W-14 mains and in southern portion of the City of Slidell.

No flow records exist for any stream in the study area. Flood hydrographs for different storm frequencies were developed by synthetic methods utilizing the basin characteristics and the associated 10-, 50-, 100-, and 500-year frequency rainfall in the study area. The basin characteristics such as the size of the drainage area, mean basin length, slope factor, lag time, etc., were determined from U.S. Geological Survey (USGS) quad (Scale 1" = 2,000 feet, contour interval 5 feet). The synthetic unit hydrographs
were developed by the procedures developed for small urban and rural drainage basins by the Texas Water Development Board (Reference 2). The resulting peak discharges were also verified by other hydrograph techniques (References 3 and 4). Generalized rainfall frequency-depth-duration data (Reference 5) were used with the synthetic unit hydrographs to develop runoff hydrographs for the study area. The resultant discharge hydrographs were assumed to have the same frequencies of occurrences as their associated storms. The 500-year frequency rainfall was extrapolated from the 10-, 50-, and 100-year rainfall plot on log-probability paper.

The peak discharge-drainage area relationships for the selected recurrence intervals are presented in Table 1, "Summary of Discharges."

The hurricane surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for Lake Pontchartrain. The analyses reported herein reflect the stillwater elevations caused by tidal surges which propagate inshore from Lake Pontchartrain, but do not include any local wind setup or wave action effects at Slidell because depths are too small to support their generation.

The hurricane surge elevations for Slidell (W-13 and W-14 lower reaches) for the 10-, 50-, 100-, and 500-year frequencies are shown on the Flood Profiles (Exhibit 1). These elevations are computed assuming that an inland travelling hurricane surge drops a foot every 2.75 miles.
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<th>Flooding Source and Location</th>
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<th>50-Year</th>
<th>100-Year</th>
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<tr>
<td>At mouth</td>
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<td>At Station 11,000 (near Interstate 10, excluding eastern branch)</td>
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<td>At junction of Bayous Vincent and Bonfouca, near main pumping station</td>
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<td>5,500</td>
<td>6,700</td>
<td>7,700</td>
<td>9,600</td>
</tr>
<tr>
<td>At Gause Boulevard (U.S. Highway 190)</td>
<td>13.78</td>
<td>1,976</td>
<td>2,624</td>
<td>2,939</td>
<td>3,244</td>
</tr>
<tr>
<td>At Illinois Gulf Central Railroad</td>
<td>9.51</td>
<td>1,376</td>
<td>1,832</td>
<td>2,050</td>
<td>2,262</td>
</tr>
<tr>
<td>West Diversion Canal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At mouth</td>
<td>0.41</td>
<td>478</td>
<td>584</td>
<td>629</td>
<td>688</td>
</tr>
<tr>
<td>Reine Canal East</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At mouth</td>
<td>0.36</td>
<td>118</td>
<td>149</td>
<td>168</td>
<td>190</td>
</tr>
<tr>
<td>Reine Canal West</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At mouth</td>
<td>0.22</td>
<td>70</td>
<td>94</td>
<td>105</td>
<td>113</td>
</tr>
</tbody>
</table>
3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the City of Slidell were carried out to provide estimates of floods of the selected recurrence intervals along each flooding source. As previously stated, the southern portion of the City of Slidell is subject to flooding due to hurricane surges from Lake Pontchartrain. Flood levels were predicted for both hurricane and non-hurricane conditions, and were determined for each location or area. The higher stages were selected for use in each case.

Topography of the flood plains were obtained by field measurements, and existing topographic maps and the channel cross sections for W-13 and W-14 mains were obtained from the Louisiana Office of Public Works. Included in the hydraulic analysis were the effects of bridges, culverts and pumping stations.

Roughness coefficients (Manning's "n") for the channels and flood plains were estimated on the basis of field reconnaissance and engineering judgment. In general, roughness coefficients of 0.04 and 0.07 were used for channel flow and flood plain flow, respectively. For the proposed new channel expansion in the lower reaches of W-14 main, a channel roughness of 0.03 was used.

Water-surface elevations of floods for the selected recurrence intervals were computed through use of COE, HEC-2 computer program (Reference 6). Flood profiles were drawn showing computed water-surface elevations for floods of selected recurrence intervals. Starting elevations for the backwater profiles for W-13 and W-14 main were calculated using the slope-area method. Since hurricane surges from Lake Pontchartrain are critical in the lower portion of the study area, the water-surface profiles, show only the higher elevations for the headwater and hurricane flooding. All elevations are referenced from NGVD.

The frequency-elevation relationships for the hurricane flooding areas in the community are presented in Table 2, "Summary of Elevations.

<table>
<thead>
<tr>
<th>FLOODING SOURCE AND LOCATION</th>
<th>ELEVATION ABOVE NGVD (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10-YEAR</td>
</tr>
<tr>
<td>LAKE PONTCHARTRAIN</td>
<td></td>
</tr>
<tr>
<td>Hurricane Flooding Area 1</td>
<td>5.0</td>
</tr>
<tr>
<td>Hurricane Flooding Area 2</td>
<td>6.5</td>
</tr>
<tr>
<td>Hurricane Flooding Area 3</td>
<td>7.0</td>
</tr>
<tr>
<td>Hurricane Flooding Area 4</td>
<td>5.4</td>
</tr>
</tbody>
</table>
The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Locations of the selected cross sections used in the hydraulic analysis are shown on the Flood Profiles (Exhibit 1).

There are three pump stations in the City of Slidell for discharging the storm water from the urban areas. The total combined capacity of these stations, including additional planned expansion, is about 475 cfs. Since the hurricane surge elevations are critical in the southern part of Slidell, these pumping stations have no appreciable impact on the base flood elevations.

Bayou Vincent (W-13) and the Diversion Canal (W-14 main) are separated by the Southern Railroad embankment. Water elevations for hurricane flooding will be the same on both sides of the railroad embankment in the lower half of the study area. The drainage systems are not entirely independent and limited crossflow in the upper reaches of the study area could occur.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using a topographic map at a scale of 1:24,000 with a contour interval of five feet. In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Insurance Rate Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore not be subject to flooding. Owing to limitations of the map scale, such areas are not shown.
4.2 Floodways

The concept of a floodway, wherein the channel of a stream plus a portion of the adjacent flood plain would be kept free of encroachment, is not applicable to Slidell. Neither Bayou Bonfouca - Bayou Vincent (W-13 main) nor the Diversion Canal (W-14 main) have fully confined flood plains. A fully encroached flood plain, under these circumstances, would increase the flood heights only by insignificant amounts. Minimum water levels would be practically limited by the tendency of flood waters to flow across lower watershed boundaries. Also, since the lower reach of each stream within the city limits is characterized by hurricane flooding, the floodway concept would not be applicable to those reaches.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Slidell.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

<table>
<thead>
<tr>
<th>Average Difference Between 10- and 100-Year Floods</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2 feet</td>
<td>0.5 foot</td>
</tr>
<tr>
<td>2 to 7 feet</td>
<td>1.0 foot</td>
</tr>
</tbody>
</table>

For the areas subject to hurricane flooding, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot.
5.2 Flood Hazard Factors (FHF's)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHF's are used to set actuarial insurance premium rate tables based on FHF's from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHF's, the entire study area of the City of Slidell was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zones A1, A2, A4, A5, A7, A8: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF's.

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.
5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map (Exhibit 2) for the City of Slidell is, for insurance purposes, the principal result of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Type 5 Flood Insurance Study of the Louisiana Gulf Coast was completed by the COE for the Department of Housing and Urban Development in May 1970 (Interagency Agreement No. AA-H-8-70, Project Order No. 4). The portion of the above study pertaining to Slidell was an update of data contained in the "Interim Survey Report, Lake Pontchartrain, Louisiana and Vicinity," prepared by the COE in November 1962.

A Flood Plain Information Report for the City of Slidell was prepared by the COE in December 1971.

This study is authoritative for the purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Federal Emergency Management Agency, Mitigation Division, Federal Regional Center, Room 206, 800 North Loop 288, Denton, Texas 76201-3698.

8.0 BIBLIOGRAPHY AND REFERENCES


9.0 **REVISION DESCRIPTIONS**

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the community repository of flood-hazard data located at the City of Slidell Planning Department, 2056 Second Street, P.O. Box 828, Slidell, Louisiana 70459.

9.1 First Revision

This study was revised on April 21, 1999, to show modifications to flood hazards along Diversion Canal (W-14 Main), Bayou Vincent (W-13 Main), West Diversion Canal, and Reine Canals East and West. Diversion Canal (W-14 Main) was studied from Daney Street to 700 feet upstream of Pawns Boulevard, a distance of approximately 3.75 miles. Bayou Vincent (W-13 Main) was studied from 1,500 feet downstream of West Hall Road to 1,000 feet downstream of Interstate 12, a distance of approximately 2.36 miles. West Diversion Canal was studied from its confluence with Bayou Vincent (W-13 Main) to its confluence with Diversion Canal (W-14 Main), a distance of approximately 0.85 mile. Reine Canal East was studied from its confluence with French Branch to its confluence with Reine Canal West, a distance of approximately 0.80 mile. Reine Canal West was studied from...
its confluence with Diversion Canal (W-14 Main) to its confluence with Reine Canal East, a distance of approximately 0.85 mile. All flooding sources were studied by detailed methods.

The hydrologic and hydraulic analyses for the restudy were performed for the Federal Emergency Management Agency (FEMA) by Owen and White, Inc., under Contract No. EMT-96-CO-0023. This restudy was completed on November 12, 1997.

The results of the restudy were reviewed at the final Consultation Coordination Officer meeting held on January 21, 1998, and attended by representatives of the City of Slidell; the Louisiana Department of Transportation; Owen and White, Inc.; and FEMA. All problems raised at that meeting have been addressed in this restudy.

There was a major flood in the City of Slidell in 1995. Between Monday evening, May 8, 1995, and Wednesday morning, May 10, 1995, 23.9 inches of rain fell in the City of Slidell. The 100-year, 2-day storm is 14 inches.

There are various flood-protection measures in place along some of the studied streams and within the study area. A storage basin has been constructed along Diversion Canal (W-14 Main) north of Robert Road. A detention basin is being constructed on West Diversion Canal downstream of U.S. Highway 11. An improved drainage-outlet system is being constructed for the Belvedere area to Bayou Bonfouca. Several pumping stations in the “Hurricane Flood Effects” area are being expanded.

Discharge-drainage area relationships for Diversion Canal (W-14 Main), Bayou Vincent (W-13 Main), West Diversion Canal, and Reine Canals East and West were determined using the U.S. Army Corps of Engineers (USACE) HEC-1 computer program (Reference 7). Due to the topography of the detailed study area, hydrologic analyses need to emphasize slope in overbank and channel, flow diversion, and storage and ponding. Times of concentration and storage coefficients were computed for overland flow using the Espey Huston model (Reference 8). Clark unit hydrographs were computed for all streams and converted to runoff hydrographs using rainfall from isopluvial maps (References 5 and 9) and initial uniform loss rates. These computations and those for routing and combining the hydrograph ordinate using the modified-Puls routing method were performed using the USACE HEC-1 computer program (Reference 7).

After computation of the peak discharges, an array of decision combinations was made. Diversion occurs from Diversion Canal (W-14 Main) through West Diversion Canal to Bayou Vincent (W-13 Main). Also, Reine Canal West flow is divided between Diversion Canal (W-14 Main) and French Branch. In addition, downstream split flow occurs from Diversion Canal (W-14 Main) to Bayou Bonfouca (W-13 Main). Diversion combinations concluded when equally calculated water- surface elevations were obtained on Diversion Canal (W-14 Main) upstream of West Diversion Canal and at a common point in Reine Canal West. The discharges for the streams studied using detailed methods are shown in Table 1, “Summary of Discharges.”

Water-surface elevations for detailed studied streams were computed using the USACE HEC-2 computer program (Reference 10).
Roughness coefficients (Manning's "n" values) used in the hydraulic computations were estimated from field observations, aerial photography, and photographs. Roughness coefficients for the streams studied by detailed methods are shown in Table 3, "Manning's "n" Values."

Special flood hazard area boundaries were interpolated using topographic maps with a contour interval of 2 feet, developed for the restudy. For areas beyond the limits of these contour maps, the flood boundaries were determined using USGS 7.5-minute series topographic maps at a scale of 1:24,000, with a contour interval of 5 feet (Reference 11).

All elevations are referenced to the NGVD. Elevation reference marks and their descriptions are shown on the maps.

No floodways were computed for the streams studied by detailed methods. All streams and overbanks are relatively flat. There is ample storage available and there are numerous diversion canals. Minor fluctuations in water surface can cause diversion to adjacent basins. Streams are more affected by changes in storage than encroachment.

Exhibit 1, "Flood Profiles," was revised to reflect changes as a result of the restudy.
Table 3. Manning's "n" Values

<table>
<thead>
<tr>
<th>Flooding Source</th>
<th>Channel</th>
<th>Overbanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversion Canal (W-14 Main)</td>
<td>0.04 to 0.12</td>
<td>0.04 to 0.20</td>
</tr>
<tr>
<td>Bayou Vincent (W-13 Main)</td>
<td>0.04 to 0.12</td>
<td>0.04 to 0.20</td>
</tr>
<tr>
<td>West Diversion Canal</td>
<td>0.04 to 0.12</td>
<td>0.04 to 0.20</td>
</tr>
<tr>
<td>Reine Canal East</td>
<td>0.04 to 0.12</td>
<td>0.04 to 0.20</td>
</tr>
<tr>
<td>Reine Canal West</td>
<td>0.04 to 0.12</td>
<td>0.04 to 0.20</td>
</tr>
</tbody>
</table>
HYDROLOGIC AND HYDRAULIC STUDY
FOR
CITY BARN DRAINAGE IMPROVEMENTS
CITY OF SLIDELL, LOUISIANA
DEPARTMENT OF ENGINEERING
CITY OF SLIDELL PROJECT NO. 100-118
HDCA PROJECT NO. 2014-10 (PHASE II)

Prepared by:
H. DAVIS COLE & ASSOCIATES, LLC
1340 POYDRAS STREET, SUITE 1850
NEW ORLEANS, LA 70112
Phone (504) 836-2020
Fax (504) 836-2010

APRIL 2016
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Appendix D – Topographic and Boundary Survey, Prepared by All South Consulting Engineers (ASCE)

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SECTION 1 – PROJECT BACKGROUND

INTRODUCTION

The City of Slidell, Louisiana (COS), has applied for funding under the Hazard Mitigation Grant Program (HMGP), a program funded through the Federal Emergency Management Agency (FEMA), to improve existing drainage systems within the City. Part of these ongoing efforts have included various improvements to the City Barn Drainage Pump Station (CBDPS) and associated drainage system. The goal of this project is to further improve the performance of the existing drainage system located along the US 11 (Front Street) Highway Route near Bayou Pattasat and Bayou Bonfouca in Slidell, Louisiana and to further reduce the recurring flooding throughout the drainage basin by reducing maximum water surface elevations within the area.

This project will include improvements to the existing CBDPS, located at the end of Bayou Lane, and reshaping the cross-section of Bayou Pattasat as it approaches the drainage pump station. The existing CBDPS, which has a current capacity of 400 cubic feet per second (cfs) and is being upgraded to a capacity of 575 cfs, is the primary means of removing rain water from the south side of US 11 (Front Street) to Bayou Bonfouca. Improving the pump station itself and increasing the capacity of the channel leading to the pump station will decrease the extents of flooding in the entire basin. Further, the inclusion of a fourth mechanical bar screen cleaner at the drainage pump station will protect the pumps from damage due to foreign object ingestion as well as reduce pump down time associated with foreign object ingestion. Lastly, the reshaping of the channel directly in front of the fourth pump will reduce the velocities through the screen, helping to protect the screens themselves from damage from unusually massive objects.

PURPOSE

The focus and purpose of this Hydrologic and Hydraulic (H&H) Study is to detail the effects of the in progress capacity improvements to the pump station on the performance of the drainage system. Additionally, this study reviews the downstream effects of the proposed pump expansion.

PROJECT AUTHORIZATION

COS entered into an agreement with H. Davis Cole & Associates, LLC (HDCA) to provide engineering consulting services for the City Barn Drainage Pump Station Capacity Improvements. These services included development of a study describing the existing drainage basin and the development of recommendations to improve the conveyance of water within the basin and through the CBDPS. This study is captured under Amendment 2 to the Agreement mentioned above, which was executed on February 18th, 2016.

STUDY LOCATION AND AREA

The general study area includes the full length of Bayou Pattasat, northwest of US 11 through the CBDPS and where it intersects with Bayou Bonfouca and Southeast of US 11 where it branches off into two reaches, one extending to the W-14 Canal and the other extending to 3rd...
Street (Sgt. Alfred Drive). The entire drainage basin consists of over 350 acres including commercial, industrial, and residential properties.

The length of Bayou Pattasat from the CBDPS and where it crosses US 11 is approximately 950 feet. Once crossing under US 11 the bayou continues on for approximately 850 feet until splitting off into the northern reach with a length of approximately 4200 feet and ending at the W-14 canal and the southern reach with a length of approximately 2200 feet and ending at 3rd Street (Sgt. Alfred Drive).

All of the storm water collected in the basin described above flows downstream through Bayou Pattasat until it reaches the CBDPS. The water is then pumped up and over the existing berm and into Bayou Bonfouca where it flows south to its eventual outfall into Lake Pontchartrain. The general study area is depicted below in the following figure.

![Figure 1.1 – Vicinity Map and General Study Area](image)

The existing CBDPS, located at the most downstream point of Bayou Pattasat has a current pumping capacity of 400 cfs. A new project currently underway will increase the capacity of the station to 575 cfs by adding one more pump. This project is intended to be complete by September-October 2016 in anticipation of hurricane season. The improved capacity of the drainage pump station will better protect the drainage basin against a 100-year storm event.

**PREVIOUS WORK AND STUDIES BY OTHERS**

The following list of studies and/or works done by others were utilized by HDCA in order to develop the basis for this H&H Study of the described project area:
- Bayou Patassat (City Barn) Drainage Study Addendum 1 by J.V. Burkes & Associates, Inc.
- Flood Insurance Study for the City of Slidell prepared by the Federal Emergency Management Agency

Copies of these references are included as Appendix “A” and “B”, respectively, to this study.

In addition, a geotechnical investigation was prepared by Professional Services Industries, Inc. (PSI) to define the general site and soil conditions and for the development of the safe canal slopes for the Bayou Pattasat drainage canal. A copy of this completed geotechnical investigation is included as Appendix “C” to this study.

Finally, a topographic and boundary survey was prepared by All South Consulting Engineers (ASCE). This topographic and boundary survey was utilized for topographic data to supplement the model runs and for the review of limitations of channel shaping due to property limitations, such as servitudes, rights – of – way, and property boundaries. A copy of the topographic survey prepared for the project is included as Appendix “D” to this study.

The observations and recommendations contained within this H&H Study are generally based upon the unsteady – state existing drainage model provided to HDCA by COS. It is HDCA’s understanding that the drainage model was originally developed by the United States Army Corps of Engineers and utilized in previous studies of the project area. The model is assumed to be a true and accurate representation of the geometry of the drainage basin, drainage features, and prevailing hydrologic conditions. In addition, generally accepted hydraulic principles were utilized for the preparation of this study.

STUDY ORGANIZATION

This H&H Study for the CBDPS is divided into three sections and two appendices as described below:

- Section 1 – Project Background
- Section 2 – Study Procedures and General Hydrologic and Hydraulic Findings
- Section 3 – Recommended Improvements
- Appendix A – Previous Study – Bayou Pattasat Drainage Study, Prepared by J.V. Burkes and Associates
- Appendix B – Flood Insurance Study for the City of Slidell, 1999
- Appendix C – Geotechnical Investigation prepared by Professional Services Industries (PSI)
- Appendix D – Topographic and Boundary Survey, Prepared by All South Consulting Engineers (ASCE)
- Appendix E – Comparison of Water Surface Elevations for Various Events
• Appendix F – Exhibit Plates

• Appendix G – Downstream Water Surface Estimation Calculations
SECTION 2 – STUDY PROCEDURES AND GENERAL HYDROLOGIC AND HYDRAULIC FINDINGS
SECTION 2 – STUDY PROCEDURES AND GENERAL HYDROLOGIC AND HYDRAULIC FINDINGS

DESCRIPTION OF THE STUDY AREA AND DRAINAGE CHARACTERISTICS

The general area considered in this study consists of just over 350 acres and is depicted in Figure 2.1 below:

The study area is currently drained through Bayou Pattasat which consists of two major ditch reaches. Bayou Pattasat drains from East to West, reaching its confluence with Bayou Bonfouca (alternatively referred to as the W-13) at the City Barn Drainage Pump Station. The confluence of the two bayous is controlled by a floodgate facility. Generally, the water surface elevation in Bayou Bonfouca is higher than the water surface elevation in Bayou Pattasat and opening the floodgate serves no purpose in aiding the drainage of the Bayou Pattasat basin. Accordingly, all water runoff falling within the basin must be pumped out of the basin.

Accordingly, the basin is served by forced drainage. Since the floodgates do not effectively provide a reliable means of drainage, and the pump station does not have the pumping capacity to directly drain the 100 - year event, it is the opinion of HDCA that the focus of improvements to the drainage basin should occur at or around the pump station itself, and other areas where storage for runoff may be available.
Generally, Bayou Pattasat in the area of the CBDPS is approximately 40 feet wide at top of bank, varying in depth from 4 to 10 feet. The canal widens and deepens in the vicinity of the drainage pump station. Based upon the review of the topographic and boundary survey prepared by ASCE, the southern bank of the canal actually is within property not owned by the COS, although some relief is provided by the way of servitudes granted to COS. The canal bank is generally steep, in some places exceeding a 3:1 (horizontal to vertical) slope.

Previous reports have indicated that there is some cross-over of flow from the W-14 drainage into the Bayou Pattasat basin. Based on previous reports, the W-14 drainage canal is not suitable for the water demand at which it should be so when heavy rainfall events occur the Bayou Pattasat drainage area is easily and adversely impacted. The effects of the W-14 drainage canal overflow were mentioned previously by others and HDCA believes was captured in the HEC-RAS model.

**CLIMATE**

Slidell, as with Southeast Louisiana, has a humid subtropical climate. Weather patterns are characterized by hot summers with frequent precipitation, mild winters, no actual dry season, and a generally warm and humid climate. As Slidell is rather close to the Gulf Coast, it does experience direct impacts from tropical activity.

**SOILS AND LAND USE**

HDCA utilized the United States Department of Agriculture (USDA) Web Soil Survey (WSS) to identify predominate soil types within the area.

The study area is predominantly composed of Myatt Fine Sandy Loam and Stough Fine Sandy Loam. These soils are generally frequently flooded and poorly drained, runoff time is long since the slope is nearly level, and the water table is usually high for long periods of time which generally occurs in the winter and spring.

According to the Louisiana Department of Transportation and Development (DOTD) Hydraulics Manual, Myatt soil is classified as hydrologic groups B and D and Stough soil is classified as hydrologic group C. Groups B and D are described as having moderate to very slow infiltration rates and water transmission therefore having high runoff potential. Soil group C is described as having slow infiltration rates and water transmission, also resulting in high runoff potential. Overall, the predominate soils throughout the Olde Towne drainage basin do not allow much infiltration, meaning that most of the water that hits the ground runs off and needs to then be transferred to the drainage ditches and on toward the CBDPS. The more the soils allow runoff the more water the drainage basin needs to drain, making the drainage outlets in need of storing and transporting large amounts of water on a daily basis much less during hurricane season.

The majority of the study area is developed and is used for residential and commercial purposes. This developed urban to suburban study area produces a more intensive peak discharge than an undeveloped area. Enhancing the drainage system is challenging because the slope is little to none in some areas of the drainage study area therefore not giving the water basin much relief.
STUDY ASSUMPTIONS AND PROCEDURES AND DRAINAGE MODEL

In general, the hydrologic behavior of the study area analyzed with the aid of a computer model created and run in HEC – RAS. Developed by the U. S. Army Corps of Engineers Institute for Water Resources, HEC – RAS is widely accepted as the industry standard for the modeling of unsteady and steady state flow regimes for riverine areas.

The HEC-RAS has many capabilities, including but not limited to the calculation of Steady Flow Water Surface Profiles, Unsteady Flow Simulation, and Sediment Transport/Movable Boundary Computations. For this particular study, the Unsteady Flow Simulation was used. The Unsteady Flow Simulation is simply a program developed to mimic the effects of an unsteady flow traveling through a network of channels. These channels consists mainly of open ditches. Additionally, the drainage area contains bridges and junctions, which are modeled in accordance with standard procedures for the HEC – RAS program.

HEC – RAS completes its analysis of storm events by pairing a geometry with a specific flow file. In general, the program determines water surface elevations by balancing of the “Energy Equation”, relating a specific flow at a specific time to a specific geometric consideration at the point of analysis. In this particular case, the geometry of this drainage basin has already been modeled by others. Some cross-sections throughout the length of Bayou Pattasat and the pumps located at the CBDPS were previously entered into the geometry of this project. HDCA modified the existing model by updating the geometry of the model to better suit existing and proposed conditions.

HDCA created three specific model geometries for this project as noted below:

- **Existing Conditions Model (HDCA):** This model geometry was derived from the original “existing conditions geometry” contained within the existing drainage model. HDCA modified this geometry by adjusting the “pump on and pump off” elevations to better reflect the pump set points as well as separating the pump groups into three separate groups to allow for variation in the pump set point elevations for each pump. Further, HDCA modified the canal cross sections directly adjacent to the drainage pump station to reflect the widening of the canal during the installation of the mechanical bar screen cleaners at the facility. Additional interpolated cross sections were included to provide additional model resolution near the drainage pump station.

- **Phase I Conditions:** This model geometry was derived from the HDCA conditions model to reflect the “City Barn Drainage Improvements Project” currently under construction. Specifically, these modifications included the addition of a fourth drainage pump with a rated capacity of 175 cubic feet per second and the revision of cross sections near the CBDPS to reflect the removal of earth on the south bank of the CBDPS facility.

- **Phase II Conditions:** This model geometry was derived from Phase I Conditions model geometry. These modification included the revision of cross sections to reflect proposed removal of material associated with proposed shaping of the canal.

In order to determine the effects of different rain events on specific geometry files, the software must have hydrographs input for each different rain event. To complete this process, HDCA paired unsteady flow data files with specific geometries. Given all of the necessary data, and after telling the program to compute, the software runs the specified hydrograph of unsteady
flow through the geometry of the drainage basin, through all of the ditches, junctions, pump stations, etc. The result of this computation is shown through different schematics such as a hydraulic grade line of the entire geometry, velocity at various locations throughout the geometry, and water surface elevations represented in cross-sections of river stations.

HDCA utilized unsteady flow files provided with the drainage model, as they were assumed to be a true and accurate representation of the hydrologic characteristics of the drainage basin. Of note, the previous model was completed utilizing restart files, commonly referred to as “Hot – Start” files. As a simplifying assumption, HDCA overwrote the initial conditions from initial model runs and checked the water surface elevations against the previous models. As these were in general concurrence (within hundredths of a foot), HDCA believes that the simplified initial conditions are relatively accurate. HDCA employed the existing conditions unsteady flow files for its initial conditions model runs, and the “Post 1” unsteady flow files for its Phase I and Phase II model runs as the Post 1 unsteady flow file was the most equivalent unsteady flow, consisting of the addition of one pump to CBDPS.

HDCA ran each different geometry with each different flow file, ultimately creating twelve plans within the program. The plans are as detailed in Table 2.1 below:
### Table 2.1 – Geometry and Flow File Pairings

<table>
<thead>
<tr>
<th>Analysis Case</th>
<th>HEC – RAS Geometry File</th>
<th>HEC – RAS Unsteady Flow File</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Year – Existing Conditions</td>
<td>HDCA ECM (R)</td>
<td>ECM 10 Year</td>
</tr>
<tr>
<td>25 Year – Existing Conditions</td>
<td>HDCA ECM (R)</td>
<td>ECM 25 Year</td>
</tr>
<tr>
<td>50 Year – Existing Conditions</td>
<td>HDCA ECM (R)</td>
<td>ECM 50 Year</td>
</tr>
<tr>
<td>100 Year – Existing Conditions</td>
<td>HDCA ECM (R)</td>
<td>ECM 100 Year</td>
</tr>
<tr>
<td>10 Year Phase I Conditions</td>
<td>HDCA Phase I</td>
<td>Phase I 10 Year</td>
</tr>
<tr>
<td>25 Year Phase I Conditions</td>
<td>HDCA Phase I</td>
<td>Phase I 25 Year</td>
</tr>
<tr>
<td>50 Year Phase I Conditions</td>
<td>HDCA Phase I</td>
<td>Phase I 50 Year</td>
</tr>
<tr>
<td>100 Year Phase I Conditions</td>
<td>HDCA Phase II</td>
<td>Phase I 100 Year</td>
</tr>
<tr>
<td>10 Year Phase II Conditions</td>
<td>HDCA Phase II</td>
<td>Phase II 10 Year</td>
</tr>
<tr>
<td>25 Year Phase II Conditions</td>
<td>HDCA Phase II</td>
<td>Phase II 25 Year</td>
</tr>
<tr>
<td>50 Year Phase II Conditions</td>
<td>HDCA Phase II</td>
<td>Phase II 50 Year</td>
</tr>
<tr>
<td>100 Year Phase II Conditions</td>
<td>HDCA Phase II</td>
<td>Phase II 100 Year</td>
</tr>
</tbody>
</table>

The results of the Unsteady Flow Simulation for Existing Conditions Model, Phase I Conditions, and Phase II Conditions were all compared and the results are discussed Section 3 of this Study.
ESTIMATION OF EFFECTS DOWNSTREAM OF CBDPS

In order to estimate the effects of the increased flow in Bayou Bonfouca downstream of CBDPS, HDCA utilized the City of Slidell Flood Insurance Study to create a synthesized stage – discharge relationship for Bayou Bonfouca. This method is widely accepted in the industry for estimating the effects of increased or decreased flow within an open channel. The results of this analysis are included in Section 3 of this Study.
SECTION 3 – GENERAL HYDRAULIC FINDINGS AND RECOMMENDATIONS

Prepared By:

H. Davis Cole & Associates, LLC
Consulting Engineers
SECTION 3 – GENERAL HYDRAULIC FINDINGS AND RECOMMENDATIONS FOR IMPROVEMENTS

GENERAL FINDINGS

The analysis of the drainage basin indicated that the maximum water surface elevations for the Bayou Pattasat drainage basin were indeed reduced by the under construction and proposed improvements. Detailed discussion of these is included below and in the appendices to this report. However, it was noted that the reduction in water surface elevations for the Phase I project are more dramatic than the Phase II project.

The geotechnical analysis of the Bayou Pattasat canal indicated that the maximum allowable slope of the canal should be limited to a 3:1 slope. Of further note, the ability to shape this canal is severely limited on the south side of the canal by existing servitudes and rights of way as well as utilities on the north side. As a general recommendation, COS should investigate possible acquisition or cooperative endeavor agreements to allow for additional excavation of the canal to the south of the channel. This would dramatically increase the available storage in the vicinity of CBDPS, allowing for further reductions.

As a basis of comparison, HDCA compared the previous modeling results prepared by others with our own existing conditions model and Phase I and Phase II as detailed below.

10 – YEAR STORM EVENT

Table 3.1 below illustrates the average water surface elevations for the Phase I and Phase II projects for the ten – year storm event. These are compared against the previous existing conditions model for comparison.

Table 3.1 – 10 Year Storm Event – Average WSE

<table>
<thead>
<tr>
<th>Average WSE, Existing Model</th>
<th>Maximum Previous Conditions</th>
<th>Average Maximum WSE, HDCA Existing Conditions Model</th>
<th>Average Maximum WSE, HDCA Phase I Conditions Model</th>
<th>Average Maximum WSE, Previous Existing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.21</td>
<td>6.19</td>
<td>5.69</td>
<td>5.69</td>
<td></td>
</tr>
</tbody>
</table>

A detailed comparison of water surface elevations for the ten – year storm event are included in Appendix “E” to this Study. Further, inundation maps for the ten – year event are included in Appendix “F” to this Study.
25 – YEAR STORM EVENT

Table 3.2 below illustrates the average water surface elevations for the Phase I and Phase II projects for the ten-year storm event. These are compared against the previous existing conditions model for comparison.

<table>
<thead>
<tr>
<th>Average WSE, Existing Model</th>
<th>Maximum WSE, HDCA Existing Conditions Model</th>
<th>Average Maximum WSE, HDCA Phase I Conditions Model</th>
<th>Average Maximum WSE, Previous Existing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.70</td>
<td>6.69</td>
<td>6.16</td>
<td>6.17</td>
</tr>
</tbody>
</table>

A detailed comparison of water surface elevations for the twenty five – year storm event are included in Appendix “E” to this Study. Further, inundation maps for the twenty five – year event are included in Appendix “F” to this Study.

50 – YEAR STORM EVENT

Table 3.3 below illustrates the average water surface elevations for the Phase I and Phase II projects for the fifty – year storm event. These are compared against the previous existing conditions model for comparison.

<table>
<thead>
<tr>
<th>Average WSE, Existing Model</th>
<th>Maximum WSE, HDCA Existing Conditions Model</th>
<th>Average Maximum WSE, HDCA Phase I Conditions Model</th>
<th>Average Maximum WSE, Previous Existing Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.94</td>
<td>6.93</td>
<td>6.38</td>
<td>6.39</td>
</tr>
</tbody>
</table>

A detailed comparison of water surface elevations for the fifty – year storm event are included in Appendix “E” to this Study. Further, inundation maps for the fifty – year event are included in Appendix “F” to this Study.

100 – YEAR STORM EVENT

Table 3.4 below illustrates the average water surface elevations for the Phase I and Phase II projects for the one hundred – year storm event. These are compared against the previous existing conditions model for comparison.
Table 3.4 – 100 Year Storm Event – Average WSE

<table>
<thead>
<tr>
<th>Average WSE, Previous Conditions</th>
<th>Maximum Average WSE, HDCA Existing Conditions Model</th>
<th>Average Maximum WSE, HDCA Phase I Existing Conditions Model</th>
<th>Average Maximum WSE, Previous Conditions Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.38</td>
<td>7.36</td>
<td>6.82</td>
<td>6.81</td>
</tr>
</tbody>
</table>

A detailed comparison of water surface elevations for the one hundred – year storm event are included in Appendix “E” to this Study. Further, inundation maps for the one hundred – year event are included in Appendix “F” to this Study.

ADDITIONAL HYDRAULIC BENEFITS OF THE PHASE II PROJECT

While it should be noted that the Phase II project does not show appreciable benefits in terms of maximum water surface elevation reduction, the project has additional hydraulic benefits which will enhance the service life and reliability of the pump station components.

First, the straightening of the channel directly in front of the pump currently under installation will allow for a straighter, more direct flow of water. This is more ideal for the pump operation and will lead to smoother operation and less sacrifice of efficiency due to any turbulence.

Additionally, the addition of the fourth screen will reduce the velocities of the flow at the screen interface. At the approximate worst case pump off water surface of -2.0, the average screen velocities will be reduced from 9.5 feet per second to 7.0 feet per second. This will reduce potential for damage due to large, massive object impacts and will improve screen capture efficiency.

ANTICIPATED DOWNSTREAM EFFECTS

While the water surface elevations upstream of the CBDPS will certainly decrease as a result of improvements to the CDBPS and Bayou Pattasat canal, the increase of discharge into Bayou Bonfouca will result in a nominal increase in the water surface elevation downstream of the station.
Table 3.5 below illustrates the expected increases in water surface elevation. Detailed calculations are included as Appendix “G” to this Study.

<table>
<thead>
<tr>
<th>Storm Return Interval</th>
<th>FIS Discharge, CFS (Note 1)</th>
<th>Elevation, NGVD (From FEMA FIS Profile)</th>
<th>Additional Flow (CFS)</th>
<th>Total Flow</th>
<th>Estimated Elevation w/ Additional Flow (Note 2)</th>
<th>Estimated Total Change (Inches) (Note 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Year</td>
<td>5500</td>
<td>5</td>
<td>175</td>
<td>5675</td>
<td>5.40</td>
<td>4.80</td>
</tr>
<tr>
<td>50 Year</td>
<td>6700</td>
<td>8</td>
<td>175</td>
<td>6875</td>
<td>8.30</td>
<td>3.60</td>
</tr>
<tr>
<td>100 Year</td>
<td>7700</td>
<td>9</td>
<td>175</td>
<td>7875</td>
<td>9.15</td>
<td>1.80</td>
</tr>
<tr>
<td>500 Year</td>
<td>9600</td>
<td>10</td>
<td>175</td>
<td>9775</td>
<td>10.15</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Notes: 1) Discharge in CFS from FIS Study, City of Slidell, Louisiana, April 21, 1999. 2) Estimate from synthesized stage – discharge curve based on FIS Study Discharges. 3) Calculated as change in elevation in feet multiplied by 12 inches per foot. 4) Change in elevation less than 0.1 foot, reported as 0.1 foot.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

In general, it was found that the proposed improvements will reduce the water surface elevations within the Bayou Pattasat Drainage Basin and yield hydraulic benefits which will enhance efficiency and service life of the mechanical components of the station. Further improvements are limited by the restrictive servitudes and rights of way which encumber potential widening of the channel and further pursuit of relief of these servitudes is in order.
Hydrologic and Hydraulic Study
City Barn DPS Capacity Improvements
Funded by Hazard Mitigation Grant Program
St. Tammany Parish, Louisiana

APPENDIX A – PREVIOUS STUDY –
BAYOU PATTASAT DRAINAGE STUDY,
PREPARED BY J.V. BURKES AND ASSOCIATES

Prepared By:
EXEMPLARY SUPPORTING DOCUMENTATION FROM Bayou Pattasat (City Barn) Drainage Study ADDENDUM 1 Prepared by J.V. Burkes and Associates, Inc., June 2014

For a full version of this report, the general public can send a request to:
email: FEMA-NOMA@dhs.gov,
 telephone: 225-267-2962
 fax: 225-346-5848

Regular mail:
DEPARTMENT OF HOMELAND SECURITY-FEMA
ATTN: SLIDELL CITY BARN PUMP STATION DRAINAGE IMPROVEMENTS
1500 MAIN STREET
BATON ROUGE, LOUISIANA 70802.
APPENDIX B – FLOOD INSURANCE STUDY FOR CITY OF SLIDELL, 1999
EXCERPTED SUPPORTING DOCUMENTATION FROM Bayou Pattasat (City Barn) Drainage Study ADDENDUM 1 Prepared by J.V. Burkes and Associates, Inc., June 2014

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Appendix E
Public Notice, 8-Step, FONSI
Interested parties are hereby notified that the Federal Emergency Management Agency (FEMA) has prepared a draft Supplemental Environmental Assessment (SEA) and draft Finding of No Significant Impact (FONSI) in compliance with the National Environmental Policy Act (NEPA). The purpose of the SEA is to update the existing Environmental Assessment and associated FONSI signed on 1/27/17. The applicant’s proposal will improve drainage within the Slidell area by upgrading the City Barn Pump Station’s pumping capacity. The SEA has assessed the effects on the human and natural environment given the need for additional modifications to the original City Barn Pump Station proposal. The proposed site is located along the US 11 (Front Street) Highway Route, at the end of Bayou Lane, in St. Tammany Parish, Slidell, Louisiana.

The proposed drainage improvement project is intended to reduce the frequency of flooding within Slidell, Louisiana. This project entails replacing an existing pump with a higher pumping capacity pump, replacing an existing outfall pipe with a larger outfall pipe, temporary dewatering of the site, a new fuel storage area, and reconfiguration of the deck on the existing dock. FEMA has previously reviewed and provided funding for numerous hazard mitigation efforts for the City Barn Pump Station.

The purpose of the draft SEA is to analyze the potential environmental impacts associated with the preferred action and alternatives. The draft SEA evaluates a No Action Alternative; the Preferred Action Alternative- Improve the City Barn Pump Station; and an Alternative Action- Construct a Larger Retention Basin in Bayou Patassat at the City Barn Pumping Station.

The draft FONSI is FEMA’s finding that the preferred action would not have a significant effect on the human and natural environment.

The Draft SEA and Draft FONSI is available for review at the St Tammany Parish Library, Slidell Branch, at 555 Robert Blvd, Slidell, LA 70458 – Mondays through Thursdays 9:00am to 8:00pm; Fridays and Saturdays 9:00am to 5:00pm. The documents can also be downloaded from FEMA’s website at [http://www.fema.gov/resource-document-library](http://www.fema.gov/resource-document-library).

This public notice is published in the Advocate-New Orleans edition for five (5) days, Wednesday July 11, 2018 through Sunday, July 15, 2018, and in the Parish’s newspaper of record –the St. Tammany Farmer on Wednesday, July 18, 2018. There is a thirty (30) day comment period, beginning on Wednesday July 11, 2018 and concluding on Friday, August 10, 2018 at 4 p.m. Comments may be mailed to: DEPARTMENT OF HOMELAND SECURITY-FEMA EHP-City Barn Drainage Improvements, 1500 MAIN STREET, BATON ROUGE, LOUISIANA 70802. Comments may be emailed to: fema-noma@fema.dhs.gov or faxed to: 225-
346-5848. Verbal comments will be accepted or recorded at 225-267-2962. If no substantive comments are received, the draft SEA and associated draft FONSI will become final.
8-STEP PROCESS

DATE: 7/2/2018
PREPARED BY: Jill Kelly, Environmental Protection Specialist
PROJECT: City of Slidell City Barn Pump Station Drainage Improvement Project
Hazard Mitigation Grant Program Project No. 1603-0321am7, FEMA DR-1603-LA
LOCATION: Slidell, LA
Latitude 30.273494 Longitude -89.788233

EO 11988-FLOODPLAIN MANAGEMENT
EO 11990-WETLAND PROTECTION

STEP 1
Determine whether the proposed action is located in a wetland and/or The 100-yr floodplain (500-year floodplain for critical actions [44 CFR 9.4]), or whether it has the potential to affect or be affected by a floodplain or a wetland (see 44 CFR 9.7).

The City of Slidell enrolled in the National Flood Insurance Program (NFIP) on 12/16/1980. Per Preliminary Digital Flood Insurance Rate Map (DFIRM) Panel Number 22103C0495F, dated 4/30/08, project is located in Zone "AE (EL 11)", areas with in the 100-year flood, Base Flood Elevations (BFE) determined. Per St. Tammany Parish Advisory Base Flood Elevation (ABFE) Map LA-MM40, dated 01/18/06, project is located in an "AE EL 10" Zone.

STEP 2
Notify the public at the earliest possible time of the intent to carry out an action in a floodplain or wetland, and involve the affected and interested public in the decision making process (see 44 CFR 9.8).

A cumulative public notice concerning the Hazard Mitigation Grant Program (HMGP) Assistance in floodplain and wetland areas will be or has been published in the New Orleans Times-Picayune, Baton Rouge Advocate, Lafayette Daily Advertiser, Lake Charles American Press, Hammond Star, Monroe News-Star, Shreveport Times, and the Alexandria Daily Town Talk.

STEP 3
Identify and evaluate practicable alternatives to locating the proposed action in a floodplain or wetland (including alternative sites, actions and the "no action" option) [see 44 CFR 9.9]. If a practicable alternative exists outside the floodplain or wetland, FEMA must locate the action at the alternative site.

(Proposed Alternative):
proposed improvements and upgrades at the existing City Barn Pump Station (CBPS):

- Construction of a new diesel fuel storage facility to house a 2,000 gallon diesel storage tank, to ensure efficient continuous operation of the City Barn pumps when needed during flooding.
- A new pre-cast concrete work platform on the CBPS, from which to safely perform upgrades and maintenance.
- Excavation for removal of the existing 67 cfs pump and its replacement with a 133 CFS pump. The replacement pump would increase the City Barn pumping capacity by 66 gallons per minute (gpm), to an overall capacity of 641 cfs, which is needed to ensure efficient operation during flooding.
- Installation of sheet piling for temporary dewatering within the inlet channel, to install a new drainage pump sump. Modifications of the sump area would allow for greater drawdown to better facilitate regular maintenance.
- Removal of the existing 36-inch outfall and installation of a new 48-inch outfall pipe in the levee, constructed in the same footprint as the existing outfall for the existing pump. The larger drainage outfall through the levee is needed to accommodate the new larger pump.

It is important to note that no excavation of Bayou Patassat or Bonfouca would be undertaken outside of the footprint of the existing drainage pumping station sump and outfall area, and no bank stabilization would be completed as a part of this project.

(Dismissed Alternatives):

CONSIDERED ACTION 2: Replace an Existing Pump with a 200 cfs Pump, and Construct a Larger Retention Basin in Bayou Patassat at the CBPS. The considered alternative to increase the retention area of the existing basin of Bayou Patassat at CBSP. The applicant would excavate about 92,000 cubic yard (cy) of material from the basin of Bayou Patassat property. This would provide approximately five (5) additional acres in stormwater retention. In addition, 361 liner feet of sheet pile would be added to the steep slope section adjacent to Textron on the bank opposite the CBPS. This bank would fail without the protection of the sheet pile.

CONSIDERED ACTION 3: Bank Stabilization, Larger Retention Ponds on Private Property Upstream, and a Gravity Outfall. According to the applicant’s engineer, in the development of the project, many alternatives that would have armored the bank of Bayou Bonfouca, and/or created a larger detention basin for storm water upstream of the pumping station on other private property with a gravity outfall were explored.
The available land for construction of the proposed retention ponds was researched, and this alternative was dismissed due to cost and logistics to acquire and reconfigure any new property. The effort would exceed any benefit toward meeting the purpose and need.

The alternative for construction of a static, flood control structure was also considered that would eliminate the need for pumps by allowing flood waters to flow to Bayou Bonfouca via gravity. This alternative was deemed not feasible due to the fact that tidal influences would seasonally inhibit adequate gravity flow through such a structure. Additionally, an outfall was considered over the existing gravity flow control structure. Because the gravity flow control structure is an operational feature, clearances for access of personnel and equipment would be required. This would require the discharge pipe to go over the gravity control structure at a height appropriate for equipment to pass through. Due to the additional complexity of construction and logistics for crossing the levee at the gravity control structure, this alternative was also dismissed.

(No Action Alternative)

NO ACTION: Although funds to upgrade the CBPS have been approved, the surrounding area still experiences flooding during disasters and local heavy storm events, and the pump station is not operating at enough capacity. The No Action Alternative would result in no additional upgrades to the CBPS or increases to pumping capacity. If any of the existing pumps at the City Barn failed to pump water or did not pump enough water during a flood event, this would result in continued hazardous conditions for not only the residents of Slidell, but also businesses and emergency responders who utilize the roadways and live in this area.

STEP 4

Identify the full range or potential direct or indirect impacts associated with, the occupancy or modification of floodplains and wetlands and the potential direct and indirect support of floodplain and wetland development that could result from the proposed action (see 44 CFR 9.10).

Four (4) previous separate certified H and H Studies have been completed for the City Barn Pump Station, including:

- City Barn Pump Station Channel Improvements (Bayou Patassat) Drainage Study- Burkes & Associates, Inc., Engineer stamped by Sean M. Burkes, dated 6/12/2012.


Per these studies, generally the water surface elevation (WSE) in Bayou Bonfouca is higher than the water surface elevation in Bayou Patassat. Which means the stormwater must be forced from Bayou Patassat via pumping into Bayou Bonfouca. Flows from Bayou Patassat's entrance into Bayou Bonfouca are controlled by two (2) outfalls at the existing City Barn Pump Station: one (1) is gravity fed through a mechanical gate that can be closed off during tropical storm events, and the second outfall is currently connected to three (3) pumps. During rain events, the City Barn Pumping Station is designated to lower water levels throughout central Slidell. The maximum total pumping capacity for this station is 260,000 gallons per minute, or 575 cfs from the Bayou Patassat and the south side of U.S. 11 (Front Street) into Bayou Bonfouca. This is the primary means of removing rain and flood water in the surrounding area.

As cited in the Updated H and H by H. Davis Cole & Associates, LLC (HDCA) dated April 27, 2018, the analysis of the modeling data indicates that the proposed improvements would have small effects on the peak WSE within Bayou Bonfouca downstream of the drainage pump station due to the influence of Lake Pontchartrain. Results indicate that the increase in WSE would be small (on the order of 0.01 to 0.08-foot) near the pumping station outfall.

The proposed action would improve drainage at the CBPS, resulting in a decrease of maximum WSE throughout the drainage basin.

All of the previous H and H studies recommend upgrading pumps at the CBPS to protect the watershed area against storm events. The proposed upgrade of the fourth pump, and increasing the flow capacity of the CBPS would decrease the extent of flooding in the entire basin. Further, the inclusion of a larger outfall pipe connected to the upgraded fourth pump would help drain the area more quickly, and the inclusion of the new fuel storage tank area would help the CBPS run more continuously and drain floodwaters in the area more efficiently.
This pump station is the primary means of removing water from the south side of U.S. 11 (Front Street) to Bayou Bonfouca. H. Davis Cole & Associates, LLC, Engineering (HDCA) modeled in the previous H and H Studies Analysis of the modeling data indicates that the proposed increase in capacity of the CBPS from 575 cfs to 641 cfs would reduce the average peak WSE in the basin by 0.22-foot (2.64-inches) for the 100-year storm event. Overall, modeling data indicates that the entire suite of improvements yields a total reduction of 0.79 feet (9.48 inches) in the average peak WSE in the basin for the 100-year storm event.

The applicant is required to coordinate with the local floodplain administrator regarding floodplain permit(s) prior to the start of any activities. New construction must be compliant with current codes and standards.

Per 44 CFR 9.11(d)(6), no project should be built to a floodplain management standard that is less protective than what the community has adopted in local ordinances through their participation in the NFIP. All coordination pertaining to these activities and applicant compliance with any conditions should be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.

**STEP 5**

Minimize the potential adverse impacts and support to or within floodplains and wetlands to be identified under step # 4, restore and preserve the natural and beneficial values served by floodplains, and preserve and enhance the natural and beneficial values served by wetlands (see 44 CFR 9.11).

THE PREFERRED ACTION: The Improvements to the CBPS would allow the pump station to pump more water out of the water shed during storm events. The proposed drainage was designed to reduce flooding for the 10, 25, 50, and 100-year storms. The proposed pump station flows will discharge into the Bayou Bonfouca, which flows into Lake Ponchartrain then into the Gulf of Mexico.

Design plans, maps, and site photos included as attachments illustrate the work to be completed. The scope of work would not require the applicant to acquire structures for demolition, or right-of-ways. Servitudes have already been acquired. No additional right-of-ways or residential or commercial structure demolition are anticipated. Additionally, the project does not require temporary access roads to be constructed.

The applicant is required to coordinate with the local floodplain administrator regarding floodplain permit(s) prior to the start of any activities. New construction must be compliant with current codes and standards.
Per 44 CFR 9.11(d)(6), no project should be built to a floodplain management standard that is less protective than what the community has adopted in local ordinances through their participation in the NFIP. All coordination pertaining to these activities and applicant compliance with any conditions should be documented and copies forwarded to the state and FEMA for inclusion in the permanent project files.

**STEP 6**

Reevaluate the proposed action to determine first, if it is still practicable in light of its exposure to flood hazards, the extent to which it will aggravate the hazards to others. And it’s potential to disrupt floodplain and wetland values and second, if alternatives preliminarily rejected at step # 3 are practicable in light of the information gained in steps # 4 and # 5. FEMA shall not act in a floodplain or wetland unless it is the only practicable location (see 44 CFR 9.9).

The actions proposed are located in the only practicable location. There are no other practicable alternate locations outside the floodplain available.

**STEP 7**

Prepare and provide the public with a finding and public explanation of any final decision that the floodplain or wetland is the only practicable alternative (see 44 CFR 9.12).

A public notice will be published in the Advocate-New Orleans edition for 5 days, Wednesday July 11, 2018 through Tuesday, July 15, 2018, and will also be published in the paper of record –the St. Tammany Farmer on Wednesday, July 18, 2018.

**STEP 8**

Review the implementation and post-implementation phases of the proposed action to ensure that the requirements of the order are fully implemented. Oversight responsibility shall be integrated into existing processes.

APPROVAL CONDITIONED ON REVIEWS OF IMPLEMENTATION AND POST IMPLEMENTATION PHASES TO ENSURE COMPLIANCE WITH THE ORDER(S).

Project has been reviewed for compliance with 44 CFR Part 9.
DRAFT FINDING OF NO SIGNIFICANT IMPACT
FOR THE
CITY OF SLIDELL CITY BARN PUMP STATION DRAINAGE
IMPROVEMENTS PROJECT
SLIDELL, LOUISIANA
HAZARD MITIGATION GRANT PROGRAM
PROJECT NUMBER 1603-0321
FEMA-DR-1603 -LA

BACKGROUND

Through the Governor’s Office of Homeland Security and Emergency Preparedness (GOHSEP), the applicant, the City of Slidell, which will simply be referred to as “City” throughout this document, has requested federal funding through the Federal Emergency Management’s (FEMA) 404 Hazard Mitigation Grant Program (HMGP) to reduce localized flooding during and after storm events within the area of the city of Slidell (Slidell).

As documented by Slidell Public Works Department, during the major storms of 1995-2005 and later Hurricane Isaac in 2012 flood damage occurred to residences, commercial and retail industry, streets, utilities and infrastructure surrounding the City Barn Pump Station (CBPS). Flood protection is needed in this area of Slidell. The proposed City Drainage Improvement project is located at the existing CBPS, located along the US 11 (Front Street) Highway Route. This is at the end of Bayou Lane, and is within the city Servitude, at the eastern edge of the Southern Railroad right-of-way. The western edge of the existing City Barn structure is within the Bayou Patassat. Bayou Patassat consists of two (2) major reaches, and drains from East to West, reaching its confluence with Bayou Bonfouca (alternatively referred to as the W-13) at the City Barn.

FEMA-Environmental Historic Preservation (EHP) previously assessed several proposals for upgrades and improvements to the CBPS to mitigate against future flood events under NEPA Categorical Exclusions (CATEX) in accordance with 44 CFR Part 10.8(d) In addition, one (1) Environmental Assessment was completed on January 2017. The previously provided upgrades included adding and upgrading existing pumps and bar screen cleaners, and excavated and straightened a portion of Bayou Patassat to increase the water detention and pumping capacity of the CBPS. According to the four (4) H and H studies, upgrade work on the pumps would help reduce flooding at the site and surrounding areas during storm events. However, Slidell remains at high risk of water inundation from various sources, including flooding, hurricanes, tropical storms, and thunderstorms.
The purpose of this proposal is to further reduce flooding in Slidell, provide additional capacity to the pumping station, ensure adequate services are provided to residents, and structures are protected during local flooding events and disasters. The proposed improvements and upgrades at the existing CBPS would include:

- The removal of the existing 67 cubic feet per seconds (cfs) pump and its replacement with a 133 cfs pump.
- Replacement of an existing 36-inch outfall with a new 48-inch outfall pipe through the levee.
- Installation of sheet piling for temporary dewatering within the inlet channel, to install a new drainage pump sump.
- Construction of a new diesel fuel storage facility to house a 2,000 gallon diesel storage tank.
- A new pre-cast concrete work platform on the CBPS, from which to safely perform upgrades and maintenance.

In accordance with FEMA Instruction 108-1-1 and the DHS Instruction 023-01-001-01, pursuant to Section 102 of the National Environmental Policy Act of 1969 (NEPA), as implemented by the regulations promulgated by the President’s Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500-1508) a Supplemental Environmental Assessment (SEA) was prepared. This draft SEA supplements the existing Environmental Assessment (EA) dated January 2017. Together, these assessments documents evaluate the grant proposal’s potential impacts on the physical and human environment. The purpose of this draft SEA is used to make a decision whether to initiate preparation of an Environmental Impact Statement (EIS) or to prepare a Finding of No Significant Impact (FONSI).

If left unprotected, future storm events have the potential to repeatedly damage homes and property in this area. The alternatives considered include 1) No Action Alternative, 2) Proposed Alternative: CBPS Construction of New Fuel Storage Area, Upgraded Pump and Replaced Drainage Outfall Through the Levee, and Modifications of the Sump Area, and 3) Considered Alternative: Replace an Existing Pump with a 200cfs Pump, and Construct a Larger Retention Basin in Bayou Patassat at the CBPS.

**FINDINGS**

FEMA has evaluated the proposed project for significant adverse impacts to geology, soils, water resources (surface water, groundwater, and wetlands), floodplains, coastal resources, air quality, biological resources (vegetation, fish and wildlife, Federally-listed threatened or endangered species and critical habitats), cultural resources, socioeconomics (including minority and low income populations), safety, noise, and hazardous materials. The results of these evaluations as well as consultations and input from other federal and state agencies are presented in the SEA.
CONDITIONS

The following conditions must be met as part of the implementation of the project. Failure to comply with these conditions may jeopardize federal funds.

- Implement construction Best Management Practices; install silt fences/straw bales to reduce sedimentation. Area soils would be covered and/or wetted during construction. If fill is stored on site as part of unit installation or removal, the contractor would be required to appropriately cover it.

- The applicant is required to coordinate with the local floodplain administrator regarding floodplain permit(s) prior to the start of any activities. New construction must be compliant with current codes and standards.

- Per 44 CFR 9.11(d)(6), no project should be built to a floodplain management standard that is less protective than what the community has adopted in local ordinances through their participation in the National Flood Insurance Program.

- Take any necessary steps to obtain and/or update all necessary approvals and environmental permits regarding this proposed project.

- If your project results in a discharge to waters of the state, submittal of a Louisiana Pollutant Discharge Elimination System (LPDES) application may be necessary.

- If the project results in a discharge of wastewater to an existing wastewater treatment system, that wastewater treatment system may need to modify its LPDES permit before accepting the additional wastewater.

- All precautions should be observed to control nonpoint source pollution from construction activities. Louisiana Department of Environmental Quality (LDEQ) has stormwater general permits for construction areas equal to or greater than one (1) acre. It is recommended that you contact the LDEQ Water Permits Division at (225) 219-9371 to determine if your proposed project requires a permit.

- If your project will include a sanitary wastewater treatment facility, a Sewage Sludge and Biosolids Use or Disposal Permit is required. An application or Notice of Intent will be required if the sludge management practice includes preparing biosolids for land application or preparing sewage sludge to be hauled to a landfill. Additional information may be obtained on the LDEQ website at http://www.deq.louisiana.gov/portal/tabid/2296/Default.aspx or by contacting the LDEQ Water Permits Division at (225) 219-9371.

- All precautions should be observed to protect the groundwater of the region.

- Be advised that water softeners generate wastewaters that may require special limitations depending on local water quality considerations. Therefore if your water system improvements include water softeners, you are advised to contact
the LDEQ Water Permits to determine if special water quality-based limitations will be necessary.

- Any renovation or remodeling must comply with Louisiana Administration Code (LAC) 33:III.Chapter 28, Lead-Based Paint Activities; LAC 33:III.Chapter 27, Asbestos-Containing Materials in Schools and State Buildings (includes all training and accreditation); and LAC 33:III.5151, Emission Standard for Asbestos for any renovations or demolitions.

- If any solid or hazardous wastes, or soils and/or groundwater contaminated with hazardous constituents are encountered during the project, notification to LDEQ’s Single-Point-of-Contact (SPOC) at (225) 219-3640 is required. Additionally, precautions should be taken to protect workers from these hazardous constituents.

- Erosion Control Devises such as silt fencing, hay bales, sediment traps, etc. must be used and maintained extensively to prevent any potential direct or indirect adverse impacts to nearby waterways.

- Applicant must comply with all conditions listed in the Coastal Use Permit (CUP) (P20150247 Revised) issued May 21, 2018 which are found in Appendix C External Agency Correspondence of the SEA. The expiration date of this revised permit is five (5) years from the date of the signature of the Secretary or his designee on the original permit which was September 9, 2015. If the Coastal Use is not completed within this five (5) year period, an extension may be granted pursuant to the requirements contained in the Rules and Procedures for CUP its (LAC 43:1.723(D))

- Vehicle operation times would be kept to a minimum. Area soils must be covered and/or wetted during construction to minimize dust.

- If at any time Heritage tracked species are encountered within the project area, please contact the Louisiana Natural Heritage Program (LNHP) Data Manager at 225-765-2643.

- Any changes to the scope or location of the proposed project or if the project has not been initiated one (1) year from the date of the solicitation of views (03/30/18), the applicant is responsible for notifying FEMA for further coordination with U.S. Fish and Wildlife Service (USFWS).

- If human bone or unmarked grave(s) are present within the project area, compliance with the Louisiana Unmarked Human Burial Sites Preservation Act (R.S. 8:671 et seq.) is required. The applicant shall notify the law enforcement agency of the jurisdiction where the remains are located within 24 hours of the discovery. The applicant shall also notify FEMA and the Louisiana Division of Archaeology at 225-342-8170 within 72 hours of the discovery. (Louisiana Unmarked Human Burial Sites Preservation Act)

- If during the course of work, archaeological artifacts (prehistoric or historic) are discovered, the applicant shall stop work in the vicinity of the discovery and take
all reasonable measures to avoid or minimize harm to the finds. The applicant shall inform their, GOSHEP State Applicant Liaison and Hazard Mitigation Assistance contacts at FEMA, who will in turn contact FEMA Historic Preservation (HP) staff. The applicant will not proceed with work until FEMA HP completes consultation with the SHPO, and others as appropriate (Inadvertent Discovery Clause).

- **Unusable equipment, debris and material shall be disposed of in an approved manner and location.** The applicant shall handle, manage, and dispose of petroleum products, hazardous materials and/or toxic waste in accordance with all local, state and Federal agency requirements. All coordination pertaining to these activities should be documented and copies forwarded to the state and FEMA as part of the permanent project files.

- **Mitigation and abatement measures will be required to reduce the noise levels to a range that would be considered acceptable.** The applicant must comply with the local ordinance. Slidell Ordinance for dB limits is as follows:

  Industrial At all times 85 dB

  Commercial 7:00 a.m. to 10:00 p.m. 75 dB, and 10:00 p.m. to 7:00 a.m. 65 dB

  Residential 7:00 a.m. to 10:00 p.m. 70 dB, and 10:00 p.m. to 7:00 a.m. 65 dB

  Two-family or multifamily/intra-dwelling 7:00 a.m. to 10:00 p.m. 60 dB

  and 10:00 p.m. to 7:00 a.m. 50 dB

- **The contractor must post appropriate signage and fencing to minimize potential adverse public safety concerns.** Appropriate signage, fencing, barriers, and traffic control measures should be in place prior to construction activities in order to alert pedestrians and motorists of project activities and traffic pattern changes.

- **To minimize worker and public health and safety risks from project construction and closure, all construction and closure work must be done using qualified personnel trained in the proper use of construction equipment, including all appropriate safety precautions.** Additionally, all activities must be conducted in a safe manner in accordance with the standards specified in Occupational and Safety Health Act (OSHA) regulations and the U.S. Army Corps of Engineers (USACE) safety manual.

- **If hazardous materials are unexpectedly encountered in the project area during the proposed construction operations, appropriate measures for the proper assessment, remediation, management and disposal of the contamination would be initiated in accordance with applicable federal, state, and local regulations.** The contractor would be required to take appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction area.

- **The Louisiana Department of Natural Resources (LDNR) Office of Conservation should be contacted at 225-342-5540 if any unregistered wells of any type are**
encountered during construction work. For pipelines and other underground hazards, Louisiana One Call should be contacted at 800-272-3020 prior to commencing operations.

- Applicant must comply with all conditions listed in the USACE Programmatic General Permit (MVN 2012-0958-Ell) issued on October 17, 2016.

- During the project impact analysis process developers should identify project-related impacts to migratory birds and the conservation measures that will be used to mitigate them. For additional Migratory Bird Conservation recommendations, guidance and tools to help reduce impacts to birds and their habitats please visit the LESO webpage: https://www.fws.gov/lafayette/Migratory_Birds/MigBird.html and the Service’s Migratory Bird Program Webpage (https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/communication-towers.php).

- The applicant must review the National Bald Eagle Management (NBEM) Guidelines is available at: http://www.fws.gov/migratorybirds/pdf/management/nationalbaldeaglenanagementguidelines.pdf to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the Bald and Golden Eagle Protection Act (BGEPA).

- If a bald eagle nest occurs or is discovered within 660 feet of the proposed project area, then USFWS requires an evaluation to be performed to determine whether the project is likely to disturb nesting bald eagles. The applicant is required to conduct the evaluation on-line at: https://www.fws.gov/southeast/our-services/eagle-technical-assistance. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. All coordination pertaining to these activities should be documented and copies forwarded to the state and FEMA as part of the permanent project files.

- U.S. Fish and Wildlife Service (USFWS) recommends that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season because some waterbird colonies may change locations year-to-year. To minimize disturbance to colonial nesting birds please refer to the colonial nesting waterbird guidance on the Louisiana Ecological Services Office (LESO) Web page https://www.fws.gov/lafayette/Migratory_Birds/MigBird.html.

CONCLUSIONS

Based upon the incorporated SEA, and in accordance with Presidential Executive Orders 12898 (Environmental Justice), 11988 (Floodplain Management), and 11990 (Wetland Protection), FEMA has determined that the proposed action implemented with the conditions and mitigation measures outlined above and in the SEA will not have any significant adverse effects on the quality of the natural and human environment. As a result
of this FONSI, an Environmental Impact Statement will not be prepared and the proposed action as described in the SEA may proceed.

**APPROVALS**

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Jerame Cramer  
Environmental Liaison Officer, Region VI- LRO  
DR-1603/1607-LA

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Thomas “Mike” Womack  
Director of the Louisiana Recovery Office  
FEMA 1603/1607-DR-LA

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