Appendix 8 – IET Agency Coordination

Annex A – Early screening of the initial array of measures

From: Keeler, Barbara
To: Carithers, Clay MVN
Subject: FW: Augmentation -- B aux C
Date: Thursday, March 14, 2013 8:01:36 PM

Clay:

I'll be out of the office for about a week and wanted to leave you with an update on Bayou aux Carpes. EPA, NPS, and USFWS agree that the following alternatives are still on the table for discussion as augmentation features: 1, 2, 3 (as long as the Corps maintains the opening), and 6.1. That leaves out alternatives 4 (property rights problems), 5 (NPS does not want to assume control of any engineered structure), and 6.2, 6.3, 6.4, and 6.5 (unproven utility). See also Angela's note below regarding operation of the Old Estelle Canal structure.

Hope this helps.

Barbara Keeler

Environmental Protection Agency

Marine & Coastal Section (6WQ-EC)

1445 Ross Ave.

Dallas, TX 75202-2733

214-665-6698

keeler.barbara@epa.gov

From: Trahan, Angela [mailto:angela_trahan@fws.gov]
Sent: Tuesday, March 12, 2013 8:28 AM
To: Keeler, Barbara
Cc: David Walther; Guy Hughes
Subject: Re: Augmentation -- B aux C

Thanks, Barbara.

I agree with the selected alternatives, and I think its the best holistic approach to try to reestablish historic hydrologic conditions without relying on active management features (control structures). I would lean towards more gaps along BAC and the SNGPL canal to try to get sheet flow across more area. It may be that there are already enough existing gaps that only four more along the SNGPL canal are needed as Mike pointed out.

Also, aside from allowing storm water discharge to enter the northeastern corner, I expect that the the Old Estelle Canal gap would also facilitate hydrologic benefits during larger rain events and tidal input (Mike's model did point this out). In this instance, it would be beneficial to keep the gate on Old Estelle Canal open. Just something to consider when designing the management plan.

Thanks for the opportunity to comment,

Angela

.....

Angela Trahan

Fish and Wildlife Biologist

U.S. Department of Interior

Fish and Wildlife Service

Louisiana Ecological Services Office

646 Cajundome Blvd., Suite 400

Lafayette, LA 70506

(337) 291-3137

http://www.fws.gov/lafayette/

On Mon, Mar 11, 2013 at 1:54 PM, Keeler, Barbara <Keeler.Barbara@epa.gov> wrote:

Angela:

I spoke today at length with Guy Hughes and it seems that we agree on implementing augmentation alternatives 1, 2, 3 (as long as the Corps maintains the opening), and 6.1. That leaves out alternatives 4 (property rights problems), 5 (NPS does not want to assume control of any engineered structure), and 6.2, 6.3, 6.4, and 6.5 (unproven utility).

It is my understanding that you could support this grouping but please confirm that for me.

Thanks.

Barbara Keeler

Environmental Protection Agency

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214-665-6698

keeler.barbara@epa.gov

Annex B – Augmentation Evaluation Meeting Notes

Bayou aux Carpes 404(c) Augmentation Interagency Environmental Team Meeting
Evaluation Report and Recommended Plan Discussion
September 24, 2019
Meeting Notes

I. Roll Call:

NPS – Guy Hughes
NPS - Dusty Pate
LDNR – Frank Cole
CPRA – Robert Routon
USFWS – Hannah Sprinkles
NMFS – Craig Gothreaux
LDWF – Matt Weigel
EPA – Raul Gutierrez
USACE - Patrick Smith
USACE - Melanie Goodman
USACE - Elizabeth Behrens
USACE - Catherine Bourg
USACE - Kevin Harper

II. A brief presentation of the Bayou aux Carpes 404(c) Augmentation Measures Evaluation Report (Report) was given. The Report was transmitted to the IET on August 31, 2019 for a 14 day IER comment period. There were no comments of non-concurrence received during the IET Report comment period. Explicit support for the recommended plan, Measure 3 as the TSP, was given by NPS, LDNR, LDWF, USFWS, and NMFS during the IET Report comment period. The LDEQ stated no objections. The USGS stated they cannot provide recommendations or concurrence. As per the report, the USACE recommends selecting Measure 3, removing the plug from Bayou aux Carpes and the GIWW, as the recommended plan. Results from the request for IET verbal concurrence or non-concurrence with the Report evaluation and recommended plan are as follows:

NPS – Guy Hughes – CONCUR
LDNR – Frank Cole – CONCUR
CPRA – Robert Routon – CONCUR
USFWS – Hannah Sprinkles – CONCUR
NMFS – Craig Gothreaux - CONCUR
LDWF – Matt Weigel – CONCUR
EPA – Raul Gutierrez – EPA does not object to the recommended plan; EPA would formally reply upon receipt of a formal request for approval.

III. Comments and responses related to engineering and design of the recommend plan were presented and discussed.
   a. In general, there was agency support for considering adding some sinuosity or meander where the plug occurs. The details of this would be determined at a later time and coordinated with the agencies.
   b. In general, there was some agency support for considering placing some or all material excavated as part of the recommended plan in the vicinity of the artificial connection at the Southern Natural Gas Pipeline Canal and the GIWW. After excavation, this material could become property of the NPS for their beneficial use in this manner.

c. There was a discussion regarding landownership and access if the recommended plan were to be implemented.
    i. It is likely that two private parcels on either side of the plug. Access may be limited to waterborne for the private landowner if the recommended plan is implemented.
    ii. More work/research is needed to fully understand landownership in the project vicinity.

IV. A kick-off discussion of the monitoring and adaptive management planning process for the recommended plan occurred.
    a. An interagency agreement with those willing and active members of the IER team would be developed documenting the commitment to participate in the planning and analyses.
    b. There was a consensus that the most likely adaptive management action would be bringing in new material to plug, effectively reversing the recommended plan.

Annex C – February 19, 2020 Site Visit

From:	Smith, Patrick W CIV USARMY CEMVN (US)
To:	Miller, Clay; Gutierrez, Raul; Martinez, Maria; Hayes, Mark
Cc:	Behrens, Elizabeth H CIV USARMY CEMVN (USA); Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US); Pate, Dusty; Hughes, Guy D; Matthew Weigel; Frank Cole; Mark Hogan; Robert Routon (CPRA); David Chambers
Subject:	BAC field trip 2/19/2020
Date:	Thursday, February 20, 2020 9:28:00 AM
Attachments:	FIgure 4.jpg Bayou aux Carpes Plug Removal -14 February 2020 - final.pdf

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All,

I wanted to thank you for your participation in yesterday's field visit. I think it went really well with good participation from all agencies. Guy and the rest of the NPS crew, as well as the folks at the Jean Lafitte Swamp Tour, did a fabulous job with logistics. Attached is the poster I presented and the middle figure indicating the approximate location of the historic channel overlaying a recent aerial photograph.

Please do not hesitate to contact me with any questions, concerns, or comments regarding the BAC plug removal project or the USACE's request for concurrence letter and documentation.

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

Bayou aux Carpe 404c Area Interagency Site Visit

February 19, 2020

NAME	AGENCY	PHON E NUMBER
Matt Weigel	LOWF	985-302-7889
CLAY MILLER	EPA - HQ	202-566-1365
Raul Gutierrez	EPA	214-665-6697
Maria Martinez	EPA	214-665-2230
Joy Przyborski	EPA	214-665-6605
MARK HAYES	EPA	214-665-2705
KEVIN HARPER	COE	504-862-1151
Carol Burdine	COE	504 862-2498
Patrick Smith	USACE	504 862-1583
David Chambers	CPRA	5042804069
Julie Whitbeck	NPS	504-717-9811
Wesley Bollinger	NPS	917-455-2671
Julie Torres	NPS	504-559-8615
Kelly Altenhofen	NPS	406-350-0799
Elizabeth Behrens	USACE	504-862-2025
Becky Lasell	NPS	504.589.3882 x407
Duffy Pat	NPS	404-772-0637
Guy Hughes	NPS	504 512 2558
Mark Hogan	LDNR	225-219-9530
Austin LeRay	LDNR	985-246-4825
Melanie Goodman	USACE	5048621940
Frank Cole	LDNR	504460-3789

Annex D – Material Disposal Plan

From:	Smith, Patrick W CIV USARMY CEMVN (US)
To:	Gutierrez, Raul; Hughes, Guy; Dusty Pate; Craig Gothreaux - NOAA Federal; Patrick Williams - NOAA Federal; Elizabeth Hill; Matthew Weigel; Sprinkle, Hannah; Walther, David; Swarzenski, Christopher; Frank Cole; Mark.Hogan@la.gov; Whitbeck, Julie; Robert Routon (CPRA)
Cc:	Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA); Behrens, Elizabeth H CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US); Miller, Clay; Grey, Patrick R CIV USARMY CEMVN (USA)
Subject:	RE: Bayou aux Carpes Meeting
Date:	Wednesday, April 15, 2020 11:04:00 AM
Attachments:	Excess Dredge Material Disposal Alternatives 4-10-2020.DOCX Disposal Site Alternatives.jpg

---

IET,

Thanks everyone for their participation in a really productive meeting on March 27. See attached documentation describing our discussion and subsequent discussions with Engineering regarding potential disposal options, if needed.

Please provide any comments by April 22.

Thanks,
Patrick

-----Original Message-----
From: Smith, Patrick W CIV USARMY CEMVN (US)
Sent: Friday, March 20, 2020 5:42 AM
To: Gutierrez, Raul <Gutierrez.Raul@epa.gov>; Hughes, Guy <guy_hughes@nps.gov>; Dusty Pate <haigler_pate@nps.gov>; Craig Gothreaux - NOAA Federal <craig.gothreaux@noaa.gov>; Patrick Williams - NOAA Federal <patrick.williams@noaa.gov>; Elizabeth Hill <Elizabeth.Hill@la.gov>; Matthew Weigel <mweigel@wlf.la.gov>; Sprinkle, Hannah <hannah_sprinkle@fws.gov>; Walther, David <david_walther@fws.gov>; Swarzenski, Christopher <cswarzen@usgs.gov>; Frank Cole <Frank.Cole@LA.GOV>; Mark.Hogan@la.gov; Whitbeck, Julie <julie_whitbeck@nps.gov>; Robert Routon (CPRA) <Robert.Routon@LA.GOV>
Cc: Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA) <Marshall.K.Harper@usace.army.mil>; Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>; Goodman, Melanie L CIV USARMY CEMVN (US) <Melanie.L.Goodman@usace.army.mil>; Miller, Clay <Miller.Clay@epa.gov>
Subject: Bayou aux Carpes Meeting

Hello everyone,

I hope that everyone is doing well and staying safe. Due to IT constraints beyond my control, I am unable to read and respond to emails during normal business hours. Please call if you'd like to discuss.

I would like to schedule a meeting to discuss the subject project. Engineering has recently provided me an update that I would like to discuss. It seems that is it now fairly likely that excavating the plug material to create a gap would produce more quantities of material than could be handled in the vicinity. We would like to discuss disposal options. Webinar/teleconference info below

Please respond by COB Friday (3/21) with your availabilities during the following times (I wish doodle poll was still free or I had a license....); all times are CDT:

Tuesday 3/24:

0900 - 1000,
1000 - 1100,
1400 - 1500,
1500 - 1600, OR

1600 - 1700

Wednesday 3/25:

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1000 - 1100,
1400 - 1500,
1500 - 1600, OR
1600 - 1700

Thursday 3/26:

1400 - 1500,
1500 - 1600, OR
1600 - 1700

Friday 3/27:

0900 - 1000,
1000 - 1100,
1400 - 1500,
1500 - 1600, OR
1600 - 1700

Webinar (use “call me” feature to do both):
https://usace.webex.com/join/patrick.w.smith

Teleconference:
1-877-848-7030
Access code: 161 290 6
Security code (to join): 0000

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

WBV-404(c) Floodwall Augmentation
Bayou aux Carpes Plug Removal
Review of Alternatives for Beneficial Use or Disposal of Excess Excavated/Dredged Material

April 10, 2020

Discussion/Background: The majority of the material that would be excavated for access and from removing the plug at Bayou aux Carpes is expected to be beneficially deposited. The current plan is to beneficially deposit the material in close proximity to the new opening in order to create channel sinuosity, and emergent and/or shallow water habitat. However, based on the current preliminary design, MVN anticipates that there will be approximately 5,000 to 6,500 cubic yards of material from dredging access and removing the plug at Bayou aux Carpes in excess of what can be used beneficially in the area immediately adjacent to the work site.

The IET had a webinar/teleconference on March 27, 2020 to discuss possible beneficial uses and/or disposal of any excess materials. The following alternatives are ideas that were discussed in the teleconference or that were otherwise identified later.

Alternatives:

1. NMFS suggested disposing/stockpiling the material behind the foreshore rock dike below the WCC 404(c) area floodwall for later beneficial use by NPS. MVN determined that this is not feasible because the foreshore berm was constructed with an expanded clay core which was necessary to ensure stability as compared to a full stone berm. Any material placed behind the berm would negatively impact the berm stability. Further, the purpose of the berm is to prevent erosion of the 404(c) area bank line from the WCC pump station discharge. The IER 12 requirement was for the berm to be offset from the 404c bank line with no impacts to the bank line. The space between the foreshore berm and bank line is to remain void. Also, NPS and USFWS use this space for easy access to the north east section of 404(c) area for monitoring purposes.

2. The possibility of stockpiling the excess material in one or more of the keyhole canals along GIWW, for later beneficial use by NPS was discussed. MVN determined that this is not feasible due to the need to clear existing bank line and emergent vegetation and it is likely that some dredging in the GIWW for access would be necessary. Further, backfilling in the keyhole canals along the GIWW is not included in the NPS canal backfilling planning documentation, and it would have new impacts to the 404(c) area not yet considered.

3. NPS suggested disposing the material beneficially in the interior keyhole canal adjacent to the head of Bayou aux Carpes near the intersection w/ the SNGPL canal. It is expected that the entire length of Bayou aux Carpes would likely have to be dredged to provide access to the interior keyhole canal. This would be self-defeating and would have substantial impacts to the Bayou aux Carpes aquatic and adjacent habitats.

4. It had been suggested early on that we deposit excess material to plug the SNGPL Canal. The intent would be that the Corps would deposit the material in the mouth and NPS would shape as appropriate as part of their canal backfilling project. This alternative was eliminated because of hydrologic connectivity and navigation concerns. Also, it is likely that some access dredging would be require to get into the canal with a barge.

5. MVN suggested looking at the WCC disposal area on the east bank of the GIWW below the WCC structure. It is not practical to use this site for long term "beneficial use" for wetland habitat because it is a WBV-WCC disposal area approved to be filled to +3.5 feet. However there would be other secondary safety benefits to aircraft using the Naval Air Station in the area if the shallow open water portion of the site were to be filled. The site is supposed to be filled above an elevation to prevent open water which attracts water fowl. Waterfowl present a flight hazard to aircraft utilizing the nearby Naval Base air strip. This site would likely require excavating floatation access to reach the site. It would also require additional equipment to get the material over the rock retaining dike without damage, and to shape and rework the material inside the disposal area. This site is not part of the BAC 404(c) site, and is located in Plaquemines Parish, which expands need for additional ROE/ROW.

6. Expand the disposal area immediately adjacent to the plug as much as possible, dispose excess remaining material to off-site landfill. It is likely that the majority of the material could be deposited within the plug vicinity and GIWW bank line.

From:	Hughes, Guy D
To:	Smith, Patrick W CIV USARMY CEMVN (US); Gutierrez, Raul; Pate, Dusty H; Craig Gothreaux - NOAA Federal; Patrick Williams - NOAA Federal; Elizabeth Hill; mweigel@wlf.la.gov; Sprinkle, Hannah H; Walther, David; Swarzenski, Christopher M; Frank Cole; Mark.Hogan@la.gov; Whitbeck, Julie L; robert.routon@la.gov; Altenhofen, Kelly J
Cc:	Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA); Behrens, Elizabeth H CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US); Miller, Clay; Grey, Patrick R CIV USARMY CEMVN (USA)
Subject:	[Non-DoD Source] Re: [EXTERNAL] RE: Bayou aux Carpes Meeting
Date:	Tuesday, April 21, 2020 5:32:26 PM
Attachments:	Excess Dredge Material Disposal Alternatives 4-10-2020_NPS_04212020.docx

NPS Comments on April 10, 2020

WBV-404(c) Floodwall Augmentation Bayou aux Carpes Plug Removal
Review of Alternatives for Beneficial Use or Disposal of Excess Excavated/Dredged Material

Discussion/Background: No comment

Alternatives:

1. No Comment
2. Recommend striking the last sentence - please see the NPS 2010 FONSI at parkplanning.nps.gov/jela and the RESTORE Council 2015 FONSI at restorethegulf.gov.
3. NPS recommended a survey of Bayou aux Carpes to determine the depth to support this entire statement. The intent of the call was to understand the cost of disposal of the excess material and maximize beneficial use within the 404c area to further the augmentation measure. If a survey receives any further consideration from the team, then the keyhole immediately south of the southern point of the "V-levee"/HSDRRS, that we first visited on our boat tour, could also be considered as a location. Cost and impacts could receive more objective analysis when the draft plug removal design and construction methodology is provided to the team for review with the preferred alternative disposal cost. See the interaction with our comment on alternative #6.
4. No comment
5. No comment
6. There was discussion on the call about getting a cost estimate for the disposal in a landfill (or whatever becomes the preferred alternative) so that the team could prospectively justify the same expense with minimal or temporal impacts (that might be concurrently mitigated within the action with proper planning) and provide further beneficial use within the 404c Area (alternatives 2-4). There could also be coordination or outreach to the adjacent landowner for disposition of the material adjacent to the plug site.

From: Smith, Patrick W CIV USARMY CEMVN (US) <Patrick.W.Smith@usace.army.mil>
Sent: Wednesday, April 15, 2020 11:04 AM
To: Gutierrez, Raul <Gutierrez.Raul@epa.gov>; Hughes, Guy D <Guy_Hughes@nps.gov>; Pate, Dusty

H <Haigler_Pate@nps.gov>; Craig Gothreaux - NOAA Federal <craig.gothreaux@noaa.gov>; Patrick Williams - NOAA Federal <patrick.williams@noaa.gov>; Elizabeth Hill <Elizabeth.Hill@la.gov>; mweigel@wlf.la.gov <mweigel@wlf.la.gov>; Sprinkle, Hannah H <hannah_sprinkle@fws.gov>; Walther, David <david_walther@fws.gov>; Swarzenski, Christopher M <cswarzen@usgs.gov>; Frank Cole <Frank.Cole@LA.GOV>; Mark.Hogan@la.gov <Mark.Hogan@la.gov>; Whitbeck, Julie L <Julie_Whitbeck@nps.gov>; robert.routon@la.gov <robert.routon@la.gov>
Cc: Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA) <Marshall.K.Harper@usace.army.mil>; Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>; Goodman, Melanie L CIV USARMY CEMVN (US) <Melanie.L.Goodman@usace.army.mil>; Miller, Clay <Miller.Clay@epa.gov>; Grey, Patrick R CIV USARMY CEMVN (USA) <Patrick.R.Grey@usace.army.mil>
Subject: [EXTERNAL] RE: Bayou aux Carpes Meeting

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Patrick

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Sent: Friday, March 20, 2020 5:42 AM
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Cc: Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA) <Marshall.K.Harper@usace.army.mil>; Behrens, Elizabeth H CIV USARMY CEMVN (USA) <Elizabeth.H.Behrens@usace.army.mil>; Goodman, Melanie L CIV USARMY CEMVN (US) <Melanie.L.Goodman@usace.army.mil>; Miller, Clay <Miller.Clay@epa.gov>
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1500 - 1600, OR
1600 - 1700

Friday 3/27:

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1000 - 1100,
1400 - 1500,
1500 - 1600, OR
1600 - 1700

Webinar (use "call me" feature to do both):
Blockedhttps://usace.webex.com/join/patrick.w.smith

Teleconference:
1-877-848-7030
Access code: 161 290 6
Security code (to join): 0000

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

NPS Comments on April 10, 2020

WBV-404(c) Floodwall Augmentation Bayou aux Carpes Plug Removal
Review of Alternatives for Beneficial Use or Disposal of Excess Excavated/Dredged Material

Discussion/Background: No comment

Alternatives:

1. No Comment
2. Recommend striking the last sentence - please see the NPS 2010 FONSI at parkplanning.nps.gov/jela and the RESTORE Council 2015 FONSI at restorethegulf.gov.
3. NPS recommended a survey of Bayou aux Carpes to determine the depth to support this entire statement. The intent of the call was to understand the cost of disposal of the excess material and maximize beneficial use within the 404c area to further the augmentation measure. If a survey receives any further consideration from the team, then the keyhole immediately south of the southern point of the "V-levee"/HSDRRS, that we first visited on our boat tour could also be considered as a location. Cost and impacts could receive more objective analysis when the draft plug removal design and construction methodology is provided to the team for review with the preferred alternative disposal cost. See the interaction with our comment on alternative #6.
4. No comment
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6. There was discussion on the call about getting a cost estimate for the disposal in a landfill (or whatever becomes the preferred alternative) so that the team could prospectively justify the same expense with minimal or temporal impacts (that might be concurrently mitigated within the action with proper planning) and provide further beneficial use within the 404c Area (alternatives 2-4). There could also be coordination or outreach to the adjacent landowner for disposition of the material adjacent to the plug site.

Annex E – Monitoring and Adaptive Management Plan

From:	Smith, Patrick W CIV USARMY CEMVN (USA)
To:	Gutierrez, Raul; Hughes, Guy D; Dusty Pate; Craig Gothreaux - NOAA Federal; Patrick Williams - NOAA Federal; Elizabeth Hill; Sprinkle, Hannah H; Walther, David; Swarzenski, Christopher; Whitbeck, Julie; Danielle Richardi; David Chambers
Cc:	Behrens, Elizabeth H CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US); Frank Cole; Elizabeth Hill; Mark.Hogan@la.gov; Matthew Weigel
Subject:	Bayou aux Carpes MAM Plan Meeting
Date:	Thursday, August 13, 2020 10:19:00 AM

Hello all,

In October 2019, I wrote members of the IET asking if they would be interested in participating in monitoring and adaptive management (MAM) planning for the Bayou aux Carpes Augmentation Project (Project). IET members who indicated they wish to participate are in the To line of this email. Members of the IET that did not indicate they would be interested have been cc'd. If you are in the cc line and wish to participate, please let me know as soon as you can.

We are working on an outline for the MAM plan and would like to hold a meeting to discuss this and other monitoring planning items at the end of next week. I will send out the outline and an agenda prior to the meeting. Please indicate your availability for the time slots below, if you are interested in participating. I'd like to get the meeting scheduled by Monday of next week.

Thursday 8/20

9:00-10:30
10:00-11:30
12:30- 2:00
3:00-4:30

Friday 8/21

9:00-10:30
10:00-11:30
12:30- 2:00
3:00-4:30

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

From: Swarzenski, Christopher M
To: Smith, Patrick W CIV USARMY CEMVN (USA)
Subject: [Non-DoD Source] Re bayou aux carpes
Date: Thursday, August 13, 2020 11:33:10 AM

Hey Patrick

I can't participate in the MAM because it's too time consuming but if you have any questions about anything please feel free to contact me. I have a pretty thorough understanding of that habitat and issues and am always available if you want to run something by me.

Cheers Chris

From:	Smith, Patrick W CIV USARMY CEMVN (USA)
To:	Gutierrez, Raul; Hughes, Guy D; Dusty Pate; Craig Gothreaux - NOAA Federal; Patrick Williams - NOAA Federal; Elizabeth Hill; Sprinkle, Hannah H; Walther, David; Whitbeck, Julie; Danielle Richardi; David Chambers; Behrens, Elizabeth H CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US)
Subject:	BAC MAM Plan Discussion
Start:	Thursday, August 20, 2020 3:00:00 PM
End:	Thursday, August 20, 2020 4:30:00 PM
Location:	Webinar / Teleconference
Attachments:	2020-08-18 DRAFT BAC MAM outline.docx

All,

The purpose of this meeting is to discuss the BAC MAM plan outline with the MAM Team (attached).

Webinar (use “call me” feature):
https://usace.webex.com/join/patrick.w.smith

Teleconference:
1-877-848-7030
Access code: 161 290 6
Security code (to join): 0000

Thanks,
Patrick

From:	Smith, Patrick W CIV USARMY CEMVN (USA)
To:	Sprinkle, Hannah H; Craig Gothreaux - NOAA Federal; Danielle Richardi; Gutierrez, Raul; Whitbeck, Julie L
Cc:	Behrens, Elizabeth H CIV USARMY CEMVN (USA); Goodman, Melanie L CIV USARMY CEMVN (US); Williams, Jolene; Hughes, Guy D; David Chambers
Subject:	BAC Preliminary Draft MAM Plan
Date:	Monday, December 21, 2020 9:07:00 PM
Attachments:	2020-12-21 DRAFT BAC MAM Plan.docx

Hello all,

Attached should be the preliminary draft mam plan. Please provide comments by January 7, 2021. We plan to discuss this MAM Plan and your comments on January 11, 2021. I have sent a meeting invite for 11 AM. I am available from 11 until 2:30 on 1/11 and would be open to re-arranging it within these times on 1/11 or to 1/12, as necessary.

I will be away from my computer until 1/4, but will be available to discuss this. Please give me a call at 706-799-2277 if you'd like to discuss between now and then.

We would address agency comments and submit a final draft mam plan as an appendix with the Supplemental Environmental Assessment (SEA). During public review of the SEA (1/21/2020 – 2/20/2021), I would ask for concurrence from the MAM team regarding this plan and would finalize it before the Colonel signs the FONSI (3/20/2021).

Thanks and have a great holiday, what's left of the solstice, and new year!

-Patrick

Patrick Smith, PhD
Biologist, Environmental Studies Section
Regional Environmental Planning Division, South
USACE, New Orleans District
(504) 862-1583

Annex F – IET Design file coordination

From:	Smith, Patrick W CIV USARMY CEMVN (USA)
To:	Hughes, Guy D; Gutierrez, Raul; Dusty Pate; Murphy, Julie W CIV USARMY CEMVN (USA); Williams, Jolene; Craig Gothreaux - NOAA Federal; Patrick Williams - NOAA Federal; Elizabeth Hill; Matthew Weigel; Sprinkle, Hannah H; Walther, David; Swarzenski, Christopher M; Frank Cole; Mark.Hogan@la.gov; Chambers, David V CIV (USA); Danielle Richardi; Renee Bennett (CPRA); Gregory Grandy
Cc:	Goodman, Melanie L CIV USARMY CEMVN (US); Behrens, Elizabeth H CIV USARMY CEMVN (USA); Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA); Grey, Patrick R CIV USARMY CEMVN (USA)
Subject:	Bayou aux Carpes 85% Design Plans
Date:	Tuesday, October 6, 2020 6:36:00 PM
Attachments:	BAC Draft_10012020.pdf

IET,

Attached should be the 85% design plan for the Bayou aux Carpes Augmentation Plan. It is an update to the C-02 plan discussed with the NPS, EPA, USFWS, and CPRA on 9/8 and 9/9/2020. Based on agency input at these meetings, the C-02 plan was preferred, because the plug material would be redistributed within Bayou aux Carpes to create beneficial shallow water habitat.

We plan to discuss this during tomorrow's bi-weekly meeting. Please come prepared with any questions, comments, and concerns. We would like to transmit this design to the EPA as a reply to their request for a more detailed disposal plan after tomorrow's meeting. Any questions, comments, or concerns can be submitted to me via email, as well.

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

NPS and USFWS ABANDONED OIL AND GAS WELL PLUGGING AND RECLAMATION		
Site Number	**Description**	**List of Compliance Documentation**
NPS-Jean Lafitte-2	Canal Reclamation by Backfilling	Canal Reclamation at Barataria Preserve Environmental Assessment (NEPA, ESA, NHPA)
NPS-Jean Lafitte-2	Canal Reclamation by Backfilling	Finding of No Significant Impact Canal Reclamation at Barataria Preserve (NEPA, ESA, NHPA)
NPS-Jean Lafitte-2	Canal Reclamation by Backfilling	March 3, 2010 Letter from Louisiana Department of Environmental Quality, Environmental Services (CWA Section 401, State WQ Certification)
NPS-Jean Lafitte-2	Canal Reclamation by Backfilling	April 28, 2010 Cover Letter and Individual Permit from U.S. Army Corps of Engineers, New Orleans District (CWA Section 404 and RHA)
NPS-Jean Lafitte-2	Canal Reclamation by Backfilling	February 3, 2010 Letter from Louisiana Department of Natural Resources, Office of Coastal Management (CZMA)

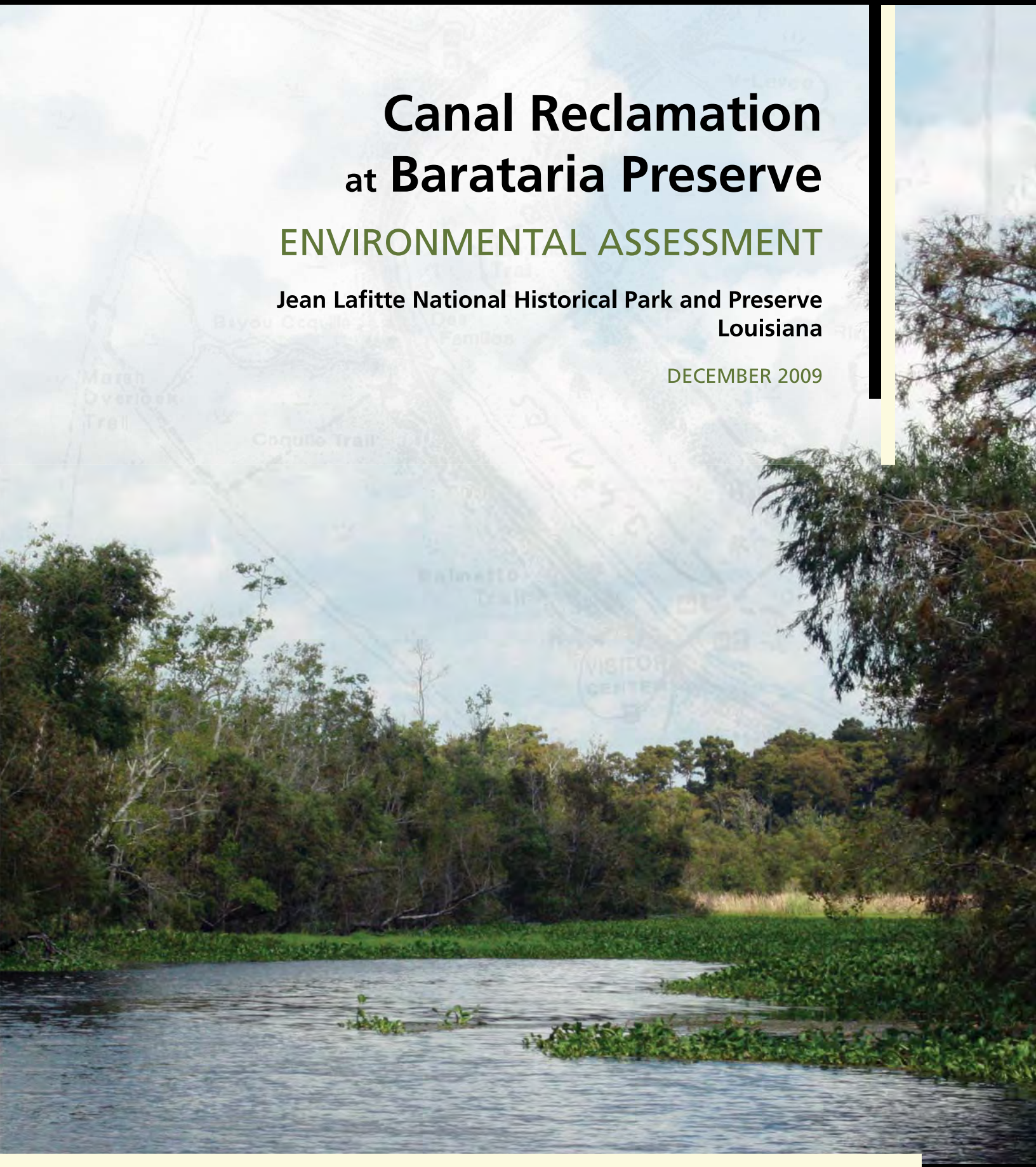
National Park Service
U.S. Department of the Interior

Canal Reclamation at Barataria Preserve

ENVIRONMENTAL ASSESSMENT

Jean Lafitte National Historical Park and Preserve
Louisiana

DECEMBER 2009



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National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical Park and Preserve
Louisiana

Canal Reclamation at Barataria Preserve
Environmental Assessment
Jean Lafitte National Historical Park and Preserve

December 2009

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EXECUTIVE SUMMARY

PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed project is to restore functions, resources, and values related to hydrology in the Barataria Preserve (Preserve) unit of the Jean Lafitte National Historical Park and Preserve that are affected by non-historic canals, spoilbanks, and dikes, and to increase the resiliency of Preserve ecosystems to subsidence, sea level rise, and storm events. A portion of the funding for this project may come from funds associated with the American Recovery and Reinvestment Act of 2009.

Oil and gas exploration, development, and transportation, along with residential development projects that never fully materialized, have scarred the landscape of the Preserve with man-made non-historic canals and earthen structures. More than 590 acres of the Preserve are directly affected by these non-historic canals, spoilbanks, and dikes, and more than 20 linear miles of non-historic canals throughout the Preserve have been identified for reclamation.

Currently, non-historic canals and spoilbanks in the Preserve contribute to increased rates of land loss and to the spread of invasive vegetation species. Canals and their associated spoilbanks alter hydrology and have both direct and indirect roles in Louisiana's land loss problem. Directly, canals have turned marsh into open water, and spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind the spoilbanks. This hydrologic alteration can limit sediment deposition, movement of nutrients and aquatic wildlife, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplification of tidal volumes and increased saltwater intrusion into freshwater marsh. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by invasive exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely impact the Preserve.

ALTERNATIVES CONSIDERED

The National Environmental Policy Act (NEPA) requires that federal agencies explore a range of reasonable alternatives and provide an analysis of what impacts the alternatives could have on the human environment (the natural and physical environment and the relationship of people with that environment). The alternatives under consideration must include a "no action" alternative as prescribed by 40 Code of Federal Regulations (CFR) 1502.14.

The no action alternative (alternative A) is a continuation of current conditions and "sets a baseline of existing impacts continued into the future against which to compare impacts of action alternatives" (NPS DO #12, Section 2.7). Under the no action alternative, the National Park Service (NPS) would not reclaim more than 20 miles of non-historic canals within Barataria Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands. The non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals.

Under the preferred alternative (alternative B), the NPS would reclaim more than 20 miles of non-historic canals within Barataria Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands and partially filling the open water of the canals with the degraded soil and

vegetative material. The canals would then be allowed to revert to marsh and shallow marsh pond habitat by natural processes, recreating freshwater wetlands.

Degrading developer-built spoilbanks and dikes would be accomplished from the canals and/or the spoilbanks themselves using a marsh buggy, barge-mounted excavator, or similar earth-moving equipment. Access to the reclamation areas would be via canals and/or spoilbanks. In consideration of habitat preservation/restoration and potential impacts to navigation and recreation, the NPS may use one or a combination of techniques including check meanders, vegetation removal, gapping, and revegetation. Implementation methods would be based on existing conditions of Barataria Preserve at the time of degrading and funding considerations.

This environmental assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 as amended; implementing regulations, 40 CFR 1500-1508; Department of the Interior (DOI) NEPA Regulations 43 CFR pt. 46 (DOI 2008), and NPS Director's Order 12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS, 2001a). Compliance with Section 106 of the National Historic Preservation Act of 1966 is occurring concurrently with the NEPA process, but separately from this environmental assessment.

Note to Reviewers and Respondents: If you wish to comment on the EA, you may submit comments electronically or mail them directly to the park. This EA will be on public review for 30 days**.** Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Comments may be submitted:

• Online at www.parkplanning.nps.gov/jela (click on project and follow instructions),

• Or by mail to:

Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130

Attn: Canal Reclamation at Barataria Preserve

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Acronyms and Abbreviations

CFR	Code of Federal Regulations
cm	centimeter
DO	Director's Order
DOI	U.S. Department of the Interior
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
GIWWCC	Gulf Intracoastal Waterway West Closure Complex
ha	hectare
IBA	Important Bird Area
MBTA	Migratory Bird Treaty Act of 1918
NEPA	National Environmental Policy Act
NPS	National Park Service
NWI	National Wetlands Inventory
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey

PURPOSE AND NEED

The National Park Service (NPS) proposes to reclaim disturbed wetlands in the 25,000-acre Barataria Preserve (Preserve), a unit of the Jean Lafitte National Historical Park and Preserve (the park). These disturbed wetlands include canals and their earthen spoil deposits. The canals were dredged for the various purposes of accessing oil and gas drill sites, creating oil and gas pipeline routes, and providing borrow material for the construction of dikes meant to facilitate drainage and residential subdivision development in wetlands, which never fully materialized. These canals were constructed prior to the park's establishment and NPS ownership and before the imposition of stricter regulatory requirements under the wetland provisions of the Clean Water Act. These canals and their associated spoilbanks have had lasting effects on the landscape and environment because very few have been reclaimed. For convenience and readability, these disturbed wetland areas will hereinafter be referred to as "canals," although it should be understood that it is the purpose of this project to remediate the entire area of wetland disturbance associated with the canals, including the spoilbank areas.

The Barataria Preserve's marsh habitat formed over thousands of years in a unique deltaic system. The Preserve anchors the northeast portion of the Barataria-Terrebonne National Estuary, deemed ecologically significant by the U.S. Environmental Protection Agency (EPA) in 1990. This unique ecosystem supports a diverse and biologically rich assemblage of plants and animals and is the only example of an estuarine floating marsh in the national park system and one of only four large estuarine floating freshwater marsh systems in the world. More than 150 species of vascular plants have been identified in the floating marsh (Nolfo-Clements 2006).

The project area consists of about 25,000 acres in the upper freshwater zone of the Barataria Basin, one of the most productive estuarine wetlands in North America, and includes a portion of an abandoned delta of the Mississippi River and associated ecological zones, including natural levees, hardwood forests, baldcypress swamp, and fresh to slightly saline waters (intermediate marsh). The Preserve contains hundreds of archeological sites marking a progression of prehistoric and historic habitations (NPS 1995).

This environmental assessment (EA) analyzes the impacts that would result from the implementation of the proposed action and the no action alternative. The action alternative proposes to reclaim more than 20 miles of non-historic canals in the Preserve by degrading developer-built spoilbanks and dikes to the level of the surrounding wetlands and partially filling the canals with the degraded soil and vegetative material. The no action alternative represents the current condition and management actions. No reclamation activities would occur. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended and implementing regulations, 40 Code of Federal Regulations (CFR) 1500-1508, and NPS Director's Order 12 (DO #12) and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001). Compliance with Section 106 of the National Historic Preservation Act of 1966 is occurring concurrently with the NEPA process but separate from this EA.

PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed project is to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. A portion of the funding for this project may come from funds associated with the American Recovery and Reinvestment Act of 2009.

Oil and gas exploration, development, and transportation, along with residential development projects that never fully materialized, have scarred the landscape of the Preserve with man-made canals. More than 590 acres of the Preserve are directly affected by these non-historic canals, and more than 20 linear miles of non-historic canals have been identified for potential reclamation throughout the Preserve.

Currently, non-historic canals in the Preserve contribute to increased rates of land loss and to the spread of invasive exotic plants. Canals alter hydrology and have both direct and indirect roles in Louisiana's land loss problem. Directly, canals have turned marsh into open water, and their spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind the spoilbanks. This hydrologic alteration can limit sediment deposition and movement of nutrients and aquatic wildlife, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplified tidal volumes and increased saltwater intrusion into freshwater marsh. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely impact the Preserve.

Reclamation of more than 20 miles of non-historic canals is needed to help restore and maintain the integrity of the ecological and biological processes of the Preserve. Without adequate reclamation measures, canals in the Preserve would continue to stress Preserve resources and values, with continued adverse impacts on natural hydrology, ecology, water quality, and wetland functions and values. Combined with other sources of cumulative adverse impacts, man-made canals have contributed to increased rates of land loss in the Preserve, the Barataria estuary, and throughout coastal Louisiana.

OBJECTIVES

Objectives are "what must be achieved to a large degree for the action to be considered a success" (NPS DO #12) and represent more specific statements of purpose and need. All alternatives selected for detailed analysis must meet all objectives to a large degree and must resolve the purpose of and need for action. The following objectives were identified by the interdisciplinary team for this project:

- Restore wetland functions and values: hydrology (which includes water, sediment and nutrient movement); vegetation; wildlife habitat; and access for estuarine organisms to the wetlands
- Improve visitor experience
- Avoid or minimize adverse impacts to park resources and values
- Improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms)

PROJECT LOCATION

Barataria Preserve, a unit of the Jean Lafitte National Historical Park and Preserve, is located in southeastern Louisiana, approximately 15 miles from downtown New Orleans in the upper freshwater zone of the Barataria Basin (Figures 1 and 2). The Preserve houses numerous facilities including the Barataria Visitor Center, the Environmental Education Center, and numerous hiking and canoeing trails. Despite its proximity to a metropolitan area, the Preserve exhibits exceptional examples of natural and cultural resources reflective of the Mississippi River Delta. The Preserve's location also makes it vulnerable to natural and man-made forces, and the intensity of natural events is strengthened by previous man-made actions. The project location is limited to the immediate vicinity of the more than 20 miles of non-historic canals proposed for reclamation within the Preserve boundary (Figure 3).

PURPOSE AND SIGNIFICANCE OF JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE

Establishment and Purpose

Jean Lafitte National Historical Park and Preserve was established by an Act of Congress on November 10, 1978 (Public Law 95-625), to "…preserve for the education, inspiration, and benefit of present and future generations significant examples of natural and historical resources of the Mississippi River Delta region and to provide for their interpretation in such manner as to portray the development of cultural diversity in the region." Jean Lafitte National Historical Park and Preserve consists of six separate units in south Louisiana: the French Quarter Visitor Center, the Chalmette Battlefield and National Cemetery, the Barataria Preserve Unit, the Acadian Cultural Center in Lafayette, the Prairie Acadian Cultural Center in Eunice, and the Wetlands Acadian Cultural Center in Thibodaux. Each of these sites provides a diversity of valuable natural and cultural resources preserved and interpreted by the NPS.

The Crescent City District consists of the French Quarter site (which houses administrative offices and a visitor center), the Chalmette National Cemetery (the final resting place for more than 15,000 soldiers), and the Chalmette Battlefield (the site of the 1815 Battle of New Orleans), which is managed as a historically significant cultural landscape. The Acadian District interprets the Acadian culture of the Mississippi River Delta region. The 25,000-acre Barataria Preserve is the largest natural area managed by Jean Lafitte National Historical Park and Preserve.

Significance

Park significance statements capture the essence of a park's importance to the nation's natural and cultural heritage. Understanding park significance helps managers make decisions that preserve the resources and values necessary to the park's purpose. The significance of the Jean Lafitte National Historical Park and Preserve is reflected in the following statements, as presented in the Resource Management Plan (NPS 1997):

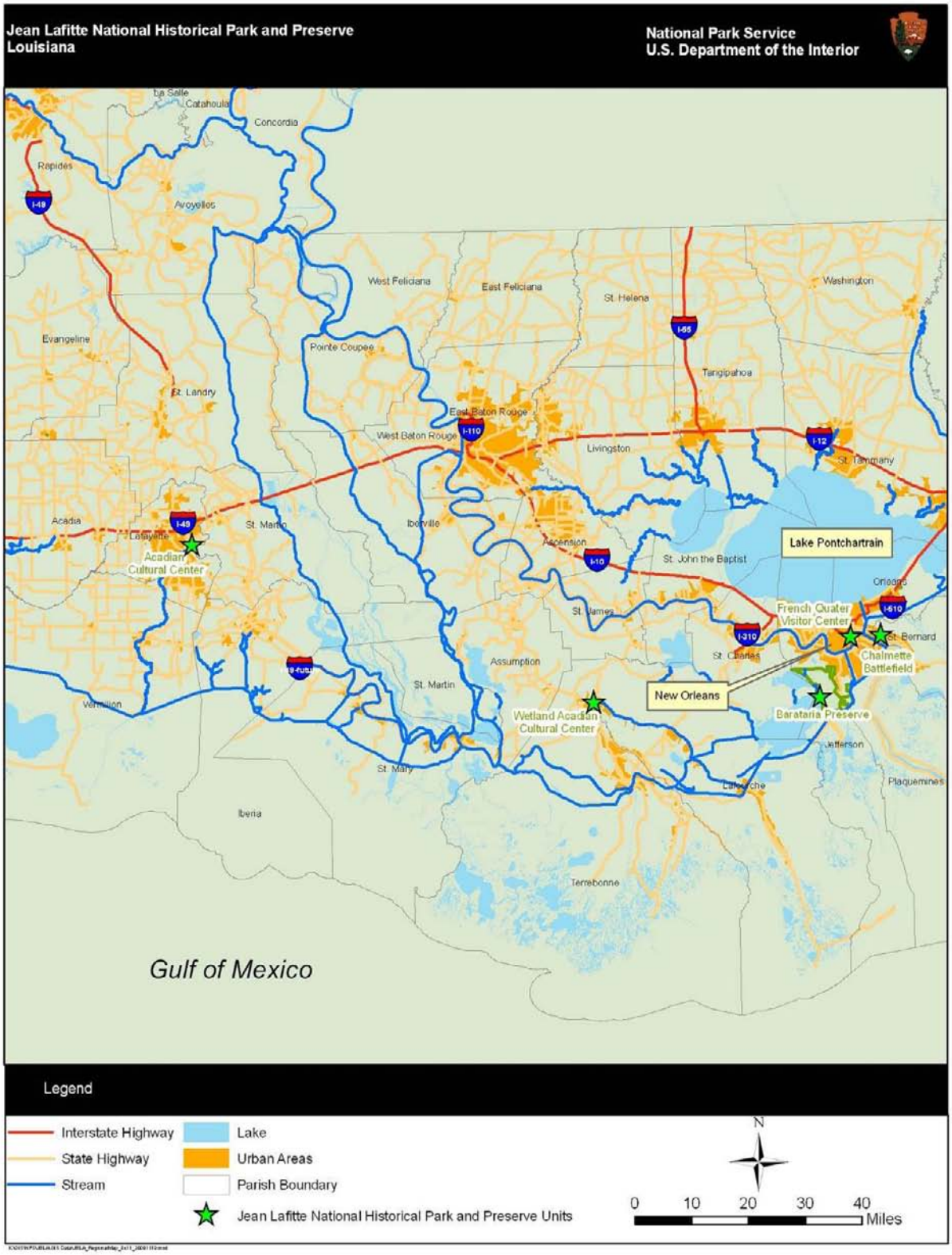

Figure 1. Location of Jean Lafitte National Historical Park and Preserve in Southeastern Louisiana

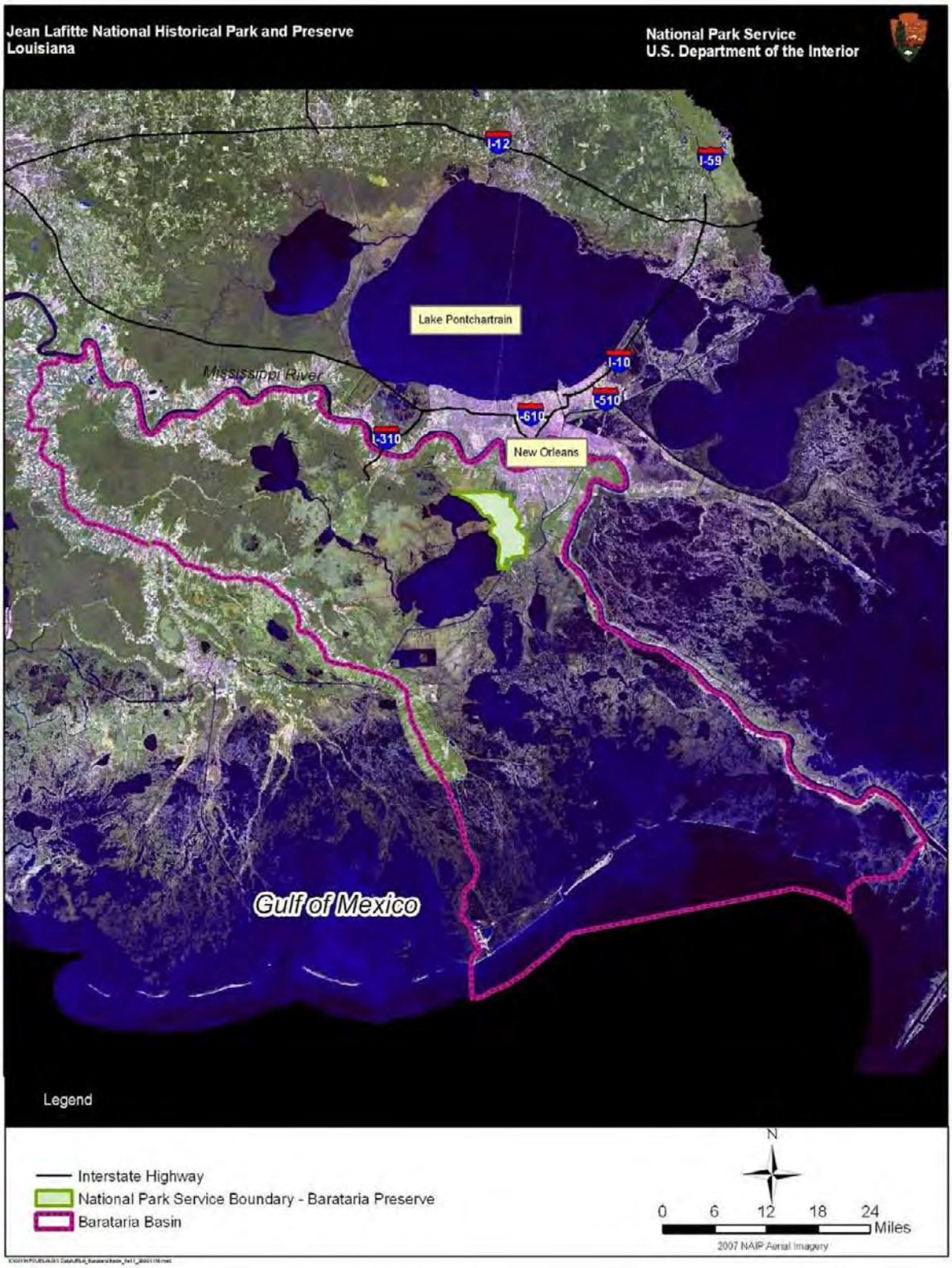

Figure 2. Location of Barataria Preserve within the Barataria Basin

Figure 3. Non-Historic Canals and Drillslips to be Reclaimed in Barataria Preserve

"In creating Jean Lafitte, Congress recognized the lower Mississippi River Delta Region as an area of pivotal national significance, both in terms of its natural and its historic resources. The region comprises the largest and most productive estuarine and wetland system on the continent: barrier islands, alluvial ridges, bottomlands, swamps, fresh to saline marshes, beaches, mudflats, lakes, rivers, bayous, and coastal bays."

"Jean Lafitte National Historical Park and Preserve's mandate is to celebrate the totality of the delta region's character through the preservation and interpretation of natural and historical resources. Obviously the park cannot manage or contribute to the preservation and interpretation of all of the diverse resources of the delta region. Therefore, representative examples were chosen to demonstrate the character of the region as a whole and preserved within the park's units.

The delta's regional character is a product of its climate, geography, geology, bountiful resources, and the mixing of many diverse peoples. These forged a cultural and environmental symbiosis reflected in the language, architecture, food, music, festivals, customs, and life-ways that make the Delta Region a distinctive and significant component of the United States.

The park focuses its interpretive effort on the interrelationship between people and the natural environment. In profoundly important ways, this unique environment shaped the development of the region's unique culture. In an equally profound sense, people have modified the environment of the delta. The interplay of culture and nature in the delta is a paramount theme because the Delta environment forced the development of unique cultural adaptations not found elsewhere in the United States.

However, the modifications of deltaic processes instituted by people have had systemic effects of such magnitude that the very delta is threatened with physical disappearance and with it, the culture that depends upon it. In response, a concerted effort among citizens, businesses, and governments at every level has been undertaken to halt and reverse this environmental catastrophe. The park is part of this partnership, not only to help in the preservation of these resources, but also to help in the interpretation of the effort."

PROJECT BACKGROUND

Exploratory oil and gas wells drilled in the Preserve from the 1950s to the 1980s required construction of a widespread network of canals through emergent and forested wetlands and creation of spoilbanks as dredging occurred. Other canals were dredged as corridors for oil and gas pipelines. Abandoned, unreclaimed canals have had lasting effects on the landscape and environment.

Other areas of the Preserve are affected by canals dredged in the early 1970s to provide borrow material for the construction of dikes. The dikes were built to facilitate drainage and residential development in wetlands, which never fully materialized. Like canals constructed in support of oil and gas exploration and development, the canal and dike systems were never reclaimed and have caused long-term effects on the environment within the Preserve.

Within the Preserve, the canals under consideration for reclamation are recent additions to the landscape and are not considered historic resources. The presence of these canals exaggerates the impact of many current chronic stresses on coastal Louisiana. Canals alter natural hydrological functions, disrupt sheet flow of fresh water and nutrients, amplify tidal volumes, and serve as conduits for saltwater intrusion into freshwater marsh. These effects on freshwater marsh or forested swamp systems result in declining plant viability and potential long-term changes in species

composition. The majority of spoilbanks and dikes of these canals are dominated by the invasive Chinese tallow tree (*Triadica sebifera*), and the existence of the canals facilitates tallow seed distribution into the marsh and associated scrub-shrub habitats that are readily colonized by the tallow tree. The dominance of Chinese tallow prevents the growth of native plants, thus reducing the habitat value for native wildlife.

Backfilling abandoned canals and degrading dikes and spoilbanks has been widely used as a restoration technique in wetland habitats in southeastern Louisiana and has been used successfully in the Preserve. The NPS initiated the preparation of this EA to examine issues and alternatives for a solution to the detrimental effects these canals have on the natural and biological resources in the Preserve.

NATIONAL PARK SERVICE PLANS, POLICIES, AND ACTIONS

Created and approved in 1982, the *Jean Lafitte National Historical Park and Preserve General Management/Development Plan* guides the overall management and use of park resources. The general management portion of the plan outlines overall interpretation of the park's natural and cultural resources, visitor use, development, and administration. The development concept portion refines proposals for the developed areas and discusses the spectrum of existing and new facilities that would allow opportunities for recreation to continue for future generations. Designated management zones for park lands and waters indicate what park operations and management functions, visitor uses, and developments are appropriate in different locations. These zones are based on the park's authorizing legislation, NPS policies, the nature of the park's resources, and established uses.

A 1995 amendment to the General Management Plan was created and approved to address changes and issues concerning cooperating agreements, resource additions, natural resource management, and visitor use and general development. Among other things, the plan amendment guides the direction for natural resource management and interpretation in the Preserve. The amendment also re-examines some of the actions proposed in the 1982 plan, substituting new proposals where appropriate.

The *Jean Lafitte National Historical Park and Preserve Resource Management Plan* created in December 1997 identifies natural and cultural resources and their location in the context of Louisiana's Mississippi River Delta Region and describes and evaluates current resource management activities. The Resource Management Plan serves as the park's primary planning document for addressing critical resource issues and problems. The overall resource management goals for the Jean Lafitte National Historical Park and Preserve are to protect representative examples of the natural and historical resources of Louisiana's Mississippi River Delta Region and adjacent areas of Acadiana through NPS ownership and conservation through partnerships that promote such protections and to provide the means and opportunities for people to experience those resources and understand how they contribute to the development of a unique culture.

SCOPING

Two internal scoping meetings were held on September 24, 2009, and October 8, 2009. The meetings were conducted by an interdisciplinary team of NPS staff from both Jean Lafitte National Historical Park and Preserve and the Denver Service Center. The September meeting included a discussion on purpose, need, and objectives for the project; various alternatives; potential environmental impacts;

past, present, and reasonably foreseeable future projects that may have cumulative effects; and possible mitigation measures. During the October meeting, team members conducted a site visit to view the project area and the areas that would be affected by the action.

On September 30, 2009, the NPS published a scoping brochure detailing their intentions to prepare an EA for Canal Reclamation at Barataria Preserve in the Jean Lafitte National Historical Park and Preserve. The NPS wished to determine the scope of issues to be addressed in the EA, identify significant issues related to canal reclamation at the Preserve, and obtain feedback on initially proposed alternatives. The NPS conducted a 30-day public scoping period (ending October 31, 2009) and invited the public to send written comments to the Superintendent or to enter them online at www. parkplanning.nps.gov/jela. A press release was also sent to *The Times Picayune* on October 5, 2009. During the 30-day scoping period, 32 pieces of correspondence were received. Comments included both support for and against the project, a suggested new alternative to spread the degraded spoil material across the marsh instead of placing it in the canals, requests to remove certain canals from the project, concerns about continued access to private properties, including concern about the continued ability of companies to exercise their mineral rights in the Preserve, concerns about potential impacts, and suggestions for resource topics to include in the analysis. More information about the nature of the comments can be found in the "Coordination and Consultation" chapter of this EA.

ISSUES

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations, as well as problems that may arise from the implementation of any of the alternatives. Potential issues associated with this project were identified by the park staff, input from other agencies consulted, the initial scoping meeting, and the public during the public scoping period.

The primary concern of the park, as identified during the internal scoping meetings, is to protect Preserve resources and ensure their continued use and enjoyment for park visitors. Other identified issues and concerns are listed below.

Natural Resources: Activities associated with the construction project activities affect natural resources such as soils, water quality, vegetation, and wildlife.

Visitor Use and Experience: Concerns raised during scoping included access to areas open for hunting within the Preserve, the length of time the project would take, the impact of other projects that could be occurring at the same time (U.S. Army Corps of Engineers [USACE] aquatic vegetation spraying, canoe trail debris removal, and Bayou aux Carpes acquisition/mitigation), administrative boat use, and mitigation focused on visitor use and experience.

IMPACT TOPICS

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations as well as problems that may arise from the implementation of any of the alternatives. Park staff identified potential issues associated with the implementation of the reclamation activities during internal scoping. A primary concern is to ensure that any alternative considered would allow for minimal disturbance of the existing Preserve functions, resources, and values. Issues and concerns identified during scoping were grouped into impact topics that are discussed in the "Affected Environment" chapter and analyzed in the "Environmental Consequences"

chapter of this EA. Table 1 describes each of the topics that are considered in the analysis. The narrative that follows provides a justification as to why particular topics were dismissed from analysis.

Table 1. Impact topics retained for further evaluation and relevant laws, regulations, and policies

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Soils and Geology	The proposed action would degrade developer-built spoilbanks and dikes resulting in disturbances to the soils. Soil disturbances could also result from the use of equipment necessary to move large volumes of material. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Management Policies*
Vegetation and Non-native Species	The proposed action could result in the removal of native vegetation. Several forms of vegetation located in the proposed project area could be affected by the proposed reclamation activities, as some vegetation may need to be removed or disturbed to carry out the proposed action. Project-related disturbances may occur to live vegetation from the use of large equipment. Moreover, since equipment would be operating in waterways, there may be disturbance to floating and rooted aquatic vegetation. The project would reduce habitat typically dominated by exotic invasive vegetation. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Organic Act*; NPS *Management Policies*; Resource Management Guidelines (NPS-77); *Federal Noxious Weed Control Act*; Executive Order 13112; Invasive Species (1999)
Fish and wildlife	The rich estuarine environment of coastal Louisiana supports an abundance and diversity of wildlife. The Preserve's ecological complex of terrestrial and aquatic habitats provides a generous supply of habitat for resident and migratory wildlife. Activities necessary to carry out the proposed action would involve increased human activity and the use of heavy equipment. This would create disturbances and may temporarily displace wildlife from the area. Canal and spoilbank vegetation habitat would be converted to wetland. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Organic Act*; NPS *Management Policies*; Resource Management Guidelines (NPS-77); *Fish and Wildlife Coordination Act of 1934* (PL 85-624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Special Status Species	The U.S. Fish and Wildlife Service (USFWS) determined the proposed action alternative would not impact federally listed species (USFWS 2009). However, migratory birds such as neotropical species may be impacted by the removal of vegetation on the spoilbanks. Therefore, during scoping the interdisciplinary team decided this impact topic would be retained for further analysis in this EA.	*Fish and Wildlife Coordination Act of 1934* (PL 85-624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Hydrology and Water Quality	In-stream work would be necessary for reclamation activities, potentially resulting in	*Clean Water Act*; *Fish and Wildlife Coordination Act of 1934* (PL 85-

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
	adverse impacts on water quality. There could be beneficial effects resulting from decreased erosion of the canal banks. Therefore, this impact topic was retained for further analysis in this EA.	624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Wetlands	More than 95% of the Preserve is classified as emergent and forested wetlands according to the 1992 USFWS National Wetlands Inventory (NWI) (Cowardin et al. 1979). The proposed project activities could impact wetlands through the use of heavy equipment, potentially resulting in the compaction of wetland soils and destruction of some wetland vegetation. There would be long-term beneficial impacts to the areas experiencing spoilbank removal and partial filling. The spoilbanks present an artificial area of high elevation and mineral soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow, and primarily native wetland species are expected to recolonize the area after spoil material removal. Partial filling of open water areas with material from the spoilbanks is expected to create additional areas of submerged and emergent vegetation. Therefore, this topic was retained for further analysis in this EA.	Executive Order 11990 Protection of Wetlands, NPS *Management Policies* and Procedural Manual DO #77-1: Wetland Protection, *Clean Water Act* Sections 404 and 401
Visitor Experience, Health and Safety	The proposed action could disturb visitors during construction due to reduced access and noise from construction. The visitor experience could be affected. Temporary recreational area closures and increased noise and pollution levels may result under this alternative**.** Therefore, this impact topic was retained for further analysis in this EA.	NPS *Management Policies*

IMPACT TOPICS ELIMINATED (OR DISMISSED) FROM FURTHER ANALYSIS AND CONSIDERATION

The following impact topics were eliminated from further analysis in this EA. A brief rationale for dismissal is provided for each topic. With mitigation, potential impacts to these resources would be negligible and localized.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. The NPS, under the direction of *Management Policies 2006* and DO #77-2: *Floodplain Management* would strive to preserve floodplain values and minimize hazardous floodplain conditions. According to DO #77-2, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains. For restoration projects that restore to grade without any fill materials, a Statement of Findings for floodplains is not required. Coordination with the NPS' Water Resources Division

confirmed that if this project would result in a net beneficial impact to the floodplain, it would not be necessary to develop a floodplain Statement of Findings. The proposed action would restore more natural conditions within the Preserve; would not place humans or Preserve infrastructure at increased flood risk; and, therefore, would not require a Statement of Findings.

The proposed action is consistent with NPS policy that dictates the preservation of floodplain values and functions as it would be providing beneficial impacts to floodplain functions and values over the long term. The proposed action specifically supports the NPS policy that states "[NPS] will protect and preserve the natural resources and functions of floodplains, and restore when practicable, natural floodplain values previously affected by land use activities within floodplains." Since this alternative is consistent with NPS policy and does not involve the development or occupancy of floodplains, this impact topic has been dismissed from further consideration.

Prime and Unique Farmland

The Council on Environmental Quality (1980) states that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's (USDA's) Natural Resource Conservation Service as prime farmlands or unique farmlands. Prime farmland defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops, such as fruits, vegetables, and nuts.

Within the project area, there are lands designated as prime farmlands (USDA 2004). However, these areas have not been in agricultural production since the early 1900s. While park rangers interpret previous farming practices and agricultural uses, there are no plans to put these lands back in production. Therefore, the topic of prime and unique farmlands has been dismissed from further consideration.

Air Quality

The Clean Air Act of 1963 (U.S.C. 7401 et seq.) was established to promote public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with NPS units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural and historic resources and objects, and visitor health) from adverse air pollution impacts. The Preserve is located in an area classified by the EPA as "in attainment" for all six criteria air pollutants.

The proposed action could result in increases in fugitive dust and emissions from construction vehicles and equipment used to degrade the spoilbanks. However, any impacts would be localized and negligible. Due to the project location, environmental conditions, and the temporary nature of the activities, any emissions and fugitive dust would rapidly dissipate, and emission levels would not be higher than those produced by vehicles and equipment during normal park operations.

Any impacts of reclaiming the non-historic canals on climate change would be mainly due to emissions of nitrous oxides and carbon dioxide from the burning of fossil fuel in vehicles and construction equipment, which can affect global warming. However, these impacts would be

temporary and negligible. Removing vegetation from spoilbanks would decrease the amount of vegetation that could remove carbon dioxide from the atmosphere, but this decrease would be negligible and would be offset once wetland vegetation reestablished itself. For these reasons, air quality was dismissed as an impact topic from this analysis.

Archeological Resources and Historic Structures

Because of pre-construction surveys and avoidance mitigation, the NPS determined that there would be no adverse impacts to archeological sites in the project area. The NPS would conduct a Phase I survey for archeological sites in the project area, focusing especially on areas where canal segments have intersected or cut into natural waterways or historic canals, and on canal segments in recently acquired lands. The archeologist who conducts this survey would visit: (1) the state site files office to determine if there are previously identified archeological sites in the newly acquired lands and obtain copies of all associated site forms; (2) all spoilbanks and dikes to be impacted, especially those in the newly acquired lands; and (3) all intersections of canals and spoilbanks in the project area with natural waterways and/or historic canals and perform a pedestrian survey (if above water), and, if deemed necessary, conduct limited subsurface testing.

Known sites identified in the Phase I survey would be flagged for avoidance by the archeologist during the survey and removed from the project area. Should the action alternative be implemented, the park would have staff from the Southeast Archeological Center complete the pre-construction Phase I survey as implementation is funded for each part of the project area. This mitigation would also cover historic structures if any are discovered during the survey(s). If evidence of archeological sites or historic structures is inadvertently discovered during construction activities, work in the area would cease, and qualified NPS personnel would assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribe. Based on these factors, archeological resources were dismissed as an impact topic from this analysis.

Cultural Landscapes

None of the canals targeted for reclamation are identified as contributing elements to the historical features of the Barataria Unit National Historic District, which was placed on the National Register of Historic Places in 1989. A draft cultural resources report which, when final, would be used as the basis for an amended National Register nomination for the district (Swanson 2008) also did not identify any project canals as contributing elements, despite the fact that Pipeline Canal, Tarpaper Canal, and the drillslip on the east bank of Bayou Bardeaux between Lakes Cataouatche and Salvador are all slightly more than 50 years old and, therefore, could have been considered contributing resources if they were significant. Canals in the entire Preserve are a category of cultural landscape features that either contributes (historic) or does not contribute (non-historic) to the nomination. None of the historic canal features, the Kenta, Delery-Ross, Wood's Place, Millaudon, Dugue's, Labranche, and Waggaman Canals, along with meander cut-offs of Bayou Segnette, are included in the project area. However, parts of the project area overlap with segments of historic canals that have been already modified by the non-historic land uses which the project seeks to reclaim.

Ethnographic Resources

Ethnographic resources within the Preserve are associated with American Indian tribes, African American communities, Isleño people, and other traditional users of the resources in the Preserve.

These ethnographic resources include plants, animals, and physical features identified as having religious, subsistence, occupational, or other significance by one or more of these groups. The NPS has not received any information regarding effects to ethnographic resources from park users or Indian tribes contacted as part of the initial public scoping process for the project. While ethnographically significant plants, such as wild onion (*Allium canadense*), muscadine grape (*Vitis rotundifolia*), dewberry (*Rubus* sp.), and sneezeweed (*Helenium* sp.), do occur in the Preserve, American Indian tribes are not collecting them within the Preserve boundaries. Most fish and wildlife species of ethnographic significance were utilized as food sources or for fur and include species still commercially important to the region as well as game species. The project is likely to beneficially affect fish and shellfish populations by creating shallow water habitat. The park has had no response from scoping indicating that any physical features or locations within the Preserve that would be affected by the project have significance to any associated group. Based on these factors, ethnographic resources were dismissed as an impact topic from this analysis.

Museum Collections

The park's museum collection is not likely to be affected by the project because it would not result in the intentional excavation of archeological sites. However, a small number of artifacts may be collected as part of the pre-construction Phase I cultural resources survey and become part of the collection. Based on these factors, museum collections were dismissed as an impact topic from this analysis.

Soundscapes

According to NPS *Management Policies 2006*, park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Examples of natural sounds include sounds produced by natural and physical processes including territorial calls of birds and wind passing through forests. As a result of the proposed action, natural soundscapes may be interrupted by the sound of project workers, heavy equipment, and vessels on a temporary and negligible basis. The frequency, duration, and magnitude of noise from the project would not exceed those already produced by park staff and visitors during normal park operations and recreational activities. For these reasons, soundscapes is dismissed from further analysis.

Land Use

The proposed action of reclaiming non-historic canals within the Preserve would not alter land use designations in the Preserve. Within the boundaries of the Preserve there are land holdings that are subject to mineral reservations that allow operators owning those property rights the right of access to the surface to explore for and develop the mineral interest. Oil and gas activities that are associated with the exploration and development of nonfederal oil and gas rights located within NPS boundaries are governed by the National Park Service Nonfederal Oil and Gas Rights and Regulations found in 36 CFR 9B (9B regulations). According to the regulations, the right to conduct oil and gas operations in units of the national park system is based on ownership rights and obtaining NPS authorization to conduct the operation (36 CFR § 9.30[a]). While the NPS must recognize the property rights of operators owning the mineral reservations, it must also fulfill its mandate from Congress through the Organic Act of 1916 to manage units of the national park system “to conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such

a manner and by such a means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1).

None of the oil and gas access canals and drillslips identified for reclamation under the proposed action are active, and all are abandoned. The 9B regulations are reasonable time, place, and manner regulations that assist park managers in carrying out park mandates while allowing oil and gas operators to exercise their property rights. Because reclaiming abandoned access canals and drillslips would not prevent operators owning mineral reservations from exercising their property rights in the future, the topic of land use was dismissed from further analysis.

Socioeconomics

The proposed action would neither change local or regional land use nor appreciably impact local business or other agencies. Contracted work for this project would be temporary, and any potential increase in workforce revenue would be temporary and negligible. Local businesses (gas stations, restaurants, canoe rentals, swamp boat tours, and shops) may benefit from additional visitors to the Preserve, but any increase is expected to be negligible and lasting only as long as project activities occur.

A swamp tour company is located immediately adjacent to the Preserve, and its boats are stored and operated in canals owned by the United States in the Bayou aux Carpes area that are proposed for reclamation; however, its ability to continue its commercial venture would not be adversely impacted. With the NPS' recent acquisition of Bayou aux Carpes, some of the canals visited by the tour boat company are now within the Preserve boundaries, and the NPS would coordinate with the tour boat company to allow it to continue its operations in the Bayou aux Carpes area under the terms of a commercial use authorization. So as not to interfere with navigation in the canals used by the tour boat company, cut woody vegetation in these canals would be placed parallel to the banks of the canal or chipped in place. Additionally, the viewing experience of the tour boat company's patrons would be enhanced by restoring spoilbank habitat consisting of invasive exotic trees back to native wetlands. Because there would be beneficial impacts and no adverse impacts to the socioeconomic environment, this topic was dismissed from further analysis.

Park Management and Operations

Park operations and management, including operational efficiency, staffing needs, interagency relations for NPS law enforcement, maintenance, and commercial use permittees, would not be affected by actions proposed in the alternatives. The park anticipates some operational changes with regard to the vessels that can be used to access reclaimed canals in the long term. However, the park currently has the capability to operate in the shallow water environments that would be created by the project, and this is not expected to change. Therefore, this topic was dismissed from further analysis.

ALTERNATIVES

NEPA requires that federal agencies explore a range of reasonable alternatives and provide an analysis of what impacts the alternatives would have on the human environment (the natural and physical environment and the relationship of people with that environment). The alternatives under consideration must include a "no action" alternative as prescribed by 40 CFR 1502.14.

This chapter describes two alternatives: the no action alternative and the proposed action (reclamation of more than 20 miles of non-historic canals within the Preserve). Alternatives considered but dismissed from further analysis are described, and the reasons for dismissal are provided. Analyses for selecting the environmentally preferred alternative and the NPS preferred alternative are also provided.

NO ACTION ALTERNATIVE (ALTERNATIVE A)

The no action alternative is a continuation of current conditions and "sets a baseline of existing impacts continued into the future against which to compare impacts of action alternatives" (NPS DO #12, Section 2.7). Under the no action alternative, the NPS would not degrade developer-built spoilbanks and dikes to the level of the surrounding wetlands for more than 20 miles of non-historic canals within the Preserve. The non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. Should the no action alternative be selected, the NPS would continue to maintain and protect the natural resources, functions, and values within the Preserve and would respond to future needs and conditions associated with the canals and coastal wetlands without extensive actions or changes in the present course.

CANAL RECLAMATION TO NATURAL LANDSCAPE BY DEGRADING DEVELOPER-BUILT SPOILBANKS AND DIKES (ALTERNATIVE B, PREFERRED ALTERNATIVE)

Under alternative B, the NPS would reclaim more than 20 miles of non-historic canals within the Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands and partially filling the open water of the canals with the degraded soil and vegetative material. The canals would then be allowed to revert to marsh and shallow water habitat by natural processes, recreating freshwater wetlands. Figure 3 under Project Location in the "Purpose and Need" chapter of this EA shows the non-historic canals and drillslips considered for reclamation.

Degrading developer-built spoilbanks and dikes would be accomplished from the canals and /or the spoilbanks using a marsh buggy, barge-mounted excavator, or similar earth-moving equipment. Access to the reclamation areas would be via canals and/or spoilbanks. In consideration of habitat restoration/preservation and potential impacts to navigation and recreation, the NPS may also use one or a combination of the following techniques. The techniques implemented would be based on existing conditions in the Preserve at the time of degrading and funding considerations.

Check Meanders: In areas where canals identified for reclamation meet a maintained navigable waterway, that is, the Bayou Segnette Waterway, check meanders would likely be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation. The check meander would be installed in the canal upstream of the confluence with the navigable waterway and would consist of a double earthen plug with small openings on either end to allow for water exchange and aquatic access for fish and wildlife (Figure 4). The check meander would be

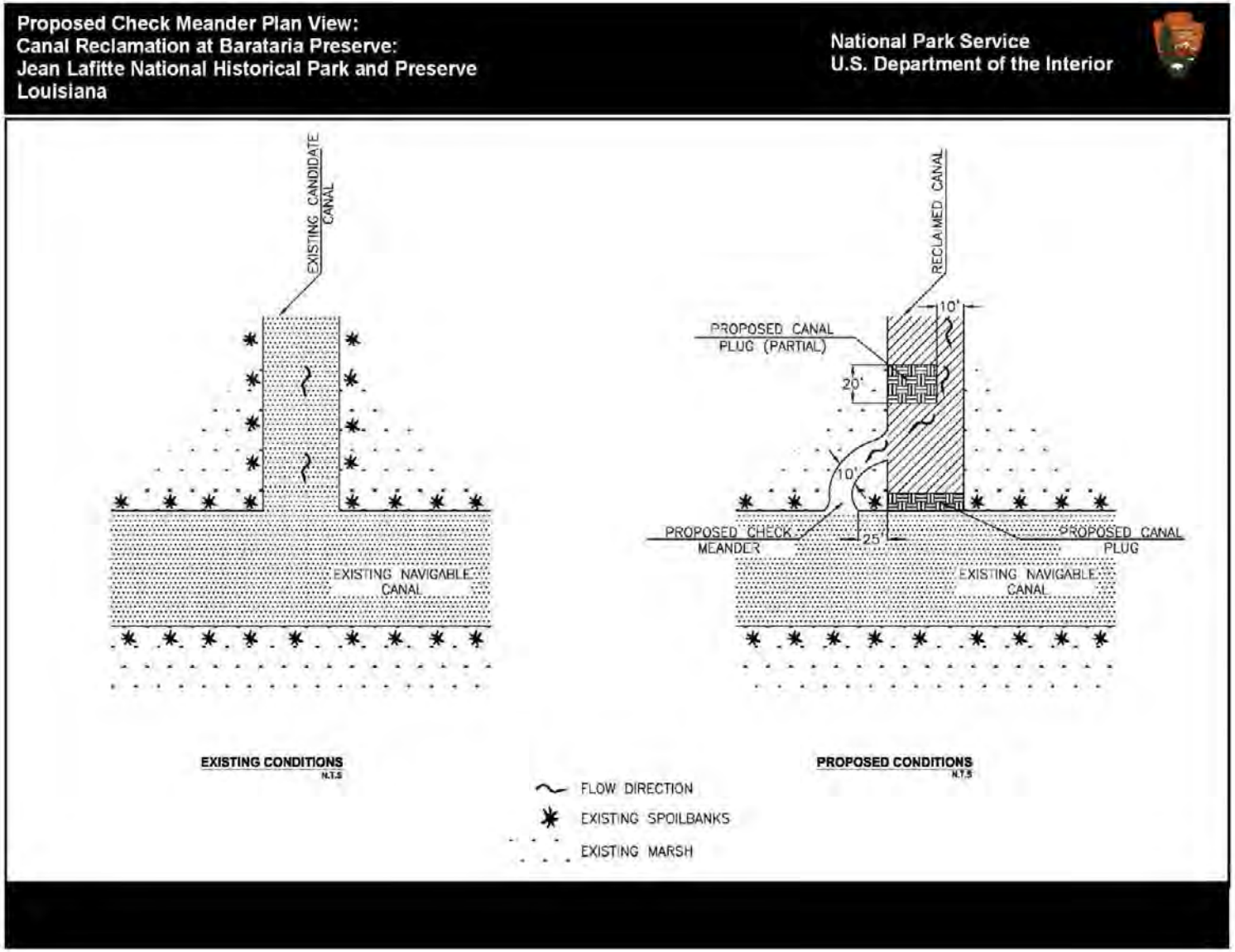

Figure 4. Check Meanders

constructed using only spoilbank material available from the canal itself. The purpose of the check meander would be to prevent the discharge of woody vegetation and sediment from the partially filled canal into the navigable channel and to protect the reclaimed canal from direct wave action and tidal surges from the navigable channel. Check meanders constructed as part of past reclamation projects in the Preserve have withstood multiple hurricane tidal surges/releases.

Vegetation Removal: In non-historic canals where pushing woody vegetation into the open water may interfere with navigation such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal, and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by commercial swamp tours, cut woody vegetation may be placed parallel to the banks of the canal or chipped in place. Woody vegetation may also be chipped in place in canals or drillslips that meet a navigable waterway to prevent large woody debris from drifting into the navigable waterway.

Gapping: Gapping is a technique whereby spoilbanks would be intermittently breached to restore hydrological connections between the canal and the surrounding marsh or wetland. Gapping would likely be used in areas throughout the project area where it would be too costly to degrade an entire developer-built spoilbank or dike due to the amount of material present. The gapped material would be used to partially fill the open water area of the canal.

Revegetation: Some reclaimed areas that are adjacent to forested wetlands may be revegetated with native woody species such as baldcypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatic*).

MITIGATION MEASURES OF THE ACTION ALTERNATIVE

The following mitigation measures would be implemented under the action alternative:

General

- NPS personnel would identify spoilbanks and canals to be degraded and partially filled and would regularly monitor the work.
- To minimize possible petrochemical spills from construction equipment, the contractor would regularly monitor and check equipment to identify and repair any leaks
- Spill containment materials would be staged near the action area for use to contain or collect any accidental fuel or chemical spills from construction equipment.
- Upon discovery, any fuel or chemical spills associated with construction activities would be immediately contained and reported to the NPS.
- Fueling of vehicles and equipment would take place outside the Preserve whenever possible; if fueling within the Preserve is required, no less than two persons would attend these activities, and fueling would be completed over a physical barrier, such as a tarp, and absorbent materials.

Soils and Geology

- To eliminate impacts to soils outside of the immediate project areas, equipment access to the areas to be degraded would be via the canals and/or spoilbanks.

Vegetation

- Weed control measures (e.g., cleaning/washing of vehicles/vessels, equipment, and personal equipment before entering/re-entering the Preserve) would be implemented to help minimize the potential for the introduction and spread of nonnative species.
- To eliminate potential impacts to marsh vegetation caused by driving over it, construction equipment would access the project areas via the canals and/or spoilbanks.

Fish and Wildlife / Special Status Species

- Construction activities would be timed to avoid nesting activities of bird species.

Water Resources

- Boats operating in the canals during reclamation activities would use only four stroke engines.

Wetlands

- Ground crews would be instructed by park staff on how to avoid damaging any part or whole of wetland vegetation in the Preserve other than the vegetation to be removed on the spoilbanks.
- The NPS would regularly monitor to ensure non-spoilbank wetland vegetation is not damaged during reclamation activities.

Cultural Resources

- A Phase 1 survey would be conducted for archeological sites in the project area by qualified staff from the Southeast Archeological Center prior to any construction activities. The archeologist would visit: (1) the state site files office to determine if there are previously identified archeological sites in the newly acquired lands and obtain copies of all associated site forms; (2) all spoilbanks and dikes to be impacted, especially those in the newly acquired lands; and (3) all intersections of canals and spoilbanks in the project area with natural waterways and/or historic canals and perform a pedestrian survey (if above water), and, if deemed necessary, conduct limited subsurface testing.
- Known archeological sites, including those identified in the Phase I survey, would be flagged for avoidance by the archeologist and removed from the project area.
- If evidence of archeological sites or historic structures is inadvertently discovered during construction activities, work in the area would cease, and qualified NPS personnel would assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribes.

Visitor Use and Experience

- Where canals identified for reclamation meet the maintained navigable Bayou Segnette Waterway, check meanders would likely be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation.

- To avoid impacts to navigation caused by pushing woody vegetation into Tarpaper Canal, Horseshoe Canal, Pipeline Canal and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by commercial swamp tours, cut woody vegetation would either be placed parallel to the banks of the canal or chipped in place.
- Temporary canal closures would be put into place in areas where construction activities are occurring to eliminate any potential impacts to the health and safety of Preserve visitors.

ALTERNATIVES CONSIDERED, BUT DISMISSED

During the internal and public scoping process, the NPS received a number of suggestions for alternatives. The NPS considered the following alternatives, but deemed them to be unreasonable for the reasons provided. The options below were not carried forward for analysis in this EA.

Complete Plugs

Under this option, spoilbanks would be degraded, and material obtained from them would be used to construct complete plugs at the opening of canals. The plugged water channels would be left to naturally accumulate debris and return to pre-disturbance conditions. This option was dismissed because completely plugging a canal would cut off the exchange of water in and out of the canal and adjacent marsh, altering the local hydrology regime. This would result in a detrimental effect on water quality due to stagnation and a subsequent decrease in dissolved oxygen caused by decaying vegetation. These conditions would severely stress aquatic organisms currently inhabiting the channels by altering water chemistry and disrupting access. This option would therefore not meet the purpose and need of this project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

Completely Filling Canals

Under this option, canals would be partially filled with material acquired from degraded spoilbanks and then supplemented with additional dredged material obtained from an off-site source to completely fill the remaining open water of the canal. Monitoring of a previous pilot study conducted in 2001 – 2002 on two canals in the Preserve comparing this reclamation method with the method of using only degraded spoilbank material to partially fill a canal indicated that there was not a large ecological difference between the two methods after 3 years (Baustian et al. 2008). Results of the monitoring indicated that just using the spoilbank material effectively began the restoration process, while the addition of dredged sediment provided mixed restoration results. There was no appreciable difference in the amount of marsh established in the open water portions of the canals and both methods had 65% of their former spoil areas re-established as marsh. While the additional sediment used to completely fill one canal led to shallower canal depths, it also slowed soil restoration and allowed vegetation typical of young spoilbanks (e.g., black willow [*Salix nigra*]) to recolonize portions of the former spoil areas. Due to the additional construction costs of dredging and transporting additional sediments to completely fill the canal, this method cost eight times more than the method using available spoilbank material. Because completely filling a canal with supplemental dredge material does not achieve greater ecological results than just using spoilbank material yet costs eight times more, this alternative was dismissed from further analysis.

Degrading Spoilbanks onto the Marsh

Under this option, degraded spoilbank material (soil and vegetation) would be placed on the marsh instead of in the canals, thus leaving the canals as open water. Placing the degraded material on the marsh would directly destroy the type of wetland habitat that the project is trying to restore. By not partially filling the canals with spoilbank material, wetland vegetation would not be able reestablish itself in the canals and the canals would remain deeper, open water habitat. The open water habitat of the canals would continue to contribute to the loss of wetland habitat in the Preserve by, among other things, allowing saltwater intrusion into the freshwater wetlands. This option was dismissed because it did not not meet the purpose and need of this project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is defined by the Council on Environmental Quality as the alternative that would promote the national environmental policy as expressed in NEPA Section 101. This includes:

1. Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assuring for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities; and
6. Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources.

Simply put, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources (Council on Environmental Quality, *NEPA's 40 Most Asked Questions*, 6a).

The no action alternative is not the environmentally preferred alternative because it would not improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 2, 3, and 4) as well as alternative B nor would it fulfill the responsibilities of each generation as trustee of the environment by improving the degraded condition of the Preserve wetlands (NEPA criteria 1). Failure to reclaim the canals would allow the disruption of natural patterns of water movement to continue, degrade water quality, result in continued erosion, and preserve habitat for invasive floating vegetation.

After completing the environmental analysis, the NPS identified alternative B as the environmentally preferred alternative in this EA because it best meets the definition established by the Council on Environmental Quality. This alternative was selected based on the following criteria:

- it would restore wetland functions and values: hydrology (which includes water, sediment and nutrient movement); vegetation; wildlife habitat; and access for estuarine organisms by reclaiming more than 20 miles of non-historic canals within the Preserve (NEPA criteria 1, 2, 3, and 4);
- it would improve visitor experience by restoring the coastal wetland landscape allowing visitors to enjoy a more natural system, representative of the historic wetlands and ecosystems present prior to the canals(NEPA criteria 2);
- it would avoid or minimize adverse impacts to park resources and values (NEPA 1, 2, and 4); and
- it would improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 1, 2, 3, and 4).

The “Environmental Consequences” chapter of this EA describes the effects on each impact topic under each alternative. Table 3 summarizes these impacts.

ALTERNATIVES SUMMARIES

Table 2 summarizes the major components of alternatives A and B and compares the ability of these alternatives to meet the project objectives identified in the “Purpose and Need” chapter of this EA.

Table 3 summarizes the anticipated environmental impacts for alternatives A and B. Only these impact topics that have been carried forward for further analysis are included. The “Environmental Consequences” chapter provides a more detailed explanation of these impacts.

Table 2. Summary of alternatives and ability to meet project objectives

Alternative Elements	Alternative A – No Action	Alternative B (Preferred Alternative) – Canal Reclamation to Natural Landscape by Degrading Spoilbanks and Dikes Built by Developers
Project Objectives	**Meets Project Objectives?**	**Meets Project Objectives?**
Restore wetland functions and values: hydrology, including water, sediment, and nutrient movement; vegetation; and wildlife habitat and access for estuarine organisms.	Does not meet objective. The presence of the canals would continue to alter historic hydrologic functions by allowing rapid tidal exchanges, disrupting the flow of freshwater nutrients, and providing a conduit for saltwater intrusion. The threat to vegetation, wildlife, and estuarine organisms would continue to influence the abundance, composition, and diversity of native species. Wetland functions and values would not be restored.	Fully meets objective. The canals would be allowed to revert to marsh and shallow water habitat by natural processes recreating wetlands and restoring natural functions and values. Primarily native wetland species would recolonize the area creating additional areas of submerged and emergent vegetation, further increasing available habitat for wildlife and estuarine organisms.
Improve visitor experience	Does not meet objective. There would be no improvement to visitor use because current conditions would remain the same.	Partially meets objective. Visitors would enjoy a more natural system, representative of the historic wetlands and ecosystems present prior to the canals.
Avoid or minimize adverse impacts to park resources and values	Does not meet objective as non-historic canals and spoilbanks in the park contribute to increased rates of land loss and to the spread of invasive vegetation species, alter hydrology, and increase saltwater intrusion into freshwater marsh. Without adequate reclamation measures, canals and spoilbanks in the park would continue to stress park resources and values, with continued adverse effects on natural hydrology, ecology, water quality, and wetland functions and values.	Fully meets objectives. Reclamation of more than 20 miles of non-historic canals would minimize adverse effects including land loss and spread of invasive species, enhance historic hydrology patterns, and reduce saltwater intrusion into freshwater marsh.
Improve the resiliency of park ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms)	Does not meet objective. The presence of the canals would continue to alter historic hydrologic functions by allowing rapid tidal exchanges, and providing a conduit for saltwater intrusion into freshwater marsh. The threat to vegetation, wildlife, and estuarine organisms would continue to influence the abundance, composition, and diversity of native species. Wetland functions and values would not be restored.	Fully meets objective. The canals would be allowed to revert to marsh and shallow water habitat by natural processes recreating wetlands and restoring natural functions and values. The reclaimed area would attenuate tidal flows, diminish saltwater intrusion into freshwater marsh, reduce habitat fragmentation, and result in greater ecosystem resiliency.

Table 3. Environmental impact summary by alternative

Impact Area	Alternative A	Alternative B
Soils and Geology	Alternative A would result in long-term negligible adverse impacts to soils and geology. Cumulative impacts would be short-term moderate and long-term negligible to moderate adverse with the no action alternative contributing only negligibly to adverse cumulative impacts. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under the no action alternative.	Under alternative B construction activities would result in short-term negligible adverse impacts and long-term beneficial impacts to soils and geology. Cumulative impacts when combined with the project impacts would be short-term negligible to moderate adverse, long-term minor to moderate adverse and long-term beneficial with alternative B contributing a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative B.
Vegetation and Non-native species	Alternative A would have long-term moderate adverse effects to vegetation associated with open water non-historic canals. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term negligible to moderate adverse and long-term beneficial on vegetation with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do	Alternative B would result in short-term minor adverse impacts to floating and terrestrial vegetation from construction activities. However, there would be beneficial impacts to vegetation by degrading spoilbanks and dikes and partially filling open water canals. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse and long-term beneficial effects to Preserve vegetation. Because there would be no major adverse impacts on vegetation, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not

Impact Area	Alternative A	Alternative B
	not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under the no action alternative.	prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative B.
Fish and Wildlife	Under alternative A, there would be long-term moderate adverse impacts to wildlife since there would be no reclamation of canals and habitat would remain degraded. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial to fish and wildlife with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative A.	Alternative B would result in short-term negligible to minor adverse impacts and long-term beneficial impacts. Cumulative impacts for alternative B would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial with alternative B adding a negligible adverse increment and a beneficial increment to overall cumulative impacts on fish and wildlife. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative B.
Special Status Species	Under alternative A, there would be long-term moderate adverse impacts to special status species. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial to park special status species. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major, adverse impacts on special status species, there would be no impairment of park resources	Alternative B would result in short-term minor adverse impacts and long-term beneficial impacts. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as long-term beneficial to special status species populations because of increased habitat with reclaimed canals. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts.

Impact Area	Alternative A	Alternative B
	and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under the no action alternative.	Because there would be no major adverse impacts on special status species, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under alternative B.
Hydrology and Water Quality	Alternative A would have long-term moderate adverse effects to hydrology and water resources associated with open water non-historic canals. Cumulative impacts for alternative A would have long-term moderate adverse impacts and long-term beneficial impacts on hydrology and water resources. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on hydrology and water resources, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water resources under the no action alternative.	Alternative B would result in short-term minor adverse impacts as well as long-term beneficial impacts to hydrology and water. Overall cumulative impacts would be short-term minor adverse and long-term moderate adverse in addition to long-term beneficial. Alternative B would add a slight adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on hydrology and water resources, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water resources under alternative B.
Wetlands	Alternative A would result in long-term moderate adverse impacts to wetlands from risks associated with non-historic canals. Cumulative impacts for alternative A would be short-term minor adverse and long-term moderate adverse and short- and long-term beneficial to wetlands. Alternative A would add a slight adverse	Alternative B would result in short-term negligible to minor adverse and long-term beneficial impacts to wetlands. Cumulative impacts to wetlands under this alternative would be short-term negligible to minor adverse, long-term moderate

Impact Area	Alternative A	Alternative B
	increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under the no action alternative.	adverse, and long-term beneficial to wetlands. Alternative B would contribute a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under alternative B.
Visitor Use and Experience Including Health and Safety	Alternative A would result in localized short-term negligible adverse impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative A would add a negligible adverse increment to overall cumulative impacts. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative A.	Alternative B would result in localized short-term negligible to minor adverse and long-term minor adverse impacts and long-term beneficial impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative B would contribute a slight adverse increment and a beneficial increment to the overall cumulative impacts to visitor use and experience. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative B.

AFFECTED ENVIRONMENT

The affected environment describes existing conditions for those elements of the natural and cultural environments that would be affected by implementation of the actions considered in this *Canal Reclamation at Barataria Preserve Environmental Assessment, Jean Lafitte National Historical Park and Preserve*. The environmental topics addressed include soils and geology, vegetation, fish and wildlife, special status species, hydrology and water quality, wetlands, and visitor use and experience including health and safety. Impacts for each of these topics are analyzed in the "Environmental Consequences" chapter of this EA.

SOILS AND GEOLOGY

The geology of the Preserve is largely influenced by the historic location of the area and the relationship between this area and the historic course of the Mississippi River. The Preserve is positioned within the upper Barataria estuarine basin between two distributary arms of the Mississippi River (the current main stem of the river and Bayou Lafourche) and straddles an older distributary arm, the Bayou des Familles/Bayou Barataria. This deltaic lobe was formed by the Mississippi River roughly 3,500 to 1,500 years ago before the river changed its course. The Bayou des Familles/Bayou Barataria distributary arm of the Mississippi River is flanked by natural levees, which average a height of 5 feet above mean sea level. These levees formed from annual spring (over-bank) flooding and depositional processes. Breaks in the natural levee formed crevasses, such as Bayou Coquille, which in turn built subdistributary lobes. Abandoned distributary beds slowly filled with sediments as the Mississippi River changed course, leaving only narrow tidal drainage streams, or bayous, in the abandoned distributary beds.

The soils within the Preserve are characteristic of those developed in a subtropical, humid climate under frequently flooded conditions within coastal and deltaic plains. The flat topography of the Preserve and abundance of slowly decaying organic matter present conditions that allow for the constant build up of both mineral and organic sediments.

Within the Preserve two broad categories of soils are found: mineral soils and organic soils. The mineral soils are characterized as being very deep, level to gently undulating, somewhat poorly drained mineral soils formed in loamy and clayey alluvium that is moderately to slowly permeable. The organic soils are very deep, very poorly drained soils formed from decomposed freshwater or brackish herbaceous material over alluvial sediments. In general, the mineral soils tend to occur along the eastern border of the Preserve and are associated with Holocene epoch alluvium and natural levees (NRCS 2009; USGS 1998). The organic soils occur within the remainder of the Preserve and are associated with Holocene epoch fresh and brackish water deltaic plains (NRCS 2009; USGS 1998). All of the soils in the Preserve belong to two soil hydrologic classes, "C" and "D"; however, the majority occurs within class "D" (NRCS 2009). For the purposes of this EA, the analysis will focus on soil class "D" because this soil type is most likely to be found along the canals proposed for reclamation.

Table 4 describes the physical properties of the class "D" soils found within the Preserve. The majority of the soils in the Preserve that formed in coastal and deltaic plains consist of highly decomposed organic material over mineral material. The upper portion of the mineral layers ranges between zero and 60 inches below the surface, depending on the thickness of the organic material.

Table 4. Physical properties of hydrologic soil class "D" soils within Barataria Preserve (NRCS 2009)

Hydrologic Soil Class	"D" Soils
Composition	Muck material over fine textured, thick clayey soils. Clay pan or clay layer begins between 0 and 60 inches below the surface.
Location	Generally located in coastal and deltaic plains
Permeability	Very low to moderately low
Erodibility	Moderate to low
Compaction	Low
Shrink / Swell Potential	Low
Ponding Frequency	Frequent
Flooding Frequency	Frequent
Run-off Potential	Low
Infiltration rate	Low to Moderate
Recharge Potential	Low

Soils with deep organic layers have a low erodibility index, but increases to moderately erodible when the depth of the clay layer is less than 20 inches below the surface (NRCS 2009). The erodibility index also depends on the rainfall energy, slope, slope length, vegetative cover, and site conservation or management practices. Although most slopes within the Preserve are relatively flat (less than two percent), soil erosion control is necessary whenever vegetative cover is removed or lost during natural environmental events.

Typically, soils with high clay content are subject to compaction; however, there is a greater possibility of compaction in the Preserve where organic matter is thin (less than 20 inches). Shrink-swell potential in the Preserve is low because the clay material associated with the class "D" soils is generally not composed of expansive material. The few clayey soils that are composed of expansive clays would tend to contract if drained. Due to the water budget of the area, flat topography, and frequency and duration of flooding, the depth of shrinkage cracks in clayey soils would probably not exceed 1 foot (NRCS 2009).

The majority of the Preserve is composed of one soil type, Kenner muck (NRCS 2009). Kenner muck soils consist of very deep, very poorly drained, very slowly permeable, organic soils (NRCS 2009). Kenner soils formed from herbaceous plant remains stratified with clayey alluvium in fresh water marshes. Other soil types that are less represented include Allemands muck, Barbary muck, Lafitte-Clovelly, and Schriever clay, Cancienne silt loam, and Cancienne silty clay loam (NRCS 2009). Allemands soils are characterized by thick organic layers underlain with thin clay layers, and are found in fresh marshes (NRCS 2009). Barbary soils are associated with swamps as the semi-fluid mineral soils that were deposited on the backslope of natural levees (NRCS 2009). Lafitte-Clovelly soils are semi-fluid organic soils typically found in intermediate to brackish marshes (NRCS 2009). The Schriever series consists of very deep, poorly drained, slowly permeable soils; they are typically found on the lower portions of natural levees in back-swamp positions on the lower Mississippi River alluvial plain (NRCS 2009). The Cancienne series consists of very deep, level to gently undulating, somewhat poorly drained mineral soils that are moderately permeable. These soils are on high and intermediate positions on natural levees and deltaic fans of the Mississippi River and its distributaries (NRCS 2009).

VEGETATION AND NON-NATIVE SPECIES

Natural communities occurring within the Preserve include bottomland hardwood forest, baldcypress-tupelo swamp, scrub-shrub swamp, fresh marsh, intermediate marsh, and submerged/floating vascular vegetation (Urbatsch, Ferguson, and Gunn-Zumo 2007). Ninety-five percent of the Preserve is classified as emergent and forested wetlands with principal habitat types consisting of bottomland hardwood forests, baldcypress-tupelo swamp, and freshwater floating marsh (NPS 1997). The Preserve's forest is among the finest examples remaining in the delta of this original forest ecosystem.

The first complete vegetation survey of the Preserve documented 328 species in 88 families (White, Darwin, and Thien 1983). The most recent study documented 524 taxa comprising 115 families (Urbatsch, Ferguson, and Gunn-Zumo 2007). Ground above sea level lies along the alluvial soils of natural levees and along spoilbanks. Elevation changes of only a few centimeters cause large changes in plant communities due to changes in saturation, salinity, and hydroperiod (Cooper, Cederbaum, and Gannon 2005). Marsh elevation changes with water levels in many locations within the Preserve.

This region supports native natural levee crest species dominated by water oak (*Quercus nigra*), with live oak (*Quercus virginiana)*, sweetgum (*Liquidambar styraciflua*), and hackberry (*Celtis laevigata*) as sub-dominants (White, Darwin, and Thien 1983). Dwarf palmetto (*Sabal minor*) is the dominant understory plant species, interspersed with hawthorn (*Crataegus viridis*) and deciduous holly (*Ilex decidua*). Forest gaps are colonized by Chinese tallow, American beautyberry (*Callicarpa americana*), and vines including Eastern poison ivy (*Toxicodendron radicans*), dewberry, muscadine, trumpet creeper (*Campsis radicans*), and numerous grasses. Chinese tallow, a nonnative species, has become the most successful colonizing species, and now dominates many of the spoilbanks within the Preserve.

The backslopes of natural levees are cloaked with more water-tolerant species, including swamp red maple (*Acer rubrum* var. *drummondii*) and green ash (*Fraxinus pennsylvanica*). On the backslope, the understory comprises primarily taller specimens of dwarf palmetto. The backslope elevations descend into swampy areas where soils are inundated most of the year; baldcypress and water tupelo are the dominant canopy species and are interspersed with black willow (*Salix nigra*) and pumpkin ash (*Fraxinus profunda*) (White, Darwin, and Thien 1983). Wax myrtle (*Morella cerifera*) shrubs are often found in the understory of this area.

In addition to the diversity of native plants, the Preserve is plagued by a multitude of nonnative plants. Many of these exotic plants are invasive and rapidly outcompete native species, thus preventing natural regeneration of native species. Common nonnative aquatic plants include water hyacinth (*Eichhornia crassipes*), common salvinia (*Salvinia minima*), and alligatorweed (*Alternanthera philoxeroides*). Common terrestrial exotic plants and vines include Chinese tallow, Chinese privet (*Ligustrum sinense*) Japanese climbing fern (*Lygodium japonicum*), camphor tree (*Cinnamomum camphora*), and Japanese honeysuckle (*Lonicera japonica*). Many spoilbanks are dominated by Chinese tallow.

Freshwater Marsh

Within the Preserve, extensive amounts of freshwater marsh border the shoreline of Lake Salvador eastward to the western banks of Kenta Canal. This community generally occurs adjacent to brackish intermediate marshes. Small pools and deep water openings are often found scattered throughout the marsh system.

The Preserve's marshes occur beyond the swamps described above where alluvial soils have subsided well below sea level. Above this sunken surface, generations of marsh plants lay down a layer of peat, often many feet thick. The peat supports a unique floating marsh, known as floatant. In places within the Preserve, the floatant is so thick that it supports a unique floating community of shrubs and small trees; elements of this community have their closest affinities 50 miles to the north, in the pine savannahs north of Lake Pontchartrain. The Preserve floatant comprises part of the largest floating marsh complex in the world, which extends westward to the Atchafalaya Basin and is the only floatant marsh complex in the national park system.

This unique fresh marsh system is composed of masses of intertwined living plant roots forming a relatively thick mat that is suspended above the water table. Bulltongue arrowhead (*Sagittaria lancifolia* subsp. *media*) is the dominant component of the freshwater marsh system within the Preserve. Other common fresh marsh species include floating marsh pennywort (*Hydrocotyle ranunculoides*), spike rush (*Eleocharis* spp.), saltmarsh morning glory (*Ipomoea sagittata*), broadleaf arrowhead (*Sagittaria latifolia*), cattail (*Typha* spp.), alligatorweed, smooth beggartick (*Bidens laevis*), southern annual saltmarsh aster (*Symphyotrichum divaricatum*), and southern amaranth (*Amaranthus australis*) (Urbatsch, Ferguson, and Gunn-Zumo 2007).

Intermediate Marsh

The marshes of the Preserve transition from fresh to intermediate as they extend westward toward the shoreline of Lake Salvador. Intermediate marsh makes up only a very small portion of the Preserve along the southern boundaries bordering Lake Salvador near the confluence of the Bayou Segnette Waterway. This natural community includes plant species found in both fresh marsh and brackish marsh. The marsh is nearly devoid of woody species, except for wax myrtle and a recent invasion of Chinese tallow. Dominant marsh plant species include eastern baccharis (*Baccharis halimifolia*), wax myrtle, wiregrass (*Spartina patens*), common threesquare (*Schoenoplectus pungens*), pink redstem (*Ammannia latifolia*), spike rush, bristlegrass (*Setaria* spp.), cattail, and alligatorweed.

Submerged/Floating Vascular Vegetation

Submerged and floating beds of aquatic vascular vegetation can be found in bayous, canals, open water ponds, shallow depressions, and in shallow waters along the Lake Salvador and Lake Cataouatche shorelines. This community type is especially common within the slow-flowing water of canals and larger openings among the floatant marsh within the Preserve. Dominant submerged aquatic species include coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria americana*), southern naiad (*Najas guadalupensis*), and pondweed (*Potamogeton* spp.). Dominant floating species include water hyacinth, duckweed (*Lemna minor*), floating pennywort, alligatorweed, and common salvinia.

Scrub/Shrub Swamp

Scrub/shrub swamps are low, flat wetland dominated by woody vegetation less than 20 feet tall found in scattered patches throughout the interior marshes often occurring as floatants. This unique floatant scrub-shrub swamp is dominated by thickets of wax myrtle suspended upon mats of sphagnum (moss). Dominant species within the scrub-shrub swamp include Chinese tallow, black willow, eastern baccharis, Drummond's maple, buttonbush (*Cephalanthus occidentalis*), yellow spikerush (*Eleocharis flavescens*), fern species, slender yellow-eyed grass (*Xyris torta*), chalky bluestem (*Andropogon virginicus* var. *glaucus*), pine barren goldenrod (*Solidago fistulosa*), beaksedge (*Rhynchospora* spp.), arrowhead

(*Sagittaria* spp.), manyflower marshwort (*Hydrocotyle umbellata*), sawtooth blackberry (*Rubus argutus*), green flatsedge (*Cyperus virens*), pickerelweed (*Pontederia cordata*), herb of grace (*Bacopa monnieri*), smartweed (*Polygonum* spp.), turkey tangle fogfruit (*Phyla nodiflora*), giant cutgrass (*Zizaniopsis miliacea*), and rush (*Juncus* spp.) (Urbatsch, Ferguson, and Gunn-Zumo 2007).

Baldcypress-Tupelo Swamp

Baldcypress-tupelo swamp includes forested, alluvial swamps growing on sporadically exposed soils that are generally saturated or inundated throughout most of the growing season except for periods of extreme drought. Such habitat generally has relatively low floristic diversity. Within the Preserve, baldcypress-tupelo swamp is found primarily just east of the Kenta Canal extending north to south. It also occurs along the poorly drained edges of Bayou des Familles. Baldcypress-tupelo swamp transitions westward from a forested swamp to a freshwater marsh. Baldcypress and water tupelo are generally the two co-dominate species of this community. Other baldcypress-tupelo swamp woody species include swamp tupelo (*Nyssa biflora*), swamp red maple, pumpkin ash, green ash, black willow, and wax myrtle. Submerged/floating vascular vegetation is also common among the standing water. The only state-listed plant species found within the Preserve occurs in a baldcypress-tupelo swamp: floating antlerfern (*Ceratopteris pteridoides*).

Bottomland Hardwood Forest

Bottomland hardwood forests include broad areas of alluvial forested wetland occupying the floodplain of a major river system. The bottomland hardwood forest within the Preserve was divided into three divisions based on topographic position and canopy species composition (Urbatsch, Ferguson, and Gunn-Zumo 2007). The divisions of bottomland hardwood forest associations include: Hackberry-American Elm-Green Ash Forest, Sweetgum-Water Oak Forest, and Live Oak Natural Levee Forest. A description of each natural community follows.

Hackberry-American Elm-Green Ash Forest. This bottomland hardwood forest community consists of hackberry, American elm (*Ulmus americana*), and green ash, and generally is found paralleling waterways within the Preserve, especially the Bayou des Familles canal. Such forests are generally poorly drained and often have standing water present during portions of the growing season, especially during frequent or high rain events, and may often be flooded from overflow of water from associated canals.

Sweetgum-Water Oak Forest. Areas of bottomland hardwood forests are dominated by sweetgum and water oak with a dense understory of enormous dwarf palmetto. Such areas exhibit better drained soils than areas of Hackberry-American Elm-Green Ash Forest and Live Oak Natural Levee Forest, but contain many species common to these forests.

Live Oak Natural Levee Forest. Live oak forest primarily occurs along the natural levees of Bayou des Famillies and Bayou Barataria, along the southern boundaries of the Preserve along Highways 45 and 301. It also occurs on scattered higher ridges of some of the canal spoilbanks, especially along the southern banks of the Bayou Segnette Waterway and lower Kenta Canal. These areas of evergreen oak forest are described as developing on natural levees and on islands among marshes and swamps with live oak as the predominant woody species. The long limbs of live oaks are typically covered and draped with resurrection fern and Spanish moss. Such areas are often poorly drained with areas of standing water often present. A dense understory primarily composed of dwarf palmetto is typical.

FISH AND WILDLIFE

The Preserve harbors the rich and varied estuarine environment of coastal Louisiana. This complex of terrestrial and aquatic habitats supports a diversity of resident and migrant wildlife. The NPS has conducted many species surveys in the Preserve in collaboration with local universities. The following section summarizes these inventories, literature reviews, and wildlife observations to describe fauna believed to currently inhabit the Preserve.

Mammals

The Preserve's climate is warm with plentiful rainfall and fertile soils—a combination that creates ideal habitat for an abundance of terrestrial wildlife. From 2003 – 2005, 30 different mammal species were observed on the Preserve (Hood 2005). In 2006, 26 different species of mammal were reported in a survey.

The more common mammals found in the Preserve include swamp rabbit (*Sylvagus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis virginiana*), gray fox (*Urocyon cinereoargenteus*), and nine-banded armadillo (*Dasypus novemcinctus*). Seven bat species have been documented in the Preserve: eastern red bat (*Lasiurus borealis*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southeastern myotis (*Myotis austroroparius*), eastern pipistrelle (*Pipestrellus subflavus*), yellow bat (*Lasiurus intermedius*), evening bat (*Nycticeius humeralis*), and the Brazilian free-tailed bat (*Tadarida brasiliensis*).

Other species that utilize the Preserve habitat include white-tailed deer (*Odocoileus viginianus*), coyotes (*Canis latrans*), raccoon (*Procyon lotor*), mink (*Mustela vison*), and river otter (*Lutra canadensis*). More recently, nonnative species nutria (*Myocastor coypus*), black rat (*Rattus rattus*), and the house mouse (*Mus musculus*) have been found in surveys. Wild pigs (*Sus scrofa*) are a nonnative species that was thought to have been successfully eradicated from the Preserve, but has recently reappeared.

Birds

Coastal Louisiana harbors an array of habitat types including bottomland hardwood forest, baldcypress swamp, fresh and intermediate marshes, and open water. This highly varied environment hosts a diversity of resident and migratory birds. More than 400 bird species are known to occur in Louisiana, and upwards of 300 of these use the Preserve (Mac et al. 1998). Of those, northern cardinals (*Cardinalis cardinalis*), red-winged blackbirds (*Agelaius phoeniceus*), boat-tailed grackles (*Quiscalus major*), barred owls (*Strix varia*), and Carolina chickadees (*Poecile carolinensis*) were species found to be abundant during all seasons on the 2005 Barataria Preserve bird list.

Hardwood forests, emergent forested wetlands, and other terrestrial landscapes harbor nesting and feeding grounds for a variety of land birds. Land birds that are breeding in the Preserve include the northern parula (*Parula americana*), Carolina chickadee, Carolina wren (*Thryothorus ludovicianus*), tufted titmouse (*Baeolophus bicolor*), blue-gray gnatcatcher (*Polioptila caerulea*), American crow (*Corvus ossifragus*), orchard oriole (*Icterus spurius*), Cooper's hawk (*Accipiter cooperii*), and blue jay (*Cyanocitta cristata*).

The Preserve's floating swamps, in combination with shallow mudflats, deep water lakes, bayous, and other wetlands, provide water birds, particularly wading birds, with prime habitat. Great blue heron (*Ardea herodias*), great egrets (*Ardea alba*), ibis (*Plegadis* sp.), laughing gull (*Larus artricilla*), double

crested cormorant (*Phalacrocorax auritus*), common moorhen (*Gallinula chloropus*), green herons (*Butorides virescens*), and black-necked stilts (*Himantopus mexicanus*) use the Barataria marsh and wetlands for breeding grounds.

Abundant shallow water ponds provide habitat for wintering waterfowl. Waterfowl are an important commercial resource for recreational hunting, especially in Louisiana. They generally nest in the northern United States and Canada in the spring and summer and overwinter in warmer coastal climates from Florida to Mexico. Coastal Louisiana is an important over-wintering habitat for many waterfowl species. Blue-winged teals (*Anas discors*), wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), lesser scaups (*Aythya affinis*) and green-winged teals (*Anas crecca*) are commonly seen using ponds in the Preserve to pair bond, feed, and rest. Brown pelicans (*Pelecanus occidentalis*) also use open water habitat in the colder months.

Raptors that commonly inhabit the park include American kestrel (*Falco sparverius*), turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Butteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), osprey (*Pandion haliaetus*), and black vultures (*Coragyps atratus*).

At the time of the 2005 bird list of Barataria Preserve and adjacent lakes, 11 bird species were considered rare in the Preserve: white-winged scoters (*Melanitta fusca*), pomarine jaeger (*Stercorarius pomarinus*), bridled tern (*Onychoprion anaethetus*), buff-bellied hummingbird (*Amazilia yucatanensis*), western kingbird (*Tyrannus verticalis*), scissor-tailed flycatcher (*Tyrannus forficatus*), Nashville warbler (*Vermivora ruficapilla*), Cape May warbler (*Dendroica tigrina*), mourning warbler (*Oporornis philadelphia*), western tanager (*Piranga ludoviciana*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*).

Reptiles and Amphibians

A 2001 – 2002 inventory of reptiles and amphibians in the Preserve (Anderson and Seigel 2002) found 19 amphibian and 36 reptile species inhabiting the hardwood forests, swampland, and marshland. Common amphibians found included eastern newts (*Notophthalmus viridescens*), green tree frogs (*Hyla cinerea*), and bronze frogs (*Rana clamitans*). The American alligator (*Alligator mississippiensis*) is a common reptile inhabiting the Preserve, along with the Gulf Coast ribbon snake (*Thamnophis proximus*), ground skinks (*Scinella lateralis*) and green anoles (*Anolis carolinensis*). Venomous snakes inhabiting the Preserve include cottonmouth (*Agkistrodon piscivorus leucostoma*) and copperhead (*Agkistrodon contortrix contortrix*).

Fish

The Preserve offers diverse and richly inhabited aquatic systems from open water and deep water canals to slow-moving bayous and intermediate marsh. Within the Preserve, dissolved oxygen levels can be very low and salinity fluctuates. Most water is approximately 1 meter deep, so the water temperature closely follows the air temperature and can experience increases as the air warms. The western portion of the Preserve borders lakes with salinities around 5 parts per thousand. Fish species inhabiting this ecosystem must therefore be somewhat saltwater tolerant. NPS observations and a 2003 – 2005 fish inventory (Schultz 2005) documented 63 species of freshwater and saltwater fish. Other inventories have found as many as 66 (Seale 1999, Swarzenski et al. 2004, Schultz 2005). The most common species found in the Preserve are typical of coastal Louisiana and include gar (*Lepisosteus* spp.), sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and catfish (*Ictalurus* spp.). Atlantic stingrays (*Dasyatis sabina*) were included in the

2003 – 2005 fish list (Schultz 2005). Several species of crappie and killfish are also common in the Preserve.

Invertebrates

Aquatic invertebrates in the Preserve are abundant and diverse. The majority of species documented in the Preserve were freshwater species, but some brackish water and marine species were also found (Swarzenski et al. 2000). Invertebrates from 84 genera belonging to 51 families were documented in a 2000 survey. True flies (*Diptera*) were the most diverse order with 38 taxa. Crustaceans, especially those from the order Amphipoda, were most abundant. The most richly inhabited areas were the floating rafts of aquatic plants that make up the floating marshes in the Preserve. Crawfish, crabs, shrimp and other benthic invertebrates form the base of a food web in the coastal ecosystem, which supports many of the larger aquatic and terrestrial species inhabiting the Preserve.

SPECIAL STATUS SPECIES

The Endangered Species Act of 1973 requires the NPS to address impacts to federally listed threatened, endangered, and candidate species as well as species proposed for listing. Also, NPS policy requires that state listed species, and others identified as species of management concern by the park, are to be managed in parks in a manner similar to those that are federally listed. In addition, the NPS *Management Policies 2006* and DO #77: *Natural Resources Protection* requires the NPS to examine the impacts on federal candidate species, as well as state listed threatened, endangered, candidate, rare, declining, and sensitive wildlife and vegetation species. Table 5 presents listed species within the Preserve.

Observations by park staff and recent biological inventories indicate that no federally listed threatened or endangered species reside in the project area.

Although it does not include any critical habitat, potential habitat for six federally listed aquatic species is found in the Preserve. The green sea turtle (*Chelonia mydas*) (federally listed endangered, except breeding populations in Florida and Mexico that are listed as threatened; and state listed threatened) is found in shallow waters and lagoons. The hawksbill sea turtle (*Eretmochelys imbricate*) (federally listed endangered and state listed endangered), the most frequently encountered sea turtle, is found in warm bays and estuaries. Kemp's Ridley sea turtle (*Lepidochelys kempii*) (federally listed endangered, state listed endangered) is found in gulf waters but only comes ashore to lay eggs. The leatherback sea turtle (*Dermochelys coriacea*) (federally listed endangered, state listed endangered) has been found in Gulf Coast waters. The loggerhead sea turtle (*Caretta caretta*) (federally listed threatened, state listed threatened) has also been found in the Gulf Coast waters. The West Indian manatee (*Trichechus manatus*) (federally listed endangered, state listed endangered) can inhabit both freshwater and marine waters and typically forages in warm waters near shorelines (USFWS 2009). The pallid sturgeon (*Scaphirhynchus albus*) (federally listed threatened, state listed threatened) is a fish species that has been known to occur in Louisiana. Critical habitat for the gulf sturgeon (*Acipenser oxyrhinchus desotoi*) (federally listed threatened, state listed threatened) is located in the extreme northern end of Jefferson Parish, near, but not within, the Preserve.

Three state animal species of special concern are found within the Preserve. These include the saltmarsh topminnow (*Fundulus jewkinsi*); Cooper's hawk (*Accipiter cooperii*), a breeder in Louisiana, which has been observed in the Preserve during the breeding season; and the alligator snapping turtle (*Macroclemys temminckii*), a species that has been observed in the Preserve (LDWF 2009; NOAA 2009).

Table 5. Listed species or their habitat within Barataria Preserve

Common Name	Scientific Name	Federal Status	State Status
BIRDS			
Cooper's Hawk	*Accipiter cooperii*	SofC	SofC
Bald Eagle	*Haliaeetus leucocephalus*	P[1]	P
Least Tern	*Sterna a. antillarum*	E	E
FISH			
Saltmarsh Topminnow	*Fundulus jewkinsi*	NL	SofC
Pallid Sturgeon	*Scaphirhynchus albus*	T	T
MAMMALS			
West Indian Manatee	*Trichechus manatus*	E	E
REPTILES			
Green Sea Turtle	*Chelonia mydas*	ET[2]	T
Loggerhead Sea Turtle	*Caretta caretta*	T	T
Leatherback Sea Turtle	*Dermochelys coriacea*	E	E
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	E
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	E
Alligator Snapping Turtle	*Macroclemys temminckii*	UR	SofC

T – Threatened
E – Endangered
ET – Endangered and Threatened
NL – Not listed
SofC – Species of Concern
UR – Under Review
P – Protected
[1]The Bald Eagle is protected by the Bald and Golden Eagle Protection Act (16 USC 668 a-d).
[2] The Green Sea Turtle is Endangered in Florida and Mexico's Pacific coast breeding colonies and Threatened in all other areas.

The bald eagle (*Halaieetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act (16 USC 668 a-d). Bald eagles forage near the Preserve and in the waters of Lakes Salvador and Cataouatche. In the past, a bald eagle has nested within 1 mile of the Preserve boundary; however, the current status of the nest is unknown. The federally listed endangered interior least tern (*Sterna a. antillarum*) and the recently delisted brown pelican (*Pelicanus occidentatlis*) are known to forage in the Preserve (NPS 2009).

The Louisiana Natural Heritage Program has identified additional species of conservation concern in Louisiana, including the glossy ibis (*Plegadis falcinellus*) (resident), American woodcock (*Scolopax minor*) (winter), cerulean warbler (*Dendroica cerulea*) (migrant), American kestrel (*Falco sparverius*) (winter), and loggerhead shrike (*Lanius ludovicianus*) (resident).

Critical habitat for the piping plover (*Charadrius melodus*) (federally listed as endangered and threatened, state listed as endangered and threatened) is located in the extreme northern and southern ends of Jefferson Parish, near, but not within, the Preserve.

Migratory Birds

While the Endangered Species Act of 1973 protects only species listed as endangered or threatened, the Migratory Bird Treaty Act of 1918 (MBTA) protects all migratory birds and their nests from direct harm. Section 703(a) provides that "it shall be unlawful at any time, by any means, or in any manner, to…take…any migratory bird, any part, nest, or egg of any such bird." In construing the MBTA, the courts have held that the Act's "taking" prohibition does not apply to habitat modification. *Citizens Interested in Bull Run, Inc. v. Edrington*, 781 F. Supp. 1502 (D.Ore. 1991); *Mahler v. United States Forest Service*, 927 F. Supp. 1559 (S.D. Ind. 1996); *Seattle Audubon Society v. Evans*, 952 F.2d 297 (9th Cir. 1991). While habitat destruction that indirectly causes the death of migratory birds or the destruction of their nests does not constitute a taking within the meaning of the MBTA, the MBTA does prohibit the direct, though unintended, taking of protected migratory birds and/or nests.

The Preserve is a component of the Barataria-Terrebonne Important Bird Area (IBA) which has been nominated by the Louisiana IBA program as a Global IBA. The Preserve is a site partner of the Gulf Coast Bird Observatory, and has documented more than 230 species. At least 60 of these are known to breed within the park.

Because of its location on the northern Gulf Coast of Louisiana, the Preserve is important to trans-gulf neotropical spring and fall migrants as stopover habitat. In addition, it is located at the ecotone of the forested Mississippi Alluvial Valley and the marshes of the West Gulf Coastal plain (respectively the largest bottomland forest and marsh ecosystems in North America). Both of these systems are vital to bird populations and have experienced extreme rates of habitat loss and conversion.

The area is important for migrants that use the Preserve seasonally, including both stopover migrants in the spring and fall, and temperate migrants that winter in the marshes and forests of the Gulf Coast. The Preserve also harbors important breeding habitat, especially its marshes and swamps, and serves as foraging habitat for species which breed elsewhere in the Barataria estuary.

Several priority Partners in Flight and Audubon Watchlist species occur in the Preserve. Prominent among these species are birds that breed in or near the Preserve and that have populations that are all or in part neotropical trans-gulf migrants. Examples of these birds include (but are not limited to) Mississippi kite (*Ictinia mississippiensis*) and least bittern (*Ixobrychus exilis*). Examples of those that are stopover migrants include (but are not limited to) the western, white-rumped and stilt sandpipers (*Erolia* spp.) and Baltimore oriole (*Icterus galbula*). Those that winter in the Preserve include (but are not limited to) the pied-billed grebe (*Podilymbus podiceps*) and rusty blackbird (*Euphagus carolensis*). Those year-round residents or visitors include (but are not limited to) the mottled duck (*Anas fulvigula*) and loggerhead shrike (*Lanius ludovicianus*).

HYDROLOGY AND WATER QUALITY

Since the 1700s, the Preserve has experienced drastic anthropomorphic changes to the functioning deltaic system (Taylor, Day, and Neusaenger1988). Prior to human intervention, over-bank flooding from the Mississippi River allowed sheeting across the wetlands and introduced deposits of new, nutrient-rich riverine sediments into the system. The Preserve's proximity to New Orleans has resulted in expanding suburban development immediately adjacent to the Preserve boundary. Agriculture, urban development, oil and gas exploration, canal construction, and levee building have eliminated over-bank flooding. Canals now funnel drainage water from uplands out of the Preserve, converting the Preserve into a

primarily weather- and tides-based system. Spoilbanks retain water outside of the canal, submerging the surrounding wetland vegetation and leading to lower productivity and seedling regeneration.

Flow Regime

The Preserve is near sea level and, therefore, all open water within the Preserve is a near estimation of the water table level. Prior to human interference, water movement responded to the tides, which for the Gulf of Mexico, averages about a foot of range per day. Inland flows were slowed by friction and wind in the wetlands to rates as slow as 1 centimeter (cm) per second, which increased during frequent rain and flooding events (NPS 1997). The hydrology of the two lower units of the Barataria Preserve is influenced by the canal spoil banks. The further into the interior one gets in these two units, the more disconnected the water level fluctuations there are when compared with surface water fluctuations in the waterways surrounding the two units. The interior of the Preserve is functioning as a quasi-impoundment, with water levels saying an inch or more above the marsh surface for most of the year (USGS Swarzenski pers. comm. 2009). To protect residential areas rainwater must also be collected in canals and discharged with pumps across levees into adjacent canals or bayous. As a result, there is little remaining sheet flow from uplands through lowlands to waterbodies.

Water Quality

Increased development, channels, and alterations to the natural water flow in the area have affected water quality within the Preserve. Channeling nutrient-rich overflow has created problems with eutrophication in receiving waterbodies within the Preserve, which are often unable to process the nutrient loads (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to eutrophication of Preserve waters (Conner and Day 1987).

Dissolved oxygen levels are highly variable depending on location, time of year, and the amount of floating plant material. During the long growing season, rapid and extensive floating plant growth is linked to decreased water quality. Excessive accumulation of floating aquatic plants form thick mats. Vegetation mats prevent light from penetrating the water column and alter water chemistry. These changes in water chemistry frequently result in low levels of dissolved oxygen, increased water temperature, and lower specific conductivity. Severely reduced dissolved oxygen levels may result in mortality of fish and macroinvertebrates. After two fish kills, a 1982 water quality testing revealed extremely detrimental conditions for fish with high ammonia nitrogen, ammonia, ammonium, iron, carbon dioxide, and low dioxide levels (Berjarano 1982, 1985). A high number of sewage fly pupa, a biological indicator of organic pollution, were also found. In addition to urban runoff, known points of entry for pollutants include the Bayou Segnette Pumping Station and multiple sewage treatment plants.

Regional Aquifers

The groundwater surrounding New Orleans exists in five aquifers: “shallow aquifer,” the “200-foot” sand, the “400-foot” sand, the “700-foot” sand, and the “1,200-foot” sand (Rollo 1966). Most groundwater withdrawals were historically from the 700-foot aquifer, which is not declining (Dial 1983). The major aquifer for northwestern Jefferson Parish contains saltwater and shows a northern movement of the saltwater line with higher withdrawal rates (Dial and Tomaszewski 1988).

Most of the freshwater input available to the Preserve is through precipitation. The average annual precipitation in the Barataria Basin is 156 cm/year. Approximately 61 cm/year is available for runoff and groundwater recharge because of loss to evaporation (Taylor, Day, and Neusaenger 1988).

Salinity

The health of freshwater wetlands is highly dependent on salinity. Wetland loss and canal construction south of the Preserve in the lower Barataria Basin have provided avenues for saline waters from the Gulf of Mexico to enter freshwater wetlands in the upper portion of the basin. Since many wetland plants have limited tolerance for prolonged exposure to salt, gulf waters must be kept at bay to maintain the integrity of this system. Multiple studies have noted increased salinity in surface water within the Preserve and an increase of salt-tolerant vegetation in certain areas of the Preserve (Kucera 1984; Taylor, Day, and Neusaenger 1988). Salinities in the Preserve are also known to vary with the seasons - increasing in the spring and peaking in the fall (Taylor Day, and Neusaenger 1988).

In order to combat the influence of saltwater from the Gulf of Mexico and Barataria Bay, the Davis Pond Freshwater Diversion was constructed to divert freshwater from the Mississippi River into the northern part of the Barataria Basin. When fully operational, the diversion is capable of pumping more than 10,000 cubic feet per second of Mississippi River water into its outflow pond and adjacent Lake Cataouatche. Operation of the diversion mimics that of the natural flooding regime of the river and this input of freshwater helps to keep the salinity levels below levels that are capable of destroying freshwater marshes in the upper and middle portions of the basin.

WETLANDS

For regulatory purposes under the Clean Water Act, the term wetlands refers to “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands include areas inundated or saturated by surface or groundwater for a sufficient length of time during the growing season to develop and support characteristic soils and vegetation. The NPS classifies wetlands based on the USFWS Classification of Wetlands and Deepwater Habitats of the United States, or the Cowardin classification system. Based on this classification system, a wetland must have one or more of the following attributes (NPS 2005):

- the habitat at least periodically supports predominantly hydrophytic vegetation (wetland vegetation);
- the substrate is predominantly undrained hydric soil; or
- the substrate is non-soil and saturated with water, or covered by shallow water at some time during the growing season.

Wetlands are significant in that they provide important habitat for the wildlife of the Preserve.

Some functions of wetlands are interdependent with the surrounding landscape. For example, wetlands dampen the effects of storms by reducing flood crests and flow rates, thereby reducing flooding in surrounding areas. The effectiveness of wetlands for flood abatement may vary, depending on the size of the area, type and condition of vegetation, slope, the location of the wetland in the flood path, and the saturation of wetland soils before flooding. A 1-acre wetland can typically store about 3 acre-feet of

water, or one million gallons. An acre-foot is one acre of land, about three-quarters the size of a football field, covered 1 foot deep in water. Three acre-feet describes the same area of land covered by 3 feet of water. Trees and other wetland vegetation help slow the speed of flood waters. This action, combined with water storage, can actually lower flood heights and reduce the water's destructive potential (EPA 2006).

A variety of amphibians, reptiles, birds, and mammals require wetlands during substantial parts of their lives and depend on wetlands spaced throughout the landscape. Other creatures have adapted to wetlands that maintain standing water for only a few weeks to a month during the year and remain dry the rest of the year. Wetlands also provide essential habitat for 60% of threatened and 40% of endangered species. Overall, each type of wetland may provide similar functions but for different organisms (NPS 2005).

The Preserve is part of the largest, most productive, and most imperiled wetland in the United States (Urbatsch, Ferguson, and Gunn-Zumo 2007). Marshes in the Preserve comprise part of the largest floating marsh complex in the world, which extends westward to the Atchafalaya Basin. This globally unique resource was formed as alluvial soils subsided below sea level. The Preserve is composed of predominantly marsh and bottomland vegetation communities. These communities are described in the "Vegetation" section of this chapter and include Freshwater Marsh, Intermediate Marsh, Submerged/Floating Vascular Vegetation, Scrub-Shrub Swamp, Baldcypress-Tupelo Swamp, Bottomland Hardwood Forest, Hackberry-American Elm-Green Ash Forest, Sweetgum-Water Oak Forest, and Live Oak Natural Levee Forest.

More than 95% of the Preserve is classified as emergent and forested wetlands according to the 1992 USFWS National Wetlands Inventory (NWI) (Cowardin et al. 1979). According to the NWI, the most common wetland systems found in the Preserve are palustrine and estuarine, with fewer amounts of lacustrine and riverine. Common subsystems include palustrine emergent, palustrine forested, palustrine scrub-shrub, and estuarine intertidal emergent.

Bayou aux Carpes is a 2,905-acre area comprised of primarily wetlands on the eastern side of the Preserve. The functions and values of Bayou aux Carpes are of such high quality that the area was one of the first where the EPA exercised its authority under Section 404(c) of the Clean Water Act to prohibit, restrict, or deny the discharge of dredged or fill material into waters of the United States. There are only 11 more of these areas, known as 404(c) areas, in the country. A large portion of the Bayou aux Carpes 404(c) area was acquired by the United States to settle a lawsuit in 1996. The federal land in the area was transferred to NPS management in March 2009.

Factors affecting the Preserve's wetlands include sea level rise, subsidence, shoreline erosion, and climate extremes. The health of the floating marsh is highly dependent on the ability of plants to produce below-ground roots that hold the marsh mat together. Because these plants have limited tolerance for prolonged exposure to salt, Gulf waters must be kept at bay in order to maintain the integrity of this system. As described above under "Salinity," the Davis Pond Freshwater Diversion helps to prevent saltwater intrusion into the freshwater marsh.

VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY

The resources and surrounding natural landscapes of the Preserve provide many opportunities for public recreational use. Some of the most popular recreational uses include hiking, wildlife viewing, photography, canoeing, fishing, and hunting.

Within the Preserve, ranger-guided walks, canoe trips, summer camps, and environmental education programs are available year-round. About 10 miles of walking trails provide Preserve visitors with an avenue to explore the forests, swamps, and marshes of the Preserve. Ten miles of non-motorized (canoe) trails (Figure 5) plus 20 miles of natural bayous, canals, and waterways are available for recreational boating and fishing. The most popular canoe trails are Bayou des Familles, Bayou Coquille, the Kenta Canal complex, and Twin Canals. These trails allow visitors the opportunity to immerse themselves in natural and cultural resources found in the park. The park also maintains three canoe launches located at Twin Canals, Kenta Canal, and Bayou des Familles. Adjacent to the Preserve's boundary on Bayou des Familles is a livery that rents canoes to the public year round. Ranger-led canoe tours are also conducted by the NPS. Due to reduced water flow, floating aquatic vegetation, increased sedimentation, and accumulation of detritus that has decreased overall water levels, all of the canoe trails within the Preserve are seasonally impassable.

In addition to these amenities, the visitor center near Crown Point provides interpretation of the Preserve's diverse resources and complex history.

A number of privately owned fishing camps also are located within the Preserve. They are mostly concentrated along the very western end of Tarpaper Canal and the northern end of the Bayou Segnette Waterway between Lake Cataouatche and Lake Salvador.

In addition to NPS visitors there is a commercial swamp tour boat company that operates in some of the canals in Bayou aux Carpes. The company is located immediately adjacent to the Preserve, and its boats are stored and operated in canals owned by the United States that are proposed for reclamation. The tour boat company is not a park concessionaire, but because of the recent acquisition of Bayou aux Carpes by the NPS, the NPS will be coordinating with the tour boat company to allow it to continue its operations in the Bayou aux Carpes area under the terms of a commercial use authorization.

The majority of recreational activities enjoyed by the public at the Preserve are compatible with each other. However, to prevent confrontation among user groups, the park restricts public use and access in certain areas. For example, where bank fishing and canoeing are popular along Twin Canals, motorized boats are prohibited. Individuals wanting to hunt and trap are required to apply for a (free) permit and are restricted to designated hunting zones (Figure 5). Hunting is prohibited within 500 feet of a roadway, trail, waterway, or structure to ensure visitor safety and to prevent user conflicts.

Health and Safety

The Preserve attempts to prevent unreasonable risks to visitors; however, as with activity anywhere there is some risk of injury. To reduce risk to visitors, safety information is included in most publications provided to visitors. Information on specific risks - for example, dangers of Preserve wildlife - is also published on the park website to educate visitors on how to avoid risky behavior. Safety notifications and policies are also included in most programs presented by park staff, and are posted at various visitor use sites throughout the Preserve.

Figure 5. Visitor Use and Non-Historic Canals to be Reclaimed at Barataria Preserve

ENVIRONMENTAL CONSEQUENCES

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

The environmental consequences discussion addresses the potential impacts to each resource area (i.e., impact topics) for each alternative. To determine resource impacts, the action alternative is compared to the no action alternative, or baseline, before reclamation activities are implemented. In the absence of quantitative data, best professional judgment was used. In general, impacts were determined through consultation and collaboration with a multidisciplinary team of NPS and professional staff. Regulatory agency consultation with the USFWS, Louisiana State Historic Preservation Officer, and existing data sources such as soil surveys, various studies on Preserve ecology, and park planning documents were also used to assess the potential impact of each alternative.

Impacts are classified as either direct or indirect. A direct impact is an impact that occurs as a result of the proposal or alternative in the same place and at the same time as the action. An indirect impact is an impact that occurs later in time or farther in distance than the action. These are future impacts, or the impacts of reasonably expected connected actions (NPS 2001).

Potential impacts of all alternatives are described in terms of type (beneficial or adverse), context, duration (short- or long-term), and intensity (negligible, minor, moderate, or major). Definitions of these descriptors include:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context: The affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as a whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic. As such, the impact analysis determines the context.

Duration: The duration of the effect is described as short term or long term.

Short-term: Impacts that occur only during project construction activities or last less than one year.

Long-term: Impacts lasting longer than one year.

Intensity: Because definitions of impact intensity (negligible, minor, moderate, and major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed.

CUMULATIVE IMPACTS

The Council on Environmental Quality regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-

federal) or person undertakes such other actions" (40 CFR Part 1508.7). Cumulative impacts are considered for the no action and action alternative and were determined by combining the impacts of the alternative being considered with impacts of other past, present, or reasonably foreseeable future projects or plans in the study area. Table 6 summarizes the cumulative impact projects and describes the various resource areas that could be affected by these projects. Analysis of cumulative impacts follows four steps:

- Step 1—Resources Affected. Identify resources affected by any of the alternatives.
- Step 2—Boundaries. Identify an appropriate spatial boundary for each resource.
- Step 3—Cumulative Action Scenario. Determine which actions to include with each resource.
- Step 4—Cumulative Impact Analysis. Summarize the cumulative impact, which includes the effects of the proposed action plus other actions affecting the resource; defined context, intensity, duration and timing; defined thresholds, methodology, etc.

For all resources, the impact analysis area for cumulative impacts is the northeastern portion of the Barataria Basin in the vicinity of the Preserve.

Table 6. Cumulative impacts projects

Type of action	Cumulative Action	Description	Status
Flood and Storm Surge Control	Gulf Intracoastal Waterway West Closure Complex	The Gulf Intracoastal Waterway West Closure Complex (GIWWCC) is a storm surge protection system currently under construction and is targeted for completion in 2011. The project consists of a surge barrier on the Gulf Intracoastal Waterway below the confluence of the Algiers Canal and Harvey Canal, and the largest drainage pumping station of its type in the nation with a capacity of 20,000 cubic feet per second. During a storm surge of sufficient size, the gates of the barrier will close and the Harvey Canal and Algiers Canal will act as detention basins. Safe water levels would be maintained by the pumping stations of the complex.	Past, Present, and Future
	Levee Construction	In 1999 and 2001, six borrow pits totaling 110 acres were excavated along the eastern portion of the park boundary. Soil was used to construct nearby hurricane protection levees. Today, the pits remain and have filled with water. The construction of levees along rivers and canals has reduced natural flooding regimes and denied sediment input to adjacent wetlands and contributed significantly to land subsidence. Recent plans were proposed to construct additional hurricane protection levees near Barataria Preserve under USACE direction. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to address the need for levee improvement and coastal wetland restoration. New levee alignments and strengthening of existing levees are proposed. Plans include installing flood gates, constructing new earthen levees, and increasing the width and height of existing levees. To obtain material suitable for constructing or increasing the height of existing earthen levees, there is a need for borrow material. Lands adjacent to the park are suitable for use in levee construction. After excavation is complete, borrow pits would fill with water and create deep water ponds. Due to their anticipated depth, ponds would not be suitable for the establishment of emergent wetland or submerged aquatic vegetation.	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
NPS Land Acquisition	Bayou aux Carpes Acquisition	The Bayou aux Carpes is a 2,905-acre area comprised of primarily wetlands located on the eastern side of the park. The functions and values of the Bayou aux Carpes are of such high quality that the area was one of the first where the EPA exercised its authority under Section 404(c) of the Clean Water Act to prohibit, restrict, or deny the discharge of dredged or fill material into waters of the United States. There are only 11 more of these areas, known as 404(c) areas, in the country. A large part of the Bayou aux Carpes 404(c) area was acquired by the United States to settle a lawsuit in 1996. The federal land in the area was transferred to NPS management in March 2009.	Past and Present
	CIT Tracts Acquisition	The CIT Tracts are an area comprising forested wetlands located on the northern side of the Preserve. The area was acquired by the United States in 1994 to settle a lawsuit. Management of the property was transferred to the NPS in March 2009.	
Ecological Restoration Activities in or Near the park	Oil and Gas Access Canal Reclamation	In 2002 reclamation activities occurred at two dead-end canals connected to the Segnette Waterway. Spoilbank material was returned to the canals, and the southern canal had additional material pumped into it from Lake Salvador. Check meanders were installed to prevent erosion of the reclaimed areas.	Past
	Lake Salvador Shoreline Protection	The Lake Salvador shoreline in the Preserve experienced high rates of land loss from 1953 – 1983, averaging 13 feet a year. This caused breaches in the lake shoreline, which exposed surrounding marsh sediments to erosion. In 1992, the retreating shoreline reached the spoilbank of the Bayou Segnette Waterway, a USACE navigational canal that bisects the Preserve. Hurricane Andrew breached the spoilbank and the waters of the lake and waterway became contiguous. Implementation of shoreline protection was approved in 1993. Four types of shoreline protection structures were tested. Rock shoreline protection proved to be the most effective. Nine thousand feet of rock shoreline protection were implemented in phase II of the project, and a further 7,300 feet of shoreline were protected in phase III. Shoreline protection of Lake Salvador would have a beneficial impact on the soils and geology of the area. In 1992, the state constructed a breakwater where the breach occurred along the western bank of the waterway. In 1996, the USACE, with NPS funding, built a second breakwater parallel to the state breakwater to create a containment area for marsh restoration by the placement of fill material. The fill material would mostly be derived from the beneficial use of dredged material from ongoing USACE navigational maintenance projects. To date, approximately 200,000 cubic yards of material have been placed within the restoration area. In 2010 the USACE will place up to an additional 700,000 cubic yards of material, which would complete the filling of the containment area.	Past, Present, and Future
	Davis Pond Freshwater Diversion Structure	The Davis Pond Freshwater Diversion Structure was opened in 2001 and became fully functional in 2008 (USACE 2004a). The structure is designed to imitate historic spring floods by diverting an average of 5,000 cubic feet per second of water from the Mississippi River through Davis Pond into Lake Cataouatche and Lake Salvador.	Past, Present, and Future
	Other Ongoing Wetland Restoration Projects	The benefits of coastal wetlands have moved to the forefront of public attention since the devastation caused by Hurricanes Katrina and Rita in 2005. Projects vary in size and magnitude and are being conducted throughout the state on private and public lands. The park has identified wetland restoration projects and is working with officials from state and federal agencies to implement these projects. Wetland	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
		restoration is ongoing and highly dependent on available funding. The park annually submits wetland restoration projects for funding consideration through the NPS Disturbed Lands program and the Coastal Wetlands Restoration, Planning, and Protection Act. Types of restoration projects include terracing, rock revetment, vegetative plantings, and constructed crevasses.	
	Invasive Vegetation Control	The park has been working with the New Orleans District of the USACE Operations Division since 2001 to utilize the herbicide 2, 4-D (2, 4-Dichlorophenoxyacetic Acid) to control water hyacinth and alligatorweed, and the herbicide Reward (Diquat) to control common salvinia. During the growing season, the plants form dense floating mats that cover over 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Giant salvinia (*S. molesta*) was observed and documented in the Preserve for the first time during research that occurred between June 2006 and April 2008. The waterways authorized for herbicide treatment within the park are Kenta Canal, Pipeline Canal, Tarpaper Canal, Bayou des Familles, Millaudon Canal, Parallel Canal, Ross Canal, and the northern part of Twin Canals. Typically, USACE sprays between 150 and 325 acres of park waterways. There is no set schedule, and the areas and acreage treated varies each year, as does the species treated. Spraying is performed from flat-bottom boats with outboard propulsion for some areas, and airboats for shallow waterways or those that contain large floating mats of the exotics. The Louisiana Department of Wildlife and Fisheries began introducing water hyacinth weevils (*Neochetina eichhorniae* and *N. bruchi*) statewide using aerial drops from helicopters into heavily infested areas, including some in Jefferson Parish in 1974. Water hyacinth weevils were released in Jean Lafitte National Historical Park and Preserve in the 1980s. Observations by park staff indicate that the Preserve currently contains a well-established population of water hyacinth weevils that are widespread within park areas. However, water hyacinth remains a problem. Between June 2002 and June 2005, salvinia weevils (*Cyrtobagous salviniae*) were released in the Preserve in an attempt to establish biological control of common salvinia. The U.S. Department of Agriculture (USDA) Agricultural Research Service Invasive Plant Research Laboratory, which coordinated the releases, was unable to determine if the weevils became established in the park because of several environmental perturbations that occurred during their research, notably Hurricane Katrina. The results, which were reported in late 2007, were not encouraging. In June 2009, the same species of salvinia weevils, which were locally raised on giant salvinia, were released in the Preserve.	Past, Present, and Future
Nearby Urban Development	Rapid expansion in the Westbank area of Jefferson Parish	Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Massive clearing of vegetation has increased the amount of soil disturbance, compaction, and erosion. Once devoid of vegetation, soils are washed into ditches and canals, increasing turbidity and runoff, resulting in adverse impacts to soils and geology.	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
Deltaic Subsidence	Deltaic Subsidence	Soil compaction and land subsidence is a natural process occurring in recent deltaic land formations. However, this process is accelerated by anthropogenic forces attributed to altered land use, increased development, changes in hydrology, and oil and gas extraction. Average land subsidence rates in the New Orleans region average 5mm/year (Burkett, Zilkowski, and Hart no date). These rates are expected to continue and possibly increase, which would impact areas throughout southeastern Louisiana.	Past, Present, and Future
Oil and Gas Activities	Various	Oil and gas activities include exploration, extraction, and maintenance. In 2004, two wells were directionally drilled in the park. Both were determined to be dry holes, and plans to drill two additional wells were abandoned. In June 2006, a new well was drilled in Lake Salvador within a mile of Barataria Preserve. Recent seismic activity was conducted along the park's western boundary in Lake Cataouatche in 2006. In April 2007, the park was approached about directionally drilling a gas well in the park, but the project was dropped.	Past, Present, and Future
Visitor Activities Within or Adjacent to Jean Lafitte National Historical Park and Preserve	Hunting and Fishing	Included in the park's enabling legislation are provisions for fishing, hunting, and trapping. Fishing occurs in park waterways and adjacent to the park boundary in Lakes Salvador and Cataouatche. Hunting and trapping are managed through permitting, and trapping is focused on controlling the nutria population (a nonnative, invasive species). As outlined in the Superintendent's Compendium, visitors are permitted to legally take small quantities of certain plants, nuts, and fruits for personal consumption.	Past, Present, and Future
Facility Development and Maintenance	Palmetto Trail Reopening	The park repaired and has reopened the Palmetto Trail, which was heavily damaged as a result of Hurricane Katrina. The 0.9-mile trail runs parallel to Highway 45 from the Visitor Center to the Bayou Coquille parking lot.	Past
	Debris Removal and Dredging of Canals within Barataria Preserve	The park proposes to remove debris and dredge detritus from canoe trails at Barataria Preserve (NPS 2008). The debris resulted from the high winds and storm surge associated with Hurricanes Katrina and Rita in 2005. Debris would be removed from the waterways; woody debris would be cut into small pieces and left to rot; non-biodegradable debris would be disposed of properly offsite; and dredge material would be pumped into surrounding wetlands as a thin layer of slurry.	Future

IMPAIRMENT ANALYSIS

In addition to determining the environmental consequences of the alternatives under consideration, the NPS *2006 Management Policies 2006* and DO #12 require analysis of potential effects to determine if actions would impair park resources and values. The fundamental purpose of the national park system as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. These laws give the NPS the management discretion to allow impacts to park resources and values (when necessary and appropriate) to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. NPS

managers must always seek ways to avoid or minimize, to the greatest degree practicable, adversely impacting park resources and values.

The impairment prohibited by the Organic Act and the General Authorities Act is an impact, in the professional judgment of the responsible NPS manager, that harms the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts. An impact to any park resource or value may constitute impairment, but an impact would more likely constitute impairment if it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's General Management Plan or other relevant NPS planning documents.

An impairment determination is included in the conclusion statement of the impact analysis of each alternative. Impairment determinations are not made for visitor use and experience, health and safety, socioeconomics, or park operations and management because impairment findings relate to park resources and values; these impact areas are not generally considered to be park resources or values. Impairment determinations are not made for visitor use and experience because, according to the Organic Act, enjoyment cannot be impaired in the same way an action can impair park resources and values.

UNACCEPTABLE IMPACTS ON PARK RESOURCES OR VALUES

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS applies a standard that offers greater assurance that impairment would not occur. The NPS would do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Unacceptable impacts are impacts that, individually or cumulatively, would be inconsistent with a park's purposes or values, or would:

- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process,
- create an unsafe or unhealthful environment for visitors or employees,
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with park programs or activities, an appropriate use, the atmosphere of peace and tranquility, the natural soundscape maintained in wilderness, and natural, historic, or commemorative locations within the park.

SOILS AND GEOLOGY

Methodology and Assumptions

To analyze the impacts to soils and geology, background information was compiled from park documents, USDA soil survey maps, scientific publications, and professional expertise.

Study Area

The area of analysis for direct and indirect impacts to soils and geology is limited to the immediate vicinity of the candidate canal sites and access areas. The NPS developed the following definitions for intensity thresholds for impacts to soils and geology:

Negligible: Impacts to surficial and shallow geology including soils would be at or below the lowest levels of detection. Any effects would result in very little or no physical disturbance, compaction, or erosion, and changes to soil productivity or fertility would be slight.

Minor: Impacts to surficial and shallow geology including soils would be detectable in relatively few areas. Effects would result in small amounts of disturbance, compaction, or erosion, and changes to soil productivity or fertility would be small. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts to surficial and shallow geology including soils would be detectable over a relatively wide area or in numerous areas. Effects would result in disturbance, compaction, or erosion, and changes to soil productivity or fertility would be detectable. Mitigation measures, if needed to offset adverse impacts, could be extensive but would likely be successful.

Major: Impacts to surficial and shallow geology including soils would be readily apparent over a relatively large proportion of the Preserve. Effects would result in disturbance, compaction, or erosion, and changes to soil productivity or fertility would be readily apparent. Extensive mitigation measures would be required to offset any adverse impacts, and their success would not be guaranteed.

No action Alternative (Alternative A)

Under the no action alternative, the NPS would not degrade developer-built spoilbanks and dikes to the surrounding marsh level for more than 20 miles of non-historic canals within the Preserve. The non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals.

The soils within the proposed project area formed in coastal and deltaic plains and have properties of frequently flooded soils. The presence of the spoilbanks creates an impoundment of hydrology such that water levels remain approximately 1 inch above the soil surface for the majority of the year, the exception being in high evaporation seasons. Soil formation is affected by the impoundment of hydrology because the soil substrate is organic. Having these marshes more or less continuously inundated slows down decomposition and enhances the buildup of organic matter. On the other hand, the presence of spoilbanks may reduce the frequency and duration of tidal flooding of these impounded areas. Both processes are

important to the long-term ecological health of the marshes. In addition, channels facilitate erosion from wave action (wind, boats) as well as more rapid tidal discharges. Should the NPS select alternative A, it would continue maintaining and protecting the natural resources, functions, and values within the Preserve and respond to future needs and conditions associated with the canals and coastal wetlands without extensive actions or changes in the present course. Any effects to surficial and shallow geology, including soils, would be slight and undetectable. Thus, the impacts to soils and geology would be long-term negligible and adverse.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the vicinity of the project area have affected or could affect soils. Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Massive clearing of vegetation has increased the amount of soil disturbance, compaction, and erosion. Once devoid of vegetation, soils are washed into ditches and canals, increasing turbidity and runoff. Urban development near the Preserve results in long-term moderate adverse impacts due to extensive erosion after vegetation clearing has taken place.

Recent plans to implement storm surge protection projects and to construct hurricane protection levees would cause extensive soil disturbance near the Preserve. These plans include installing flood gates, constructing new earthen levees, and increasing the width and height of existing levees, all of which would affect soils and geology of the area. The construction of levees along rivers and canals has reduced natural flooding regimes, greatly diminished sediment input to adjacent wetlands and contributed significantly to large areas of land subsidence. Flood and storm surge control projects near the Preserve would result in long-term minor to moderate adverse impacts.

Soil compaction and land subsidence is a natural process occurring in recent deltaic land formations. However, this process is accelerated by human influences attributed to altered land use, increased development, changes in hydrology, and oil and gas extraction. Land subsidence rates in the New Orleans region average 5 millimeters/year (Burkett, Zilkowski, and Hart no date). These rates are expected to continue and possibly increase, impacting large areas throughout southeastern Louisiana. Human influences would result in long-term minor to moderate adverse impacts.

Disturbance to geological features and soils occurs from oil and gas activities, including exploration and pipeline maintenance. Unless reclaimed, disturbance from these activities creates long-term adverse effects, though they are generally minor because of the small footprint of oil and gas operations. However, the indirect effects of unreclaimed oil and gas access canals lead to land loss in coastal wetlands. These cumulative effects have the potential to cause long-term minor to moderate adverse impacts.

The park proposes to dredge detritus from canoe trails in the Preserve (NPS 2008). Approximately 488,787 cubic yards of material would be dredged from approximately 125 acres of waterbottoms in Bayou des Famillies, Bayou Coquille, Lower and Upper Kenta Canal, Twin Canals, Fuller's Trenasse, Bayou Boeuf, and Wood's Place Canal. The dredge spoil from the project would be spread as a slurry layer no more than 6 inches deep on approximately 605 acres of wetlands adjacent to these waterways. Dredging activities would have a short-term moderate adverse impact on soils of the canals (NPS 2008).

Some plans and projects within the Preserve would also have beneficial effects on soils, including dredging activities described above. Pumping dredge material/detritus slurry into the surrounding wetlands would mimic over-bank flooding and provide nutrients and sediments to large areas of wetland.

This aspect of dredging activities could have a long-term beneficial impact on the soils of the surrounding wetland areas by helping to counteract subsidence.

The high quality wetland areas of Bayou aux Carpes and the CIT Tracts were transferred to NPS ownership in 2009. Acquisition and preservation of these areas by the NPS would have a long-term beneficial impact because these areas would no longer be subject to clearing or other human activities that are detrimental to soils and geology.

Lake Salvador experienced high rates of land loss from 1953 – 1983, averaging 13 feet a year. This caused breaches in the lake shoreline, which exposed surrounding marsh sediments to erosion. Implementation of shoreline protection was approved in 1993. Four types of shoreline protection structures were tested. Rock shoreline protection proved to be the most effective. Nine thousand feet of rock shoreline protection was implemented in phase II of the project, and a further 7,300 feet of shoreline were protected in phase III. Shoreline protection of Lake Salvador would have a long-term beneficial impact on the soils and geology of the area.

Although some cumulative impacts would be long-term and beneficial to soils and geology, overall, the cumulative impacts when added to the long-term negligible adverse impacts under alternative A would have short-term moderate and long-term negligible to moderate adverse impacts on soils and geology.

Conclusion: Alternative A would result in long-term negligible adverse impacts to soils and geology. Cumulative impacts would be long-term beneficial and short-term moderate and long-term negligible to moderate adverse with the no action alternative contributing only negligibly to adverse cumulative impacts. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B, spoilbanks would be degraded and vegetation would be cleared using marsh buggies, barge-mounted excavators, or other earth-moving equipment. Minor disturbance may occur to soils from the use of large equipment and from an increase in the number of people in the project area. Heavy earth-moving equipment would access the reclamation sites via the canals or the spoilbanks and remain in existing waterways on a barge or on the spoilbanks. This would limit the impacts to the spoilbanks and canals themselves and would result in no long-term adverse impacts to surrounding wetlands and soils. Soil disturbance would result from the removal of spoil material from the spoilbanks within the project. The spoilbanks present an artificial area of high elevation and mineral soils. Reclamation of the spoilbank areas to organic soils would result in a beneficial impact.

Check meanders would be designed and installed upstream from the confluence of any canal with the Bayou Segnette Waterway. Installation of check meanders would be expected to prevent wave activity, whether produced by boat or wind, from entering the reclaimed canal from the waterway. This would help reduce erosion in the reclaimed canal, resulting in a beneficial impact.

In areas where trees are either chipped in place or felled and placed parallel to the canal banks, soil disturbance and compaction would result causing short-term negligible adverse impacts.

The NPS may use a technique called gapping in areas where there is too much material to degrade the entire spoilbank cost effectively. Gapping would include intermittently breaching spoilbanks to reestablish hydraulic connections with the surrounding wetlands and partially filling the canals with this material. Through reestablishing the hydraulic connection of the canals with the surrounding wetlands, gapping would allow sediments to build up naturally over the wetlands; thus, this activity would result in beneficial impacts. However, the beneficial impacts would be less than in those areas where the spoilbanks are completely degraded. While impacts resulting from this alternative would be short-term negligible adverse to soils and geology during project activities, overall the project would result in long-term beneficial effects once complete.

Cumulative Impacts: The same actions identified as contributing cumulative effects under alternative A would also occur under alternative B. Overall, when combined with the impacts of alternative B, the cumulative impacts would be short-term negligible to moderate adverse, long-term negligible to moderate adverse and long-term beneficial to soils and geology in the Preserve.

Conclusion: Under alternative B, construction activities would result in short-term negligible adverse impacts to soils and geology; however, long-term impacts would be beneficial. Cumulative impacts when combined with the project impacts would be short-term negligible to moderate adverse, long-term negligible to moderate adverse and long-term beneficial with alternative B contributing a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on soils and geology, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative B.

VEGETATION AND NON-NATIVE SPECIES

Methodology and Assumptions

The methodology used for assessing impacts to vegetation communities included identification of the communities in the Preserve and the potential effects from canal reclamation activities on the structure, composition, or distribution of plant communities. Impacts to vegetation may result from the direct removal of vegetation and the degradation of existing vegetation. The assessment of impacts is based on professional expertise and observation and was developed through discussions with NPS staff and a review of previous and current research.

Study Area

The area of analysis for direct and indirect impacts to vegetation is limited to the immediate vicinity of the candidate canal sites and access areas. The NPS developed the following definitions for intensity thresholds for impacts to vegetation:

Negligible: Impacts would not cause discernable alteration to the composition, abundance, or diversity of the native vegetation.

Minor: Impacts would cause limited alteration to the composition, abundance, or diversity of the native vegetation, but the change would be small and of little perceptible consequence. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would cause alteration to the composition, abundance, or diversity of the native vegetation. The change would be measurable, and of some perceptible consequence. Mitigation measures, if needed to offset adverse effects, may be more involved, but would likely be successful.

Major: Impacts would cause substantial alteration to the composition, abundance, or diversity of the native vegetation. The change would have measurable and perceptible consequences. Extensive mitigation measures would be required to offset any adverse effects and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under this alternative, there would be no reclamation activities, and non-historic canals would remain open allowing for the continued intrusion of saltwater into freshwater marsh often changing the vegetation community composition. Earthen spoilbanks at higher elevations than the surrounding marsh interrupt hydrology and nutrient and sediment movement through the Preserve. Many of these spoilbanks support species of nonnative vegetation that are invasive and rapidly outcompete native species, thus preventing the establishment of native marsh vegetation. During a study performed in 2007, almost half (55 species) of all plant species documented during the study were exotic species (Urbatsch, Ferguson, Gunn-Zumo 2007). These effects could cause further changes in the abundance and quality of native vegetation surrounding these canals and would result in long-term moderate adverse impacts to vegetation.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the vicinity of the project area would contribute both adverse and beneficial cumulative impacts on vegetation. Rapid urban development in Jefferson Parish, especially near the Preserve, has led to a decrease of native vegetation and forested areas. Increased development and habitat fragmentation also provides a conduit for invasive exotic species to adversely impact native vegetation communities. Park managers have seen an increase in the presence of invasive exotic species along the Preserve's boundary. Urban development would have short- and long-term minor adverse effects on vegetation by potentially altering the native vegetation composition, abundance, and diversity.

The park repaired the Palmetto Trail, which was heavily damaged as a result of Hurricane Katrina. Removal and replacement of damaged sections involved the use of power tools, equipment, increased human presence, and a staging area for materials. Some vegetation was cut and removed, which may allow a potential increase in invasive plant species until mitigation measures are employed. This would result in short-term negligible adverse impacts to vegetation.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial impacts on vegetation. Increasing the size of protected area buffers the Preserve's existing vegetation by reducing impacts from storm surge, wave energy, and wind effects. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area had been

successfully reclaimed to wetland conditions (Turner et al. 2006). Wetland reclamation projects result in short-term minor adverse impacts to vegetation from construction and fill activities. However, wetland reclamation projects also result in long-term beneficial impacts by converting deeper open water areas and upland spoilbanks to wetland conditions which enables primarily native wetland vegetation to recolonize the area.

Other ecological restoration projects also provide beneficial impacts to vegetation. The Lake Salvador Shoreline Protection project helps prevent shoreline erosion that can adversely impact vegetation, while the Davis Pond freshwater diversion project helps combat saltwater intrusion into freshwater marsh, which would otherwise kill salt-intolerant native wetland species. The Davis Pond diversion project also mimics spring flood conditions that help to move sediment through the system providing beneficial nutrients and sediment deposition to vegetation, resulting in long-term beneficial impacts.

The park has been working with the New Orleans District of the USACE Operations Division since 2001 to chemically treat and control water hyacinth, common salvinia, and alligatorweed. During the growing season, these plants form dense floating mats that cover more than 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Typically, the USACE sprays between 150 and 325 acres of Preserve waterways. Additionally, between June 2002 and June 2005 the park released salvinia weevils (*Cyrtobagous salviniae*) in the Preserve in an attempt to establish biological control of common salvinia. Exotic species management projects result in short- and long-term beneficial impacts. While chemical treatment damages target vegetation, it has not provided control of the exotic species in the Preserve and can also harm native floating and submerged aquatic vegetation causing short-term negligible adverse impacts.

Man-made canals have allowed saltwater intrusion into freshwater marsh and channeling of nutrient-rich overflow. Rather than allowing typical slow inland flows where nutrients can be absorbed by the marsh, water in the canals is directed swiftly through the marsh to receiving waterbodies, which are often unable to process the nutrient loads, resulting in problems with eutrophication that can affect the composition, abundance, and diversity of native species (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). Therefore, man-made canals constructed during oil and gas activities would affect the composition, abundance, and diversity of native species that have a low tolerance to salinity and eutrophication causing long-term moderate adverse impacts on vegetation.

Overall, when beneficial and adverse impacts of the cumulative actions are combined with the long-term moderate adverse impacts under alternative A, there would be short-term negligible to minor and long-term negligible to moderate adverse cumulative impacts as well as long-term beneficial cumulative impacts on vegetation.

Conclusion: Alternative A would have long-term moderate adverse effects on vegetation associated with open water non-historic canals. Non-historic canals would remain open allowing for the intrusion of saltwater into freshwater marsh causing further changes to the composition, abundance, and diversity of native vegetation. Spoilbanks would continue to support nonnative vegetation that outcompetes native species. Cumulative impacts under alternative A would be short-term negligible to minor adverse, long-term negligible to moderate adverse and long-term beneficial on vegetation with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of Preserve resources and values. Because the impacts

previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B, clearing of spoilbank vegetation using marsh buggies, barge-mounted excavating equipment, or other earth-moving equipment would be conducted from either the canals and/or the spoilbanks themselves. Spoilbank vegetation would be disturbed during project activities from the use of large equipment and from an increase in the number of people in the project area. Because equipment would be operating in waterways, there would also be disturbance to floating and rooted aquatic vegetation. Additionally, some branches may need to be cut for the equipment to get to the project site. Project activities would primarily remove spoilbank vegetation with minimal impacts to native wetland vegetation. These disturbed areas would be recolonized primarily by native emergent wetland and shallow water vegetation species. As a result of this alternative, short-term minor adverse impacts to vegetation would occur.

During reclamation operations, weed control measures would be implemented to minimize the potential spread of nonnative species. Baldcypress and water tupelo would be used to revegetate and enhance areas where appropriate and would have a long-term beneficial effect. Restrictions on the areas where equipment would be used would reduce or eliminate the adverse impacts to wetland vegetation.

The spoilbanks present an artificial area of high elevation and soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow but the removal of native vegetation would also occur. Chinese tallow-dominated spoilbanks are a type of fringe wetland that provides habitat but little food and nutrients (Barrow 2001). Although reclamation would result in the loss of spoilbank forested habitat, contiguous high quality forested habitat is found within the Preserve. Further analysis on habitat impacts is provided in the "Fish and Wildlife" and "Special Status Species" sections of this chapter.

Cumulative Impacts: Cumulative impacts to vegetation under this alternative would include those described under alternative A. The introduction of nonnative species is not a concern because they are already present in the project area, and this alternative would not be expected to increase their distribution.

Alternative B would contribute short-term minor adverse effects during reclamation activities through the removal of vegetation on the spoilbanks and submerged aquatic vegetation, but these species would ultimately be replaced by primarily native wetland vegetation, resulting in long-term beneficial effects. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial cumulative impacts to Preserve vegetation.

Conclusion: Alternative B would result in both adverse and beneficial impacts. Equipment and project activities would result in short-term minor adverse impacts to floating and terrestrial vegetation in the canals and on the spoilbanks. However, there would be long-term beneficial impacts to vegetation from

planting native vegetation on disturbed areas. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse and long-term beneficial effects to Preserve vegetation from alternative B. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative B.

FISH AND WILDLIFE

Methodology and Assumptions

Impacts to fish and wildlife were analyzed from NPS professional expertise and observation, previous and current research, and an ongoing inventory. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting fish and wildlife throughout all of Barataria Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to fish and wildlife:

Negligible: Impacts would result in a change to native wildlife populations and their supporting habitats, but the change would not be of any measurable or perceptible consequence. Alterations would be within the range of natural fluctuations and would not affect wildlife population viability or dynamics between different species.

Minor: Impacts would result in changes to native wildlife populations, and/or cause localized changes to their supporting habitats, but the changes would be barely perceptible to the species or habitat function. Occasional responses to disturbance by some individuals could be expected, but alterations would be within the range of natural fluctuations and would not affect overall wildlife population viability, or dynamics between different species. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable. Impacts would result in measurable effects to native wildlife populations, and/or to a relatively large area of their supporting habitats. The viability of wildlife populations and dynamics between different species would be affected, but these changes would be short term. Remaining habitat would be sufficient to support the previous diversity of species at comparable populations. Mitigation measures, if needed to offset adverse effects, may be extensive, but would likely be successful.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and might have permanent consequences for a species population, dynamics between multiple species, or unique habitats. Responses to disturbance by many individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Remaining habitat would not be sufficient to support the previous diversity of species at comparable populations. Extensive mitigation measures would be required to offset any adverse effects, and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion into freshwater marsh. As a result, changes in native aquatic species could be measurable and over a large habitat area resulting in long-term moderate adverse effects. The Preserve provides important breeding habitat for terrestrial and aquatic native species, especially in its marshes and swamps, and serves as foraging habitat for species that breed elsewhere in the Barataria estuary. As a result of taking no action, common wetland wildlife species would continue to utilize the canals and spoilbanks at present levels; however, important fish and wildlife habitat within interior marsh/wetlands would continue to decline over time resulting in long-term moderate adverse impacts to fish and wildlife.

Cumulative Impacts: The coastal Louisiana region has undergone several past and ongoing large-scale projects that impact the Preserve's ecosystem. Continual pressure from urban development in Jefferson Parish has required the clearing of forest and vegetated areas, resulting in decreased available native habitat and habitat fragmentation for resident fish and wildlife, particularly for large mammals. These changes have also provided a conduit for invasive exotic species to enter the Preserve. The importance of the remaining habitats present in the Preserve is becoming more apparent as the surrounding development encroaches. Neighboring habitat destruction and increased human presence reaffirms the ecological importance of the park for fish and wildlife. Park managers have seen an increase in the presence of invasive exotic vegetation along the park's boundary, which provides little value for native fauna. Urban development would have long-term moderate adverse effects on fish and wildlife by harming species viability over a large area of habitat.

Population increases in the surrounding areas expand the demand for recreational activities in the Preserve, including visitor use of hiking and canoeing trails. Park visitors are required to remain on trails, which reduces the likelihood of encountering or disturbing wildlife. However, an increase in visitor use could have localized short-term negligible to minor adverse effects on fish and wildlife.

Although necessary to protect growing coastal urban centers from catastrophic flooding events, levee construction generally has negative impacts on adjacent wetlands and their inhabitant fish and wildlife. Levees along rivers and canals disturb natural flooding regimes, inhibit sediment input to adjacent wetlands, and contribute to land subsidence. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to improve existing levees. Recent plans include the construction of additional hurricane protection levees near the Preserve under USACE

direction. The construction of these levees would remove wildlife habitat and potentially alter habitat near them. This would result in long-term minor to moderate adverse impacts on fish and wildlife.

The GIWWCC storm surge protection system would maintain safe water levels by way of pumping station complexes, but the project would generally have long-term moderate adverse impacts on fish and wildlife due to disturbance from construction and fill activities, as well as from further disconnecting Preserve waterways from the natural flooding regime.

Oil and gas activities including exploration, extraction, and maintenance have been ongoing in the Preserve for decades. Oil and gas activities have minor to moderate adverse impacts on fish and wildlife. Access canals created for oil and gas activities cause direct loss of wetlands and result in deep open water, increase erosion, and allow saltwater intrusion into freshwater marsh, thereby destroying freshwater and brackish-water vegetation (Bass and Turner 1997; Gosselink 1998) and wildlife habitat.

Canals constructed have allowed channeling of nutrient-rich overflow. Rather than typically slow inland flow rates where nutrients are absorbed by the marsh, water in the canals is directed swiftly through the marsh to receiving waterbodies, which are often unable to process nutrient loads, creating problems with eutrophication (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). Oil and gas activities would have long-term moderate adverse effects on fish and wildlife by affecting the composition, abundance, and diversity of native species based on their tolerance to salinity and eutrophication.

Some canals in the Preserve are used as canoe trails to enhance visitor experience. As a result of debris downed by several recent tropical cyclone events, the park is proposing to dredge the canoe trails to remove debris and make the canals once again passable for visitors. This action is expected to have short-term minor adverse impacts on fish and wildlife from noise and increased human activity; however, the project would ultimately result in long-term beneficial impacts due to an overall improvement in the quality of fish and wildlife habitat in the canals being dredged.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial impacts on fish and wildlife by protecting large tracts of habitat. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area has been successfully reclaimed to wetland conditions (Turner et al. 2006). By reconnecting these two canals with the surrounding marsh, the projects have diminished the fragmented nature of the marsh in these areas, providing larger tracts of marsh for wetland species.

Additionally, the Lake Salvador Shoreline Protection project and the Davis Pond freshwater diversion project have helped combat erosion and saltwater intrusion into freshwater marsh. The acquisition and reclamation of additional areas for management and preservation by the NPS has long-term beneficial impacts for fish and wildlife by increasing the size of protected habitat and buffering the Preserve's habitats from urban development.

Provisions for fishing, hunting, and trapping, which, if managed correctly, have a long-term beneficial impact on fish and wildlife, are included in the park's enabling legislation. Fishing occurs in Preserve waterways and adjacent to the Preserve boundary in lakes Salvador and Cataouatche. While there are no records of annual fish harvest, fishing pressure is low enough to reasonably assume that harvest rates are not adversely impacting fish populations. Additional information provided from recent fisheries studies

indicates fish populations are stable or increasing. Hunted species include waterfowl, gray squirrel, rabbit, wild or feral hogs, nutria, and white-tailed deer. Hunter participation and harvest has declined in the last four years. The recommended annual harvest rate for white-tailed deer that was proposed in a recently completed deer management plan is 90 to 100 individuals (Chamberlain and Nyman 2006). Actual harvest rates over the last 15 years have been far lower than the recommended annual rate, averaging 29 individuals and have been as low as 20 in the 1992 – 1993 season (NPS 1997; Chamberlain and Nyman 2006).

Cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the long-term moderate adverse effects of the no action alternative, would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on Preserve fish and wildlife.

Conclusion: Under alternative A, there would be long-term moderate adverse impacts on fish and wildlife because there would be no reclamation of canals and habitat would remain degraded. Cumulative impacts under alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial to fish and wildlife with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

The elevated spoilbanks adjacent to the canals support tree and shrub communities that would not typically be sustained within the surrounding marsh habitat. While there are some native species, most spoilbanks are dominated by the Chinese tallow tree, an invasive exotic species. The limitations of Chinese tallow-dominated spoilbanks are discussed in more detail in the "Vegetation" and "Special Status Species" sections of the "Environmental Consequences" chapter of this EA. The spoilbanks are also fairly narrow and only provide a fringe type habitat, which provides little protective cover or forage habitat. Removal of the spoilbank habitat would result in most wildlife species currently inhabiting them to be displaced to other nearby forested riparian habitats that are more expansive and provide a higher quality of habitat, so the net impact would be short-term and negligible. Benthic invertebrates in the canals would likely be buried by placement of spoil material in the canals, but this would be a short-term negligible to minor impact as benthic species would be expected to recolonize the area after the work is completed. Fish in the canals would vacate the area during project activities, but would be expected to return once the work is completed resulting in short-term negligible adverse impacts. Along the Bayou Segnette Waterway where earthen plugs would be created in the reclaimed canals to prevent spoil material from drifting into the navigable waterway, check meanders incorporated into the design of the plugs would allow aquatic organisms to move freely between the open water of the waterway and the reclaimed canal.

Long-term beneficial impacts would result from converting the poor quality spoilbank habitat to native marsh habitat. Similar to the canal off of the Bayou Segnette Waterway that was reclaimed in 2001 by the

same method proposed under this alternative, the degraded spoilbanks and the partially filled canals are expected to revert to the submerged and emergent vegetation naturally occurring in the Preserve, increasing the available habitat for native wildlife species (Baustian and Turner 2006; Baustian et al. 2009). Reclaiming the canals would also restore the historical hydrology of the project area and restore wetland functions by facilitating a slower and more natural tidal exchange. The integrity of the interior wetlands would be preserved by a reduction in the tidal exchange, as well as wave energy that contributes to erosion and saltwater intrusion into the freshwater marsh. All of which would provide long-term beneficial impacts to fish and wildlife by increasing the amount of and preserving the existing native wetland habitat.

Cumulative Impacts: Cumulative impacts to fish and wildlife under this alternative include those described under alternative A. Additional impacts to fish and wildlife may include beneficial impacts to fish and wildlife populations because of increased habitat with reclaimed canals. The introduction of nonnative fish and wildlife species is not a concern since they are already present in the project area, and it is not expected that this alternative would increase their distribution. Overall, cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the short-term negligible to minor adverse and long-term beneficial effects of alternative B, would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on Preserve fish and wildlife.

Conclusion: Alternative B would result in short-term negligible to minor adverse impacts and long-term beneficial impacts. Cumulative impacts for alternative B would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial with alternative B adding a negligible adverse increment and a beneficial increment to overall cumulative impacts . This would ultimately enhance the natural conditions in the Preserve, which would assist the NPS in fulfilling park purposes and other resource management goals. Because there would be no major, adverse impacts on fish and wildlife, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative B.

SPECIAL STATUS SPECIES

Methodology and Assumptions

Impacts to special status species were analyzed from NPS professional expertise and observation, previous and current research, and an ongoing inventory. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting special status species throughout all of Barataria Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to special status species:

Negligible: Impacts would result in a change to individuals or populations and their supporting habitats, but the change would be of no measurable or perceptible consequence. Alterations would be within the range of natural fluctuations and would not affect population viability or dynamics between different species.

Minor: Impacts would result in changes to special status species populations, and/or cause localized changes to their supporting habitats, but the changes would be barely perceptible to the species or habitat function. Occasional responses to disturbance by some individuals could be expected, but alterations would be within the range of natural fluctuations and would not affect overall population viability or dynamics between different species. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable. Impacts would result in measurable effects to populations and/or to a relatively large area of their supporting habitats. The viability of populations and dynamics between different species would be affected, but these changes would be short term. Mitigation measures, if needed to offset adverse effects, may be extensive, but would likely be successful.

Major: Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable and might have permanent consequences for a species population, dynamics between multiple species, or unique habitats. Responses to disturbance by many individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Remaining habitat would not be sufficient to support the species at comparable populations. Extensive mitigation measures would be required to offset any adverse effects, and their success would not be guaranteed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater, allowing continued deltaic subsidence, and providing a conduit for saltwater intrusion into freshwater marsh.

According to park staff and recent biological inventories, no federally listed threatened or endangered species reside in the proposed project area. Three state animal species of special concern are found within the Preserve. Potential habitat for six aquatic species of concern can be found in the Preserve. One federally listed migratory bird species has been recorded in the Preserve in the past. Several migratory bird species listed in the state of Louisiana occur in the Preserve.

The habitat in the Preserve is especially important for migratory birds and aquatic special status species listed in the “Special Status Species” section of the “Affected Environment” chapter of this EA. Marshes and swamps are breeding areas for aquatic species. Passage migrants and temperate migrants utilize the Preserve seasonally. Under alternative A, special status species would continue to utilize the canals and spoilbanks at present levels; however, important habitat for these species within interior wetlands would

continue to decline over time resulting in long-term moderate adverse effects to aquatic and migratory bird special status species.

Cumulative Impacts: The coastal Louisiana region has undergone several past and ongoing large-scale projects that impact the ecosystem of the Preserve. In addition, there are many projects planned to restore and reclaim parts of the region's wetlands. As a component of the Barataria-Terrebonne IBA, many migratory bird species depend on the Preserve for breeding and foraging habitat.

Continual pressure from urban development in Jefferson Parish has required the clearing of forest and vegetated areas resulting in decreased available native habitat and habitat fragmentation for migratory birds. These changes have also provided a conduit for invasive, exotic species to enter the Preserve. Competition from invasive species can put additional pressure on special status species. Urban development would have long-term moderate adverse effects on migratory bird special status species.

Population increases in the surrounding areas expand the demand for recreational activities in the Preserve, including visitor use of the hiking and canoeing trails. Park visitors are required to remain on trails, which reduces the likelihood of encountering or disturbing wildlife, however, an increase in visitor use could have localized short-term negligible to minor adverse effects on both aquatic and migratory bird special status species.

Levee construction is necessary to protect growing coastal urban centers from catastrophic flooding events, but generally has negative impacts on adjacent wetlands and their inhabitant species. Levees along rivers and canals disturb natural flooding regimes, deny sediment input to adjacent wetlands and contribute to land subsidence. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to address the need for levee improvement. Recent plans have been created to construct additional hurricane protection levees near the Preserve under the direction of the USACE. This would result in a long-term minor to moderate adverse impact on aquatic and migratory bird special status species.

Oil and gas activities including exploration, extraction, and maintenance have been ongoing in the Preserve for decades. Oil and gas activities have long-term minor to moderate adverse impacts on special status species. Access canals cause direct loss of wetlands and result in deep open water, increased erosion, and allow saltwater intrusion into freshwater marsh, thereby destroying freshwater and brackish-water vegetation (Bass and Turner 1997; Gosselink 1998). Two special status species of fish occur in marsh waters. These species have salinity requirements that may be negatively impacted by saltwater intrusion caused by canals (Peterson, Fuller, and Woodley 2003).

Some canals in the Preserve are used as canoe trails to enhance visitor experience. As a result of debris downed by several recent tropical cyclones, the park is proposing to dredge the canoe trails to remove the debris and make the canals passable for visitors. This action is expected to have short-term minor adverse impacts on special status species from noise and increased human activity; however, the project would ultimately result in long-term moderate beneficial impacts due to an overall improvement in the quality of habitat in the canals being dredged. Long-term beneficial impacts to wetland habitat would occur from pumping a thin layer of the dredge material/detritus slurry into the surrounding wetlands. This process would mimic over-bank flooding and would provide nutrients and sediments to the wetlands, improving this habitat for special status species.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial

impacts on fish and wildlife by protecting large tracts of habitat. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area has been successfully reclaimed to wetland conditions (Turner et al. 2006). By reconnecting these two canals with the surrounding marsh, the projects have diminished the fragmented nature of the marsh in these areas, providing larger tracts of marsh for wetland species.

Additionally, the Lake Salvador Shoreline Protection project and the Davis Pond freshwater diversion project have helped combat erosion and saltwater intrusion into freshwater marsh. The acquisition and reclamation of additional areas for management and preservation by the NPS has long-term beneficial impacts for fish and wildlife by increasing the size of protected habitat and buffering the Preserve's habitats from urban development.

Cumulative impacts from past, present, and reasonably foreseeable future actions when combined with the long-term moderate adverse impacts under alternative A would be short-term negligible to minor and long-term minor to moderate adverse and long-term beneficial impacts to Preserve special status species.

Conclusions: Under alternative A, there would be long-term moderate adverse impacts to special status species. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial to park special status species. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on special status species, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

As a result of this alternative, short-term minor impacts to special status species and habitat would occur from the use of heavy equipment and increased human activity. Short-term disturbance would result from abnormal noise levels caused by construction equipment. To mitigate these impacts, project activities would only be allowed during the day to reduce the amount of time wildlife is disturbed (although many bird species are diurnal, the majority of activity takes place during dawn and dusk). Special status species are expected to move from the project area once activities begin and return after the project is completed. Because activities would be limited to spoilbanks and within the canal waterways, habitat disturbance would occur only in localized areas and not throughout the entire project area at any given time.

Tree and shrub communities on spoilbanks would be removed, and spoilbanks would revert to primarily native marsh habitat. Coastal woodlands next to spoilbank vegetation provide stopover sites for migratory landbirds (Barrow et al. 2005). The spoilbanks in the project area are fairly narrow and provide only fringe type habitat, which does not provide much cover or forage. Canal spoilbanks throughout much of the Preserve are also dominated by Chinese tallow trees. These invasive plants provide some cover for migrating birds on their stopover, but little food and nutrients (Barrow 2001). As a member of the *Euphorbiaceae* family Chinese tallow foliage is known to be toxic to livestock and more importantly, to have low numbers of leaf-chewing insects, particularly *Lepidopteran* larvae (Redlus 1997; Barrow 2001).

Lepidopteran larvae, or caterpillars, are an important nutrient source for migrant birds. Chinese tallow seeds, which the birds eat, have a waxy coating and are high in saturated fatty acids, making them difficult for birds to metabolize (Baldwin et al. 2008). Therefore, the birds acquire limited to negative nourishment from the seeds. While studies found that migrant bird species richness did not differ between tallow stands and native riparian forests (Barrow 2001), Chinese tallow provides little in the way of nourishment for the energy-intensive demands of migration. Therefore, these fringe wetlands are potentially functioning as an ecological sink for migratory birds. The surrounding riparian forests are considered higher quality habitat for cover and forage. In the absence of Chinese-tallow dominated spoilbanks, migratory species would likely select these surrounding riparian forests as stopover points during their migration and would benefit from the higher habitat quality.

There would be long-term beneficial impacts to the areas experiencing reclamation. Native wetland species are expected to recolonize the area after spoil material removal, providing additional native habitat. Partially filling open water areas with material from the spoilbanks is expected to create additional areas of shallow water and emergent marsh naturally occurring in that area, further increasing available habitat (Baustian and Turner 2006; Baustian et al. 2009).

Cumulative Impacts: Cumulative impacts to special status species under this alternative include those described under alternative A. Cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the short-term minor adverse and long-term beneficial impacts of alternative B, would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as beneficial on Preserve special status species.

Conclusions: Alternative B would result in short-term minor adverse impacts and long-term beneficial impacts. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as long-term beneficial to special status species populations because of increased habitat with reclaimed canals. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts. This would ultimately enhance the natural conditions in the Preserve, which would assist the NPS in fulfilling park purposes and other resource management goals. Because there would be no major adverse impacts on special status species, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under alternative B.

HYDROLOGY AND WATER QUALITY

Methodology and Assumptions

Impacts to hydrology and water quality were analyzed from NPS professional expertise and observation, previous and current research, and ongoing monitoring. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting hydrology and water quality throughout all of the Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to hydrology and water quality:

Negligible: Impacts to hydrology and water quality would not be detectable or would fall outside of the normal range of fluctuation and remain well below water quality standards or criteria. Water quality ranges and stream flow would remain comparable to historic and baseline conditions.

Minor: Impacts would result in detectable changes to hydrology and water quality; however, the impacts would be small and localized and remain below water quality standards or criteria. Water quality ranges and stream flow would remain comparable to historic and baseline conditions. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in changes to hydrology and water quality that would be readily detectable but remain at or below water quality standards or criteria. Water quality ranges and stream flow would occasionally and temporarily deviate from historic and baseline conditions. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in changes to hydrology and water quality that would be substantial and exceed water quality standards and criteria. Water quality ranges and stream flow would frequently fall outside of historic and baseline conditions. Extensive mitigation measures would be required to offset any adverse impacts, and would not be guaranteed to succeed.

No Action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion. As a result, the continued change to hydrology could be measurable and over large areas and would have long-term moderate adverse effects to hydrology and water quality.

Cumulative Impacts: As wetland ecology is centrally dependent on hydrology (Turner 1987) the integrity of the Preserve as a valued cypress/tupelo swamp, intermediate marsh, and freshwater marsh ecosystem is highly affected by the cumulative impacts to its hydrologic regime.

Hydrologic changes have occurred extensively throughout the Preserve and the surrounding area. Most notably, canals and levees have been constructed for oil and gas exploration. Canals and spoilbanks alter both above- and below-ground hydrology. They introduce unnaturally fast-flowing water to the interior of the marsh which causes erosion and other problems (Turner 1987). In fact, studies have shown that canal density and wetland loss by erosion have a clear positive correlation (Scaife, Turner, and Costanza 1983), and many large areas of open water have formed near canals and spoilbanks in the past five decades,

while none have formed away from them (Turner 1987). Levees disrupt natural hydrology by compressing and compacting the material below them, creating an above and below-ground drainage block and isolating one area of marsh from another (Turner 1987). When a levee crosses a natural drainage channel, the natural channel typically closes off, silts in, or erodes into a pond area.

Canals streamline the flow of saltwater inland; allowing for saltwater intrusion which destroys freshwater vegetation that is intolerant of salt, resulting in the loss of wetland habitat (Turner 1987). Periodic floods are important in recharging marshes with nutrient-rich sediment. Natural wetland drainage is slow, which allows nutrients to absorb in the marsh. Canals instead channel nutrient-rich sediment swiftly to receiving waterbodies denying surrounding marsh area of nutrients and sediment (Turner 1987). Receiving waterbodies in the Preserve are often unable to process the nutrient loads, which creates problems with eutrophication (Taylor, Day, and Neusaenger1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). In other areas, spoilbanks and levees prolong flooding, keeping marsh vegetation submerged for longer than is natural, or eventually creating more open water area. Oil and gas activities have long-term moderate adverse effects on hydrology and water quality by altering baseline and historic hydrologic conditions.

The Davis Pond Freshwater Diversion (approximately 3 miles north of the Preserve) was constructed to maintain salinity at natural levels within the Barataria estuary disrupted in part by saltwater intrusion from canals. The project diverts freshwater from the Mississippi River into the Preserve. The structure impacts 777,000 acres of marshes associated with the watershed of the Davis Pond structure (USACE 2004a). However, water quality of the Mississippi River is poor, largely from urban and agricultural run-off (including fertilizers and herbicides). Bayou Segnette, which bisects the western portion of the Preserve, has been identified as a waterbody with low levels of dissolved oxygen, and high nutrients and pathogen loads. The influx of this water may negatively impact marsh ecosystems in the Preserve. The Davis Pond Freshwater Diversion has long-term moderate adverse effects on hydrology because it affects a large area and alters baseline and historic hydrologic conditions.

Rapid urban development in Jefferson Parish, especially near the Preserve, has led to a decrease in water quality and disrupted flow regime. Man-made levees disconnect the Preserve from the natural flooding regime, altering the amount, rate, and type of water that enters the park. Levees hydrologically isolate different areas of marsh in the Preserve and add to wetland loss with ponding (Turner 1987). Additional levee construction has been proposed and may influence lands adjacent to the Preserve and further decrease sheet flow. Urban development would have long-term moderate adverse effects on hydrology by altering baseline and historic hydrologic conditions.

The GIWWCC is a storm surge protection system currently under construction that would maintain safe water levels by way of pumping station complexes, but would generally have negative impacts on hydrology and water resources by further disconnecting Preserve waterways from the natural flooding regime. The effects of this would be long-term moderate and adverse.

Several tracts of wetland have been acquired by the park in recent years. The Bayou aux Carpes and the CIT Tracts were acquired in March 2009. These tracts of high quality wetland will insulate the Preserve from poor water quality urban runoff. The acquisition of additional wetland areas has long-term beneficial impacts on the hydrology and water quality of the park.

Overall, when the beneficial and adverse effects of these cumulative actions are combined with the long-term moderate adverse effects of alternative A, there would be long-term moderate adverse impacts and long-term beneficial impacts on hydrology and water quality.

Conclusion: Alternative A would have long-term moderate adverse effects to hydrology and water resources associated with open water non-historic canals. Cumulative impacts for alternative A would have long-term moderate adverse impacts and long-term beneficial impact on hydrology and water quality. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on hydrology and water quality, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water quality under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

The preferred alternative would reclaim more than 20 miles of non-historic canals within the Preserve by degrading spoilbanks and dikes to the level of the surrounding wetlands and partially filling the canals with this soil and vegetative material. Check meanders constructed in reclaimed canals along the Bayou Segnette Waterway would diminish the artificially high flow rates of water in the canals. The recolonization of canals by native marsh vegetation would recreate freshwater wetlands and aid in restoring the natural hydrology.

Wetland characteristics are centrally dependent on hydrology (Turner 1987). Therefore, restoring hydrologic functions by reclaiming canals would have beneficial impacts to the Preserve. Backfilling and building check meanders partially restores pre-canal drainage patterns by slowing and spreading out flow, which is more similar to natural sheet flow. Important nutrient loads from natural flooding would be returned with the disruption of channelized drainage caused by canals. This also helps in reducing erosion and saltwater intrusion, two important causes of wetland loss (Turner et al. 2006; Turner 1987). Shallower depths, slower moving water, and reduced saltwater intrusion created by reclamation activities provide suitable conditions for native marsh species to recolonize canal areas (Turner et al. 2006). Past reclamation activities have shown that successful recolonization decreases open water area, further decreasing flow rates and improving conditions for more recolonization, creating a positive feedback loop (Turner et al. 2006). Reduced areas of open water also decrease habitat for invasive floating vegetation that is harmful to water quality.

Reclamation of two oil and gas canals in the Preserve was completed in 2002. These canals have been monitored for rate of recolonization by native marsh species and were found to be 37% to 42% restored in 3 years, by 2006 (Turner et al. 2006). Studies indicate a maximum recovery rate for backfilled canals of 94% after 20 years (Baustian and Turner 2006). Failure to reclaim canals would allow the continued disruption of natural hydrology, continued wetland loss and degraded water quality.

During reclamation operations turbidity levels and quantities of suspended particulates within the water column would temporarily increase from the placement of degraded spoil material in the canals. In canals where check meanders are installed, the check meanders would trap additional sediments to minimize

impacts on local water quality in the adjacent canals. In all locations, turbidity levels and suspended particulates would rapidly return to ambient conditions following completion of construction activities resulting in short-term minor adverse impacts.

With the use of any motorized equipment there is always the possibility of accidental fuel spills or leaks. Spill containment materials would be staged near the action area in case of accidental spills. However, spills and leaks are unlikely, and to further minimize the likelihood of occurrence, all equipment would be checked regularly to identify and repair any leaks; only four stroke boat motors would be used for boats operating in the canals during reclamation activities; spill containment materials would be staged near the construction activities; and, if a spill or leak is discovered, it would be immediately contained and cleaned up and park staff would be notified.

With the use of mitigation measures, alternative B would result in short-term minor adverse and long-term beneficial impacts to hydrology and water quality.

Cumulative Impacts: Cumulative impacts to hydrology and water quality under this alternative include those described under alternative A. Alternative B would contribute localized short-term minor adverse effects during reclamation activities, but long-term beneficial effects once reclamation is complete. Overall, when the beneficial and adverse effects of the cumulative actions are combined with the short-term minor adverse and the long-term beneficial impacts of alternative B, there would be short-term minor adverse and long-term moderate adverse impacts in addition to the long-term beneficial impacts on hydrology and water quality.

Conclusion: Alternative B would result in short-term minor adverse impacts as well as long-term beneficial impacts to hydrology and water quality. Overall cumulative impacts would be short-term minor adverse and long-term moderate adverse in addition to long-term beneficial. Alternative B would add a slight adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on hydrology and water quality, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water quality under alternative B.

WETLANDS

Methodology and Assumptions

Impacts to wetlands were analyzed from NPS professional expertise, previous and current research, consultation with other experts, and park documents. In addition, related scientific documents relating to this and similar activities were reviewed.

Study Area

The area of analysis for direct and indirect impacts to wetlands is limited to the immediate vicinity of the candidate canal sites and access roads. The NPS developed the following definitions for intensity thresholds for impacts to wetlands:

Negligible: Impacts would affect wetlands, but would not alter wetland functions and values.

Minor: Impacts would affect a limited number of individuals of plant or wildlife species within the wetland. The change to wetlands in terms of area, composition, and structure would be detectable but inconsequential. Wetland processes, functions, and integrity would remain unaffected. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would have a measurable effect on plant or wildlife species within the wetland, but all species would remain indefinitely viable. Changes to wetlands would be readily apparent, but would only temporarily affect the wetland's composition and structure. Wetland processes, function, and integrity could also be temporarily affected. Mitigation measures, if needed to offset adverse effects, would be extensive, but would likely be successful.

Major: Wetland species would be at risk of extirpation from the Preserve. Wetland processes, function, and integrity would be altered to the point where wetland structure and composition would permanently change. Extensive mitigation measures would be required to offset any adverse effects, and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion into freshwater marsh. The integrity of the existing interior marshes and associated wetland communities would continue to be threatened, resulting in possible break up and eventual conversion to open water. The no action alternative would result in long-term moderate adverse impacts to wetlands.

Cumulative Impacts: In southeastern Louisiana, wetland loss and degradation is occurring due to natural and man-made processes. Urban development, oil and gas exploration, and changes in land use and hydrology have reduced the extent and quality of wetlands surrounding the Preserve. The construction of levees along rivers and canals has reduced natural flooding regimes, denied sediment input to adjacent wetlands, and contributed significantly to land subsidence. Oil and gas exploration is attributed to direct loss as new canals are cut through wetlands, resulting in large areas of deep open water. In addition to the direct creation of open water area, canal dredging causes secondary loss of wetlands. Canals expose sediments to wave action, increasing erosion. Canals also allow saltwater to intrude further into wetland systems, destroying freshwater and brackish-water vegetation. Interlocking spoilbanks from canal intersections can effectively impound areas and lead to wetland loss (Gosselink 1998). Studies have shown that for every 1.0 hectare (ha) of canal dredging, 2.85 ha of open water are created and 1.0 ha of wetland is lost from spoilbank placement (Bass and Turner 1997). These activities would have long-term moderate adverse effects on wetlands.

It is reasonably foreseeable that forested wetlands in the Preserve would be impacted by nearby levee construction under the direction of the USACE. As a result of Hurricane Katrina, the state and federal

governments are devising a coastal protection and reclamation plan to address the need for levee improvement and coastal wetland reclamation. New levee alignments and strengthening of existing levees are being proposed. In order to obtain material suitable for constructing or increasing the height of existing earthen levees, there is a need for borrow material. Current planning documents indicate that the borrow material would come from inside the Preserve. Preliminary meetings with park officials and the public have been held to discuss construction plans and alternatives. After excavation is complete, borrow pits would become deep water ponds unsuitable for the establishment of emergent wetland or submerged aquatic vegetation. Floating aquatic vegetation may become established. These activities would permanently change the vegetation of wetland areas and have long-term moderate adverse effects on wetlands.

Reclamation projects have been initiated to combat loss of wetland area in southeastern Louisiana. The benefits of coastal wetlands have moved to the forefront of public attention since the devastation caused by Hurricanes Katrina and Rita in 2005. Projects vary in size and magnitude and are being conducted throughout the state on private and public lands. Large-scale reclamation projects in nearby wetlands may have indirect beneficial impacts on the Preserve as they buffer the Preserve's habitats by reducing the storm surge, wave energy, and wind effects. Large-scale reclamation projects near Jean Lafitte National Historical Park and Preserve include the GIWWC Project and the shoreline reclamation of Lake Salvador. The acquisition of Bayou aux Carpes and the CIT Tracts by the park have placed thousands of acres of additional wetland under NPS management and preservation.

The park has identified wetland reclamation projects and is working with officials from state and federal agencies to implement these projects. The park has implemented successful reclamation projects including backfilling two dead-end canals along the Bayou Segnette Waterway, debris removal and dredging of existing park canals, and using dredge material to fill open water ponds which were previously floating marsh. Wetland reclamation is ongoing and is highly dependent on available funding. The park annually submits wetland reclamation projects for funding consideration through the NPS Disturbed Lands program and the Coastal Wetlands Restoration, Planning, and Protection Act. Reclamation projects result in long-term beneficial impacts.

The park has been working with the New Orleans District of the USACE Operations Division since 2001 to chemically treat and control water hyacinth, common salvinia, and alligatorweed. During the growing season, these plants form dense floating mats that cover more than 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Typically, the USACE sprays between 150 and 325 acres of Preserve waterways. Additionally, between June 2002 and June 2005, the park released salvinia weevils (*Cyrtobagous salviniae*) in the Preserve in an attempt to establish biological control of common salvinia. Exotic species management projects result in short-term minor adverse and beneficial impacts.

The past, present, and reasonably foreseeable future actions would have short-term minor and long-term moderate adverse impacts to wetlands and short- and long-term beneficial impacts to wetlands when combined with the long-term moderate adverse effects of alternative A.

Conclusion: Alternative A would result in long-term moderate adverse impacts to wetlands from risks associated with non-historic canals. Cumulative impacts for alternative A would be short-term minor adverse and long-term moderate adverse and short- and long-term beneficial to wetlands. Alternative A would add a slight adverse increment to overall cumulative effects. Because there would be no major

adverse impacts on wetlands, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B it would be impossible to avoid impacting wetland habitats because virtually all of the Preserve is classified as wetlands. Minor adverse impacts would result from sedimentation from partially filling canal areas with spoil material and destruction of wetland vegetation growing on the spoilbanks. The use of equipment in the project area would result in the compaction of spoilbank soils and temporarily destroy or alter spoilbank vegetation. Impacts would be negligible temporary and localized since equipment would not be present in all areas of the project at any given time, and due to the low ground pressure of the equipment. Due to the extensive seed source and small amount of disturbance in a localized area, wetland vegetation would only be impacted in a small area and is expected to rapidly recolonize disturbed sites once work is completed (Baustian et al. 2009).

To avoid impacting wetland vegetation outside of the spoilbanks, vehicle access to the project site locations would be via the canals or the spoilbanks themselves. Other mitigation measures during project activities would include instructions to ground crews on how to avoid damaging any part or whole of wetland vegetation outside of the spoilbanks themselves. The NPS would also regularly monitor project activities to ensure wetland vegetation is not damaged during reclamation activities.

The spoilbanks present an artificial area of high elevation and mineral soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow, and primarily native wetland species are expected to recolonize the area after spoil material removal (Baustian et al. 2009). Partial filling of open water areas with material from the spoilbanks is expected to create additional areas of submerged and emergent vegetation. This methodology has been used in many areas of coastal Louisiana and at other locations in the Preserve. Research has documented the long-term beneficial effects of this process (Baustian and Turner 2006; Baustian et al. 2009). Reclaiming the canals would create acres of new wetlands and would also protect the existing interior marsh by facilitating a slower and more natural tidal exchange between the remaining open water canals and the interior marsh, reducing wave energy that contributes to erosion, and reducing saltwater intrusion into the freshwater marsh, which can destroy salt intolerant species. Construction of check meanders in those canals to be reclaimed along the Bayou Segnette Waterway would provide additional protection from wave action along that maintained navigable water way as well. Spoilbank removal and partial filling of the canals would have a beneficial impact on wetlands.

Cumulative Impacts: Cumulative impacts to wetlands under this alternative include those described under alternative A. Implementation of this alternative would contribute to the various wetland reclamation plans throughout the state, including the Coast 2050 plan and the Louisiana Coastal Areas – Ecosystem Restoration Study (USACE 2004b). The past, present, and reasonably foreseeable future actions, in combination with the short-term negligible to minor adverse and long-term beneficial impacts

from alternative B, would have short-term negligible to minor adverse, long-term moderate adverse cumulative impacts, and long-term beneficial cumulative impacts on wetlands.

Conclusion: Alternative B would result in short-term negligible to minor adverse and long-term beneficial impacts to wetlands. Cumulative impacts to wetlands under this alternative would be short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial to wetlands. Alternative B would contribute a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under alternative B.

VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY

Methodology and Assumptions

The methodology for assessing impacts on visitor use and experience is based on professional judgment and was developed through consultation with NPS staff and other experts.

Area of Analysis

Any area used for visitor use, or where visitors may be within the Preserve is included in the impact analysis for visitor use and experience, including health and safety. The Preserve boundary is the impact analysis area for evaluating direct and indirect effects. The NPS developed the following definitions for intensity thresholds for impacts to visitor use and experience including health and safety:

Negligible: Changes in visitor use and/or experience would be below or at the level of detection. Visitors are not likely to be aware of the effects associated with the alternative. There is no expectation for endangering visitor health and safety.

Minor: Changes in visitor use and/or experience would be detectable, although the changes would be slight. Few visitors would be aware of or affected by the implementation of the alternative. There is little expectation for endangering visitor health and safety with the application of mitigation measures.

Moderate: Changes in visitor use and/or experience would be readily apparent. Many visitors would be aware of or affected by the implementation of the alternative, and would likely express an opinion about the effects. Extensive mitigation measures would be necessary to reduce risk of endangering visitor health and safety.

Major: Changes in visitor use and/or experience would be readily apparent and have important consequences. Most visitors would be aware of or affected by the implementation of the alternative, and would likely express a strong opinion about the effects. Extensive mitigation measures may not reduce the risk of endangering visitor health and safety.

No action Alternative (Alternative A)

Under the no action alternative, no reclamation activities would take place so there would be no temporary impacts from additional noise sources or canal closures for construction activities. Maintenance activities to protect the natural resources, functions, and values within the Preserve would continue and responses to future needs and conditions associated with the canals and coastal wetlands would occur without extensive actions or changes in the present course. Maintenance activities could result in temporary closures of small areas used by visitors to the Preserve. Closing the areas where maintenance activities occur would prevent any risk to visitor health and safety. The impacts to visitor use and experience, including health and safety, would be localized short-term negligible and adverse.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the central Barataria Basin in the vicinity of the Preserve have affected or could affect visitor use and experience. Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Urban development near the Preserve could result in more visitors to the Preserve with the Preserve being noticeably more crowded. More visitors also mean more pollution and noise originating from both inside and outside the Preserve as a whole. The impacts would be long-term moderate and adverse.

Recent plans to implement storm surge protection projects and to construct hurricane protection levees would cause adverse impacts to visitor use and experience during construction in the Preserve. The construction of levees along rivers and canals would affect visitor use by causing noise disturbances and possible area closures. Risks to health and safety would not increase because all construction areas would be closed to visitor use. Flood and storm surge control projects near the Preserve result in short- and long-term minor adverse impacts.

Visitor use and experience are also adversely affected by oil exploration, production, transport and maintenance activities. These activities or associated abandoned infrastructure are readily noticeable, and could cause closures and increased noise levels. Oil well or pipeline leaks are another possibility and could be harmful to visitors, increasing risks to health and safety. However, oil and gas related infrastructure also provides access to the Preserve for certain visitor groups, which would be beneficial. These activities have the potential to cause long-term minor to moderate adverse and long-term beneficial impacts.

As a result of several recent tropical cyclones, the park is proposing to remove downed debris and dredge canoe trails in the Preserve. Canals impacted by the project include Bayou des Famillies, Bayou Coquille, Lower and Upper Kenta Canal, Twin Canals, Fuller's Trenasse, Bayou Boeuf, and Wood's Place Canal. The dredge spoil from the project would be spread as a slurry layer no more than 6 inches deep on approximately 605 acres of wetlands adjacent to these waterways. During the project activities, short-term minor adverse impacts would occur from noise and temporarily closing areas to visitor use for safety reasons. However, the project would result in long-term beneficial impacts to visitor use by reopening areas to visitors that are currently impassible during much of the year.

The CIT Tracts are an area comprising forested wetlands located on the northern side of the Preserve. The area was acquired by the United States in 1994 to settle a lawsuit. Management of the property was transferred to the NPS in March 2009. Acquisition of the Bayou aux Carpes area in the southern portion of the Preserve also occurred in 2009, and would provide visitors with more recreational area to use. These acquisitions would have long-term beneficial impacts on the visitor use and experience of the

Preserve. Shoreline protection of Lake Salvador would preserve areas of the Preserve that are used for recreation that would otherwise have been destroyed. As a result, the impacts would be long-term and beneficial on visitor use and experience.

Planned and routine facility development and maintenance would have short-term minor adverse impacts to visitor use during the construction and maintenance. The park has recently made repairs to the Palmetto Trail, which was heavily damaged by Hurricane Katrina. Impacts from this improvement are long-term and beneficial.

These past, present, and reasonably foreseeable future actions would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on visitor use and experience, including health and safety. In combination with the localized short-term negligible adverse impacts of alternative A, the overall cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial.

Conclusion: Alternative A would result in localized short-term negligible adverse impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative A would add a negligible adverse increment to overall cumulative impacts. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience including health and safety under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Impacts to visitor use and experience under alternative B would vary. In the area of construction activities, canals would be closed to visitor use for safety reasons. These closures would be temporary, and the areas would be reopened to visitors after project activities were complete. Because all 20 miles of non-historic canals would not be reclaimed at once, the temporary closures would only impact small areas of the Preserve at any one time and would, therefore, result in short-term negligible to minor adverse impacts.

Increased noise levels from equipment during reclamation activities would also impact visitor experience. However, the frequency, duration and magnitude of noise from the project would not exceed those already produced by park staff and visitors during normal park operations and recreational activities. Therefore, these impacts would result in short-term negligible adverse effects on visitor use and experience.

In canals where pushing woody vegetation into the open water may interfere with navigation, such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by a commercial swamp tour, cut woody vegetation would either be chipped in place or placed parallel to the banks of the canals. This would allow visitors to still use the canals without impacting navigation. These techniques may also be employed in areas where canals and/or drillslips meet a navigable waterway so that woody debris does not drift into the waterway and impact navigation. Though woody debris would be managed along these waterways, the placement of spoilbank

material into canals would reduce water depths and potentially limit access by some vessels. Along the Bayou Segnette Waterway, which is a maintained waterway, check meanders would be installed in reclaimed canals. Check meanders would prevent woody debris and sediment from moving into the waterway and impeding navigation. However, check meanders themselves represent a potential impediment to navigation. With these mitigation measures, impacts to boat navigation in these canals would be reduced, and are expected to be long-term minor adverse.

Opportunities for fishing access by boats would be reduced as described above in reclaimed canals, but fish habitat, in general, would be enhanced. Marsh areas open for hunting would not be affected, although temporary closures in the vicinity of project activities may result in short-term minor adverse impacts.

While there would be short-term negligible to minor and long-term minor adverse impacts from implementing the proposed action, reclaiming the canals and allowing them to revert to more natural open marsh habitat would provide long-term beneficial effects to the visitor use and experience by allowing visitors to enjoy a more natural system, representative of the wetlands and ecosystems present prior to the canals.

Cumulative Impacts: The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. These past, present, and reasonably foreseeable future actions would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on visitor use and experience, including health and safety. In combination with the impacts of alternative B, the overall cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial.

Conclusion: Alternative B would result in localized short-term negligible to minor and long-term minor adverse impacts and long-term beneficial impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative B would contribute a slight adverse increment and a beneficial increment to the overall cumulative impacts to visitor use and experience, including health and safety. Because the impacts previously described (1) are not inconsistent with the Preserve's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative B.

COORDINATION AND CONSULTATION

The intent of NEPA is to encourage the participation of federal- and state-involved agencies and affected citizens in the assessment procedure, as appropriate. This chapter describes the consultation that occurred during development of this EA. This chapter also includes a description of the public involvement process and a list of the recipients of the document.

THE SCOPING PROCESS

The NPS divides the scoping process into two parts: internal scoping and external or public scoping. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for

management actions, issues, management alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, available references and guidance, and other related topics.

Public scoping is the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that people have an opportunity to comment and contribute early in the decision-making process. For this planning document, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given opportunities to express concerns or views and to identify important issues or even other alternatives.

Taken together, internal and public scoping are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this EA.

INTERNAL SCOPING

An internal scoping meeting was held at the Jean Lafitte National Historical Park and Preserve on October 8 and 9, 2009. Internal scoping uses NPS staff to determine what topics need to be analyzed in the EA. The meetings were attended by personnel from the park, the NPS Denver Service Center, the Louis Berger Group, and PENSCO. Based on these meetings, the interdisciplinary team defined the purpose, need, and objectives of the plan, identified potential issues, discussed preliminary alternatives, and defined data needs. The results of the meetings were captured in a report now on file as part of the administration record for this EA.

PUBLIC SCOPING

Public scoping efforts for this planning process focused on the means or processes to be used to include the public, the major interest groups, and local public entities. To notify interested parties of the project, an informational brochure was mailed out to 86 representatives of educational institutions, nongovernmental organizations, parish governments, and federal agencies, as well as other people who expressed an interest in the project. In addition, the park e-mailed 58 electronic copies of the brochure to a similar cross section of individuals. The brochure was also posted on the NPS' Planning, Environment, and Public Comment website (www.parkplanning.nps.gov/jela) as well as the park's website (www.nps.gov/jela/parkmgmt/publicinvolvement.htm). In addition, a press release was sent to *The Times Picayune*. With the scoping brochure, the public was given 30 days to comment on the project from October 2, 2009, through October 31, 2009.

PUBLIC SCOPING COMMENTS

During the 30-day scoping period, 32 pieces of correspondence were received from the public. These comments included both support for and against the project, requests to remove certain canals from the project, suggestions to avoid impacting middens and other archeological sites, suggestions to remove invasive species such as Chinese tallow and water hyacinth, and concerns about the adverse ecological impacts that removing the spoilbanks might have including killing off native cypress trees. Other comments suggested evaluating impacts to wildlife existing on the spoilbanks to be removed, neotropical and other migratory birds as well as other species of conservation concern, recreational fishing in the canals to be reclaimed, and hydrology; spreading the spoilbank material across the marsh instead of placing it in the canals; and conducting any work outside of the nesting season for bird species of conservation concern. Several concerns were noted about continued access to private properties, and one

commenter expressed concern about the continued ability of companies with mineral rights in the Preserve to exercise those rights and access sites if the canals and drillslips are reclaimed. Several commenters also indicated that the project should be paid for by the oil and gas companies that created the canals and expressed their displeasure that the project was being paid for with taxpayer money.

AGENCY CONSULTATION

In accordance with Section 5.5 of DO #12, coordination and public involvement in the planning and preliminary design of the proposed action was initiated early in the process. As required by NPS policies and planning documents, it is the park's objective to work with state, federal, and local governments and private organization to ensure that the park and its programs are coordinated with theirs, are supportive of their objectives, and that their programs are similarly supportive of park programs. The following agencies were consulted when preparing this EA:

Federal Departments and Agencies

- U.S. Department of the Army, Corps of Engineers
- U.S. Department of the Interior, Fish and Wildlife Service

Louisiana State Agencies

- Louisiana Department of Environmental Quality
- Louisiana Department of Natural Resources
- Louisiana Department of Wildlife and Fisheries
- State Historic Preservation Office, Louisiana

Affiliated Native American Groups

- Alabama-Coushatta Tribe of Texas
- Caddo Nation
- Chitimacha Tribe of Louisiana
- Choctaw Nation of Oklahoma
- Coushatta Tribe of Louisiana
- Jena Band of Choctaw Indians
- Mississippi Band of Choctaw Indians
- Quapaw Tribe of Oklahoma
- Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Tunica-Biloxi Tribe of Louisiana

RECIPIENTS OF THE ENVIRONMENTAL ASSESSMENT

To inform the public of the availability of the EA, the NPS will distribute a notification letter to the various agencies, tribes, and members of the public on the project mailing and e-mail lists. The EA will also be available electronically on the NPS' Planning, Environment, and Public Comment website at http://www.parkplanning.nps.gov/jela. Copies of the document will also be provided upon request.

PERMITS REQUIRED

USACE Clean Water Act Permit-Section 404/Section 10

Louisiana Department of Natural Resources Coastal Use Permit

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APPENDIX A

PUBLIC SCOPING AND AGENCY CONSULTATION LETTERS

Public Scoping Brochure

USFWS Section 7 Consultation Letter

USFWS Section 7 Consultation Response

Louisiana State Historic Preservation Office Consultation Letter

Louisiana State Historic Preservation Office Response

NPS Determination of No Adverse Effect with attached Assessment of Effect

Tribal Consultation Letters

Tribal Consultation Responses

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National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical
Park and Preserve,
Louisiana

Canal Reclamation at Barataria Preserve

National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical
Park and Preserve,
Louisiana

Planning Process

The NPS expects to release an Environmental Assessment (EA) for public review in January 2010. The EA will be available for public review and comment for 30 days. Written comments received on the EA will be reviewed to determine whether any new important issues or reasonable alternatives or mitigation measures have been suggested. If substantive issues are raised which point to the potential for significant impacts, an Environmental Impact Statement would be prepared, otherwise a Finding of No Significant Impact (FONSI) is expected.

For More Information

If you have questions about the project or would like more information, please visit **http://parkplanning.nps.gov/jela/** or contact:

Haigler "Dusty" Pate
Natural Resource Program Manager
504 589-3882 ext 119

Or send email to **jela_superintendent@nps.gov**

Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130

Project Background

As a result of funding made available through the 2009 enactment of the American Recovery and Reinvestment Act (ARRA), the National Park Service (NPS) is soliciting public comments on a proposed project that would reclaim more than 20 miles of canals in the Barataria Preserve, a unit of the Jean Lafitte National Historical Park and Preserve. The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

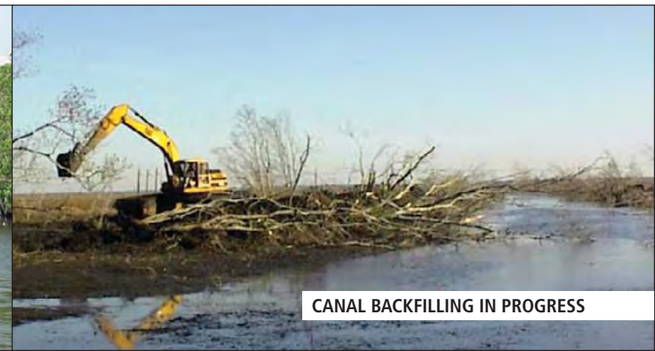
Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, and partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

Oil and gas exploration, development, and transportation, along with unsuccessful residential development projects, have scarred the landscape of the Barataria Preserve with man-made canals and drillslips (canals). More than 590 acres of the Preserve are directly affected by these non-historic canals and associated spoilbanks and dikes, and more than 20 linear miles of canals have been identified for reclamation throughout the preserve.

Canals and their associated spoilbanks alter hydrology and have both a direct and an indirect role in Louisiana's land loss problem. Directly, canals have turned marsh to open water and spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind them. This hydrologic alteration can limit sediment deposition, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplification of tidal volumes and increased saltwater intrusion. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely affect the Preserve.

NPS policies call for the restoration and active management of resources damaged or compromised in the past, including wetlands and floodplains. In addition, the legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and undermine the ability of the park to preserve and protect those values.

CANAL WITH SPOILBANKS



CANAL BACKFILLING IN PROGRESS

Purpose and Need for Project

The **purpose** of this project is to restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks; and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

This project is **needed** at this time because:

- The indirect effects of canals and spoilbanks on the park are continual stressors on park resources and values, with continued adverse effects on natural hydrology, ecology, water quality, and wetland functions and values.
- Combined with other sources of cumulative adverse impacts, canals have resulted in increased rates of land loss in the park, the Barataria estuary, and throughout coastal Louisiana.
- The NPS currently has an opportunity to fund the restoration of resources affected by canals and spoilbanks in the park in part because of the American Recovery and Reinvestment Act. The work would create jobs in the local economy, which is a goal of this legislation.

Project Objectives

The **objectives** of the project are to:

- Restore wetland functions and values (hydrology – water, sediment, and nutrient movement/vegetation/ access for estuarine organisms/wildlife habitat)
- Improve visitor experience
- Avoid or minimize adverse impacts to park resources and values
- Improve the resiliency of park ecosystems in the face of subsidence and climate change impacts - sea level rise and intensified tropical storms

Public Comment

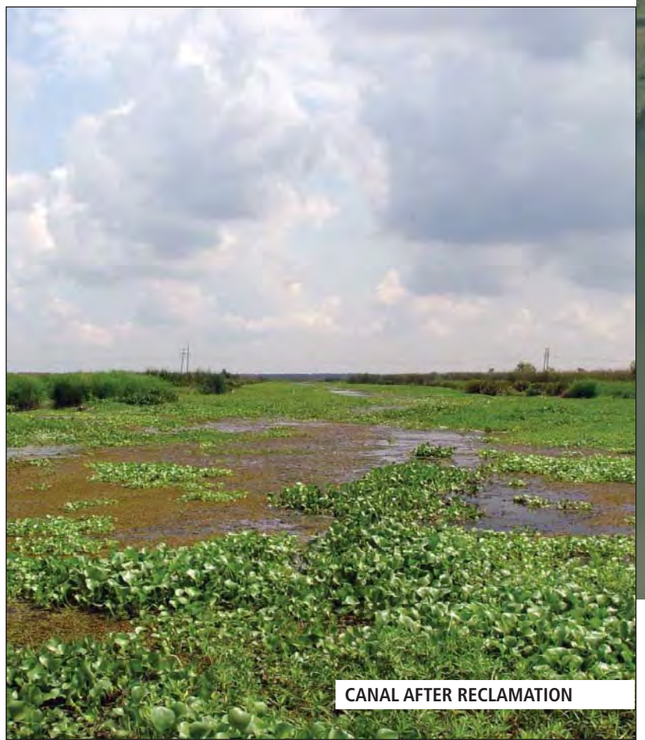
The NPS is inviting the public to provide input regarding this project, also known as "Public Scoping." Issues and concerns from the public, government agencies, and organizations will assist the NPS in preparation of an Environmental Assessment (EA). Public comments will be accepted until October 31, 2009. Submit comments to:

Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130
Attn: Canal Reclamation at Barataria Preserve

Online at: **www.parkplanning.nps.gov/jela** (click on project)
By email to: **jela_superintendent@nps.gov**

Please be sure to include your full name and address with the comments so we may add you to our mailing list for information on the planning process.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.



CANAL AFTER RECLAMATION

Canal Reclamation at Barataria Preserve

Produced 09/25/2009
FILE: BARA_CanalRestoScopeBmap.mxd

Note: Basemap is 2008 true color DOQQ aerial imagery from the USGS National Wetlands Research Center and the CWPPRA Task Force

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United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130-1035

IN REPLY REFER TO

September 2, 2009

Jim Boggs
Field Supervisor
Lafayette Ecological Services Field Office
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

Re: Section 7 Consultation for Proposed Canal Backfilling Project at Jean Lafitte National Historical Park and Preserve

Dear Mr. Boggs:

The National Park Service is currently considering a project to degrade spoilbanks and levees within the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve. Fill material from the spoilbanks and levees would be used to partially backfill the open water of canals. Most of the canals in the proposed project area were originally constructed for oil and gas exploration and development, and backfilling them would restore natural hydrology and reestablish wetland vegetation. Our title for this project is 'Restore Freshwater Floating Marsh by Reclaiming Abandoned Oil and Gas Canals,' and the internal project number in our Planning, Environment and Public Comment (PEPC) system is 25944.

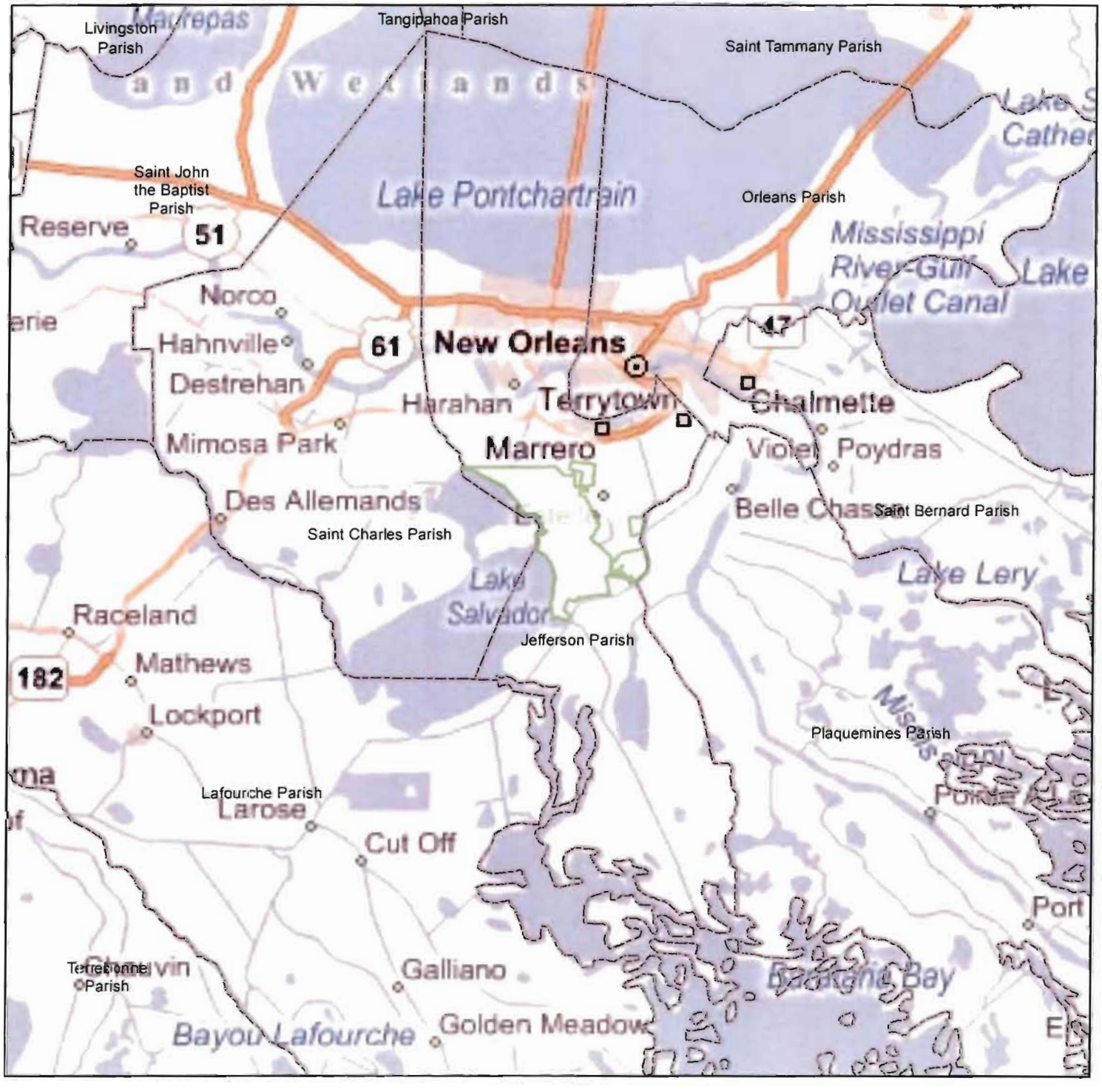
In compliance with section 7(a)(2) of the Endangered Species Act of 1973 (as amended), we are requesting your concurrence that the species distribution list we obtained from your website is accurate. We visited http://www.fws.gov/lafayette/section7/ on September 1, 2009. The last update for the list downloaded from the site was August 8, 2008. For Jefferson Parish, the location of the proposed project, the list includes the West Indian manatee, brown pelican, Gulf sturgeon, and the green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. We noted that Jefferson Parish contains critical habitat for the piping plover and Gulf sturgeon. We are also requesting confirmation that the Barataria Preserve unit, which is delineated on the attached map, does not contain critical habitat for these species.

If you have any questions or concerns, please contact me at (504) 589-3882 extension 119, or via email at haigler_pate@nps.gov. I appreciate your consideration of our requests.

Sincerely,

Haigler "Dusty" Pate
Natural Resource Program Manager

Enclosure



Jean Lafitte NHP & Pres Barataria Preserve & Region

Legend

- Barataria Preserve
- LA County Boundaries

Basemap is a live web service from the Microsoft Virtual Earth (now Bing Maps) online mapping system. © 2009 Microsoft Corp. http://maps.live.com.

Map created 09/02/2009.

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130-1035

IN REPLY REFER TO:

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September 2, 2009

Jim Boggs
Field Supervisor
Lafayette Ecological Services Field Office
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

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If you have any questions or concerns, please contact me at (504) 589-3882 extension 119, or via email at haigler_pate@nps.gov. I appreciate your consideration of our requests.

Sincerely,

Haigler "Dusty" Pate
Natural Resource Program Manager

Enclosure

SITE MAY CONTAIN WETLANDS. Contact the U.S. Army Corps of Engineers for a jurisdictional determination.
District: New Orleans
Telephone No. 504-862-2274

This project has been reviewed for effects to Federal trust resources under our jurisdiction and currently protected by the Endangered Species Act of 1973 (Act). The project, as proposed,
( ) Will have no effect on those resources
(X) Is not likely to adversely affect those resources.
This finding fulfills the requirements under Section 7(a)(2) of the Act.

Sept 11, 2009
Acting Supervisor — Date
Louisiana Field Office
U.S. Fish and Wildlife Service

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

October 2, 2009

Mr. Scott Hutcheson
Louisiana State Historic Preservation Officer
Office of Cultural Development
P.O. Box 44247
Baton Rouge, LA 70804

Attention: Section 106 Reviewer

Dear Mr. Hutcheson:

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are informing you of a proposed undertaking. The project under consideration would reclaim more than 20 miles of modern canals in the Barataria Preserve, a unit of Jean Lafitte National Historical Park and Preserve located just south of the greater New Orleans metropolitan area. We sent you a scoping brochure regarding the project on September 30, 2009, and a map of the area of potential effect is enclosed. An Assessment of Actions Having an Effect on Cultural Resources will be sent at a later date for your review.

The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

The park's legislative mandate, general management plan, and resource management plan direct that the Preserve is to be managed to preserve natural resources and values. The legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and undermine the ability of the park to preserve and protect those values.

The Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve contains the Barataria Unit Historic District and a number of prehistoric and historic sites and historic structures. The canals proposed for backfilling are in areas without adjacent sites, with one exception: 16-JE-56, a shell midden associated with the Baytown and Mississippian Cultural Periods. We propose, therefore, to leave the spoilbank intact near 16-JE-56 and to refrain from backfilling the canal in that vicinity. No other known sites within the project area have the potential to be impacted by the project.

As stated above, the purpose of this letter is to inform you of the proposal, and to request information you may have on resources potentially affected by the undertaking. If you have any questions regarding this request, please contact me at 504-589-3882, extension 111.

Sincerely,

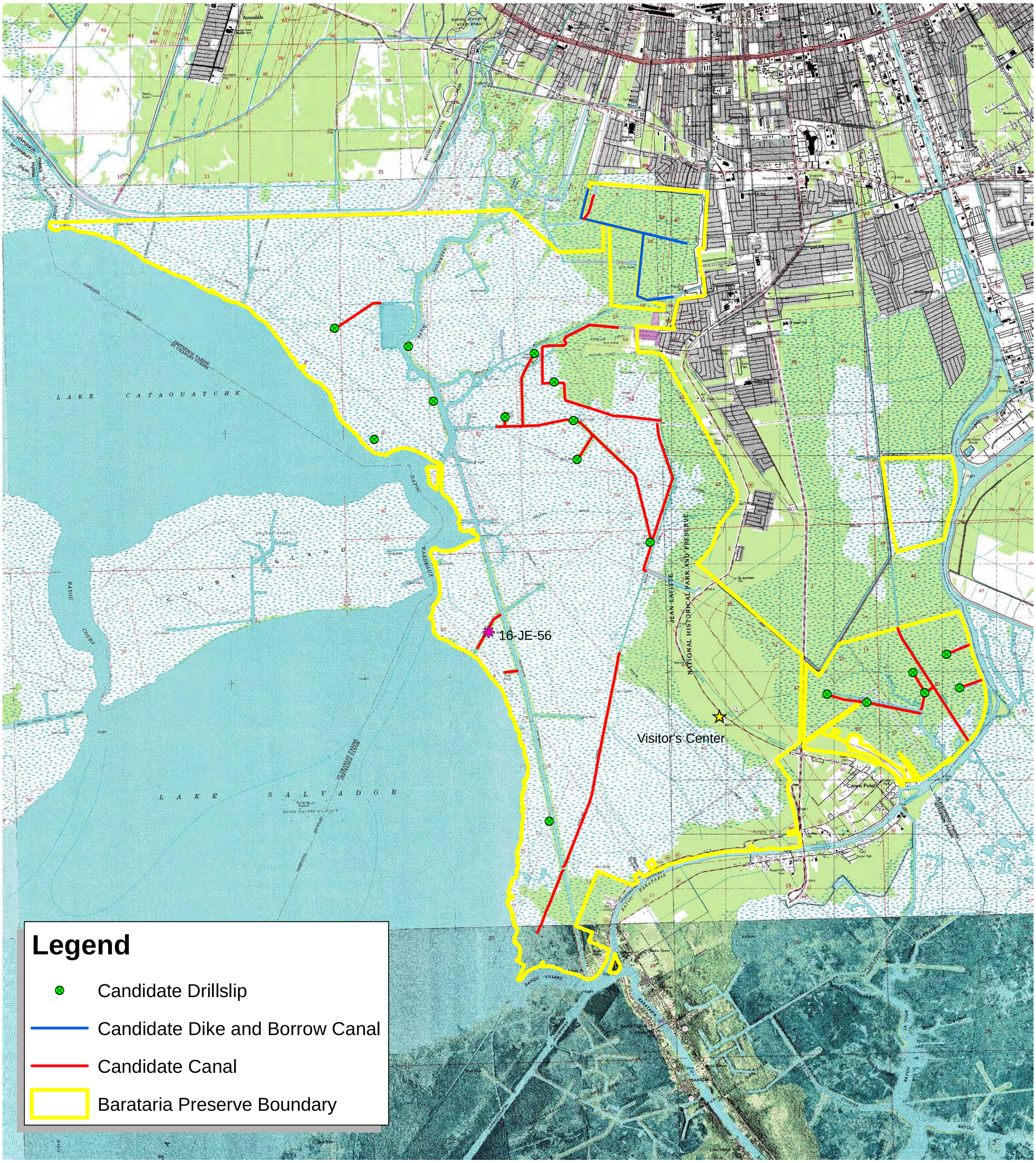
Carol A. Clark
Acting Superintendent

Enclosure

Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior

Canal Reclamation at Barataria Preserve



Note: Basemap is mosaiced USGS 7.5 minute topographic and orthophotomap (topographic) quadrangles. The following quads, or portions of quads, are included: Barataria, Bertrandville, Catahoula Bay, Lafitte, Lake Cataouatche East and West, and New Orleans East and West.

Produced 10/01/2009

FILE: BARA_CanalRestoInitConsultwSHPOMap.mxd

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

December 17, 2009

Mr. Scott Hutcheson
State Historical Preservation Officer
Department of Culture, Recreation and Tourism
Office of Cultural Development
Division of Archeology
Baton Rouge, LA 70804-4247

Re: Determination of *No Adverse Effect*, Barataria Preserve Canal Reclamation Project, PEPC # 25944, Barataria Preserve, Jefferson Parish Louisiana

Dear Mr. Hutcheson:

Enclosed is an Assessment of Effect form for the Barataria Preserve Canal Reclamation Project. The Assessment of Effect form describes the proposed undertaking, and its area of potential effects. We have previously consulted with you on this project, and in your letter dated November 13, 2009, you agreed with our treatment plan for the known archeological site (16JE56) that has the potential to be impacted by this project. The area of potential effects has not changed.

As you are aware, this project proposes to reclaim canals, by degrading their spoilbanks to the level of the surrounding marsh, and partially filling the open water with this material. The project would restore wetland vegetation directly in and around the canals and drill slips, and would provide indirect benefits to surrounding areas. The canal reclamation project will likely be done in segments as funding becomes available.

The area of potential effect for this undertaking would be confined to the spoilbanks and previously disturbed areas where archeological sites and historic properties would generally not be expected to occur, and there would be a low probability of locating significant archeological resources.

In accordance with 36 CFR 800.5(d)(1), Jean Lafitte National Historical Park and Preserve has determined that there would be *no adverse effects* on archeological resources or historic properties under the condition that the mitigations outlined in the Assessment of Effect form and presented below are followed prior to the implementation of each project phase, and that should unexpected discoveries be made during construction or buried human remains be discovered, all construction will stop and the proper authorities be contacted to consult on the project. The mitigations include the following: NPS shall conduct a Phase I archeological survey focusing especially in areas where canal segments have intersected or cut into natural waterways or historic canals and on canal

segments recently acquired where previous surveys have not been completed. The archeologist conducting the survey shall: 1) visit the state site files office to determine if there are previously identified archeological sites in the newly acquired lands, and obtain copies of all associated site forms; 2) visit all levees to be impacted, especially those in the newly acquired lands; 3) conduct a pedestrian survey of all intersections of canals and levees targeted for destruction with natural waterways and/or historic canals (if above water), and if deemed necessary, conduct limited subsurface testing; and 4) flag for avoidance site 16JE56 and any additional sites or historic properties discovered during the survey and project managers shall drop them from the project area. A buffer around identified sites or properties shall be established and the spoilbank near the site or property left intact. No backfilling or construction use would be permitted within the buffer zone. If you concur with the assessment of effect and conditions as outlined, please sign in the space provided below and return this letter to:

Carol A. Clark
Acting Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur Street
New Orleans, LA 70804

If you should have any questions, please contact me at 504-589-3882, extension 111.

Sincerely,

for

Carol A. Clark
Superintendent

Enclosure

I CONCUR

_____ _____

Scott Hutcheson — Date
State Historic Preservation Officer, Louisiana

ASSESSMENT OF ACTIONS HAVING AN EFFECT ON CULTURAL RESOURCES

A. DESCRIPTION OF UNDERTAKING

1. Park: **Jean Lafitte NHP & Pres** Park district (optional):

2. Project Description:
a. Project Name **Canal Reclamation at Barataria Preserve** Date: **December 17, 2009** PEPC project ID no. **25944**
b. Describe project and area of potential effects (as defined in 36 CFR 800.2[c])

Oil and gas exploration, development, and transportation, along with unsuccessful residential development projects, have scared the landscape of the Barataria Preserve unit of JELA with man-made canals and drill slips (canals). More than twenty linear miles of these features have been identified for reclamation throughout the preserve. The canals and their associated spoil banks or levees range in width from approximately 150 feet to over 400 feet, with about 40 to 250 feet of that width being open water. More than 590 acres are directly affected by the canals, and essentially the entire 22,500 acre preserve, which is predominately freshwater marsh and forested wetlands, is indirectly affected. The preserve contains the only example of floating marsh in the National Park System, and portions of one of only twelve areas where the EPA has exercised its authority to prohibit the placement of fill material into wetlands under Section 404(c) of the Clean Water Act. In addition, the preserve is part of the Barataria Terrebonne National Estuary.

Canals and their associated spoil banks are responsible for a large portion of the rapid land losses on the LA coast that have occurred over the past century, which are primarily due to the conversion of coastal marshes to open water. Direct conversion of wetlands to open water and spoil banks from canal dredging has been estimated at approximately 22% of the total wetland area loss in the state. Though it is difficult to quantify exactly what proportion of the land loss is from indirect effects, it is nevertheless clear that an even greater percentage of the land losses from canal dredging are due to indirect effects. Indirect effects of canal dredging are due to the alteration of natural hydrological functions and circulation patterns, that is, disruption of sheet flow of fresh water and nutrients/sediments, partial or complete impoundment of adjacent wetlands, amplification of tidal volumes, disruption of flooding patterns, and increased saltwater intrusion. Spoilbanks and levees are colonized by exotic Chinese tallow trees. Vegetation communities in wetlands adjacent to canal dredging sites are changed.

This project proposes to reclaim canals, by degrading their spoilbanks to the level of the surrounding wetlands, and partially filling the open water with this material. This wetland

restoration method, known as backfilling, is technically simple and cost-effective. The project would restore wetland vegetation directly in and around the canals and drill slips, and would provide indirect benefits to surrounding areas. Marsh vegetation is expected to begin growing on about 65% of the original spoil bank area and 25% of the open water area of the canals within 3 years, and the open water portion of the project area could continue to shrink over the long-term.

There are few environmental values at risk from the proposed project. Adverse impacts should be generally confined to the previously disturbed work areas. There is a shell midden associated with Native American and other cultures that was bisected by a canal which is part of the proposed project area. The NPS informed the Louisiana State Historic Preservation Officer (SHPO) and all associated Indian Tribes by letters dated October 2, 2009 of the planned mitigation strategy for the protection of the midden, which is identification and avoidance. The SHPO responded in a letter dated November 13, 2009 that, "We feel you have identified the one archeological site that has potential to be impacted by the project (16JE56, JELA-56) and we agree with the treatment plan for this site." There were two responses from tribes, but neither addressed the proposed mitigation for the midden. The tribal responses from the Alabama-Coushatta Tribe of Texas on October 20, 2009 and the Choctaw Nation of Oklahoma on November 9, 2009, indicated that, so far as they could determine, there would not be effects to tribal resources from the project. However, both tribes informed the NPS that in the event of the discovery of previously unidentified cultural resources during the project, work should cease, and that they would like to be notified. The NPS would comply with these requests in the unlikely event an unexpected discovery occurs.

Potential hazards associated with the nature of these former industrial sites will be identified and mitigated for. Backfilling the preserve's canals would close a portion of the open water previously available for recreation, research and education, commercial use, and park management activities. However, since the spoil material originally dredged from the marsh to create the canals has been dewatered, weathered, oxidized, and has lost most of its organic component, less material would be available to fill the open water of the canals. Therefore, the backfilling process would not close the waterways completely, at least in the short-term.

JELA-56 - Midden

3. Has the area of potential effects been surveyed to identify cultural resources?

__No
_X_ Yes, Source or reference: **Parts of area have been surveyed; new lands have not.**

___ Check here if no known cultural resources will be affected. (If this is because area has been disturbed, please explain or attach additional information to show the disturbance was so extensive as to preclude intact cultural deposits.)

4. Potentially Affected Resource(s):

Archeological resources affected?

Name and number(s): **Barataria Preserve** Location: **Jefferson Parish**
NR status: **1 - Listed in Register and documented**
Notes: **There is a midden site within the area of potential effect; however, mitigation will be built into the project to avoid adverse effects.**

5. The proposed action will: (check as many as apply)
No Destroy, remove, or alter features/elements from a historic structure
No Replace historic features/elements in kind
No Add non-historic features/elements to a historic structure
No Alter or remove features/elements of a historic setting or environment (inc. terrain)
Yes Add non-historic features/elements (inc. visual, audible, or atmospheric) to a historic setting or cultural landscape
No Disturb, destroy, or make archeological resources inaccessible
No Disturb, destroy, or make ethnographic resources inaccessible
Yes Potentially affect presently unidentified cultural resources
No Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnographic resources
No Involve a real property transaction (exchange, sale, or lease of land or structures)
__ Other (please specify)

6. Measures to prevent or minimize loss or impairment of historic/prehistoric properties:
(Remember that setting, location, and use may be relevant.)

- **Ensure that there is a buffer around the known midden site, so that project activities avoid this area.**

7. Supporting Study Data:
(Attach if feasible; if action is in a plan, EA or EIS, give name and project or page number.)

Beavers, Richard C. Archeological Site Inventory of the Barataria Marsh Unit Core Area Jean Lafitte National Historical Park, Jefferson Parish, Louisiana. National Park Service. 1982.
Franks, Herschel A., Jill-Karen Yakubik and Marco J. Giardino. Archeological Survey in 65 Acres of Land Adjacent to Bayou des Familles. Southwest Cultural Resources Center Professional Papers, No. 26, Santa Fe, New Mexico. 1990.
Fuller, R. S. Identification and Analysis of Artifacts from Thirteen Sites in and Adjacent to the Barataria Unit of the Jean Lafitte National Historical Park, Jefferson Parish, Louisiana. Manuscript in Jean Lafitte National Historical Park and Preserve Library, 1990.

Gagliano, S., R.A. Weinstein, E. Burden, K. Brooks, and W. Gladner. Cultural Resources Survey of the Barataria, Segnette and Regional Waterways, Jefferson Parish, LA. New Orleans, New Orleans District Army Corps of Engineers, 1978.
Giardino, Marco. "Overview of the Archaeology of the Coquilles Site, Barataria Unit, Jean Lafitte National Park, Louisiana." 1986.
Goodwin and Associates, Inc. Preserving the Past for the Future: A Comprehensive Archeological and Historic Site Inventory of Jefferson Parish, Louisiana (Volumes 1-3) New Orleans, R.C. Goodwin and Associates, 1985.
Goodwin, R. Christopher. Archeological Assessment of the Barataria Unit, Jean Lafitte National Historical Park. By John Stuart Speaker, Joanna Chase, Carol Poplin, Herschel Franks and R. Christopher Goodwin. Southwest Region, National Park Service. 1986.
Holmes, Barbara. Historic Resources Study. The Barataria Unit of Jean Lafitte National Historical Park. Southwest Cultural Resources Center, Professional Papers No. 5, Santa Fe, New Mexico, 1986.
Impact Assessment, Inc. Traditional Use Study: Barataria Preserve, Jean Lafitte National Historical Park and Preserve. Impact Assessment, Inc., La Jolla, California, 1998.
Swanson, Betsy. Historic Jefferson Parish: From Shore to Shore. Gretna, LA. Pelican Publishing Co., 1975.
Swanson, Besty. Historic Land Use Study of a Portion of the Barataria Unit of the Jean Lafitte National Historical Park and Preserve. New Orleans, NPS, 1987.
Swanson, Betsy. Terre Haute de Barataria: A Historic Upland on an Old River Distributary Overtaken by Forest in the Barataria Unit of the Jean Lafitte National Historical Park and Preserve. Harahan, LA. Jefferson Parish Historical Commission. 1991.
Yakubik, Jill-Karen, Herschel A. Franks and Marco J. Giardino. Archeological Investigations of Six Spanish Colonial Period Sites Barataria Unit, Jean Lafitte National Historical Park and Preserve. Southwest Cultural Resources Center Professional Papers, No. 22, Santa Fe, NM, National Park Service. 1989.
(In Draft) Swanson, Betsy. Documenting the Link Between Environment and Culture in the Barataria National Historic District. A Cultural Resource Study: A Cultural Resource Study . 2009

8. Attachments:
[ ] Maps [ ] Archeological survey, if applicable [ ] Drawings [ ] Specifications [ ] Photographs
[ ] Scope of Work [ ] Site plan [ ] List of Materials [ ] Samples [ ] Other:

Prepared by **Allison Pena** Date: **December 15, 2009** Title: **Cultural Anthropologist Acting Regional Ethnographer & NAGPRA Coordinator** Telephone: **504-589-3882**

B. REVIEWS BY CULTURAL RESOURCE SPECIALISTS

The park 106 coordinator requested review by the park's cultural resource specialist/advisors as indicated by check-off boxes or as follows:

[**X**] Archeologist
Name: **Meredith Hardy**
Date: **10/16/2009**
Comments: **This project will result in the moving of earth/ground disturbance by destroying levees to fill in non-historic canals throughout Barataria unit of JELA. Many of these canals and levees were created in the 1930s-1950s and later, and are technically historic; however, some of these canals appear to have cut and/or utilized natural waterways or older canals. These intersections may have unrecorded cultural resources. Additionally, several of these canals and levees are located on lands that have been recently acquired by JELA, and have never had a cultural resources or archeological survey. A site visit and Phase I survey is necessary for this project. On another note, these canals are themselves components of the historical ecology and landscape of the area, and the story of the oil boom, 20th century changes to the landscape, and lessons learned from these actions should be recorded, told, and interpreted.**

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected __ No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:
Archeologist who conducts this survey should: 1) visit the state site files office to determine if there are previously identified archeological sites in the newly acquired lands, and obtain copies of all associated site forms. 2) All levees to be impacted should be visited, especially those in the newly acquired lands. 3) All intersections of canals and levees targeted for destruction with natural waterways and/or historic canals should be visited with a pedestrian survey (if above water), and if deemed necessary, subjected to limited subsurface testing.

[**X**] 106 Advisor
Name: **Tommy Jones**
Date: **12/14/2009**
Comments:

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected **X** No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:
No adverse effect provided issues raised by Ms. Hardy are properly addressed.

Doc Method:
Standard 4-Step Process

[**X**] Anthropologist
Name: **Allison Pena**
Date: **12/11/2009**
Comments: **We have contacted the American Indian tribes that may be affiliated with this project. We have received two responses - one from the Alabama-Coushatta Tribe of Texas and one from the Choctaw Nation of Oklahoma and both letters confirm that the project would have no adverse effect on historic properties. There are no ethnographic concerns for this project.**

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected __X__ No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:

Doc Method:
Standard 4-Step Process

No Reviews From: **Curator, Historical Architect, Historian, Other Advisor, Historical Landscape Architect**

C. PARK SECTION 106 COORDINATOR'S REVIEW AND RECOMMENDATIONS

1. Assessment of Effect:

_____ No Historic Properties Affected ___X__ No Adverse Effect _____ Adverse Effect

2. Compliance requirements:

[**X**] A. STANDARD 36 CFR PART 800 CONSULTATION
Further consultation under 36 CFR Part 800 is needed.

[ ] B. STREAMLINED REVIEW UNDER THE 2008 SERVICEWIDE PROGRAMMATIC AGREEMENT (PA)

The above action meets all conditions for a streamlined review under section III of the 2008 Servicewide PA for Section 106 compliance.

APPLICABLE STREAMLINED REVIEW Criteria
(Specify 1-16 of the list of streamlined review criteria.)

[ ] C. PLAN-RELATED UNDERTAKING

Consultation and review of the proposed undertaking were completed in the context of a plan review process, in accordance with the 2008 Servicewide PA and 36 CFR Part 800.
Specify plan/EA/EIS: _____

[ ] D. UNDERTAKING RELATED TO ANOTHER AGREEMENT
The proposed undertaking is covered for Section 106 purposes under another document such as a statewide agreement established in accord with 36 CFR 800.7 or counterpart regulations.
Specify: _____

[ ] E. COMPLIANCE REQUIREMENTS SATISFIED BY USE OF NEPA
Documentation is required for the preparation of an EA/FONSI or an EIS/ROD has been developed and used so as also to meet the requirements of 36 CFR 800.3 through 800.6

[ ] F. No Potential to Cause Effects [800.3(a)(1)]

[ ] G. STIPULATIONS/CONDITIONS
Following are listed any stipulations or conditions necessary to ensure that the assessment of effect above is consistent with 36 CFR Part 800 criteria of effect or to avoid or reduce potential adverse effects.

Recommended by Park Section 106 coordinator:
Name: **Margo Davis, Allison Pena**
Title: **NHPA Specialists**
Date:

D. SUPERINTENDENT'S APPROVAL

The proposed work conforms to the NPS *Management Policies* and *Cultural Resource Management Guideline*, and I have reviewed and approve the recommendations, stipulations, or conditions noted in Section C of this form.

Name/Signature of Superintendent David P. Uhler for Carol Clark
Date: 12/17/09

The letter on the next page was addressed and sent to the following tribal representatives of affiliated American Indian tribes.

Alabama-Coushatta Tribe of Texas
- Oscola Clayton M. Sylestine, Principal Chief
- Bryant J. Celestine, THPO

Caddo Nation
- Brenda G. Edwards, Tribal Chairperson
- Robert Cast, THPO

Chitimacha Tribe of Louisiana
- Lonnie Martin Jr., Tribal Chairman
- Kimberly Walden, Cultural Resources Director & NAGPR Representative

Choctaw Nation of Oklahoma
- Gregory E. Pyle, Chief
- Terry Cole, THPO

Coushatta Tribe of Louisiana
- Kevin Sickey, Tribal Chairman
- Bertney Langley, Heritage Center Director
- Linda Langley, Heritage Center Director

Jena Band of Choctaw Indians
- Christine Norris, Principal Chief
- Michael Tarpley, THPO

Mississippi Band of Choctaw Indians
- Beasley Densen, Miko
- Ken Carleton, THPO & NAGPR Representative

Quapaw Tribe of Oklahoma
- John Berrey, Chairman
- Carrie V. Wilson, THPO

Seminole Nation of Oklahoma
- Enoch Kelly Haney, Principal Chief
- Natalie Deere, THPO

Seminole Tribe of Florida
- Mitchell Cypress, Chairman
- Willard S. Steele, THPO
- Dawn Hutchings, Compliance Review Supervisor

Tunica-Biloxi Tribe of Louisiana

- Earl Barbry Sr., Tribal Chairman
- Earl Barbry Jr., THPO & NAGPRA Representative

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

October 2, 2009

Address

Dear Tribal Representative:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of Jean Lafitte National Historical Park and Preserve is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes...that shall be consulted in the 106 process," I am writing to inquire if the TRIBE
desires to consult with the park regarding the proposed project. A brief description of the proposal follows this paragraph, and I have enclosed a map of the area potentially affected. An initial public scoping notice regarding the proposed project was sent to you on September 30, 2009.

The project under consideration would reclaim more than 20 miles of canals in the Barataria Preserve, a unit of Jean Lafitte National Historical Park and Preserve located just south of the greater New Orleans metropolitan area. The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

The park's legislative mandate, general management plan, and resource management plan direct that the Preserve is to be managed to preserve natural resources and values. The legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and

undermine the ability of the park to preserve and protect those values.

The Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve contains the Barataria Unit Historic District and a number of prehistoric and historic sites and historic structures. The canals proposed for backfilling are in areas without adjacent sites, with one exception: 16-JE-56, a shell midden associated with the Baytown and Mississippian Cultural Periods. We propose, therefore, to leave the spoilbank intact near 16-JE-56 and to refrain from backfilling the canal in that vicinity. No other known sites within the project area have the potential to be impacted by the project.

If you wish to consult with us regarding the project as provided for under the regulations for the National Historic Preservation Act, please write to me at the letterhead address, or contact me by phone at 504 589-3882 x111 or e-mail at jela_superintendent@nps.gov, so that we may arrange mutually agreeable time(s) and location(s) for consultation. We are looking forward to your reply.

Sincerely,

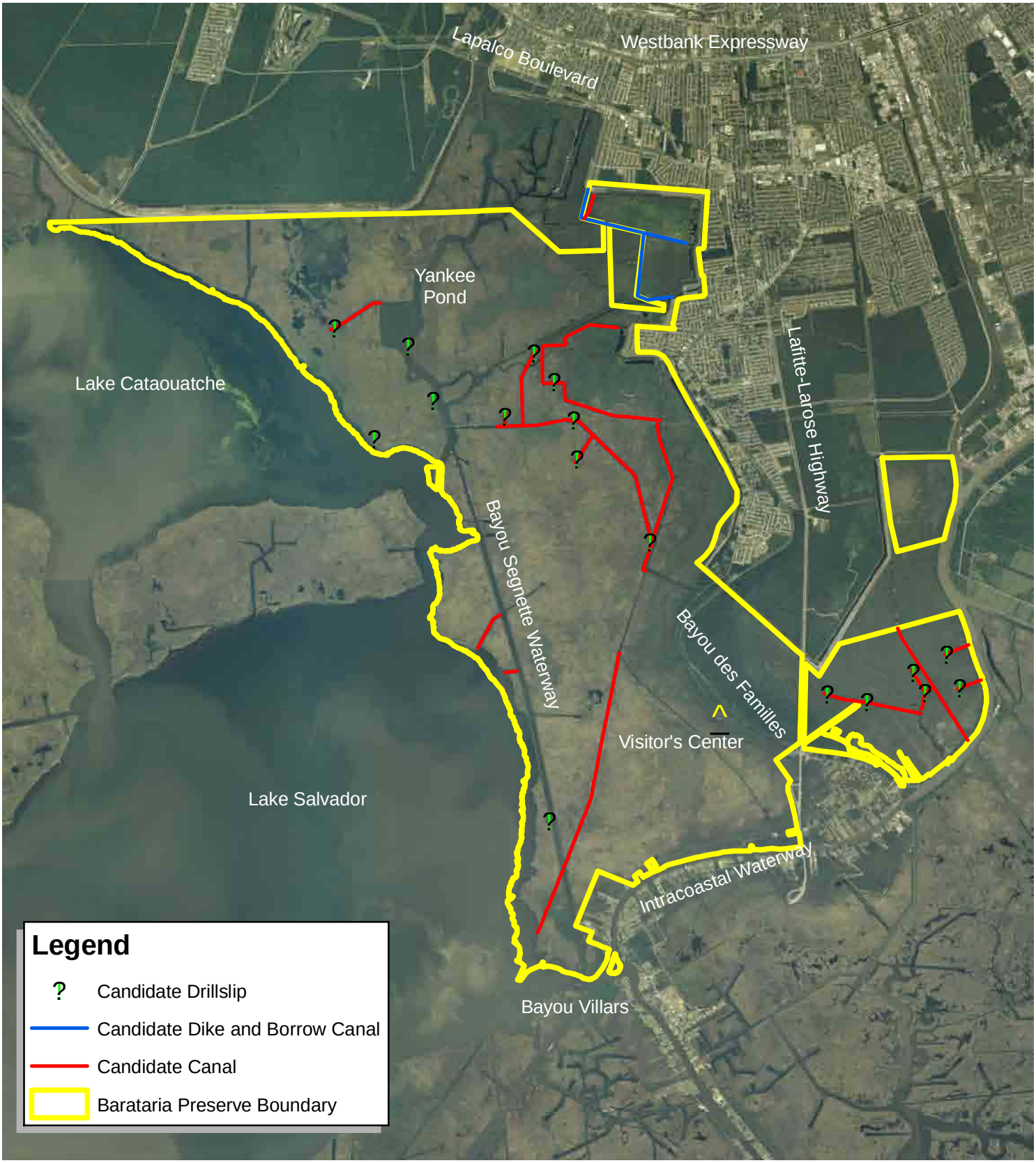
Carol A. Clark
Acting Superintendent

Enclosure

Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior

Canal Reclamation at Barataria Preserve



0 0.5 1 2 3 4 Miles

Note: Basemap is 2008 true color DOQQ aerial imagery from the USGS National Wetlands Research Center and the CWPPRA Task Force.

Produced 10/01/2009

FILE: BARA_CanalRestoScopeBmap.mxd

recd. 10/23/09

ALABAMA-COUSHATTA TRIBE OF TEXAS

571 State Park Rd 56 • Livingston, Texas 77351 • (936) 563-1100

October 20, 2009

Carol A. Clark
Jean Lafitte National Historical Park
& Preserve
419 Decatur Street
New Orleans, Louisiana 70130

Dear Ms. Clark:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe, our appreciation is expressed on your efforts to consult us regarding the Barataria Preserve Canal Reclamation proposal.

Our Tribe maintains ancestral associations within the state of Louisiana despite the absence of written records to completely identify Tribal activities, villages, trails, or burial sites. However, it is our objective to ensure significances of Native American ancestry, especially of the Alabama-Coushatta Tribe, are administered with the utmost considerations.

Upon review of your October 2, 2009 submission, no known impacts to religious, cultural, or historical assets of the Alabama-Coushatta Tribe of Texas should occur in conjunction with this proposal. However, in the event of inadvertent discovery of human remains and/or archaeological artifacts, activity in proximity to the location must cease and appropriate authorities, including this office, notified without delay.

Should you require additional assistance, please do not hesitate to contact us.

Respectfully submitted,

Bryant J. Celestine
Historic Preservation Officer

Choctaw Nation of Oklahoma

P.O. Box 1210 • Durant, OK 74702-1210 • (580) 924-8280

Gregory E. Pyle
Chief

Gary Batton
Assistant Chief

Rec 11/17/09

November 9, 2009

Ltr 11/16/09

Carol A. Cook
US Dept of the Interior
National Park Service
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

Dear Carol Cook:

We have reviewed the following proposed project (s) as to its effect regarding religious and/or cultural significance to historic properties that may be affected by an undertaking of the projects area of potential effect.

Project Description: Canal Reclamation at Barataria Preserve

Comments: After review of the above-mentioned project(s), to the best of our knowledge, it will have no adverse effect on any historic properties in the project's area of potential effect. However, should construction activities exposed human remains, buried archaeological materials such as chipped stone, tools, pottery, bone, glass or metal items, or should it uncover evidence of buried historic building materials such as rock foundations, brick, or hand-poured concrete, this office should be contacted immediately at 1-800-522-6170 ext. 2137.

Sincerely,

Terry D. Cole
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma

By: _____
Caren Johnson
Administrative Assistant
Choctaw Nation of Oklahoma

CAJ:vr

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

NPS 645/100734 December 2009

United States Department of the Interior ✧ National Park Service

National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical Park and Preserve
Louisiana

FINDING OF NO SIGNIFICANT IMPACT

CANAL RECLAMATION AT BARATARIA PRESERVE JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, LOUISIANA

The National Park Service (NPS) proposes to reclaim disturbed wetlands in the 25,000-acre Barataria Preserve (Preserve), a unit of the Jean Lafitte National Historical Park and Preserve (the park). These disturbed wetlands include canals and their earthen spoil deposits. The canals were dredged for the various purposes of accessing oil and gas drill sites; creating oil and gas pipeline routes; and providing borrow material for the construction of dikes meant to facilitate drainage and residential subdivision development in wetlands which never fully materialized. These canals were constructed prior to the park's establishment and NPS ownership, and before the imposition of stricter regulatory requirements under the wetland provisions of the Clean Water Act. These canals and their associated spoilbanks have had lasting effects on the landscape and environment because very few have been reclaimed.

The reclamation of more than 20 miles of non- historic canals is needed to help restore and maintain the integrity of the ecological and biological processes of the Preserve. Without adequate reclamation measures, canals in the Preserve will continue to stress Preserve resources and values, with continued adverse impacts on natural hydrology, ecology, water quality, and wetland functions and values.

The objectives of this project are to restore wetland functions and values including hydrology (which includes water, sediment, and nutrient movement), improve resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms), improve visitor experience, and avoid or minimize adverse impacts to Preserve resources and values.

The NPS completed an environmental assessment (EA) that provides an analysis of the environmental consequences of the alternatives considered for reclaiming more than 20 miles of non- historic canals. The EA was prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), its implementing regulations by the Council on Environmental Quality (40 CFR Parts 1500- 1508), NPS Director's Order #12, and its accompanying Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision- making* (DO- 12).

SELECTED ALTERNATIVE

Within the EA, the NPS identified alternative B as the preferred alternative. Under the preferred alternative, more than 20 miles of non- historic canals within the Preserve will be reclaimed by degrading spoilbanks and dikes to meet the level of the surrounding wetlands and partially filling the open water of the canals with the degraded soil and

vegetative material. The canals will then be allowed to revert to marsh, swamp, and shallow water habitat by natural processes, recreating freshwater wetlands.

Degrading spoilbanks and dikes will be accomplished from the canals and/or the spoilbanks using a marsh buggy, barge- mounted excavator, or similar earth- moving equipment. Access to the reclamation areas will be via canals and/or spoilbanks. In consideration of habitat restoration/preservation and potential impacts to navigation and recreation, the NPS may also use one or a combination of the following techniques. The techniques implemented will be based on existing conditions in the Preserve at the time of degrading and funding considerations.

Check Meanders: In areas where canals identified for reclamation meet a maintained navigable waterway, that is, the Bayou Segnette Waterway or the Gulf Intracoastal Waterway (GIWW), check meanders will be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation. The check meander will be installed in the canal upstream of the confluence with the navigable waterway and will consist of a double earthen plug with small openings on either end to allow for water exchange and aquatic access for fish and wildlife. The check meander will be constructed using only spoilbank material available from the canal itself. The purpose of the check meander will be to prevent the discharge of woody vegetation and sediment from the partially filled canal into the navigable channel, and to protect the reclaimed canal from direct wave action and tidal surges from the navigable channel.

Vegetation Removal: In non- historic canals where pushing woody vegetation into the open water may interfere with navigation, such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal, and Davis/Marrero Canal, as well as in canals in the Bayou aux Carpes area, cut woody vegetation may be placed parallel to the banks of the canal or chipped in place. Woody vegetation also may be chipped in place in canals or drillslips that meet a navigable waterway to prevent large woody debris from drifting into the navigable waterway.

Gapping: Gapping is a technique whereby spoilbanks will be intermittently breached to restore hydrological connections between the canal and the surrounding wetlands. Gapping will likely be used in areas throughout the project area where it will be too costly to degrade an entire spoilbank or dike due to the amount of material present. The gapped material will be used to partially fill the open water area of the canal.

Revegetation: Some reclaimed areas that are adjacent to forested wetlands may be revegetated with native woody species such as baldcypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*).

OTHER ALTERNATIVES CONSIDERED

The no action alternative (alternative A) was the only other alternative evaluated in the EA. The no action alternative is a continuation of current conditions, under which the NPS would not degrade spoilbanks and dikes to the level of the surrounding wetlands for more than 20 miles of non- historic canals within the Preserve. The non- historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. The NPS would continue to maintain and protect the natural resources, functions, and values within the Preserve and would respond to future needs

and conditions associated with the canals and coastal wetlands without extensive actions or changes in the present course.

ALTERNATIVES CONSIDERED BUT DISMISSED

The NPS considered and rejected several alternatives during the development of the draft EA.

Complete Plugs

Under this option, spoilbanks would be degraded, and material obtained from them would be used to construct complete plugs at the canal openings. The plugged water channels would be left to naturally accumulate debris and return to pre- disturbance conditions. This alternative was dismissed because completely plugging a canal would cut off the exchange of water in and out of the canal and adjacent marsh, altering local hydrology and resulting in detrimental effects on water quality. Therefore, it did not meet the purpose and need of the project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non- historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

Completely Filling Canals

Under this option, canals would be partially filled with material acquired from degraded spoilbanks and then supplemented with additional dredged material obtained from an off- site source to completely fill the remaining open water of the canal. This alternative was dismissed because previous studies in the Preserve indicate that this method does not achieve a greater ecological result than just using spoilbank material to partially fill the canals, yet costs eight times as much due to the added dredging and transportation costs.

Degrading Spoilbanks onto the Marsh

Under this option, degraded spoilbank material (soil and vegetation) would be placed on the marsh instead of in the canals, thus leaving the canals as open water. This alternative was dismissed because it would directly destroy the type of wetland habitat that the project is trying to restore, and would not meet the purpose and need of the project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non- historic canals, and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

RATIONALE FOR SELECTED ALTERNATIVE

The selected alternative (alternative B) meets the project objectives of restoring wetland functions and values including hydrology, improving resiliency of Preserve ecosystems in the face of subsidence and climate change impacts, improving visitor experience, and avoiding or minimizing adverse impacts to Preserve resources and values. As summarized in the following sections, the selected alternative (preferred alternative) also best meets the criteria in Section 101 of NEPA for the environmentally preferred alternative, and, as described in the EA, there are no significant impacts on the human environment as defined by criteria in 40 CFR 1508.27.

Environmentally Preferred Alternative

The Council on Environmental Quality (CEQ) defines the environmentally preferred alternative as the alternative that best meets the following criteria or objectives, as set out in Section 101 of NEPA:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Simply put, this means that the environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment; it also means it is the alternative that best protects, preserves, and enhances historic, cultural and natural resources (CEQ Q6a). After completing the environmental analysis, the NPS identified alternative B as the environmentally preferred alternative in the EA because it best meets the CEQ's established definition. The no action alternative (alternative A) is not the environmentally preferred alternative because it would not improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 2, 3, and 4) as well as alternative B, nor would it fulfill the responsibilities of each generation as trustee of the environment by improving the degraded condition of the Preserve wetlands (NEPA criteria 1). Failure to reclaim the canals would allow the disruption of natural patterns of water movement to continue, degrade water quality, result in continued erosion, and preserve habitat for invasive floating vegetation.

Alternative B was selected as the environmentally preferred alternative based on the following criteria:

it will restore wetland functions and values: hydrology (which includes water, sediment and nutrient movement); vegetation; wildlife habitat; and access for estuarine organisms by reclaiming more than 20 miles of non-historic canals within the Preserve (NEPA criteria 1, 2, 3, and 4);

it will improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 1, 2, 3, and 4);

it will improve visitor experience by restoring the coastal wetland landscape allowing visitors to enjoy a more natural system, representative of the historic wetlands and ecosystems present prior to the canals (NEPA criteria 2); and

it will avoid or minimize adverse impacts to Preserve resources and values (NEPA 1, 2, and 4).

MITIGATION MEASURES

The NPS places a strong emphasis on avoiding, minimizing, and mitigating potentially adverse environmental impacts. To help ensure the protection of natural and cultural resources and the quality of the visitor experience, the mitigation measures identified in Table 1 will be implemented as part of the selected alternative. The NPS will implement an appropriate level of monitoring throughout the construction process to help ensure that protective measures are being properly implemented and are achieving their intended results.

Table 1. Mitigation Measures to be Implemented.

Resource	Mitigations
General Measures	NPS personnel will identify spoilbanks and canals to be degraded and partially filled and will regularly monitor the work. To minimize possible petrochemical spills from construction equipment, the contractor will regularly monitor and check equipment to identify and repair any leaks. Spill containment materials will be staged near the action area for use to contain or collect any accidental fuel or chemical spills from construction equipment. Upon discovery, any fuel or chemical spills associated with construction activities will be immediately contained and reported to the NPS. Fueling of vehicles and equipment will take place outside the Preserve whenever possible; if fueling within the Preserve is required, no less than two persons will attend these activities, and fueling will be completed over a physical barrier, such as a tarp, and absorbent materials.
Soils and Geology	To eliminate impacts to soils outside of the immediate project areas, equipment access to the areas to be degraded will be via the canals and/or spoilbanks.
Vegetation	Weed control measures (e.g., cleaning/washing of vehicles/vessels, equipment, and personal equipment before entering/re-entering the Preserve) will be implemented to help minimize the potential for the introduction and spread of nonnative species. To eliminate potential impacts to marsh vegetation caused by driving over it, construction equipment will access the project areas via the canals and/or spoilbanks.
Fish and Wildlife/ Special Status Species	Construction activities will be timed to avoid nesting activities of bird species, including if any work with heavy machinery is within 0.2 miles of an active rookery (colonial nesting place for herons, egrets, and similar water birds), or within 1 mile of an active bald eagle nest.
Water Resources	Boats operating in the canals during reclamation activities will use only four stroke engines.
Wetlands	Ground crews will be instructed by park staff on how to avoid damaging any part or whole of wetland vegetation in the Preserve other than the vegetation to be removed on the spoilbanks. The NPS will regularly monitor to ensure non-spoilbank wetland vegetation is not damaged during reclamation activities.
Cultural Resources	A Phase 1 survey will be conducted for archeological sites in the project area by qualified staff from the Southeast Archeological Center prior to any construction activities. The archeologist will visit: (1) the state site files office to determine if there are previously identified archeological sites in the newly acquired lands and obtain copies of all associated site forms; (2) all spoilbanks and dikes to be impacted, especially those in the newly acquired lands; and (3) all intersections of canals and spoilbanks in the project area with natural waterways and/or historic canals and perform a pedestrian survey (if above water), and, if deemed necessary, conduct limited subsurface testing. Known archeological sites, including those identified in the Phase I survey, will be flagged for avoidance by the archeologist and removed from the project area. If evidence of archeological sites or historic structures is inadvertently discovered during construction activities, work in the area will cease, and qualified NPS personnel will assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribes.
Visitor Experience	Where canals identified for reclamation meet the maintained navigable Bayou Segnette Waterway or the GIWW, check meanders will be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation. To avoid impacts to navigation caused by pushing woody vegetation into Tarpaper Canal, Horseshoe Canal, Pipeline Canal and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area, cut woody vegetation will either be placed parallel to the banks of the canal or chipped in place. Temporary canal closures will be put into place in areas where construction activities are occurring to eliminate any potential impacts to the health and safety of Preserve visitors.

WHY THE SELECTED ALTERNATIVE WILL NOT HAVE A SIGNIFICANT EFFECT ON THE HUMAN ENVIRONMENT

As defined in 40 CFR §1508.27, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

No adverse or beneficial impacts were identified in the EA that are considered significant and require analysis in an environmental impact statement.

Over the short- term, reclaiming more than 20 miles of non- historic canals under the preferred alternative, while employing the mitigation measures, will result in some short- term negligible to minor adverse impacts. Project activities will disturb and compact spoilbank soils; spoilbank vegetation will be removed; fish and wildlife, including special status species, will be displaced and disturbed by noise; and benthic species will be buried through the placement of spoil material in the canals. In addition, turbidity levels and quantities of suspended particulates in the water column will increase temporarily during placement of degraded spoil material in the canals, wetlands will be adversely impacted from partially filling canal areas with spoil material and removing wetland vegetation growing on the spoilbanks, and visitors will be impacted through temporary closures and increased noise levels from equipment during project activities. Visitor use and experience will also experience long- term minor adverse impacts from reduced boat/fishing access to some reclaimed canals.

However, over the long- term, the preferred alternative will also result in beneficial impacts to soils and geology; vegetation; fish and wildlife, including essential fish habitat (EFH); special status species; hydrology and water quality; wetlands; and visitor use and experience by restoring hydrologic functions and increasing the amount of and preserving the existing native wetland habitat.

The degree to which the proposed action affects public health and safety.

In the vicinity of construction activities, canals will be closed to visitor use for safety reasons minimizing potential impacts to Preserve visitors. In canals where pushing woody vegetation into open water may interfere with navigation and present safety hazards, such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal, and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area, cut woody vegetation will either be chipped in place or placed parallel to the banks of the canals allowing visitors to still use the canals without impacting navigation. Along the Bayou Segnette Waterway and the GIWW, which are maintained waterways, check meanders will be installed in the reclaimed canals to prevent woody debris and sediment from moving into the waterway and impeding navigation.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

More than 95 percent of the Barataria Preserve is classified as forested or emergent wetlands, and the Preserve is part of the Barataria-Terrebonne National Estuary, deemed ecologically significant by the U.S. Environmental Protection Agency (EPA). It is the only example of a floating marsh in the national park system, and is part of one of only four large estuarine floating freshwater marsh complexes in the world. Bayou aux Carpes, in the eastern portion of the Preserve, is also one of only 12 areas in the country known as 404(c) areas where the EPA has exercised its authority under Section 404(c) of the Clean Water Act to prohibit, restrict, or deny the discharge of dredged or fill material into waters of the United States due to the high quality of the area. However, the 1985 final determination for the 404(c) designation concerning Bayou aux Carpes includes a provision that discharges of fill in the area would be allowed if the "discharges [were] associated with projects with the sole purpose of habitat enhancement and [were] specifically approved by EPA." and provided that the discharges were authorized by a Corps of Engineers Section 404 permit (EPA 1985). There will be short-term negligible to minor adverse impacts to wetlands during project activities from the removal of spoilbank vegetation and the placing of spoil material in the canals. However, reclaiming the canals will provide long-term beneficial impacts by creating acres of new wetlands and protecting existing interior marsh habitat. The existence of the 404(c) designation changes the regulatory environment for Bayou aux Carpes, as the NPS must meet EPA's regulatory requirements differently in Bayou aux Carpes than elsewhere in the Preserve. To ensure the integrity of the 404(c) area, the NPS will meet all of the EPA regulatory requirements as stipulated in the EPA's 1985 final determination for the Bayou aux Carpes 404(c) designation prior to commencing any construction activities in the Bayou aux Carpes area.

Executive Order 11990 (Protection of Wetlands) requires an examination of impacts to wetlands, and the 2006 NPS Management Policies and Director's Order (DO) #77-1 provide guidelines for proposed actions within wetlands. The project will not require a Statement of Findings because the project qualifies as an exception under DO #77-1 (Wetland Protection). According to the NPS Procedural Manual #77-1: Wetland Protection, actions designed specifically for the purpose of restoring degraded (or completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes are excepted. For purposes of this exception "restoration" refers to reestablishing environments in which natural ecological processes can, to the extent practicable, function at the site as they did prior to disturbance. Temporary wetland disturbances that are directly associated with and are necessary for implementing the restoration are allowed under this exception (see "conditions" in Section 4.2.2 of the NPS Procedural Manual #77-1). Actions causing a cumulative total of up to 0.25 acre of new long-term adverse impacts on natural wetlands may be allowed under this exception if they are directly associated with and necessary for the restoration (e.g., small structures or berms). The project will meet these requirements, thus no Statement of Findings for wetlands is required.

Aquatic and tidally influenced wetland habitats in the Preserve are designated as essential fish habitat (EFH) for certain life stages of brown shrimp (*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), bull shark (*Carcharhinus leucas*), red drum (*Sciaenops ocellatus*), and stone crab (*Menippe mercenaria*). Reclaiming the canals will result in short-term negligible to minor impacts that may adversely affect EFH through the temporary displacement of older life stages of species with designated EFH and their prey species,

the one- time loss of early larval stages and older life stages of benthic species, as well as their prey species caused by placement of material in the canals, and the temporary increase in turbidity levels and quantities of suspended particulates caused by construction activities. However, these short- term adverse impacts will be offset by the long- term beneficial impacts resulting from the creation of more fishery productive categories of EFH (e.g. shallow water bottoms, submerged aquatic vegetation (SAV), and marsh edge) from less productive habitats (deeper water bottoms) or non- wetland habitats (spoilbanks).

The Preserve is a component of the Barataria- Terrebonne Important Bird Area for migratory birds and is important habitat for trans- gulf neotropical spring and fall migrants as stopover habitat. This is discussed under a separate criterion below. Historic and cultural resources are also discussed under a separate criterion below.

The degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.

No highly uncertain, unique, or unknown risks were identified during either preparation of the EA or the public comment period.

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The preferred alternative neither establishes an NPS precedent for future actions with significant effects nor represents a decision in principle about a future consideration.

Within the boundaries of the Preserve, there are land holdings that are subject to mineral reservations that allow operators owning those property rights the right of access to the surface to explore for and develop the mineral interest. None of the oil and gas access canals and drillslips targeted for reclamation are active, and all are currently abandoned. The project will not preclude future reopening of reclaimed canals and drillslips for the purpose of mineral exploration and development. Therefore, reclaiming these canals and drillslips will not prevent owners or lessees of mineral rights from exercising their property rights in the future.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

Impacts on soils and geology, vegetation and non- native species, fish and wildlife, special status species, hydrology and water quality, wetlands, and visitor use and experience (including health and safety) were analyzed for the selected alternative (preferred alternative) of the EA.

As described in the EA, cumulative impacts were determined by combining the impacts of the selected alternative (preferred alternative) with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, present, or reasonably foreseeable future projects at Barataria Preserve and, if applicable, the surrounding area. Overall, the selected alternative would contribute minimally to adverse cumulative effects for each of the resources impacted by the selected alternative.

It would also add a long- term beneficial increment to cumulative effects from the creation of acres of new wetlands and the protection of existing interior wetland habitat.

The degree to which the action may adversely affect districts, sites, highways, structures or objects listed on the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

In accordance with 36 CFR 800.5(d)(1), the NPS determined that there will be no adverse effects on archeological resources or historic properties under the condition that the mitigation measures outlined in the EA and this Finding of No Significant Impact are followed prior to implementing the project, including that all work in the area will stop and qualified NPS personnel will assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribes should unexpected discoveries be made during construction or buried human remains be discovered. None of the canals targeted for reclamation are identified as contributing elements to the historical features of the Barataria Unit National Historic District. There are no known historic structures within the project area, and the NPS will leave the spoilbank intact and refrain from backfilling the canal in the vicinity of the one known archeological site, a midden.

The degree to which the action may adversely affect an endangered or threatened species or its critical habitat.

The U.S. Fish and Wildlife Service's (USFWS) website (http://www.fws.gov/lafayette/section7) was consulted on September 1, 2009, for listed species that may occur in or near the project area. The green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricate*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*), along with the West Indian manatee (*Trichechus manatus*) and pallid sturgeon (*Scaphirhynchus albus*) all are listed as species that may occur in Jefferson Parrish, the location of the project. Jefferson Parish also contains critical habit for the gulf sturgeon (*Acipenser oxyrinchus desotoi*) and the piping plover (*Charadrius melodus*). According to park staff and recent biological inventories, no federally listed threatened or endangered species reside in the project area, there is no critical habitat in the Preserve, and by letter dated September 11, 2009, the Louisiana Field Office of the USFWS indicated that the project is not likely to adversely affect these species or any critical habitat for these species.

State special status species found within the Preserve include three animal species, which have been designated as state species of special concern. The Preserve is also a component of the Barataria- Terrebonne Important Bird Area for migratory birds, which are also considered special status species, and is important habitat for trans- gulf neotropical spring and fall migrants as stopover habitat.

The preferred alternative will result in short- term minor impacts to the special status species described above from abnormal noise levels caused by construction equipment. Spoilbank vegetation used by migratory birds for cover and forage will be removed; however, this fairly narrow fringe habitat dominated by the invasive Chinese tallow tree

(*Triadica sebifera*) is considered poor quality habitat, and special status species will likely use the surrounding riparian forests, considered to be much higher quality habitat, for cover and forage in the absence of the existing spoilbank habitat. Over the long- term, the preferred alternative will result in beneficial impacts to special status species because native wetland vegetation species providing additional native habitat are expected to recolonize the area after spoil material is removed.

Whether the action threatens a violation of federal, state or local law imposed for the protection of the environment.

The selected alternative violates no federal, state, or local environmental protection laws.

IMPAIRMENT OF PRESERVE RESOURCES OR VALUES

In addition to reviewing the list of significance criteria, the NPS determined that implementation of the preferred alternative will not constitute an impairment to the Preserve resources and values. This determination is based on a thorough analysis of the impacts described in the EA and this Finding of No Significant Impact, agency and public comments received, and professional judgment of the decision- maker guided by direction in the NPS Management Policies 2006 (August 31, 2006). As described in the EA and this Finding of No Significant Impact, impairment will not occur because implementation of the preferred alternative will not result in major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of Jean Lafitte National Historical Park and Preserve; (2) key to the natural or cultural integrity of the Preserve or to opportunities for enjoyment of the Preserve; or (3) identified as a goal in the park's General Management Plan or other relevant NPS planning documents.

PUBLIC INVOLVEMENT AND AGENCY CONSULTATION

Internal scoping meetings were held at the park on October 8 and 9, 2009. The meetings were attended by personnel from the park, the NPS Denver Service Center, the Louis Berger Group, and PENSCO. This interdisciplinary process defined the purpose, need, and objectives of the plan; identified potential issues; discussed preliminary alternatives; and defined data needs.

To notify interested parties of the project, an informational brochure was mailed out to 86 representatives of educational institutions, nongovernmental organizations, parish governments, and federal agencies, as well as other people who expressed interest in the project. In addition, the park e- mailed 58 electronic copies of the brochure to a similar cross section of individuals, and the brochure was posted on the NPS' Planning, Environment, and Public Comment (PEPC) website (www.parkplanning.nps.gov/jela) and on the park's website (www.nps.gov/jela/parkmgmt/publicinvolvement.htm). In addition, a press release was sent to The Times Picayune, which resulted in a front- page story on the project on October 12, 2009, and an editorial in support of the project on October 14, 2009. With the scoping brochure, the public was given 30 days to comment on the project from October 2, 2009, through October 31, 2009.

The undertakings described in the EA are subject to Section 106, as amended in 1992 (16 USC 470 et seq.). Project scoping letters were sent to Native American tribes with identified cultural affiliation to the park and the Louisiana State Historic Preservation

Officer (LA SHPO) on October 2, 2009. The park also sent a Determination of *No Adverse Effect* to the LA SHPO on December 17, 2009, seeking concurrence with the NPS' finding that the project will have *no adverse effects* on archeological or historic properties. The determination was also sent to the Alabama- Coushatta Tribe of Texas and the Choctaw Nation of Oklahoma, the two tribes that responded to the scoping notice for the project. By letter dated January 15, 2010, the LA SHPO concurred with the NPS' *No Adverse Effect* determination. By letter dated December 30, 2009 the Choctaw Nation of Oklahoma also concurred with the *No Adverse Effect* determination, and along with the Alabama- Coushatta Tribe of Texas in their October 20, 2009 response to the initial project scoping notice, requested that they be contacted should construction activities unexpectedly discover human remains and/or archeological artifacts.

In accordance with section 7(c) of the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.), it is the responsibility of the federal agency proposing the action (in this case the NPS) to determine whether the proposed action will adversely affect any listed species or designated critical habitat. After consulting internet sources and with species experts, a consultation letter was sent to the Lafayette Ecological Services Field Office of the USFWS on September 2, 2009. By letter dated September 11, 2009 the USFWS indicated that the project will not adversely affect listed species or critical habitat.

By letter dated January 15, 2010, the National Marine Fisheries Service (NMFS) provided comments on the EA indicating that the NPS needed to include an analysis of potential impacts to Essential Fish Habitat (EFH) in the EA. While they recommended the inclusion of an EFH analysis, the NMFS also indicated that they have no EFH Conservation Recommendations to make and do not object to implementation of the project. By correspondence dated February 26, 2010, the NPS provided to NMFS a summary of information to be included in the Errata Sheet of the FONSI addressing their comments on the EA. In follow- up correspondence dated February 26, 2010, the NMFS indicated that the NPS was adequately addressing their comments and confirmed that no further formal consultation with the agency was needed.

The EA was made available for public review and comment during a 30- day period ending January 26, 2010. An electronic copy of the EA was placed on the park's PEPC website. The public was invited to submit comments or concerns related to this project online at http://parkplanning.nps.gov/jela or by mail to park headquarters in New Orleans, Louisiana.

Copies of the EA were made available at area public libraries and the park's visitor centers. Copies of the EA were also sent to the LA SHPO and the Marrero Land & Improvement Association, because they requested a copy during the public scoping period. Other entities on the mailing list for the project, educational institutions, nongovernmental organizations, parish governments, federal agencies, affiliated tribes, as well as other people, who expressed interest, received a letter announcing the availability of the EA for review.

During the 30- day public comment period, the NPS received 31 pieces of correspondence, one of which had four signatures. This total includes 2 from businesses, 2 from the Federal government, 1 from the state government, 4 from conservation

organizations, and 22 from individual citizens. Substantive comments received that necessitated textual changes to the EA are included in the Errata Sheet appended to this document. There were no substantive changes to the selected alternative or the impact analysis as a result of public comment. The Errata Sheet also contains a summary of the comments received on the EA and NPS responses to those comments.

REFERENCES

Environmental Protection Agency (EPA)

1985 Final determination of the U.S. Environmental Protection Agency's Assistant Administrator for External Affairs concerning the Bayou aux Carpes site in Jefferson Parish, Louisiana pursuant to section 404(c) of the Clean Water Act.

2006 Wetlands: Protecting Life and Property from Flooding. May 2006. Accessed December 14, 2007. Available at: http://www.epa.gov/owow/wetlands/pdf/Flooding.pdf.

CONCLUSION

The NPS has selected alternative B for implementation. The impacts that will result from the selected alternative will not impair any Preserve resources or values necessary to fulfill specific purposes identified in the park's enabling legislation.

The selected alternative does not constitute an action that normally requires preparation of an environmental impact statement (EIS). The selected alternative will not have a significant impact on the human environment. Negative environmental impacts that could occur are negligible or minor in intensity. There are no significant impacts on public health, safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the selected alternative will not violate any federal, state, or local environmental law.

Based on the foregoing, it has been determined that an EIS is not required for this action and thus will not be prepared.

Recommended: 3-3-10

Carol A. Clark — Date
Superintendent
Jean Lafitte National Historical Park
and Preserve

Approved: 3-4-10

David Vela — Date
Regional Director
Southeast Region

ERRATA SHEET

CANAL RECLAMATION AT BARATARIA PRESERVE
JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE, LOUISIANA

This errata sheet documents changes to the text of the Canal Reclamation at Barataria Preserve environmental assessment (EA) as the result of substantive comments received since the document was released on December 26, 2009. An interdisciplinary team reviewed these responses to identify any substantive comments. Substantive comments were considered to be comments that:

question, with reasonable basis, the accuracy of information in the EA.
question, with reasonable basis, the adequacy of environmental analysis.
present reasonable alternatives other than those presented in the EA.
cause changes or revisions in the proposal.

Responses to comments on the EA follow the changes in text.

EA TEXT CHANGES BASED ON SUBSTANTIVE CONCERNS

Page viii, Acronyms and Abbreviations: Add acronym after EA:

EFH Essential Fish Habitat

Page viii, Acronyms and Abbreviations: Add acronym after EPA:

GIWW Gulf Intracoastal Waterway

Page viii, Acronyms and Abbreviations: Add acronym after GIWWCC:

GMFMC Gulf of Mexico Fishery Management Council

Page viii, Acronyms and Abbreviations: Add acronyms after NEPA:

NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration

Page viii, Acronyms and Abbreviations: Add acronyms after NWI:

ppt parts per thousand
SAV Submerged Aquatic Vegetation

Page 15, Impact Topics Eliminated (or Dismissed) From Further Analysis and Consideration, Socioeconomics: Add a new paragraph before "A swamp tour company...":

"Degrading spoilbanks and partially filling the open water of canals and drillslips in areas that are subject to mineral reservations would increase the cost of accessing these sites for future exploration and development of the mineral interest because the material placed in

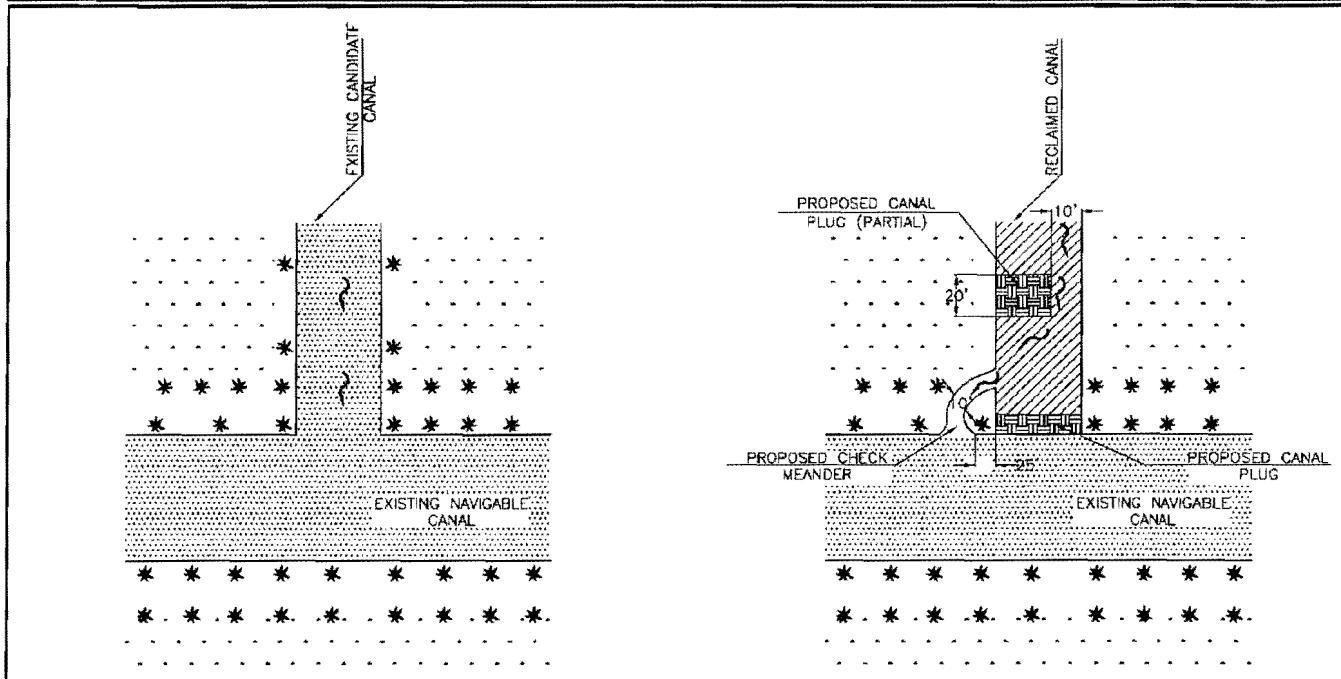
the open water of the canals and drillslips would need to be redredged. Site access can be a significant proportion of the cost of exploring and developing mineral interests, but the increase in cost associated with additional dredging due to canal reclamation would be negligible, for accessing these areas for reuse would almost certainly require some maintenance dredging regardless of whether or not the canals and drillslips were reclaimed. A large portion of the costs associated with dredging activities comes from the mobilization of equipment to the worksite, and this cost would be the same regardless of the amount of material to be moved."

Page 16, Alternatives, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Sixth paragraph (*Check Meanders*), First sentence: Add "or the Gulf Intracoastal Waterway (GIWW)" after "the Bayou Segnette Waterway".

Page 17, Alternatives, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative): Replace Figure 4. Check Meanders with following new Figure 4. Check Meanders.

Proposed Check Meander Plan View:
Canal Reclamation at Barataria Preserve:
Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior



EXISTING CONDITIONS
N.T.S

LEGEND
FLOW DIRECTION
EXISTING SPOILBANKS
EXISTING MARSH

PROPOSED CONDITIONS
N.T.S

NOTE:
1. THE FIGURES SHOWN ARE NOT TO SCALE (N.T.S).
2. ALL DIMENSIONS INDICATED IN THE PROPOSED CONDITION PLAN VIEW ARE APPROXIMATE AND MAY BE ALTERED AS PER SPECIFIC DESIGN REQUIREMENTS.

Page 18, Alternatives, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Second paragraph (*Vegetation Removal*), First sentence: Delete "used by commercial swamp tours".

Page 19, Mitigation Measures of the Action Alternative, Fish and Wildlife/Special Status Species, First bullet: Add ", including if any work with heavy machinery is within 0.2 miles of an active rookery (colonial nesting place for herons, egrets, and similar water birds) or within 1 mile of an active bald eagle nest." after "bird species".

Page 19, Mitigation Measures of the Action Alternative, Visitor Use and Experience, First bullet: Add "or the GIWW" after "Bayou Segnette Waterway".

Page 20, Mitigation Measures of the Action Alternative, Visitor Use and Experience, First bullet: Delete "used by commercial swamp tours".

Page 35, Affected Environment, Fish and Wildlife, Fish, First paragraph: Add "In addition, the water bodies and wetlands in the Preserve provide nursery and foraging habitats supportive of a variety of economically important marine fishery species, such as striped mullet (*Mugil cephalus*), Atlantic croaker (*Micropogonias undulates*), gulf menhaden (*Brevoortia patronus*), spotted sea trout (*Cynoscion nebulosus*), southern flounder (*Paralichthys lethostigma*), black drum (*Pogonias cromis*), and blue crab (*Callinectes sapidus*) (NMFS, 2010)" after "Several species of crappie and killifish are also common in the Preserve."

Page 35, Affected Environment, Fish and Wildlife, Fish: Add a new Essential Fish Habitat subsection before "Invertebrates":

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, amended by the Sustainable Fisheries Act in 1996 (the Act), requires the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Services (NMFS) and eight regional fishery management councils (Councils) to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. Essential Fish Habitat (EFH) is defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Act requires the Councils to describe and identify the essential habitat for the managed species, minimize to the extent practicable adverse effects on EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH. As required by the Act, federal agencies must consult with NMFS on all actions or proposed actions authorized, funded, or undertaken that may adversely affect EFH. In return, NMFS must provide recommendations including measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from the proposed actions. The Gulf of Mexico Fishery Management Council (GMFMC) has designated EFH for various life stages of fish and shellfish species inhabiting inshore and estuarine waters in the project area.

Aquatic and tidally influenced wetland habitats in portions of the study area are designated as EFH for certain life stages of brown shrimp (*Penaeus aztecus*), white shrimp

(*Penaeus setiferus*), bull shark (*Carcharhinus leucas*), red drum (*Sciaenops ocellatus*), and stone crab (*Menippe mercenaria*). Categories of potential EFH in the study area include estuarine emergent wetlands, submerged aquatic vegetation (SAV), estuarine water bottoms, and estuarine water column.

Red drum: The study area is designated as EFH for eggs, larvae, juvenile and adult red drum. The area covered includes all estuaries from Vermilion Bay, Louisiana, to the eastern edge of Mobile Bay, Alabama, out to depths of 150 feet (25 fathoms) (GMFMC, 2005). Given their habitat preferences, some life stages of red drum may occur within the project area. This species has been caught in the Barataria Preserve (Schultz, 2006).

Brown Shrimp and White shrimp: The study area is designated as EFH for larval/ post larval and juvenile brown and white shrimp. The area covered includes all estuaries; the US/Mexico border to Fort Walton Beach, Florida, from estuarine waters out to depths of 600 feet (100 fathoms) (GMFMC, 2005). Some life stages of brown shrimp and white shrimp may occur in saline waters within the project area.

Stone crab: The study area is designated as EFH for larval/post larval, juvenile, and adult stone crabs. The area covered includes all estuaries; the US/Mexico border to Sanibel, Florida, from estuarine waters out to depths of 10 fathoms (60 feet) (GMFMC, 2005). Some life stages of stone crab may occur in saline waters within the project area.

Bull shark: The study area is designated as EFH for neonates and juvenile bull sharks. The area covered includes all estuaries; the US/Mexico border to the boundary between the areas covered by the GMFMC and the South Atlantic Fishery Management Council from estuarine waters out to depths of 600 feet (100 fathoms). Neonates prefer temperatures of 28.2° to 32.2°C, with salinities of 18.5- 28.5 parts per thousand (ppt) whereas juveniles prefer temperatures of 21.0° to 34.0°C and salinities of 3.0 to 28.3 ppt. (NMFS, 2006). This species has been caught near the Barataria Preserve (Schultz, 2006).

Page 40, Affected Environment, Wetlands, Fifth paragraph: Add the following text after the Second sentence: "However, the 1985 final determination for the 404(c) designation concerning Bayou aux Carpes includes a provision that discharges of fill in the area would be allowed if the "discharges [were] associated with projects with the sole purpose of habitat enhancement and [were] specifically approved by EPA." and provided that the discharges were authorized by a Corps of Engineers Section 404 permit."

Page 45, Environmental Consequences, Table 6. Cumulative impacts projects, Cumulative Action: Bayou aux Carpes Acquisition, First paragraph: Add the following text after the Second sentence: "However, the 1985 final determination for the 404(c) designation concerning Bayou aux Carpes includes a provision that discharges of fill in the area would be allowed if the "discharges [were] associated with projects with the sole purpose of habitat enhancement and [were] specifically approved by EPA." and provided that the discharges were authorized by a Corps of Engineers Section 404 permit."

Page 51, Environmental Consequences, Soils and Geology, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes

(Alternative B, Preferred Alternative), Sixth paragraph, First sentence: Add "or the GIWW" after "Bayou Segnette Waterway".

Page 53, Environmental Consequences, Vegetation and Non-Native Species, No Action Alternative (Alternative A), Fourth paragraph, Second sentence: Add ", and contribute to the fragmentation of formally more extensive marsh habitat." after "...through the Preserve."

Page 57, Environmental Consequences, Fish and Wildlife, No Action Alternative (Alternative A), Second paragraph: After the fourth sentence Add "The wetlands and water bodies of the Preserve also provide foraging and nursery habitat for economically important marine fishery species."

Page 57, Environmental Consequences, Fish and Wildlife, No Action Alternative (Alternative A): Add a new Essential Fish Habitat subsection after Second paragraph:

Essential Fish Habitat

As described above, under the no action alternative the presence of the canals would continue to alter the historic hydrologic functions of the Preserve. As a result, the integrity of the existing interior marshes and associated wetland communities that provide EFH would continue to decline over time, resulting in long-term moderate impacts that may adversely affect EFH within the Preserve.

Page 59, Environmental Consequences, Fish and Wildlife, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), First paragraph: After the Fourth sentence Add "They also contribute to the fragmentation of formerly more extensive marsh habitat."

Page 59, Environmental Consequences, Fish and Wildlife, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Fourth paragraph, Seventh sentence: Add "and the GIWW" after "Along the Bayou Segnette Waterway".

Page 60, Environmental Consequences, Fish and Wildlife, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative): Add a new Essential Fish Habitat subsection after the First paragraph:

Essential Fish Habitat

The preferred alternative would result in the degrading and placement of spoilbank material in the open water of more than 20 miles of non-historic canals within the Preserve. The potential impacts of these activities on species with EFH designated in the project area are likely to differ from species to species, depending on the life history, habitat use (benthic vs. pelagic), and distribution and abundance. However, it is anticipated that short-term adverse impacts to older life-stages would be limited to temporary displacement during placement of spoil material in the canals, for species would be expected to move back into the local areas once the work is complete. There

would also be some one- time loss of early larval stages of species and older life stages of benthic species (brown and white shrimp and stone crab) resulting from placement of material in the canals.

Project activities would also result in short- term negligible adverse impacts to the prey species of all species that have EFH designated in the project area. Placing spoil material in the canals would result in the temporary displacement of prey species and a one- time burial of benthic prey species. It would also temporarily increase turbidity levels and the quantities of suspended particulates within the water column. As a result of sediment resuspension, there would be the potential for some change in local dissolved oxygen levels. However, if a change were to occur, it is anticipated that it would be temporary in nature and would not be outside the normal variation that results from natural storm events. Following the completion of work activities, prey species would be expected to recolonize the local areas.

Placement of spoil material in the canals would also create short- term adverse impacts to aquatic habitat that is designated as EFH. Any areas of SAV that exist in the canals would be buried. These impacts would be temporary as SAV would be expected to begin recolonizing the area during the next growing season. No impacts to EFH would result from the construction of check meanders, for the channels of these features connecting the reclaimed canals to the navigable waterways would be constructed through the existing spoilbanks adjacent to the mouth of the reclaimed canal, avoiding any existing wetland habitat that serves as EFH. Accessing the project site locations via the canals or the spoilbanks themselves would also avoid impacting existing wetland habitat that serves as EFH.

In addition to the short- term negligible to minor adverse impacts that may adversely affect EFH, reclaiming the canals would result in long- term beneficial impacts by creating more fishery productive categories of EFH such as shallow water bottoms, marsh edge, and SAV from less productive habitats (deeper water bottoms) or non- wetland habitats (spoilbanks). The project would also help protect interior wetland habitats that provide EFH from further decline caused by the altered hydrology resulting from the presence of the canals and their spoilbanks.

Page 63, Environmental Consequences, Special Status Species, Canal Reclamation to Natural Landscape by Degrading Developer- Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Fifth paragraph, Third sentence: Add ", and construction activities would be timed to avoid nesting activities of bird species, including if any work with heavy machinery is within 0.2 miles of an active rookery (colonial nesting place for herons, egrets, and similar water birds) or within 1 mile of an active bald eagle nest." after "...takes place during dawn and dusk)".

Page 67, Environmental Consequences, Hydrology and Water Quality, Canal Reclamation to Natural Landscape by Degrading Developer- Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Third paragraph, Second sentence: Add "and the GIWW" after "...along the Bayou Segnette Waterway".

Page 71, Environmental Consequences, Wetlands, Canal Reclamation to Natural Landscape by Degrading Developer- Built Spoilbanks and Dikes (Alternative B,

Preferred Alternative), Fourth Paragraph: Replace the seventh sentence with "Construction of check meanders in those canals to be reclaimed along the Bayou Segnette Waterway and the GIWW would provide additional protection from wave action along those maintained navigable water ways as well."

Page 71, Environmental Consequences, Wetlands, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Fourth Paragraph: Add "However, the existence of the 404(c) designation changes the regulatory environment for Bayou aux Carpes, as the NPS must meet EPA's regulatory requirements differently in Bayou aux Carpes than elsewhere in the Preserve. While the 1985 final determination for the 404(c) designation concerning Bayou aux Carpes prohibits the discharge of dredged or fill material into Bayou aux Carpes, it does include a provision that allows discharges of fill in the area if the "discharges [were] associated with projects with the sole purpose of habitat enhancement and [were] specifically approved by EPA." and provided that the discharges were authorized by a Corps of Engineers Section 404 permit (EPA 1985). To ensure the integrity of the of the 404(c) area, the NPS would meet all of the EPA regulatory requirements for this area as stipulated in the 1985 final determination for the Bayou aux Carpes 404(c) designation prior to commencing any construction activities in Bayou aux Carpes." after "Spoilbank removal and partial filling of the canals would have a beneficial impact on wetlands."

Page 74, Environmental Consequences, Visitor Use and Experience, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), Sixth paragraph, First sentence: Delete "used by a commercial swamp tour".

Page 75, Environmental Consequences, Visitor Use and Experience, Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative), First paragraph: Replace the first sentence with: "Along the Bayou Segnette Waterway and the GIWW, which are maintained waterways, check meanders would be installed in reclaimed canals."

Page 80, References: Add reference under Environmental Protection Agency heading:

1985 Final determination of the U.S. Environmental Protection Agency's Assistant Administrator for External Affairs concerning the Bayou aux Carpes site in Jefferson Parish, Louisiana pursuant to section 404(c) of the Clean Water Act.

Page 80, References: Add reference after Gosselink, J.G.:

Gulf of Mexico Fishery Management Council (GMFMC)

2005 Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico

and South Atlantic, Stone Crab Fishery of the Gulf of Mexico, Spiny Lobster in the Gulf of Mexico and South Atlantic, Coral and Coral Reefs of the Gulf of Mexico. March 2005.

Page 81, References: Add reference after Mac, M.J., P.A. Opler, C.E. Puckett Haecker, and P.D. Doran:

National Marine Fisheries Service
2006 Highly Migratory Species Fishery Management Plan. July 2006

Page 82, References: Add reference under Schultz, D. heading:

2006 A Survey and Analysis of the Fish Fauna of the Barataria Preserve of Jean Lafitte National Park. Nicholls State University, Thibodaux, LA.

RESPONSE TO CONCERNS

Concern: One commenter noted that several bald eagles are present along the canals, noting that this federally protected species prey on fish that live and spawn in the canals.

Response: As indicated in the EA on page 19 under Mitigation Measures of the Action Alternative, construction activities would be timed to avoid nesting activities of bird species. NPS has further described this mitigation measure to include proposed work within 1 mile of an active bald eagle nest. See the Errata Sheet. Restoring the open canals to freshwater wetlands will enhance fish habitat. Bald eagles are able to successfully fish in wetland habitat and there is also ample open water habitat adjacent to the canals identified for restoration.

Concern: Commenters stated that the canals allow nutrient rich water coming from the Mississippi River via the Davis Pond Diversion and other locks to reach the interior of the Preserve and can replenish the canal banks and bottoms.

Response: While the canals reach into the interior of the Preserve, they alter the natural hydrology of the wetlands. While the Davis Pond Diversion mimics spring flood conditions, the spoilbanks help restrict the amount of nutrients and sediment reaching the interior wetlands by providing a barrier. By degrading the spoilbanks to the surrounding wetland level, "spring floods" introduced by the Davis Pond Diversion project will be able to more easily spread across the Preserve bringing additional nutrients and fresh water to the interior wetland areas.

Concern: Commenters expressed concern that the park will be destroying the ridges that actually protect the Preserve, further stating that the ridges are helping the marsh because of the stability they provide.

Response: Coastal wetland systems need flooding to sustain themselves. Flooding of the wetland system brings needed nutrients and sediments into the system. Man-made spoilbanks alter the natural hydrology of the system, limiting sediment deposition and the movement of water, nutrients, and aquatic organisms throughout the wetland system. The spoilbanks, when over-topped by flooding from coastal storms also trap

saltwater behind them, not allowing it to drain naturally from the system. The ponding of saltwater behind the spoilbanks then negatively impacts the freshwater vegetation which is salt intolerant. Therefore, restoring the canals to wetland habitat by degrading the spoilbanks to the level of the surrounding wetlands will help to protect the entire wetland system.

Concern: One commenter, while supporting the reclamation of the canals within the Preserve, requested that the Final EA include more detail regarding the species composition for each spoil bank, thus providing the NPS with information that can be used to prioritize which spoil banks would be leveled and which would involve gapping.

Response: All spoilbanks are proposed to be degraded to the level of the surrounding wetlands. As indicated in the EA on page 18 under the header Gapping, gapping would be used only as a cost savings measure based on the amount of funding available. Determining which areas, if any, will be gapped as opposed to degraded will be determined by the amount of material that needs to be degraded and the funds available to accomplish the task, not the type of habitat present on the individual spoilbanks. Therefore, performing additional vegetation surveys for all of the spoilbanks identified for restoration is beyond the scope of this project.

Concern: One commenter suggested that the EA include economically important marine life, such as Atlantic croaker, striped mullet, red drum, spotted sea trout, blue crab, brown shrimp and white shrimp, as potentially being present n the Preserve. They further suggest that the EA include separate sections titled "Essential Fish Habitat" and "Fishery Resources" that accurately identify the essential fish habitat and fisheries resources of the project area, and that the EA should describe the potential impacts and benefits to essential fish habitat that could be caused by the proposed actions in all alternative plans. Further, they suggest the NPS should attempt to quantify the acreage of various habitats affected (including benefitted) by project implementation.

Response: Discussions of economically important marine fisheries species and EFH have been included in the Fish and Wildlife section of the EA. See the Errata Sheet. No habitat surveys have been undertaken for the area and topographic surveying of the spoilbanks is ongoing to determine the amount of potential fill material, so at this time it is not possible to quantify the acreage of various habitats to be affected.

Concern: One commenter noted that the invasive Chinese tallow that dominates on the spoilbanks adds to the fragmentation of formerly more extensive marsh tracts.

Response: NPS has indicated that the spoilbanks and invasive Chinese tallow adds fragmentation to formerly more extensive marsh tracts in the discussions on vegetation, fish and wildlife, and wetlands. See the Errata Sheet.

Concern: One commenter suggested that the NPS evaluate the feasibility and effectiveness of leaving a small gap in the canal plug, in lieu of dredging wetlands to create the 10- ft wide channel for the check meander, indicating that dredging the wetlands will adversely affect EFH.

Response: Creating the check meanders will not dredge existing wetlands. The channel of the check meander will be constructed through the existing spoilbank adjacent to the canal opening, similar to the construction technique used in the pilot project along the Bayou Segnette Waterway in 2001. A gap will not be created in the newly created plug because this material will not be as stable as the existing adjacent spoilbank and will likely be affected by erosion if a water channel were cut through it without additional reinforcement. Because creating the check meanders will not dredge through existing wetlands, the NPS is not evaluating creating the check meander with a 10-ft wide channel in the newly created canal plugs. Figure 4 – Check Meanders on page 17 of the EA has been revised to more accurately depict that the existing wetlands will not be dredged. See the Errata Sheet.

Concern: One commenter suggested that the NPS also destroy the ridge on the Gulf Intracoastal Waterway (GIWW) and other main water ways that are not natural, and suggested that the ridge on the GIWW will cause water to pool between the V-Levee and the GIWW and adversely impact the cypress swamp.

Response: As referenced in the comment, the dredging of the GIWW created spoilbanks similar to, but not the same as, those created by the dredging of the smaller canals that are the focus of the project. Also, development projects that never materialized resulted in the plugging of several natural and manmade waterways at their intersection with the GIWW. Degrading the spoilbanks of the GIWW would interfere with a federally-maintained shipping route. Similar issues could arise from removing the plugs in waterways that connect to the GIWW in the area, and plug removal is not the focus of the project. Therefore, they are outside the scope of this project. The Bayou Segnette Waterway, another federally-maintained waterway in the Preserve, was avoided for similar reasons, and mitigation measures were built into the project to avoid impacts to it.

Concern: Several commenters expressed concerns that the project would limit access to privately held property, including the private Harvey Family Heirs property in the Bayou aux Carpes area, with one commenter suggesting that gapping be used on the canal accessing this property to keep it sufficiently open to provide access.

Response: Though the NPS has no obligation to maintain access to private properties adjacent to park lands, the project will not foreclose access to the Harvey Family Heirs property or other private properties. Similar to other areas where degrading the spoilbanks may interfere with navigation, vegetation on the spoilbanks of the subject canal will be either chipped in place or placed parallel to the banks of the canal so as not to interfere with navigation in the canal. If a check meander is constructed on this canal it will be maintained in a manner to allow continued boat access to the canal. The EA has been revised to indicate that vegetation removal would occur in all areas affecting navigability in the Bayou aux Carpes area. See the Errata Sheet.

While not occurring along the entire length of a canal, gapping spoilbanks will still result in potential impacts to navigation for some vessels. Gapping will result in spoilbank material (vegetation and soils) backfilled into the canal, resulting in shallower water depths and the potential for vegetation to impede navigation in the vicinity of the gapped

area. Additionally, gapping is not a mitigation measure, but rather a means of restoring hydrology if the funds are not available to completely degrade the spoilbanks of a canal.

Concern: Several commenters expressed concern that reclaiming the canals would close off areas of the Preserve and deny recreational fisherman, bird watchers, nature lovers and other public users from using, seeing and enjoying the Preserve.

Response: As noted in the EA on pages 74 and 75, access to some areas by some boats would be reduced in some of the reclaimed canals. However, all of the canals would remain open and accessible to the public, and reclaiming the canals would provide long-term benefits to public users by enhancing fish habitat and by allowing visitors to enjoy a more natural environment which is representative of the wetlands and ecosystems that were present prior to the man- made canals.

Concern: Several commenters expressed concern that degrading the spoilbanks would increase saltwater intrusion, leading to a further and accelerated loss of certain marsh areas, including cypress swamps.

Response: The natural free flow of water into and out of the wetlands is what helps protect the system against saltwater intrusion. While wetland systems dampen the effect of storm surges and other changes in water levels, storm surges will inevitably cover wetland areas if the tide level is high enough, though when not impeded, the water readily drains from the system. However, the canals allow storm surges and other changes in water levels to penetrate deeper into the interior of the Preserve, and the spoilbanks actually impound some areas of the Preserve, not allowing water to freely drain out of the system. When spoilbanks are overtopped by storm surge, they prevent the saltwater from draining out of the wetlands, causing it to pond in areas behind the spoilbanks in the interior of the wetlands, adversely impacting wetland vegetation that is not salt- tolerant and leading to a buildup of salts in the soils.

Additionally, the depth of the canals to be reclaimed provides an avenue for saltwater intrusion during periods of otherwise normal water levels. The saltwater, if present, is heavier than freshwater, and moves readily into the channels along the bottom of the canals. The greater water depths in the unreclaimed canals allow saltwater to move farther into the interior of the Preserve. The project would decrease the depth of the reclaimed canals, thereby reducing saltwater intrusion.

Concern: Some commenters questioned why the swamp tour company would be granted access to certain canals whereas citizens would be denied access to the same canals and questioned if the commercial company had paid the park for access.

Response: No money has been received from the swamp tour company for this project, and the company has not offered to pay the park. The swamp tour company has applied for a commercial use authorization (CUA) which would permit them to use the canals within the Preserve as part of their tours. If the park grants a CUA to the swamp tour company, it would require a $100 fee, as well as an as yet undetermined amount to compensate the NPS for the administrative cost of processing, monitoring and enforcing the CUA. The CUA, if granted, will not give the swamp tour company preferential treatment or a right of access to canals that the public does not have.

Concern: One commenter suggested that the Preferred Alternative include provisions for monitoring the reclaimed areas, both to quantify ecosystem benefits and to inform future management actions.

Response: NPS, in coordination with the United States Geological Survey (USGS), has begun monitoring of water levels and porewater salinities in interior wetlands and canals, and plans to continue additional post- construction monitoring as funding becomes available.

Concern: Commenters recommended specific mitigation measures that could be implemented to minimize disturbances to wildlife, such as limiting any work with heavy machinery until after the nesting season if the proposed work is within 0.2 miles of an active rookery; or, if the proposed work is within 1 mile of an active bald eagle nest, any work with heavy machinery should be delayed until after the nesting season.

Response: As indicated in the EA on page 19 under Mitigation Measures of the Action Alternative, construction activities would be timed to avoid nesting activities of bird species. NPS has further described this mitigation measure to include proposed work within 0.2 miles of an active rookery or within 1 mile of an active bald eagle nest. See the Errata Sheet.

Concern: A commenter suggested that the NPS should contact various entities prior to choosing an alternative, including the Louisiana Department of Environmental Quality Water Permit Division, the U.S. Environmental Protection Agency, the Gulf Restoration Network, and the Army Corps of Engineers to obtain any necessary permits required for working in wetlands, discharges to waters of the state, discharges to a wastewater treatment facility etc.

Response: NPS will obtain all necessary permits prior to conducting any construction activities, and submitted a Joint Permit Application for Work Conducted Within the Louisiana Coastal Zone to the U.S. Army Corps of Engineers and the Louisiana Department of Natural Resources on 1/13/2010.

Concern: One commenter expressed concern regarding the need to keep canals and drillslips open in areas that are subject to mineral reservations with accompanying surface use rights, especially given the regulatory climate for trying to secure all necessary approvals and permits to dredge new location canals and drillslips.

Response: The canal reclamation project will not close any of the canals within the project area. Additionally, canal reclamation will not change land use designations in the Preserve, and as indicated in the EA on page 14 and 15 under Land Use, NPS management must recognize the private property rights of all mineral owners in the park. As further discussed on pages 14 and 15 of the EA, the NPS Nonfederal Oil and Gas Rights Regulations found at 36 CFR 9B (9B Regulations) provide a mechanism for the NPS to allow the exercise of nonfederal mineral rights in the park while providing protection to park resources. Because of the NPS' resource protection mandate, and using their regulatory authority under 9B Regulations, park managers can be expected to direct a nonfederal mineral owner or their lessee to utilize previously disturbed areas like

the reclaimed canals in any future well drilling activity if that site selection would allow access to the mineral estate as opposed to dredging new access canals and/or drillslips. A recent project in the Preserve was developed in this manner. The proponent had obtained all of the necessary permits, and the NPS was working with the proponent to issue a permit under the 9B Regulations so that they could move forward with their proposed project. However, the proponent elected not to pursue their proposal without explanation to the NPS. The proponent would have been required to backfill the canals at the conclusion of their project. This is the same type of reclamation that the NPS will be conducting.

Concern: One commenter expressed concern with using the term "abandoned" to describe the oil and gas canals and drillslips that are identified for reclamation.

Response: The use of the term "abandoned" in this context follows standard oil and gas industry terminology, and does not foreclose the re- use of infrastructure like canals and drillslips in future exploration, development, or production of minerals.

Concern: One commenter expressed concern that the EA does not properly or adequately address the issue of future oil and gas exploration within the park boundaries and the economic impacts of the proposed action on those activities.

Response: The NPS contends that the re- use of reclaimed canals and drillslips in future oil and gas drilling activities would only be marginally more expensive than re- using canals or drillslips that have not been reclaimed. As evidenced by the Joint Permit Application for a recently proposed oil and gas project in the Preserve that the proponent ultimately decided not to pursue, re- using a canal and drillslip, which have not been reclaimed, was going to require the dredging of 5,726 cubic yards of vegetated water bottoms and 35 cubic yards of wetlands. Based on the size of the spoilbanks, the NPS calculates that degrading the spoilbanks would add approximately 4,100 cubic yards of fill material to the drillslip and access canal proposed for use by the proponent. A large portion of the cost associated with dredging activities comes from the mobilization of equipment to the worksite, and this cost would be the same regardless of the amount of material to be moved. Reclaiming the canals will not foreclose the canals and drillslips from re- use in future exploration, development, or production of minerals. In the EA on page 15 under the Socioeconomics header, the NPS has included additional information discussing the potential economic impacts of the project on future reuse of the canals by owners exercising their rights under their mineral reservations to access the surface to explore for and develop mineral interests. See the Errata Sheet. However, because the impacts would continue to be negligible, the Socioeconomic impact topic is not further evaluated in the EA.

Concern: One commenter expressed concern regarding the impacts of removing trees off of the existing ridge, suggesting that such removal could facilitate storm surges to eclipse the ridges and destroy more land as a result.

Response: In areas where spoilbanks are to be degraded, the entire spoilbank, vegetation and soil, will be degraded to the level of the surrounding wetlands. These areas will then be allowed to revert to natural wetlands and shallow marsh pond habitat, recreating freshwater wetlands. As discussed on page 39 of the EA under the Wetlands header,

wetlands dampen the effects of storms by reducing flood crests and flow rates, thereby reducing flooding in surrounding areas. A 1- acre wetland can typically store about 3-acre feet of water, or one million gallons. This water storage capacity of wetlands along with the fact that wetland vegetation helps to slow the speed of flood waters, can lower flood heights and reduce the water's destructive potential on surrounding areas (EPA 2006).

Concern: One commenter was concerned about the potential adverse impacts to wildlife and wildlife habitat as a result of the proposed action, specifically, the impacts on alligators, bass, turtles, rabbits, deer, raccoons, bald eagles, etc.

Response: Restoring deeper open water canals to natural wetland habitat will enhance fish habitat, as well as the habitat of other wildlife, such as alligators, turtles and other aquatic species, that use the wetlands. As indicated in the EA on page 59, benthic organisms will likely be buried by placement of spoil material in the canals, but these species will recolonize the area once work is complete. Construction activities will not kill alligators, fish etc, as these species will temporarily move out of the construction area, but will return once construction activities are complete. Bald eagles are adept at fishing in wetland habitats and there is also ample open water habitat in other canals throughout the Preserve as well as in areas adjacent to the Preserve. As discussed on page 59 of the EA, NPS recognizes that terrestrial wildlife inhabiting the spoilbank areas will be displaced by this project. However, the spoilbanks are narrow strips that provide less optimal fringe habitat. Species displaced from the spoilbanks will be displaced to other nearby forested riparian habitats that are more expansive and provide a higher quality of habitat.

Concern: One commenter noted that the EA should clarify the regulatory requirements for dealing with the Bayou aux Carpes 404(c) area.

Response: NPS is charged with a mandate to preserve the resources entrusted to our care unimpaired for future generations, which is the core of our mission, along with making those resources available for the enjoyment of visitors. In this, the portions of the Bayou aux Carpes 404(c) area are no more or less important than any other part of the Preserve. Our goal is preservation of functioning ecosystems. However, NPS fully understands that the existence of the 404(c) designation changes the regulatory environment for Bayou aux Carpes, and that the NPS must meet EPA's regulatory requirements differently in Bayou aux Carpes than elsewhere in the Preserve. See the Errata Sheet for additional language indicating that the NPS will meet all of the EPA regulatory requirements as stipulated in the EPA's 1985 final determination for the Bayou aux Carpes 404(c) designation prior to commencing any construction activities in that area.

Concern: One commenter expressed concern that the EPA had not been formally consulted regarding the Bayou aux Carpes 404(c) area and that the NPS work with the EPA and other parties to ensure that the integrity of the 404 (c) is preserved.

Response: The 1985 final determination for the 404(c) designation concerning Bayou aux Carpes includes a provision that discharges of fill in the area would be allowed if the "discharges [were] associated with projects with the sole purpose of habitat enhancement and [were] specifically approved by EPA." and provided that the

discharges were authorized by a Corps of Engineers Section 404 permit. The NPS is consulting with the U.S. EPA Region 6 to seek their approval concerning the Bayou aux Carpes 404 (c) area. The NPS has also submitted a Joint Permit Application for Work Within the Louisiana Coastal Zone to the Corps of Engineers and the Louisiana Department of Natural Resources for the project on 01/13/2010. See the Errata Sheet for additional language indicating that the NPS will meet all of the EPA regulatory requirements as stipulated in the EPA's 1985 final determination for the Bayou aux Carpes 404(c) designation prior to commencing any construction activities in that area.

Concern: One commenter expressed concern that if the pipeline canals are dammed off, they will cause stagnant water ponds to develop within privately owned fields adjacent to the canals.

Response: Pipeline canals will not be dammed off. On canals that join the Bayou Segnette Waterway and Gulf Intracoastal Waterway, check meanders will be constructed to prevent vegetation and sediment from entering these federally- maintained navigation canals from the reclaimed canal. However, the reclaimed canal and the navigation canals will still be connected hydrologically as shown in Figure 4 of the EA on page 17, allowing water to flow naturally in and out of the surrounding wetlands. Because spoilbanks impound some areas of the Preserve and impede water flow across the wetlands, degrading the spoilbanks will reduce the likelihood of stagnant water ponds forming.

Concern: Several commenters expressed concern that degrading the spoilbanks would contribute to erosion.

Response: As described in the EA, canals and spoilbanks actually contribute to land loss. While removing vegetation would normally be associated with increased incidence of erosion, degrading the spoilbanks and partially filling the canals will convert spoilbanks and deeper open water to shallow water allowing native wetland vegetation to re-colonize the area helping to protect coastal areas from flooding and erosion.

BOBBY JINDAL
GOVERNOR

PEGGY M. HATCH
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

MAR 30 2010

JEAN LAFITTE NHP&P
MAILROOM
RECEIVED
2010 APR 2 PM 2 46

U.S. National Park Service
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, LA 70130

Attention: Haigler Pate

RE: Water Quality Certification (WQC 100203-02/AI 161324/CER 20100001)
Corps of Engineers Permit (MVN-2010-0201-EOO)
Coastal Management Permit (P20100030)
Jefferson Parish

Dear Mr. Pate:

The Louisiana Department of Environmental Quality (the Department) has reviewed your application to dredge and place spoil material for land reclamation, at various locations within Jean Lafitte National Park in Marrero, Louisiana.

Based on the information provided in the application, the Department made a determination that the requirements for a Water Quality Certification have been met and concludes that the placement of the fill material will not violate water quality standards of Louisiana as provided for in LAC 33:IX.Chapter 11. Therefore, the Department hereby issues a Water Quality Certification to the U.S. National Park Service.

Sincerely,

3/30/10

Melvin C. Mitchell, Sr.
Administrator
Water Permits Division

MCM/jjp

c: Corps of Engineers- New Orleans District
Coastal Management Division

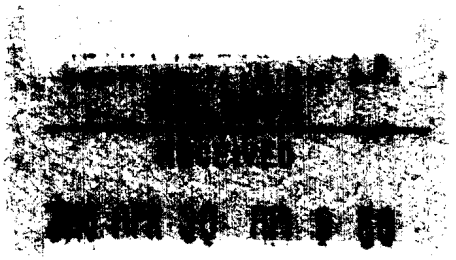
DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

Operations Division
Eastern Evaluation Section

APR 28 2010

SUBJECT: MVN-2010-0201-EOO



National Park Service
Jean Lafitte National Historical Park and Preserve
419 Decatur Street
New Orleans, Louisiana, 70130

Dear Gentlemen:

Enclosed is a permit dated this date, subject as above, authorizing work under the Department of the Army permit program.

You are again reminded that any work not in accordance with the approved plans is subject to removal regardless of the expense and the inconvenience that such removal may involve and regardless of the date when the discrepancy is discovered.

Your attention is directed to all the terms and conditions of the approval. In order to have the work approved in accordance with the issued permit, all terms and conditions of the permit and plans shown on the drawings attached thereto must be rigidly adhered to.

It is necessary that you notify the District Engineer, Attention: Eastern Evaluation Section, in writing, prior to commencement of work and also upon its completion. The notification must include the permittee's name, as shown on the permit, and the permit number. Please note the expiration date on the permit. Should the project not be completed by that date, you may request a permit time extension. Such requests must be received before, but no sooner than six months before, the permit expiration date and must show the work completed and the reason the project was not finished within the time period granted by the permit.

A copy of Page 1 of the permit (ENG Form 1721) must be conspicuously displayed at the project site. Also, you must keep a copy of the signed permit at the project site until the work is completed.

The New Orleans District Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete and return the attached Customer Service Survey or go to the survey found on our web site at http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Michael V, Farabee
Chief, Eastern Evaluation Section

Enclosure

DEPARTMENT OF THE ARMY PERMIT

Permittee: National Park Service

APR 2 8 2010

Permit No. MVN-2010-0201-EOO

Issuing Office: New Orleans District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: To excavate and degrade existing spoil bank material, and backfill approximately 20 linear miles of oil and gas canals, as shown on the enclosed drawings, in accordance with the drawings enclosed in four sheets, dated January 13, 2010.

Project Location: In Jean Lafitte National Historical Park, Jefferson Parish, Louisiana.

General Conditions:

1. The time limit for completing the work authorized ends on **MAY 31, 2015** If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least 1 month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance 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 in compliance with General Condition 4 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.

3. 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.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. 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. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions: Page 4.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

(X) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. 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.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

x _____ x 4/26/10

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

_____ April 27, 2010

(DATE)

Michael V. Farabee, Chief Eastern Evaluation Section

for Alvin B. Lee, District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____

(TRANSFEREE) (DATE)

SPECIAL CONDITIONS: MVN-2010-0201-EOO

7. The permitted activity must not interfere with the public's right to free navigation on all navigable waters of the United States.

8. The permittee must install and maintain, at the permittee's expense, any safety lights, signs, and signals prescribed by the US Coast Guard, through regulations or otherwise, on the permittee's authorized facilities.

9. 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.

10. 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 US Coast Guard so that a Local Notice to Mariners, if required, may be prepared. Notification, with a copy of your permit approval and drawings, should be mailed to the **US Coast Guard, Sector New Orleans Command Center, 201 Hammond Highway, Metairie, Louisiana 70005**, about 1 month before you plan to start work. Telephone inquiries can be directed to (504) 846-5923.

11. If the proposed project requires any additional work not expressly permitted herein, the permittee must apply for an amendment to this authorization.

12. The hatched area on page 2 of the permitted drawings, labeled Bayou aux Carpes, is regulated under Section 404(c) of the Clean Water Act. Work within the 404(c) designated area must be approved from Region 6 of the Environmental Protection Agency prior to the commencement of activities permitted herein.

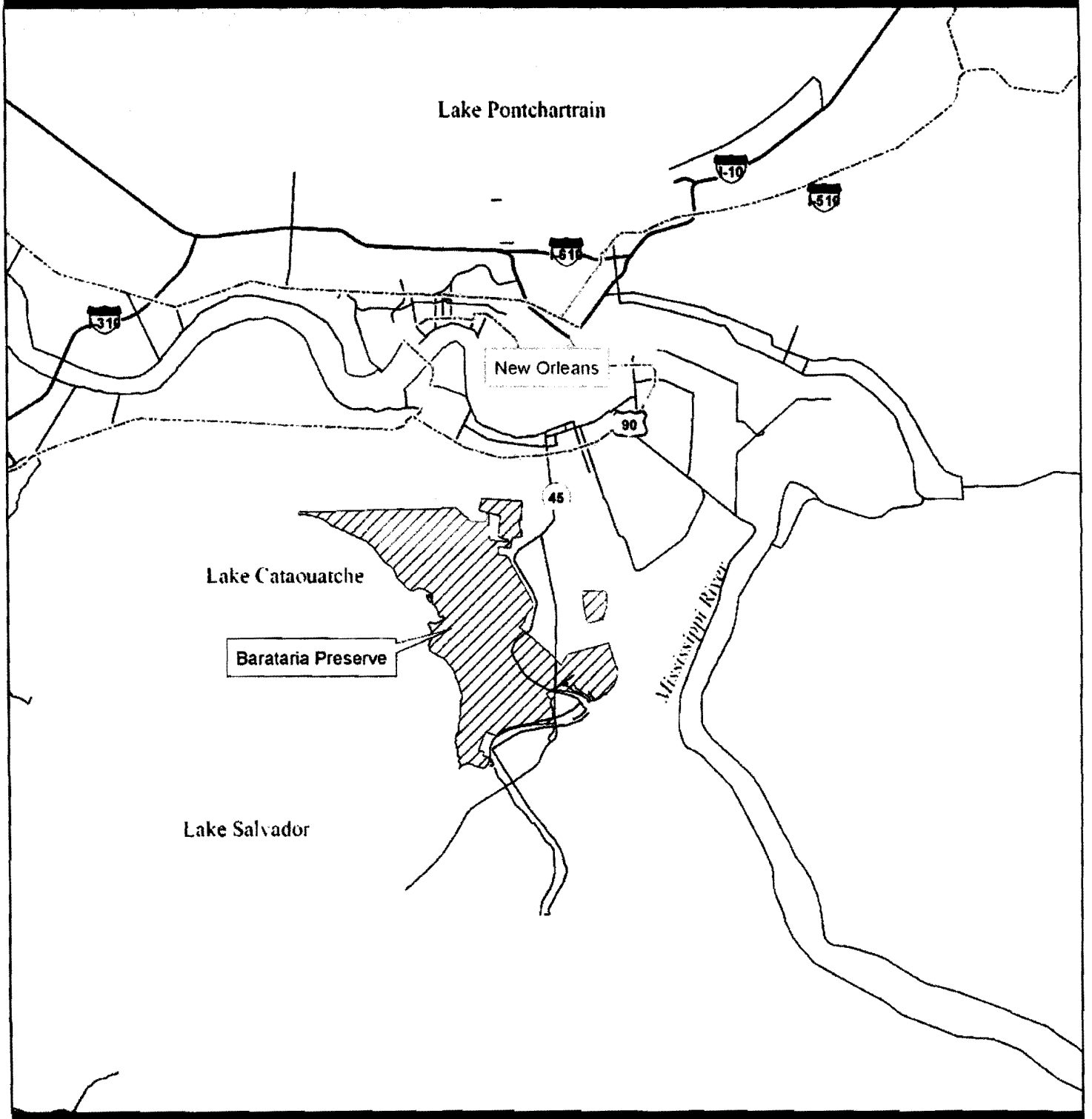
13. The permittee will restrict construction activities and marsh buggy storage within candidate canals and the spoil bank to reduce or eliminate unnecessary impacts to adjacent wetlands.

14. The Chitimacha Tribe of Louisiana has stated that the project area is part of the aboriginal Chitimacha homelands. If during the course of work at the site, prehistoric and/or historic aboriginal cultural materials are discovered, the applicant will contact the Chitimacha Tribe of Louisiana at Post Office Box 661, Charenton, LA 70523, and the Army Corps of Engineers, New Orleans District Regulatory Branch (CEMVN). CEMVN will initiate the required Federal, State, and Tribal coordination to determine the significance of the cultural materials and the need, if applicable, for additional cultural resource investigations.

① 1/13/10

Vicinity Map: Canal Reclamation at Barataria Preserve
Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior



Interstate Highway
US Highway
State Highway
Stream
Waterbody
Urban Areas
Barataria Preserve Boundary

N

0 2 4 6 8 Miles

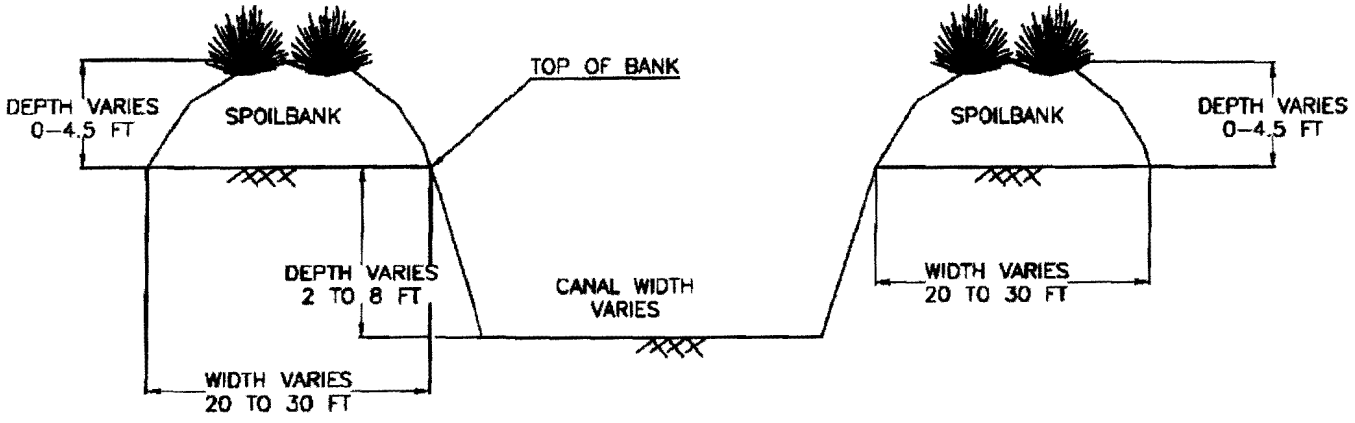
② 1/13/10

National Park Service
U.S. Department of the Interior
CIT Tracts
Yankee Pond
Horseshoe Canal
Twin Canals
Bayou Coquille
Bayou des Familles
Visitor's Center
Lake Salvador
Bayou Villars
Candidate Drillslip
Candidate Canal
Candidate Dike and Borrow Canal
Barataria Preserve Boundary
Bayou aux Carpes 404(c) area
N
0 0.6 1.2 1.8 2.4 Miles

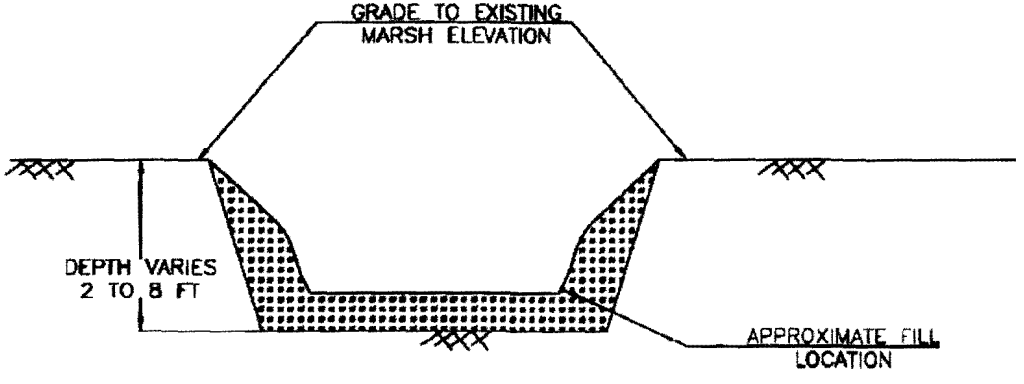
③ 1/13/10

Typical Canal/Drillslip Cross Section:
Canal Reclamation at Barataria Preserve:
Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior



EXISTING CONDITIONS
N.T.S



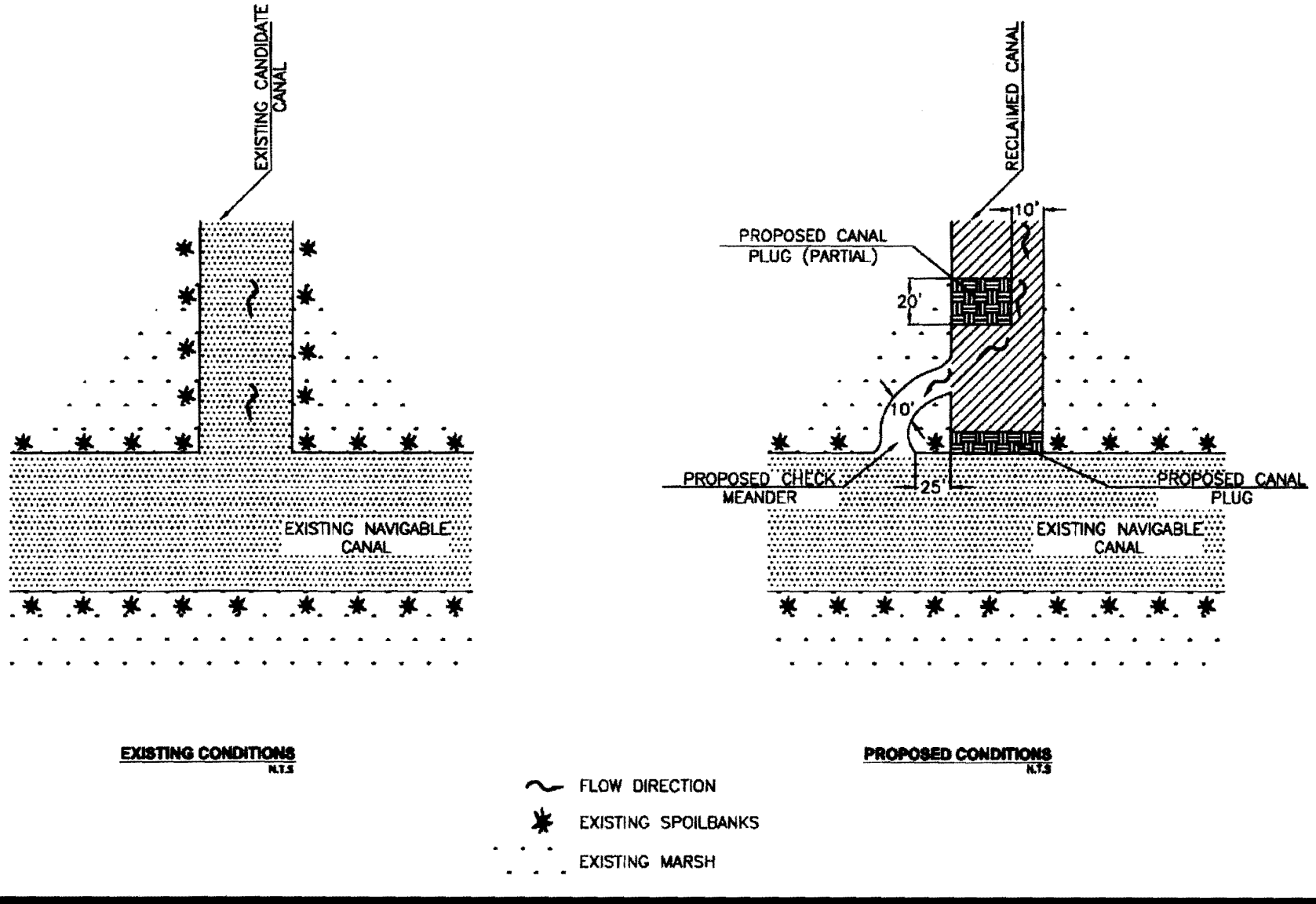
PROPOSED CONDITIONS
N.T.S

NOTE:
TREES AND VEGETATION WOULD BE PUSHED INTO CANAL. IF DOING SO WILL INTERFERE WITH NAVIGATION, THEN CUT WOODY VEGETATION WOULD EITHER BE LAID PARALLEL TO THE BANK OR CHIPPED IN PLACE.

4/13/10

Proposed Check Meander Plan View:
Canal Reclamation at Barataria Preserve:
Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior



BOBBY JINDAL
GOVERNOR

SCOTT A. ANGELLE
SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES

OFFICE OF COASTAL MANAGEMENT

February 3, 2010

Haigler Pate
Jean Lafitte National Park and Preserve
National Park Service
419 Decatur Street
New Orleans, LA 70130

RE: **C20100009,** Coastal Zone Consistency
National Park Service
Direct Federal Action
Restore wetlands including canals and spoil deposits in Barataria Preserve Unit, Jean Lafitte NHP
Jefferson Parish, Louisiana

Dear Mr. Pate:

The above referenced project has been reviewed for consistency with the approved Louisiana Coastal Resources Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in the application, is consistent with the LCRP. If you have any questions concerning this determination please contact Carol Crapanzano of the Consistency Section at (225)342-9425 or 1-800-267-4019.

Sincerely,

Gregory J. DuCote
Administrator
Interagency Affairs/Field Services Division

GJD/JDH/cmc
cc: Pete Serio, COE-NOD
David Butler, LDWF
Jason Smith, Jefferson Parish
Frank Cole, IA/FSD

Gulf Coast Ecosystem Restoration Council

Mississippi River Delta Watershed

Jean Lafitte Canal Backfilling
(DOI_RESTORE_003_048_Cat1)

Project Name: Jean Lafitte Canal Backfilling - Implementation
Cost: Category 1: $8,731,000
Responsible Council Member: Department of the Interior

Project Details: The proposed project involves reclamation of 16.5 miles of canals and the spoil deposits associated with them in the Barataria Unit of Jean Lafitte National Historical Park and Preserve in Louisiana.

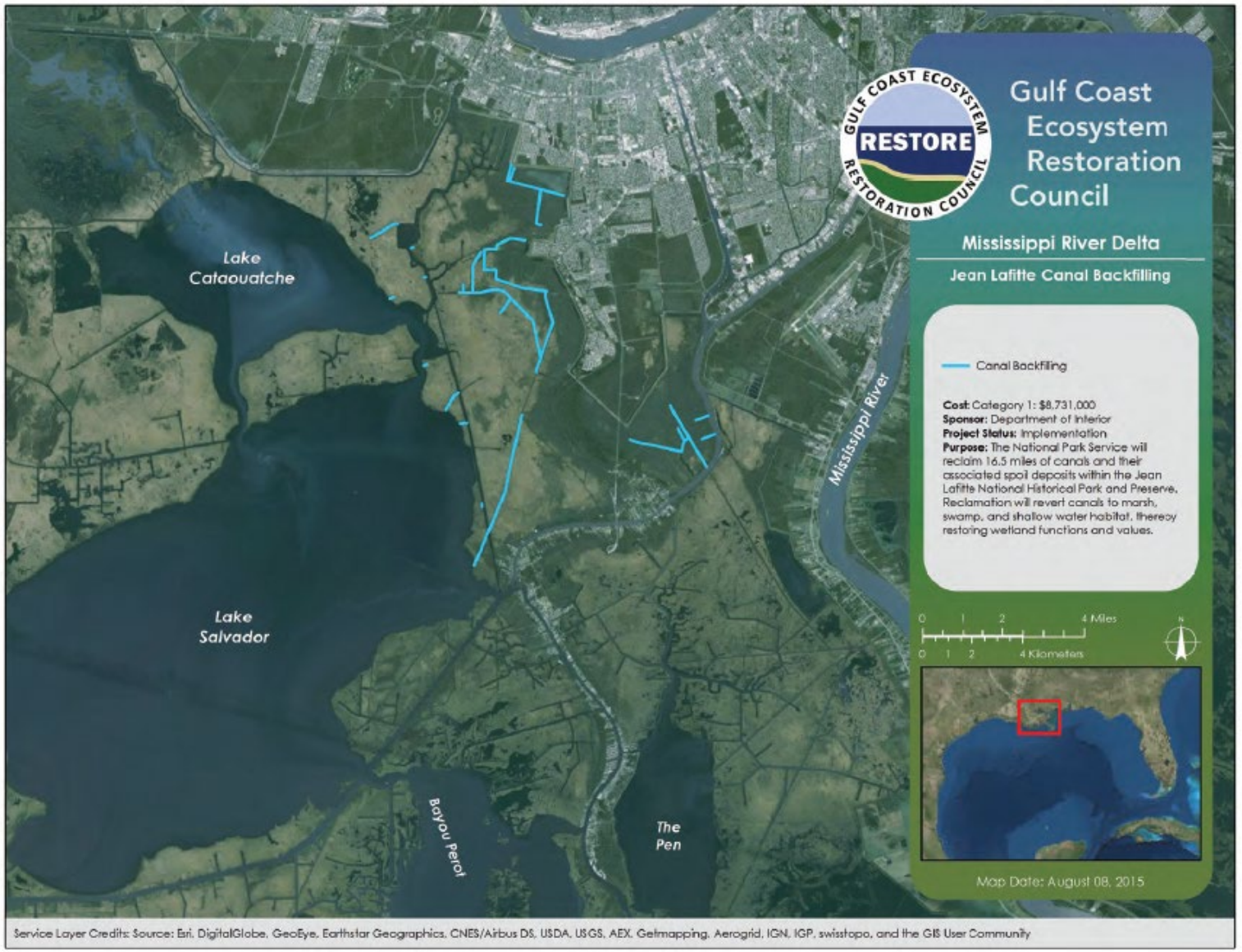
These canals were constructed prior to establishment of the Barataria Unit in the national park, and before stricter regulatory requirements under the wetland provisions of the Clean Water Act were imposed. As the canals were dredged, the soil, rock and other materials were removed and placed along the sides of the canals, which created spoil banks.

Activities: Spoil banks would be graded to meet the elevation of surrounding wetlands. The open water of the canals would be partially filled with graded soil and vegetative material in order to reclaim canals. Leveling of spoil banks and dikes would be accomplished through the use of a marsh buggy, barge-mounted excavator, or similar earthmoving equipment and by accessing each site from existing canals or spoil banks. Specific mitigation techniques would be implemented to minimize potential impacts to navigation and recreation, as well as, help meet habitat restoration/preservation objectives.

Environmental Benefits: The proposed canal backfilling and spoil bank restoration at Jean Lafitte National Historical Park would improve hydrology and restore wetland functions. The canals would revert to marsh, swamp and shallow water habitat through natural processes, thereby re-creating freshwater wetlands. The project would enhance the resiliency of a significant wetland complex adjacent to more than 20 miles of the Federal levee system protecting Greater New Orleans. These wetlands are within an estuary that continues to experience one of the highest rates of land loss in the U.S. due to many environmental factors including subsidence and climate change.

Duration: If approved, the Jean Lafitte canal restoration project would take approximately six months to complete.

More information on this activity can be found in Appendix D. Mississippi River Delta; Unique Identifier: DOI_RESTORE_003_048_Cat1.


Gulf Coast Ecosystem Restoration Council
Mississippi River Delta
Jean Lafitte Canal Backfilling
Canal Backfilling
Cost: Category 1: $8,731,000
Sponsor: Department of Interior
Project Status: Implementation
Purpose: The National Park Service will reclaim 16.5 miles of canals and their associated spoil deposits within the Jean Lafitte National Historical Park and Preserve. Reclamation will revert canals to marsh, swamp, and shallow water habitat, thereby restoring wetland functions and values.
Lake Cataouatche
Lake Salvador
Mississippi River
Bayou Perot
The Pen
0 1 2 4 Miles
0 1 2 4 Kilometers
N
Map Date: August 08, 2015
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Baseline monitoring of Bayou aux Carpes 404(c) marshes, Jefferson Parish, from 2009-2012

Christopher M. Swarzenski, United States Geological Survey

Louisiana Water Science Center

June 18, 2013

INTRODUCTION

The wetlands of the Bayou aux Carpes 404(c) property, in Jefferson Parish, Louisiana fall within the arc of the West Bank and Vicinity (WBV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) construction activities and therefore are actively being considered for augmentation. A variety of augmentation measures are being evaluated. To determine baseline conditions and to help in guiding potential augmentation measures, porewater and soils of marshes within the 404(c) property were sampled while construction activities were ongoing. Water levels also were measured.

SCOPE AND METHODS

Sample Sites

Four marshes located within the Bayou aux Carpes 404(c) area (BAC) were selected for porewater sampling (fig. 1a). Sondes were put out at two locations within the BAC to measure water levels (fig. 1a). Three marsh sites were located in the upper marsh area, south of the Old Estelle Discharge Canal (Estelle Canal). The two northern most marsh porewater sampling sites A and B represent an **interior** floating marsh **(Site A**) and a non-floating marsh south of the Old Estelle Pump Station (**Site B**; **gage),** respectively**.** Both marshes are dominated by maidencane (*Panicum hemitomon)*. This species dominates BAC marshes. A water level recorder also was located at Site B. A third marsh site **(Site C, mixed)** was located in a mixed marsh community growing near cypress trees (*Taxodium distichum).* Spikerushes (*Eleocharis* spp) were the most abundant species. This marsh community is limited in extent. The fourth marsh site **(Site D, GIWW)** was located in the marshes on the southern end of the BAC, near the Gulf Intracoastal Waterway (GIWW). The community here was dominated by Olney's three-square bulrush (*Schoenoplectus americanus)*, which was overgrown by cattails (*Typha* spp). A water level recorder was placed in the swamp on the inside of the spoil associated with the Southern Natural Gas Pipeline Canal that extends from the GIWW to the levee. Table 1 provides a summary of each sampling site.

Porewater constituents sampled included specific conductance and salinity, calcium and magnesium, alkalinity, dissolved organic carbon and total nitrogen, and the nutrients ammonium and ortho-phosphate. All porewater samples were run through a 0.45 micron filter before analysis. The exceptions were alkalinity, pH, salinity, conductance and temperature, which were measured in unfiltered water. Samples were taken quarterly over one year, at depths ranging from surface water on top of the marsh, and at 5, 15, 45 and 80

cm below the marsh surface. Not all depths were sampled for every constituent. Values obtained from these sites were compared with values from four interior reference marshes dominated by maidencane marshes located in another portion of the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve (fig. 1b).

Porewater sampling was initiated in fall 2009, but was suspended from the spring 2010 through fall of 2011 initially because of vandalism at the gaged sites and then because the marsh was inaccessible due to levee deconstruction and reconstruction. Sampling resumed in December 2011. Additional samples were taken in April, June and September of 2012. The interior site A was not sampled in December and April because levee flanks were not sufficiently revegetated to allow passage of the airboat needed to access that site. The gage site B and the mixed site C were accessed by foot on these occasions. The southernmost site D near the GIWW was accessible by airboat for all sampling rounds.

Stormwater Runoff

One augmentation measure being considered for the Bayou aux Carpes 404 (c) property is to route the storm water pumped into the Estelle Canal in a southerly direction into and through the marshes. The monitoring group expressed an interest to evaluate the quality of stormwater runoff as it exits the canal drainage system through the Old Estelle Pump Station. It was agreed that a full stormwater runoff characterization was beyond the stated scope of work. In its place, the monitoring group decided to assess levels of atrazine and fipronil that could be washed from rain runoff into the canals leading to the Old Estelle Pump Station through a single sampling designed to coincide with a period when levels might be expected to be at or near their highest concentrations. The two parameters are often found in stormwater runoff, and in sufficiently high quantities may adversely affect plants and macroinvertebrates in the wetlands. We sampled surface waters in a canal being actively pumped after a major precipitation event, a canal not under pumpage and finally downstream, in the water draining off of the upper marshes and into the Southern Natural Gas Pipeline Canal (figure 2). Early spring was picked because this is a time when the herbicide atrazine is often applied to lawns. A comprehensive suite of pesticides was analyzed. The list of analytes is shown in Appendix 1.

RATIONALE FOR POREWATER ANALYSIS

The freshwater marshes in the Bayou aux Carpes 404 (c) area, like almost all of the freshwater marshes in the upper Barataria Basin, have highly organic soils. In a non-trivial way, these organic soils interact with the source waters as teabags do with water. Source waters have their distinguishing characteristics and affect organic matter often times in unique ways. Porewater quality integrates the interactions between the source waters and soil organic matter. Sampling porewater constituents is a way to assess the organic soil environment and its comparative health.

The data collected serve two purposes. On their own they provide a baseline against which to test for change in any future sampling and analysis at the same sites. In the present, we can compare the Bayou aux Carpes data with the same data collected from nearby marshes in the Barataria Preserve also dominated by

maidencane. These latter marshes have remained stable for at least the last 15 years (the entire time they have been monitored) and provide a good indicator of what constitutes a healthy soil environment.

The water and soil data are parsed to look for indicators that soil organic matter is being decomposed (broken down) at faster rates than normally would be expected for the particular environment, with given salinity concentrations and plant communities. If data indicate this is the case, further investigation into causes might be warranted.

Source Waters

Source waters are external to the marsh environment in origin. Sources of freshwater typically are precipitation, river water or marine water. Precipitation can fall directly onto the marsh or be carried in by stormwater runoff. Tropical storms often are a source of large rainfall events. Because the Mississippi River is disconnected from the wetlands by levees and locks, it enters only through deliberate release. Marine waters originate from further south in the estuary and might enter the marshes episodically via storm surge.

Constituents that react directly with organic matter include sulfate, which originates primarily in seawater, and other oxidants such as nitrate, high concentrations of which originate mainly in the Mississippi River and from local runoff. Salinity can be used as a proxy for sulfate exposure. Atrazine conceivably reacts with soil organic matter by causing roots to senesce and organic matter to leach. Salinity can interact with organic matter indirectly by controlling which plant communities dominate in a given location.

We used the ratio of calcium to magnesium as a way to distinguish river water from rain water. River water ratios are typically around 3:1, whereas direct precipitation is closer to 1.1-1.2 (Swarzenski 2003). Without outside sources, the calcium to magnesium ratio decreases directly in proportion to salinity increases, dropping to about 0.8 or 0.9 as salinity reaches 2.0 parts per thousand. Salinity, calcium and magnesium are considered for all practical purposes to exhibit conservative behavior, meaning that their concentrations are unaffected by reactions with organic matter or plant activity.

Interpretation of porewater data is not absolute in the sense that certain numbers mean degradation or pristine conditions. Oft times, multiple factors, not a single cause, can underlie deviations from expected numbers. Long term data collection is essential until the system particulars are determined with some certainty.

Porewater Indicators

Alkalinity is a measure of reactivity of the soil organic carbon. Higher numbers indicate carbon coming into solution through mineralization of organic matter. The soil organic matter is reacting with the source water.

Dissolved organic carbon and dissolved total nitrogen (a combination of organic nitrogen and ammonium) are fairly non-reactive and tend to be in long-term balance with soil organic matter activity. The ratio of dissolved organic carbon to total nitrogen typically is stable and changes proportionally. Within a hydrologically distinct area, ratios should plot somewhat along a straight line. In areas where there is more

reaction of source waters with organic matter, the organic carbon to total nitrogen ratio frequently drops, that is dissolved organic carbon concentrations are lower relative to a given dissolved total nitrogen concentration.

Ammonium and ortho-phosphate are the inorganic nutrients that plants use for biomass production. Concentrations in many freshwater marshes in coastal Louisiana are usually low. Sometimes, ammonium values may stay elevated if sampling is done near wax-myrtle thickets, which have nitrogen fixers associated with their roots. Soil organic matter mineralization may be indicated if both inorganic phosphorus and nitrogen are consistently elevated (Swarzenski et al 2008).

Alkalinity and the inorganic nutrients are non-conservative. Their concentrations depend heavily on interactions with the soil microbial community and the plant community, through breakdown of the organic matter and plant uptake.

Soil Decomposition

To set a baseline for the degree of decomposition of the organic soils, we measured the fiber content of soils. Swarzenski et al. 2008 provide methods. A given volume of soil is gently washed over a # 120 sieve, with openings of 125 micrometers. The volume of the soil remaining in the sieve is determined (non-fractionated). This remainder is again washed over the sieve, but this time, the soil is fractionated by squeezing between the fingers an amount consistent from sample to sample. The volume of the remainder of the soil not washed through the sieve openings is again determined (fractionated). The fiber content data are plotted three ways:

- the non-fractionated volume as a percentage of the original volume;
- the fractionated volume as a percentage of the original volume; and
- the fractionated volume as a percentage of the non-fractionated volume

Together, the three measures provide a good indicator of how decomposed a given organic soil is. High numbers indicate a fibric, poorly decomposed substrate which in turn suggest a comparatively healthy marsh. Low numbers indicate more decomposed conditions. The substrate would be more easily washed away and eroded. There is a degree of subjectivity to the fractionation process that adherence to standard protocols attempts to minimize. The data are robust enough to distinguish major differences in decomposition of a particular soil.

RESULTS

The porewater data were averaged for all four sampling intervals (only two for the interior site A) and plots were generated comparing trends in the Bayou aux Carpes 404(c) marshes with those in other portions of the Barataria Preserve Unit of the National Park and Preserve (e.g. the reference area/control area). Figure 3 shows that one non-floating marsh in the control area at the Barataria Preserve Unit and both upper marshes A and B, all dominated by maidencane, deviated from the mixing line indicated by calcium:magnesium ratios or the ratio relative to salinity. This suggests that a factor other than dilution of

rainwater by seawater influences porewaters at these three locations, but not the other five, including site D near the GIWW. The non-floating marsh (Site B) at Bayou aux Carpes 404 (c) differs the most from the expected line. This site is closest to the Estelle Canal and the Old Estelle Pump Station (fig. 2). There is an opening between the marsh and the Estelle Canal near the pump station to allow easy ingress of canal water. Further east, the Estelle Canal is separated from the marsh by a continuous spoil bank, preventing direct hydrologic exchange.

Dissolved organic carbon (DOC) to total nitrogen (TN) ratios are proportional both for the Barataria Preserve marshes and for all four marshes in the Bayou aux Carpes 404 (c) area (fig. 4). Porewaters of the interior floating marsh site A at Bayou aux Carpes were in line, but substantially higher for DOC and TN than the other sites. The non-floating marsh at Site B dominated by maidencane and the marsh at Site D closest to the GIWW had elevated inorganic nitrogen and phosphorus concentrations. Ammonium only was elevated at the mixed marsh C in the Bayou aux Carpes 404(c) area and the reference floating marsh at the Barataria Preserve.

Alkalinity trended higher as salinity increased at all sites, both in the reference area and in the Bayou aux Carpes 404(c) area. Both alkalinity and salinity jumped for site D at the GIWW (fig. 5). Sulfate in seawater reacts with organic matter, possibly generating the higher alkalinity here. Calcium: magnesium ratios show the inverse. Low ratios indicate more marine influence. Site B in the Bayou aux Carpes 404(c) marshes had higher alkalinity values than would be expected based on salinity alone, suggesting some effect of water not derived from rain or marine sources. The two sites with the higher inorganic nutrient concentrations also had higher alkalinity concentrations, suggesting some mineralization of soil organic matter.

Fig. 6 shows plots of ammonium and ortho-phosphate relative to salinity, calcium: magnesium ratios and alkalinity. The high ammonium levels at the mixed marsh Site C at the Bayou aux Carpes 404(c) property and at the floating marsh at the Barataria Preserve did not appear related to reactivity to a constituent in seawater such as sulfate. Concentrations were elevated compared to the rest of the marshes without concomitant elevated alkalinity values. We might infer a local source that is not impacting the soil organic matter too much. The comparatively elevated ortho-phosphate concentrations only occurred at Site D and at the gage site B, on Bayou aux Carpes 404(c) lands. They coincided with elevated ammonium concentrations and also with increases in alkalinity. Together, this would suggest something is reacting with soil organic matter, possibly because of the nature of the source waters particular to these two sites.

Stormwater Runoff

The original sampling plan was to get one sample near the Old Estelle Pump Station, to represent the quality of the water potentially to be diverted into the Bayou aux Carpes 404 (c) wetlands, and to collect a second sample downstream close to where water was to drain into the Southern Natural Gas Pipeline Canal after flowing across the wetlands. A period of exceptionally high precipitation (more than 4 inches in 3 days, table 2) provided an opportunity to collect stormwater runoff from the surrounding neighborhood. However, the Old Estelle Pump Station was not operational during the storm event. Water was not flowing towards this station, rather it was flowing towards the Estelle 2 pumping station located north of the Old Estelle Pump Station. We added a third sampling point to collect the water that was actively draining from the surrounding watershed, Site 3.

Appendix 1 provides the complete list of constituents that were analyzed. Table 3 shows concentrations of the analytes from the list above detection limits, primarily atrazine and fipronil. These data do not reflect in any way on the annual loading of atrazine and fipronil, rather they represent spot concentrations during a period when their presence was likely. More detailed studies using pumping rates and frequent analysis of atrazine and fipronil would be needed to evaluate annual exposure of the marshes to these constituents.

Water Levels

Fig. 7 provides the hourly water levels at the two instrumented locations between February and December 2011. The data were collected with non-vented pressure transducers (Solinst, Canada) placed beneath the lowest expected water levels. Atmospheric pressure corrections were made using the weather station at the Belle Chase Naval Station. The two water level gages were not surveyed to a common datum so it was not possible to directly determine hydraulic gradients for flow directions between the marshes and the Southern Natural Gas Pipeline Canal wetlands. However, using the assumption that water levels throughout the BAC property were uniform for a short period when water levels from Tropical Storm Lee peaked made an indirect comparison possible. The peaks were matched to the same level for that storm surge (figure 7). Provided this assumption is correct, an elevation gradient between the upper marshes and the swamp interior to the east of the spoil bank of the Southern Natural Gas Pipeline Canal is indicated and suggests that flow in this direction is possible, provided there are no topographic hindrances to flow between the two areas. CRMS data from a station in the Southern Natural Gas Pipeline Canal (CRMS 185) were not available for the time period when the water level data were being collected, to evaluate gradients between the wetlands and the canal.

Soil Decomposition

We measured fiber content of the upper 25 cm of soil at the three sites A, B, and C in the upper part of BAC. The marsh at Site D had cattail mixed in. This species has a belowground root network with soft tissues that make interpretation and inferences using fiber content analysis difficult and unreliable. Of the three other sites, the non-floating maidencane marsh at Site B had the most decomposed soil material measured both in the non-fractionated and fractionated components (fig.8). This site B also had higher inorganic nutrient and alkalinity concentrations than the other sampling sites at which fiber content was analyzed. The high calcium:magnesium ratio relative to salinity (fig. 3) suggests source waters influencing this part of the BAC marsh originate from somewhere other than precipitation or marine waters (salinity), most likely river water. The site is close to the opening of the Estelle Canal into the marshes (Appendix 2).

SUMMARY

Porewater and soils of marshes in the Bayou aux Carpes 404(c) property were sampled between 2009 and 2012. Water levels at two sites were measured in 2011. Analysis indicated the marsh soil at the site closest to the opening of the Estelle Canal was comparatively more decomposed than at other sites sampled, including reference areas in the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve. Analysis of porewater suggested this site might have source waters that reacted more strongly with the soil organic matter than was the case at other sites. Soils at all marshes sampled were fibric and

not well decomposed, indicating structural integrity. Comparison of water levels between the marshes near the Estelle Canal and in the interior swamps adjacent to the Southern Natural Gas Pipeline suggest flow towards the south is possible provided there are no topographic hindrances to flow.

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Swarzenski, C.M., 2003, Resurvey of quality of surface water and bottom material of the Barataria Preserve, Jean Lafitte National Historical Park and Preserve, Louisiana, 1999-2000: U.S. Geological Survey Water-Resources Investigations Report 03-4038, 28 p.

Swarzenski, C.M., T.W. Doyle and T.G. Hargis, 2005b, Pore-water and substrate quality of the peat marshes at the Barataria Preserve, Jean Lafitte National Historical Park and Preserve, and comparison with Penchant Basin marshes, south Louisiana, 2000-2002, Scientific Investigations Report 2005-5121, 27 p.

Swarzenski, C.M., T.W. Doyle, B. Fry and T.G. Hargis, 2008, Biogeochemical Response of Organic-rich Freshwater Marshes in the Louisiana Delta Plain to Chronic River Water Influx, Biogeochemistry 90(1) p. 49-63.

Figure 1a. Location of sampling stations and type of sampling for Bayou aux Carpes 404 (c) property, Louisiana.

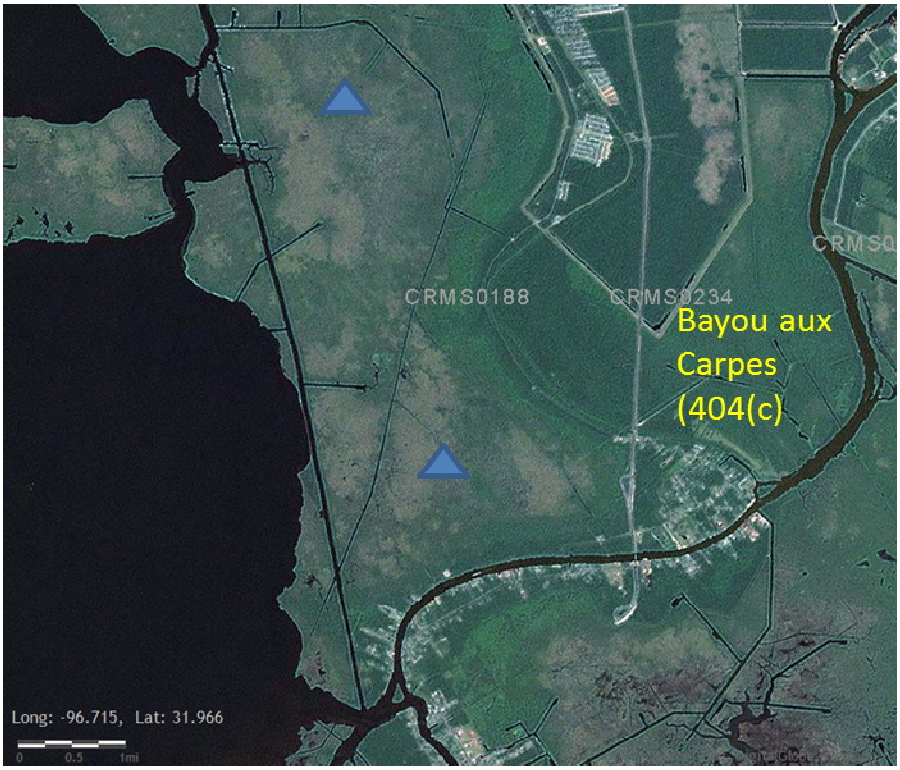


Figure 1b. Location of reference marshes (n=4) in the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve used as a comparison for Bayou aux Carpes 404(c) marshes

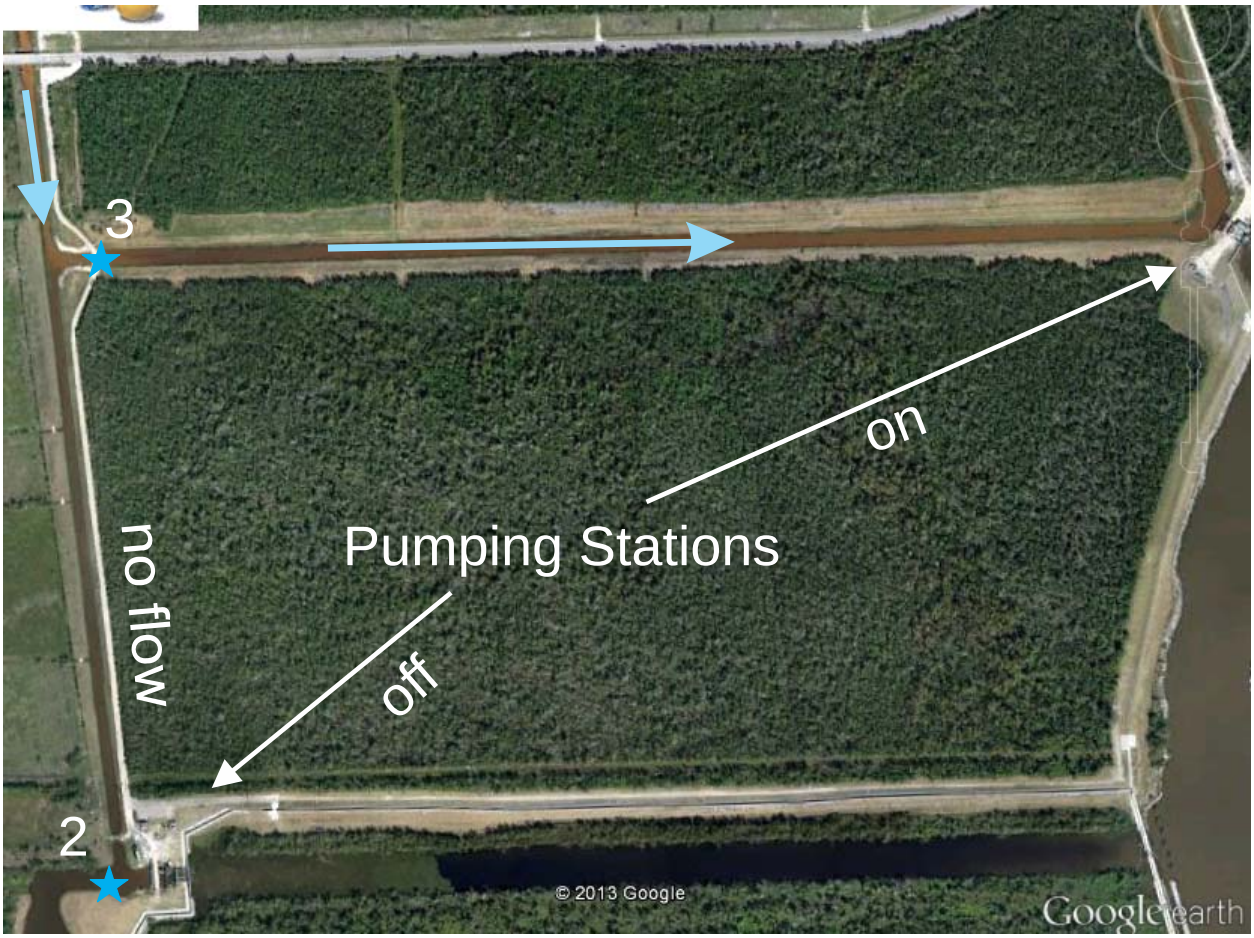


Figure 2. Close-up of stormwater sampling sites 2 and 3, with direction of flow, March 22, 2012.

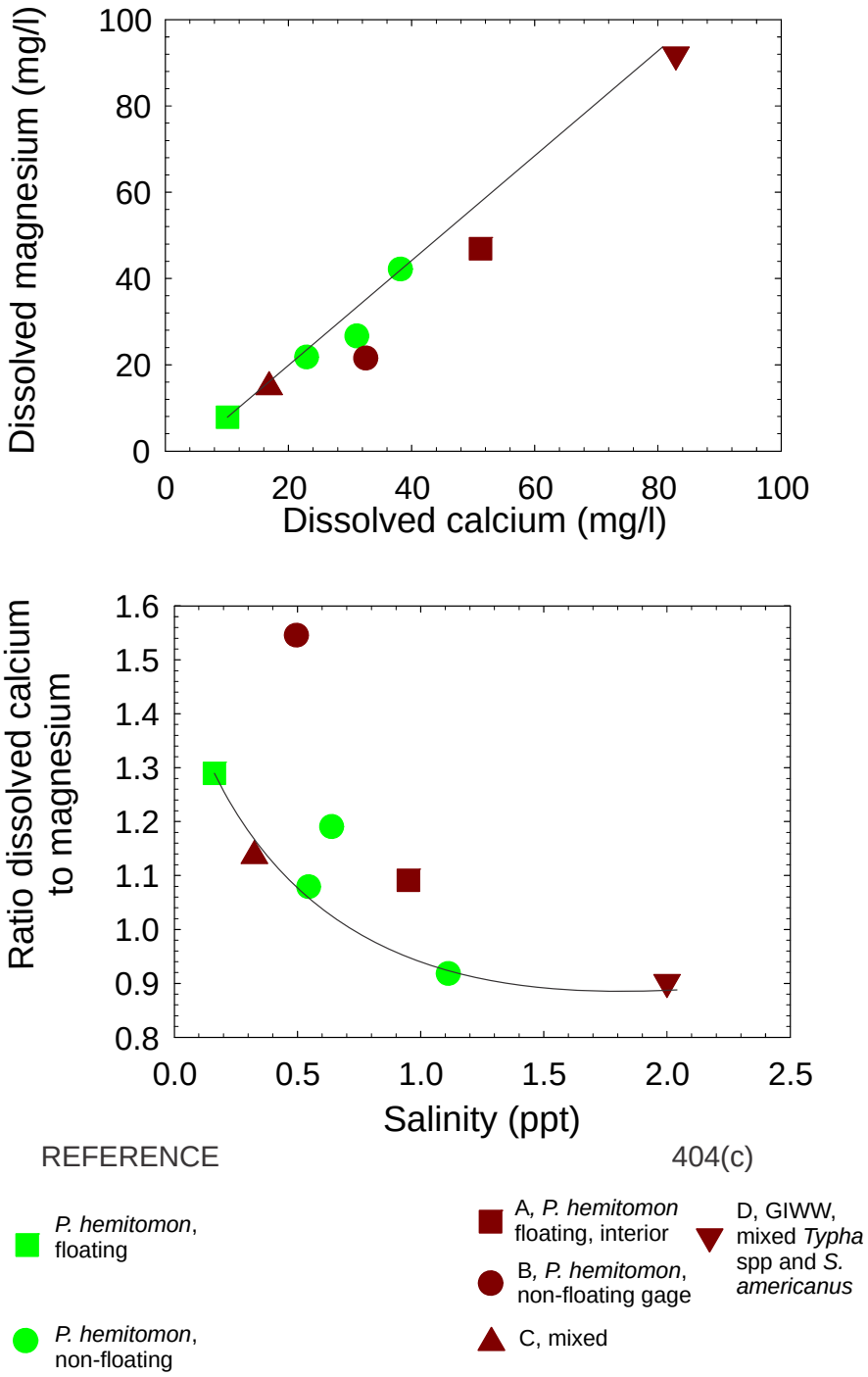


Figure 3. Plot of dissolved calcium relative to magnesium concentrations and plot of the ratio of calcium:magnesium to salinity in porewater of marshes at the Bayou aux Carpes 404(c) property (red) compared with reference marshes in other portions of the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve (green) . Lines indicate conservative mixing.

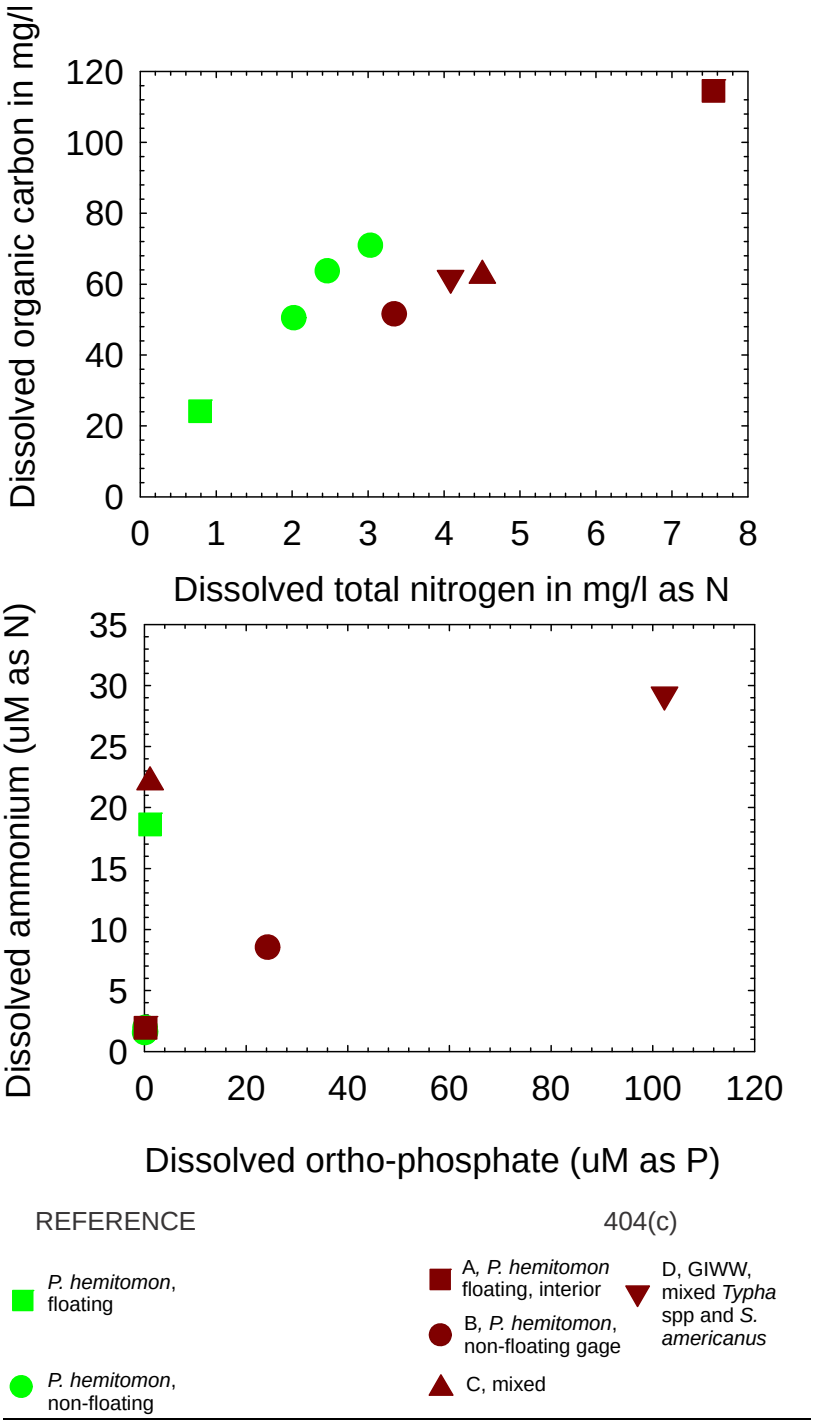


Figure 4. Plot of dissolved organic carbon relative to total nitrogen concentrations and plot of dissolved ammonium relative to ortho-phosphate concentrations in porewater of marshes at the Bayou aux Carpes 404(c) property (red) compared with reference marshes in other portions of the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve (green).

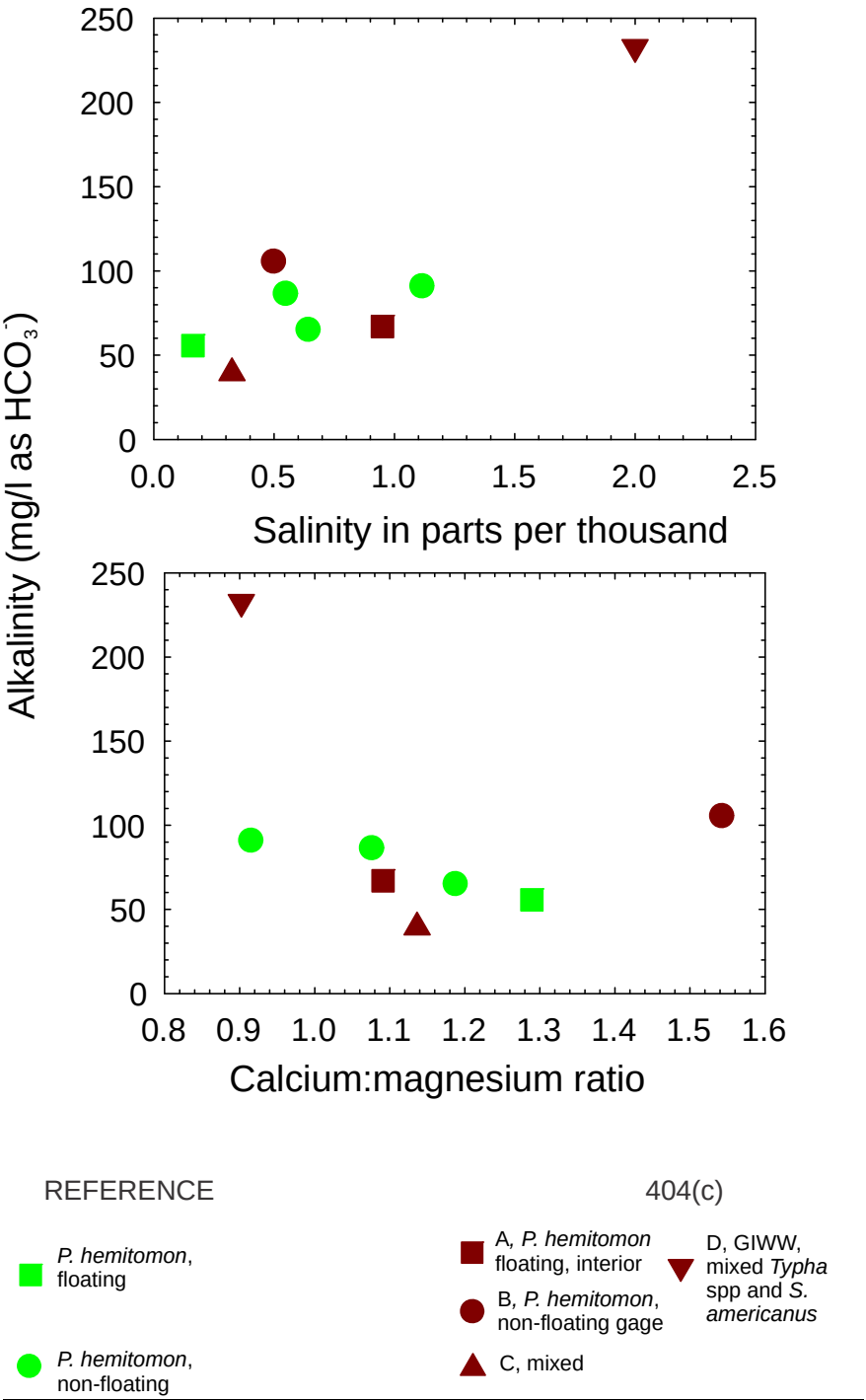


Figure 5. Plots of alkalinity relative to salinity or calcium:magnesium ratios in porewater of marshes at Bayou aux Carpes 404(c) property (red) compared with reference marshes in other portions of the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve (green).

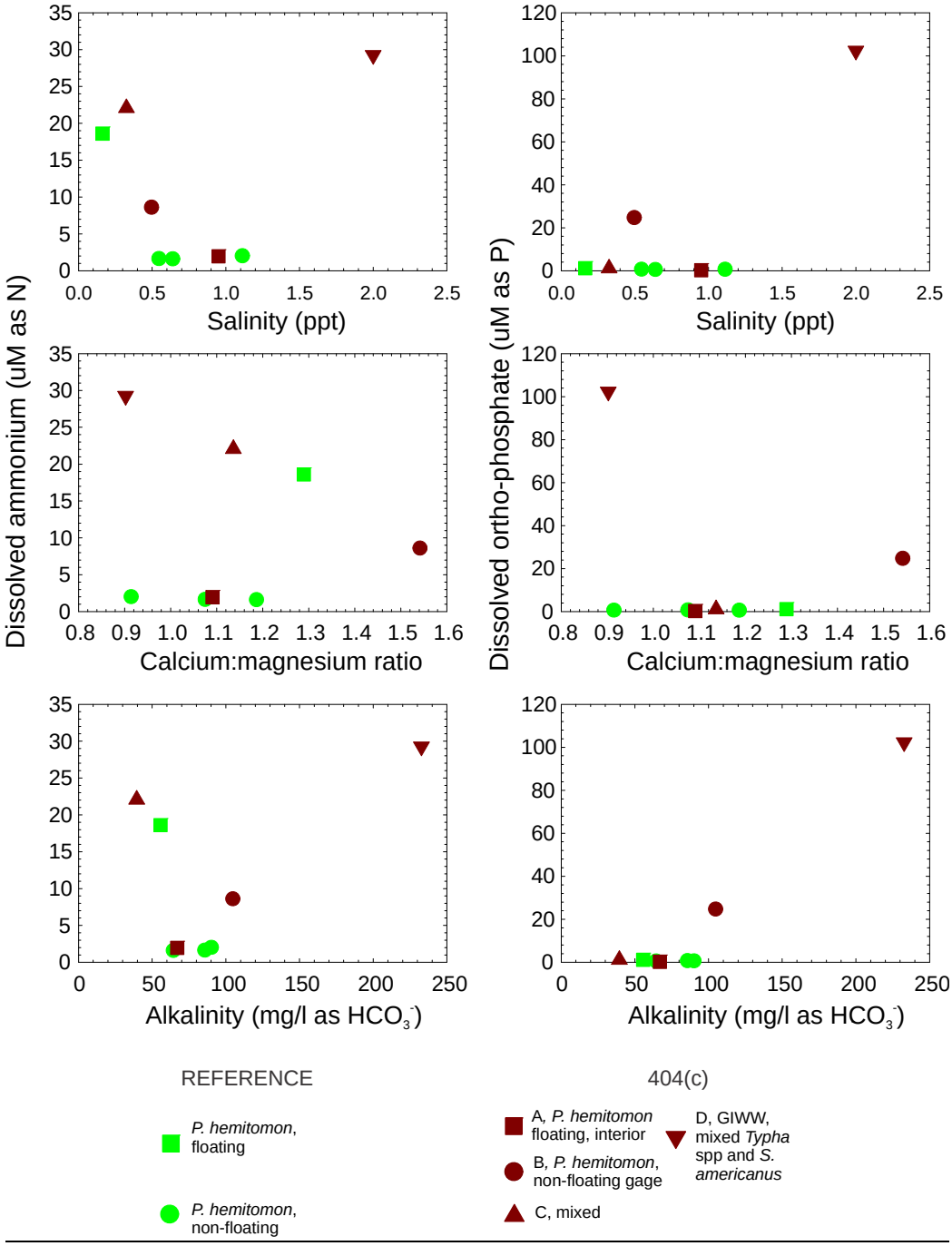


Figure 6. Plots of dissolved ammonium or ortho-phosphate relative to salinity, calcium:magnesium ratios or alkalinity in porewater of marshes at Bayou aux Carpes 404(c) property (red) compared with reference marshes in other portions of the Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve (green).

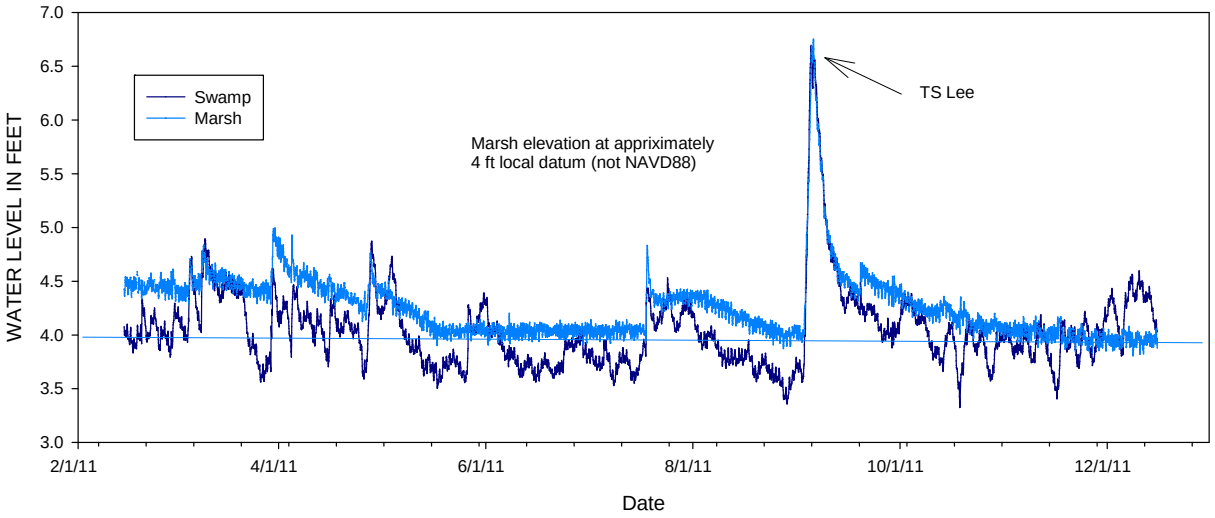


Figure 7. Hourly water levels at gage (B) and swamp site (E), February-December 2011. Marsh levels were matched to swamp levels for the peak of Tropical Storm Lee, with assumption that at that moment in time, water levels were close to the same across a wide area, including the sampling sites.

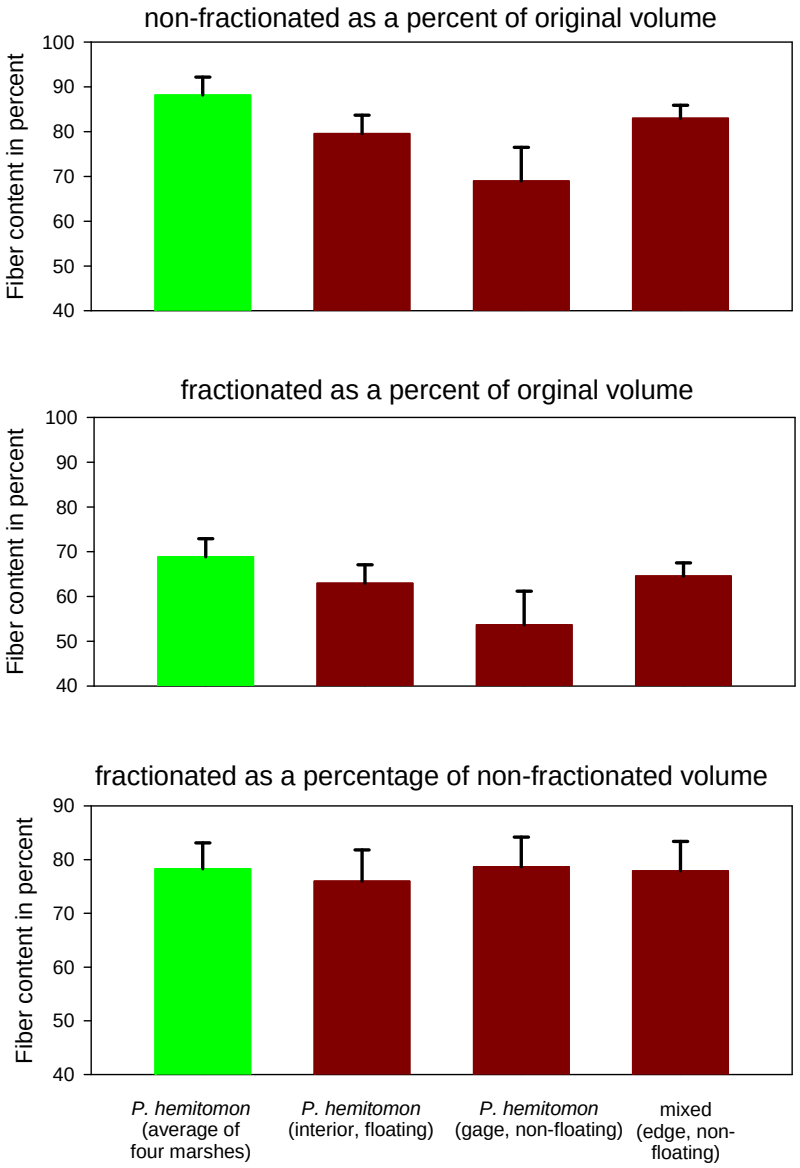


Figure 8. Fiber content analysis of soil samples at Bayou aux Carpes marshes. Values are compared with the averages from a control group of four marshes dominated by P. hemitomon at the Barataria Preserve of Jean Lafitte National Historical Park and Preserve. Values are averaged in 5-cm increments for the top 25 cm, with three replicates per depth interval.

Table 1. Vegetation, coordinates, and type of monitoring at sample sites in Bayou aux Carpes 404(c) property.

Site	Plant community	Latitude, longitude	Porewater	Water level	Stormwater
Interior (A)	*Panicum hemitomon*, floating	29° 49´ 14.99" 90° 04´ 40.70"	x		
Gage (B)	*Panicum hemitomon*, non-floating	29° 49´ 17.54" 90° 04´ 51.12"	x	x	
Mixed (C)	Mixed, *Eleocharis* spp.	29° 48´ 44.09" 90° 04´ 51.65"	x		
GIWW (D)	*Schoenoplectus americanus, Typha* spp.	29° 46´ 48.71" 90° 04´ 25.87"	x		
Swamp (E)		29° 47´ 50.99" 90° 04 48.71"		x	
Site 1		29° 48´ 33.68" 90° 04´ 54.02"			x
Site 2		29° 49´ 36.28" 90° 05´ 00.93"			x
Site 3		29° 50´ 02.12" 90° 05´ 01.00"			x

Table 2. Daily temperature extremes and total precipitation from March 18-23, 2012 at New Orleans International Airport. Waterways were sampled March 22, 2012.

DATE	High temperature degrees Celsius	Low temperature degrees Celsius	Precipitation in inches
03/18/2012	85	69	0.00
03/19/2012	80	69	0.00
03/20/2012	82	71	0.00
03/21/2012	80	62	1.87
03/22/2012	69	59	3.36
03/23/2012	83	62	1.56

Table 3. Selected pesticide concentrations in three waterways near the Old Estelle Pump Station. Sites were sampled on March 23, between 13:00 and 14:00 pm. The constituents detected during sampling are shown. The complete list of analytes is provided in Appendix 1.

SITE	Atrazine (ug/l)	Fipronil (ug/l)	Carbaryl (ug/l)	Metalo-chlor (ug/l)
1	0.146	< 0.018	b.d.	b.d.
2	0.238	< 0.018	b.d.	b.d.
3	**9.14**	0.046	0.095	0.095
Detection level	0.008	0.018	0.060	0.020

APPENDIX 1

Analytes and detection limits for stormwater pesticide analysis

1-Naphthol	0.04 ug/L	Fipronil sulfide	0.013 ug/L
2-Chloro-2,6-diethylacetanilide	0.01 ug/L	Fipronil sulfone	0.024 ug/L
2-Ethyl-6-methylaniline	0.010 ug/L	Desulfinylfipronil	0.012 ug/L
3,4-Dichloroaniline	0.004 ug/L	Fipronil	0.04 ug/L
3,5-Dichloroaniline	0.004 ug/L	Fonofos	0.01 ug/L
4-Chloro-2-methylphenol	0.0050 ug/L	alpha-HCH-d	pct
Acetochlor 34256-82-1	0.01ug/L	Hexazinone	0.008 ug/L
Alachlor	0.008 ug/L	Iprodione	0.014 ug/L
2,6-Diethylaniline	0.006 ug/L	Isofenphos	0.006 ug/L
Atrazine	0.007 ug/L	lambda-Cyhalothrin	0.01 ug/L
Azinphos-methyl	0.12 ug/L	Malaoxon	0.08 ug/L
Azinphos-methyl-oxon	0.042 ug/L	Malathion	0.02 ug/L
Benfluralin	0.014 ug/L	Metalaxyl	0.0069 ug/L
Carbaryl	0.2 ug/L	Methidathion	0.006 ug/L
Carbofuran	0.06 ug/L	Parathion-methyl	0.008 ug/L
Chlorpyrifos	0.01ug/L	Metolachlor	0.014 ug/L
Chlorpyrifos, oxygen analog	0.05 ug/L	Metribuzin	0.016 ug/L
cis-Permethrin	0.014 ug/L	Molinate	0.002 ug/L
cis-Propiconazole	0.006 ug/L	Myclobutanil	0.01 ug/L
Cyanazine	0.04 ug/L	Oxyfluorfen	0.006 ug/L
Cyfluthrin	0.016 ug/L	Paraoxon-methyl	0.01 ug/L
Cypermethrin	0.02 ug/L	Pendimethalin	0.012 ug/L
Dacthal	0.006 ug/L	Phorate	0.02 ug/L
2-Chloro-4-isopropylamino-6-amino-s-triazine	0.014 ug/L	Phorate oxygen analog	0.027ug/L
Diazinon	0.005 u g/L	Phosmet	0.2 ug/L
Diazinon	0.006 ug/L	Phosmet oxon	0.0511ug/L
Diazinon-d	pct	Prometon	0.012 ug/L
Dichlorvos	0.02 ug/L	Prometryn	0.0059 ug/L
Dicrotophos	0.08 ug/L	Propyzamide	0.004 ug/L
Dieldrin	0.009 ug/L	Propanil	0.014ug/L
Dimethoate	0.006 ug/L	Propargite	0.02 ug/L
Disulfoton	0.04 ug/L	Simazine	0.01ug/L
Disulfoton sulfone	0.014 ug/L	Tebuconazole	0.02 ug/L
alpha-Endosulfan	0.006 ug/L	Tebuthiuron	0.02ug/L
Endosulfan sulfate	0.022 ug/L	Tefluthrin	0.01 g/L
EPTC	0.002 ug/L	Terbufos	0.018 ug/L
Ethion	0.012 ug/L	Terbufos oxygen analog sulfone	0.045ug/L
Ethion monoxon	0.021ug/L	Terbuthylazine	0.006 ug/L
Ethoprophos	0.016 ug/L	Thiobencarb	0.016 ug/L
Fenamiphos	0.029 ug/L	trans-Propiconazole	0.02 ug/L
Fenamiphos sulfone	0.053 ug/L	Tribufos	0.035 ug/L
Fenamiphos sulfoxide	0.08 ug/L	Trifluralin	0.012 ug/L
Desulfinylfipronil amisw	0.029 ug/L		

APPENDIX 2

Opening between Estelle Canal (Old Estelle Discharge Canal) and marshes at the Bayou aux Carpes 404(c) property, with location of sample site B shown.

Bayou aux Carpes 404c NDVI and Habitat Analysis Summary
May 1987-2014

Purpose

The purpose of this analysis was to review the relative health of the vegetation in the Bayou aux Carpes 404c area by using the Normalized Difference Vegetation Index (NDVI) as measured through Landsat satellite imagery for the 1987 – 2014 time period. This analysis is based on remotely sensed data and not field measurements.

Introduction

The Landsat satellite measures electromagnetic radiation as it is reflected from the earth's surface. The measurements divide the electromagnetic spectrum into regions known as spectral bands (Figure 1). Satellite sensors have been designed to measure responses within particular spectral bands to enable the discrimination of Earth surface features such as vegetation, soil, and water because each contains different patterns of reflectance and absorption over different wavelengths (Ashraf, 2011).

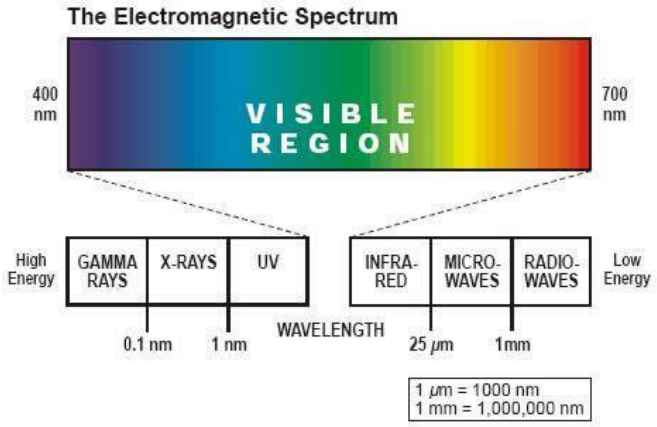
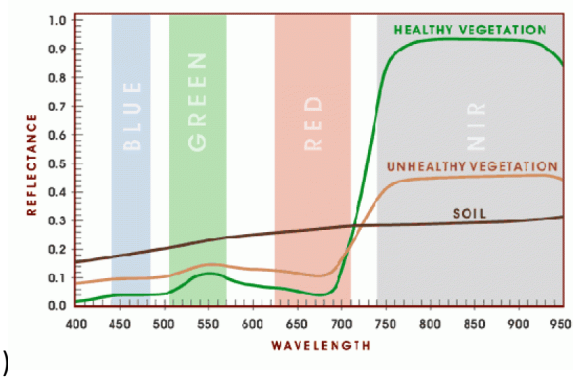


Figure 1. The visible region of the spectrum ranges from about 0.4 μm to 0.7 μm (Kyllo, 2004).

a.)



b.)

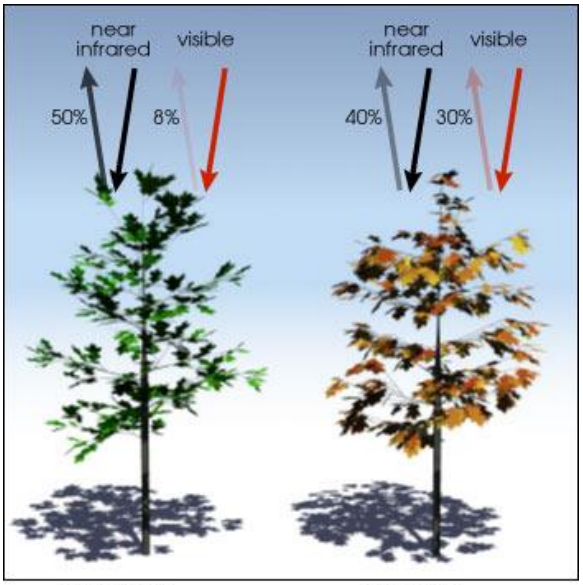


Figure 2. a.) Electromagnetic spectrum displaying vegetation reflectance curves b.) NDVI sample calculation. (Illustration by Robert Simmon, NASA, GSFC).

Healthy vegetation absorbs more light from the visible spectrum than unhealthy or sparse vegetation, and reflects more light within the infrared spectrum as the example shown in Figure 2b. Therefore, the Normalized Difference Vegetation Index (NDVI) can be used to measure the density of healthy vegetation which is calculated as the ratio between the visible and near infrared light as it is reflected from vegetation. The equation for calculation is shown below:

NDVI = (NIR – VIS)/(NIR+VIS),
where NIR = Near infrared and VIS = Visible

The resultant Index values range from 1 to -1 where values less than zero represent a lack of vegetation and values approaching 1 indicate the highest density of healthy vegetation.

The NDVI index is a widely used index and has been recently used to study the detection of stresses to agricultural crops, classification of land use and vegetative habitat, forest fire damage and recovery, hurricane impacts and vegetation recovery. It has also been used during war times to detect camouflaged sites.

METHODS

Landsat Satellite Imagery Data Collection

Initially, 13 dates of cloud-free Landsat 5 and 7 satellite imagery were selected throughout the time period 1987-2014 for the Bayou aux Carpes project area including the following dates:

May 1, 1987
May 6, 1989
May 17, 1993
May 20, 1994
May 23, 1995
May 15, 1998
May 2 1999
May 23, 2001
May 29, 2003
May 2, 2005
April 27, 2006 and May 13, 2006 (maximum NDVI value calculated)
May 8, 2007
May 3, 2014 and May 19, 2014 (maximum NDVI value calculated)

The month of May was chosen, because it coincides with the initial peak biomass in coastal Louisiana and it is also the only month during peak biomass time frame (April-August) where sufficient cloud-free scenes were available for analysis.

Climate Information

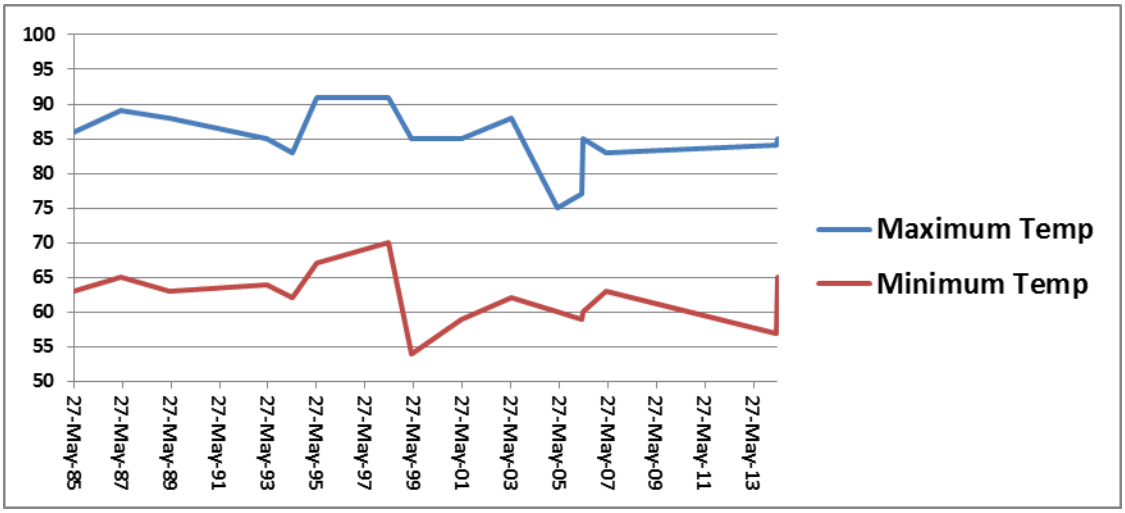


Figure 3. May Minimum and Maximum Temperature per NDVI year (LOSC, 2015).

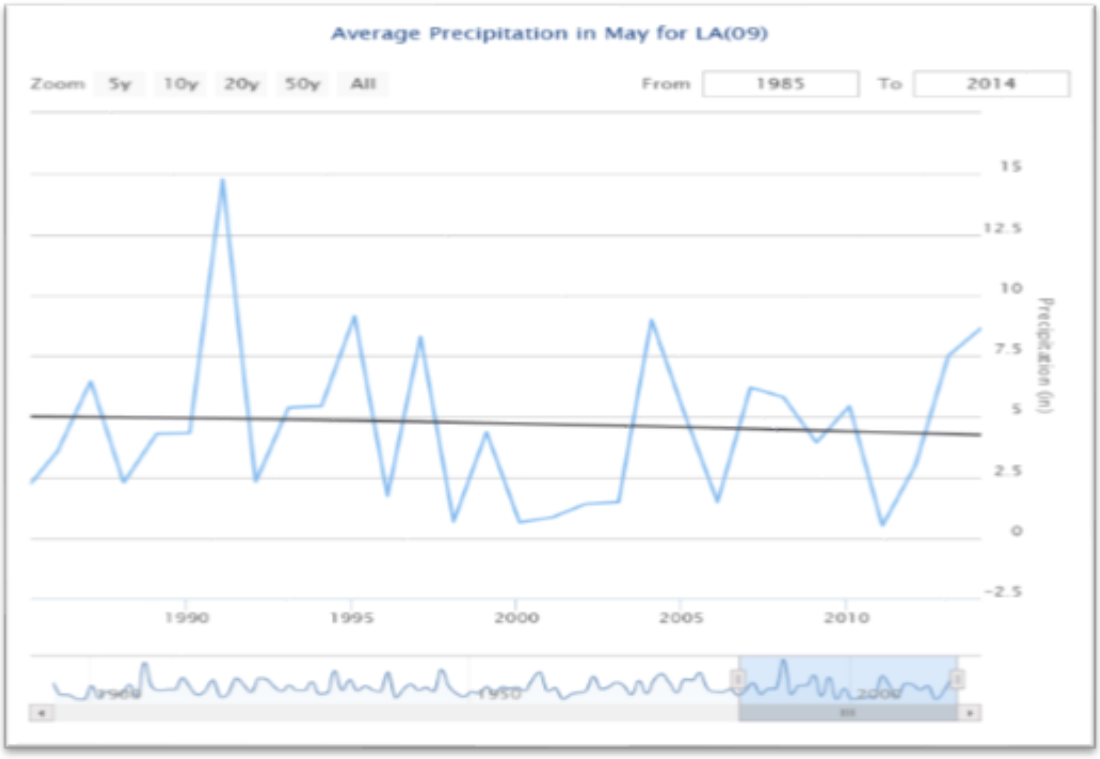


Figure 4. Average precipitation for May 1985-2014 (SRCC, 2015).

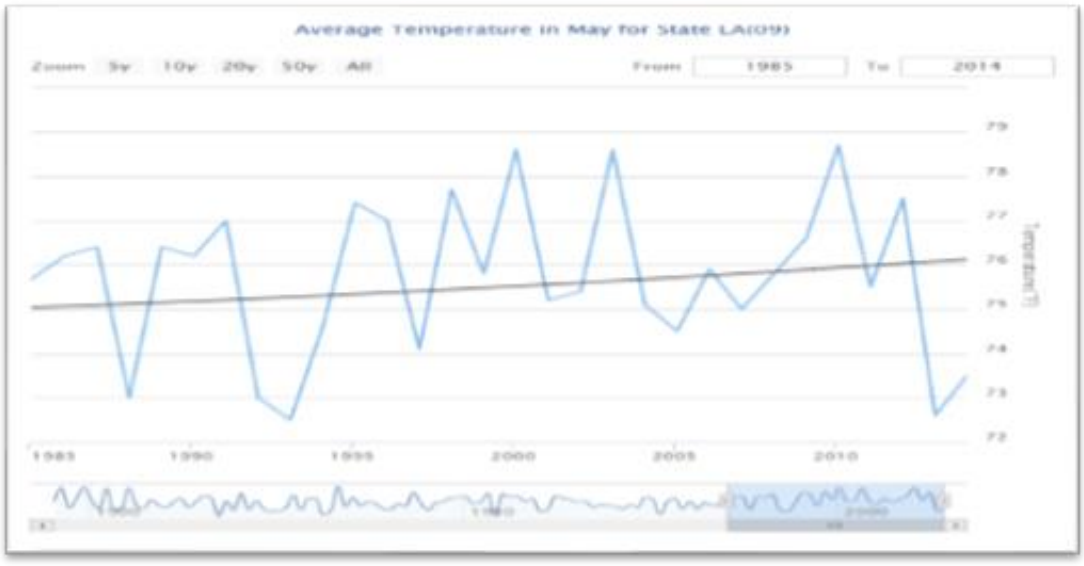


Figure 5. Average temperature for May 1985-2014 (SRCC, 2015).

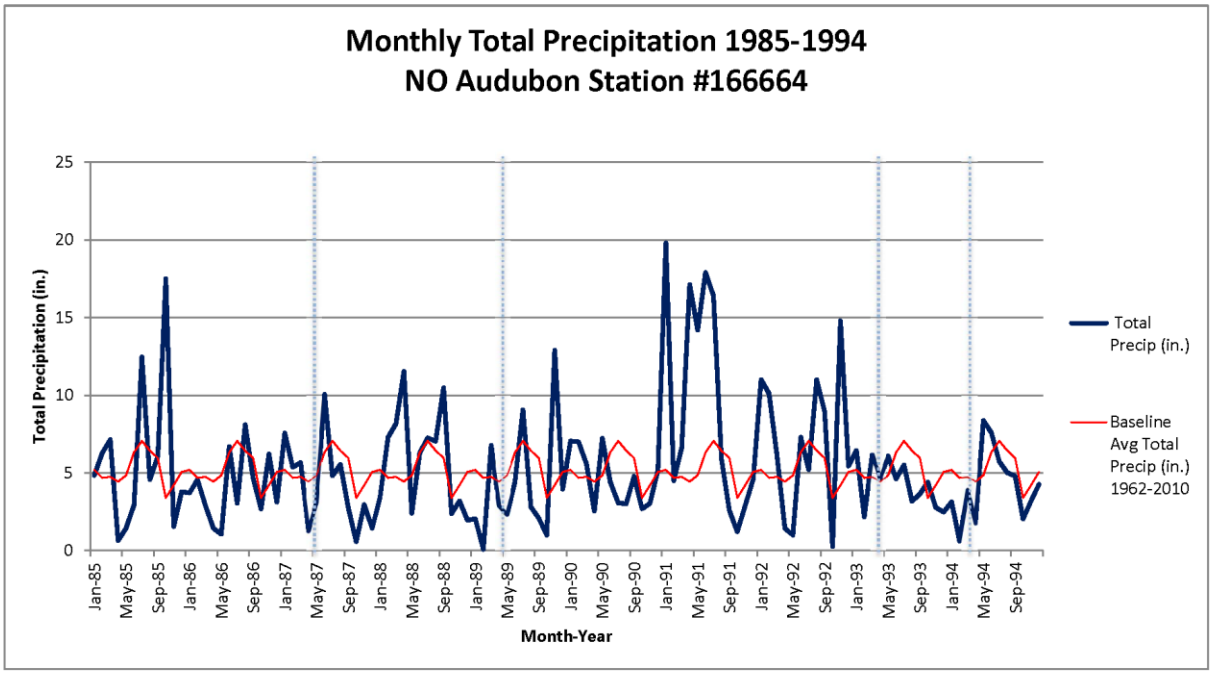


Figure 6. Monthly total precipitation 1985-1994 at New Orleans Audubon Station #166664 (WRCC 2015).

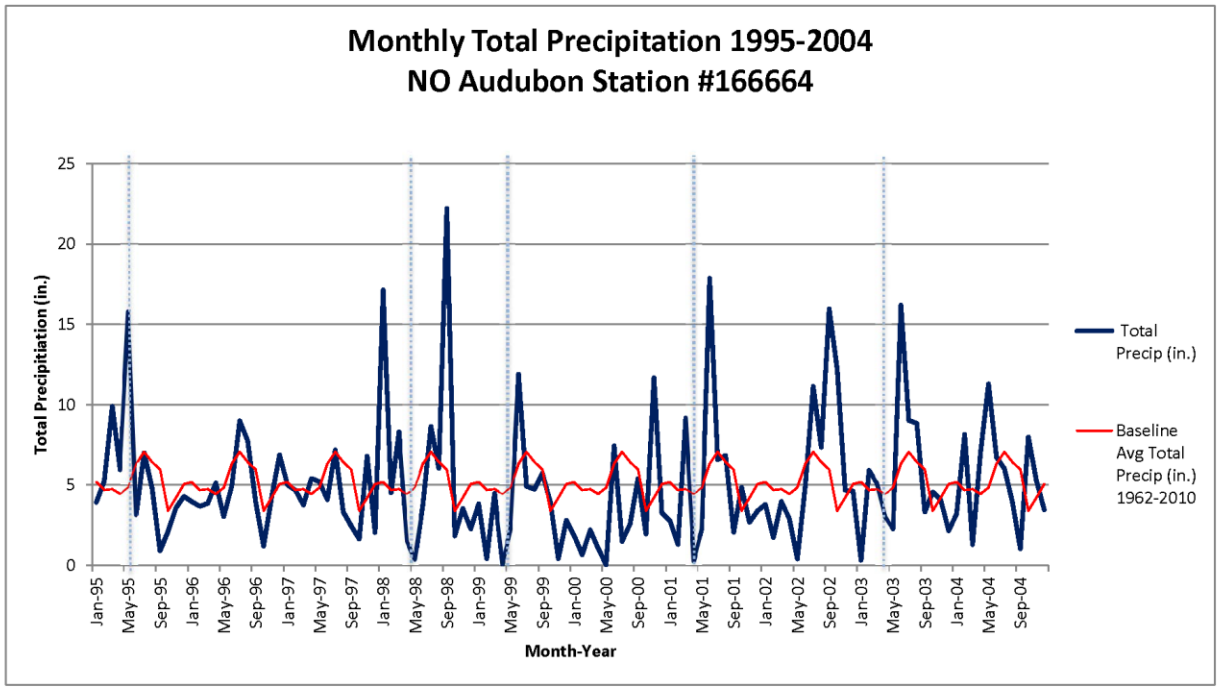


Figure 7. Monthly total precipitation 1995-2004 at New Orleans Audubon Station #166664 (WRCC 2015).

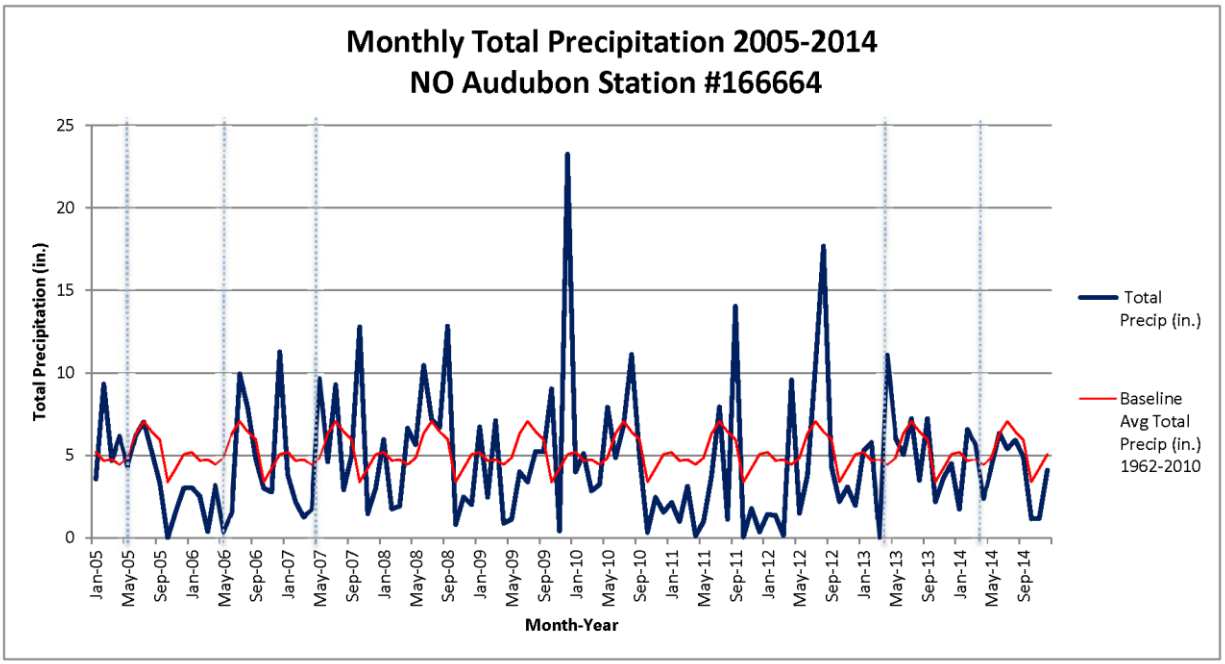


Figure 8. Monthly total precipitation 2005-2014 at New Orleans Audubon Station #166664 (WRCC 2015).

Normalize Difference Vegetation Index (NDVI)

The NDVI index values for each of the 14 time stamps are shown in Figure 10 (northern region) and Figure 11 (southern region). Index values for the Bayou aux Carpes 404c area range from 0.85 to 0, where values near zero represent open water and values approaching 1 indicate higher densities of healthy vegetation such as bottomland hardwoods and swamp as shown in shades of dark orange. NDVI values for marsh occurs between the 0.40 – 0.60 range and are normally lower than those for wooded vegetation due to the lack of considerable foliage and canopy as associated with bottomland hardwoods and swamps.

The northern portion of the Bayou aux Carpes 404c area is composed of mostly marsh in the northwestern section and wooded vegetation interspersed with marsh to the east (Figure 9). The NDVI values within the marsh areas tend to fluctuate between higher to lower values and are possibly a response to storm events as well as changes in temperature and precipitation. Prior to Hurricane Katrina in August 2005, vegetative health fluctuated from lower values in 1987, 2003 and 2005 to higher values in 1989, 1999, and 2001. The 2003 and 2005 lower NDVI values may be a result of the severe drought occurring throughout 1999-2001 coupled with a significant increase in precipitation as a result of Hurricane Lili (2002) and Tropical Storms Allison (2001), Isidore (2002), Bill (2003), and Matthew (2004). The 1999 and 2001 NDVI indicate greater values within the wooded areas and lower values within the marsh areas as a possible response to drought conditions. After Hurricane Katrina, the NDVI values continue to be high in the wooded vegetation areas and lower in the marsh areas for the 2006, 2007

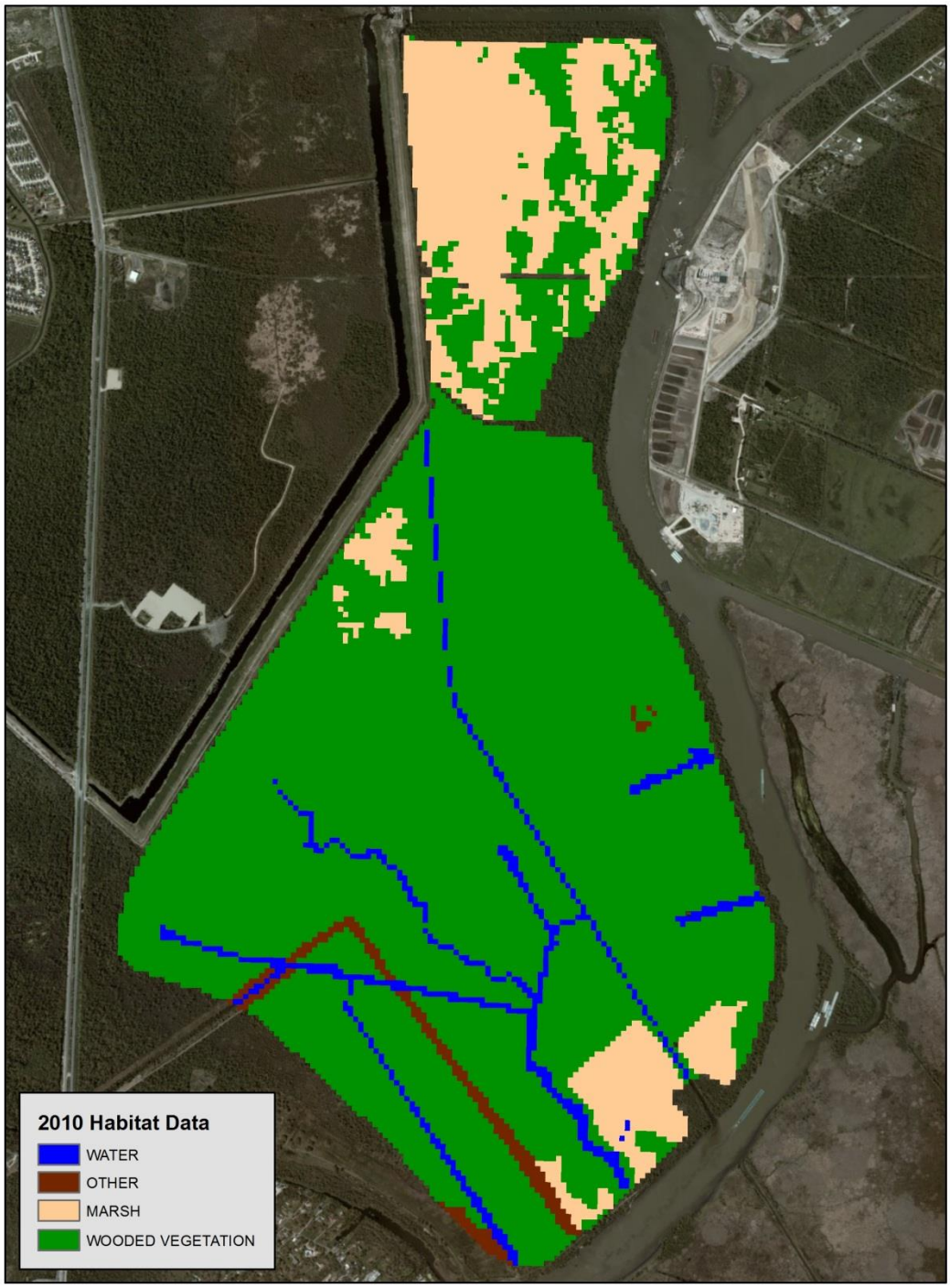


Figure 9. Bayou aux Carpes 404c Area 2010 Classified Habitat Data

and 2014 years. A sharp NDVI value increase in 2006, especially in the marsh area, can possibly be related to nutrients from Hurricane Katrina flood waters and precipitation which nourished the vegetation. The 2007 NDVI shows values continuing to lower in the marsh area, while the wooded vegetation areas remain relatively the same. The extremely low values in the marsh area in the 2014 image (appearing as a light blue strip in the image) are an artifact from the combination of Landsat 7 scenes and are probably more similar to the slightly higher values (green) surrounding the strip. The wooded vegetation area values appear to be higher along the eastern edge of the project near the landward leveed area. However, the leveed areas were not included in the analysis. Lower values closer to the center of the project are representative of sparse wooded vegetation mixed with marsh which denotes a lower reflectance value than more continuous wooded vegetation.

The southern portion of the Bayou aux Carpes 404c area is composed of mostly wooded vegetation (BLH, swamp, and scrub/shrub) with pockets of marsh in the southeast of the project area to the left and right of Bayou aux Carpes (Figure 11). A pocket of marsh also exists along the central western edge of the levee and continues to persist throughout all years. These marsh areas exhibit the lowest values in those respective areas. NDVI values fluctuate within waterways and plugged canals due to the presence/absence of aquatic vegetation, lower values when open water is present and slightly higher when aquatic vegetation is present. Lower NDVI values in the south central region of the project area are related to a cleared field which has remained clear for the entire period of analysis as well as the low values present in the utility corridor. These features are more pronounced during the drier years as shown in 1999 and 2001. Bottomland hardwoods in the southwestern portion of the project area represent consistently higher NDVI values throughout all years and appear to reach their lowest values after Hurricane Katrina possibly due to exfoliation of leaves which result in lower reflectance values from the vegetation. The notable affects from Hurricane Katrina are shown in the southeastern portion of the 2006 NDVI, along Bayou Barataria/GIWW and the plugged access canals, where NDVI values are lower and possibly reflect vegetation stress due to saltwater intrusion. However, the NDVI values in this area increase through the 2007 and 2014 years denoting a possible recovery period.

Departure from the Average Baseline Normalize Difference Vegetation Index (NDVI)

An average baseline image was created from 13 NDVI images for May 1987-2014 (Figures 10 and 11) and used to assess each NDVI year based on the departure from the average baseline (Figures 12-15). The 1998 NDVI was removed from the analysis due to the abnormally below average values possible caused by atmospheric interference. The departures from average range from -0.40, considered to be less healthy vegetation than average appearing as shades of blue and pink, to 0.25, considered greater than average healthy vegetation displayed in shades of yellow and orange. Areas depicted in shades of green represent near normal NDVI values.

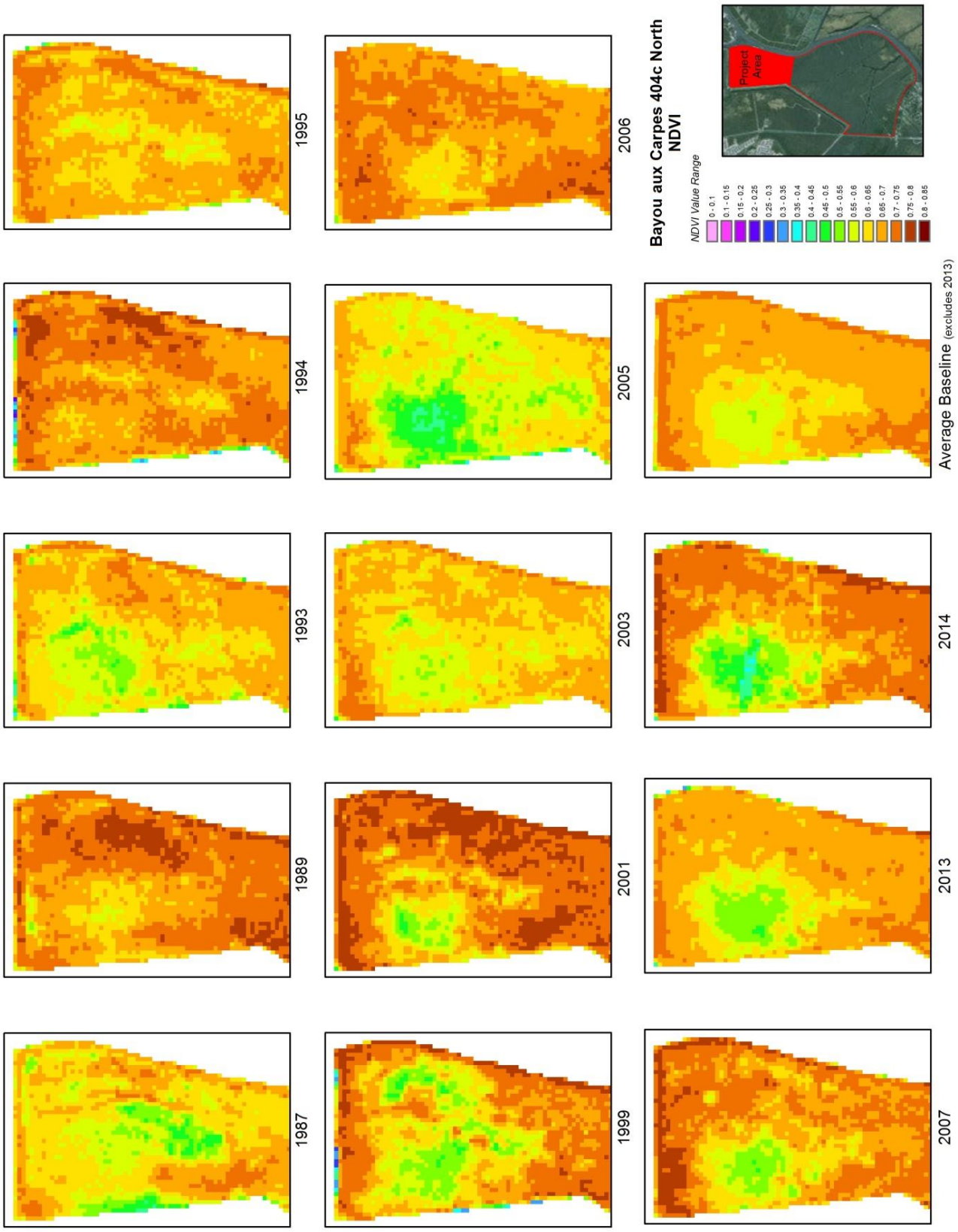


Figure 10. NDVI values for Bayou aux Carpes northern region for 1987-2014.

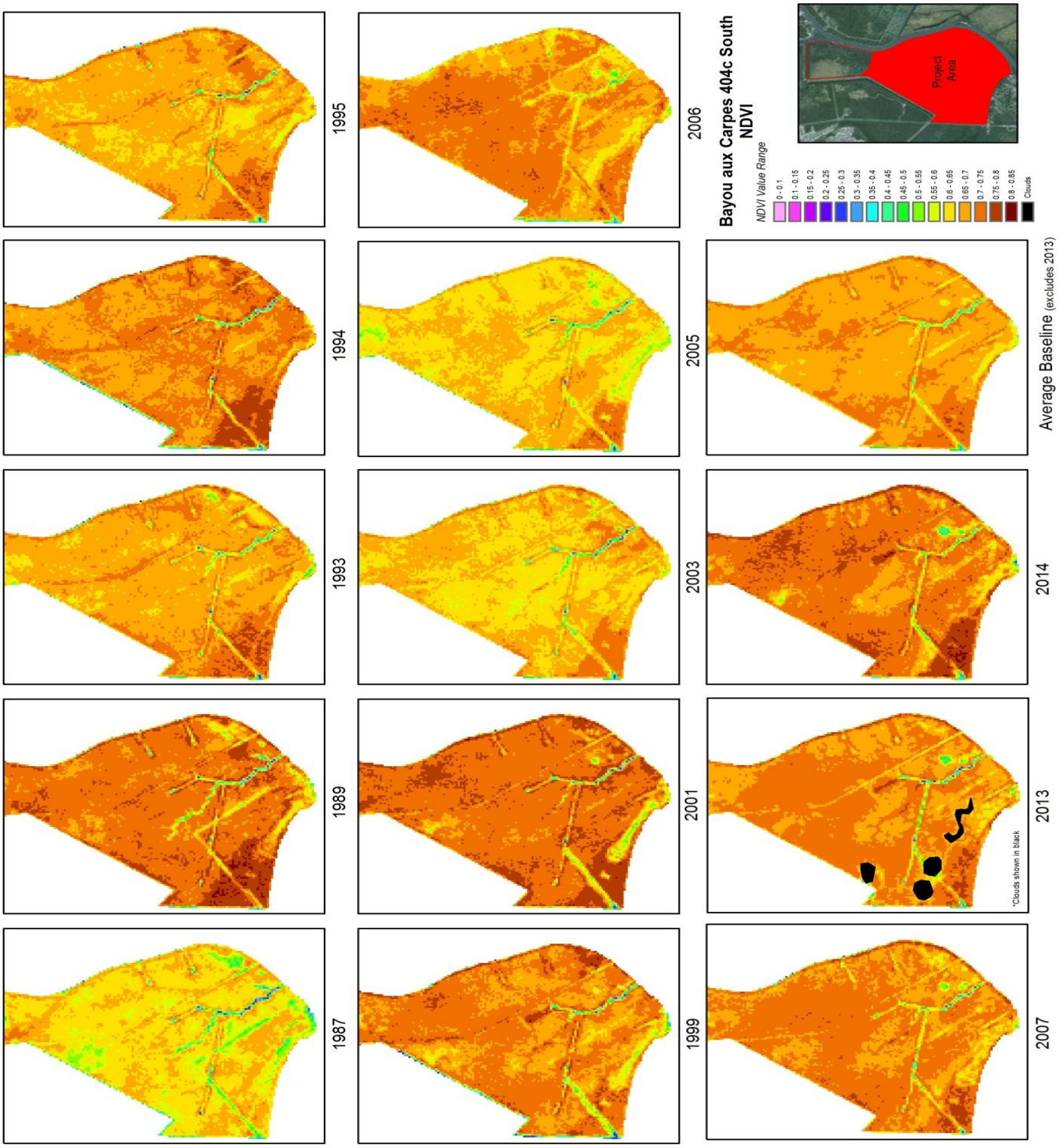


Figure 11. NDVI values for Bayou aux Carpes southern region for 1987-2014.

Within northern Bayou aux Carpes 404c area shown in Figures 12 and 13, overall NDVI values are lower or less healthy for vegetation during the 1987, 1999, 2005 and 2014 years with the lowest overall values shown in 2005 (pre-Katrina). The highest departures from average values or greater than average health of vegetation is noted in years 1989, 1994, 1995, 2001, 2003 and 2006 with the highest values shown in 1994 possibly due to recovery after Hurricane Andrew in 1992. Years 1993 and 2003 represent the closest values to normal when compared to the baseline average and also occur after Hurricane Andrew in 1992 and Hurricane Lili and Tropical Storm Isadore in 2002. Within the southern Bayou aux Carpes 404c area mostly comprised of wooded vegetation and shown in Figures 14 and 15, overall NDVI values are lower or less healthy for vegetation during 1987, 2003, 2005, 2006. Values slightly higher or healthier than average are noted in 1989, 1994, 1999, 2001, 2007, 2014 with the years 1993 and 1995 being the most representative of normal conditions. Figure 12. Departure from average baseline NDVI values for Bayou aux Carpes north from 1987-1999.

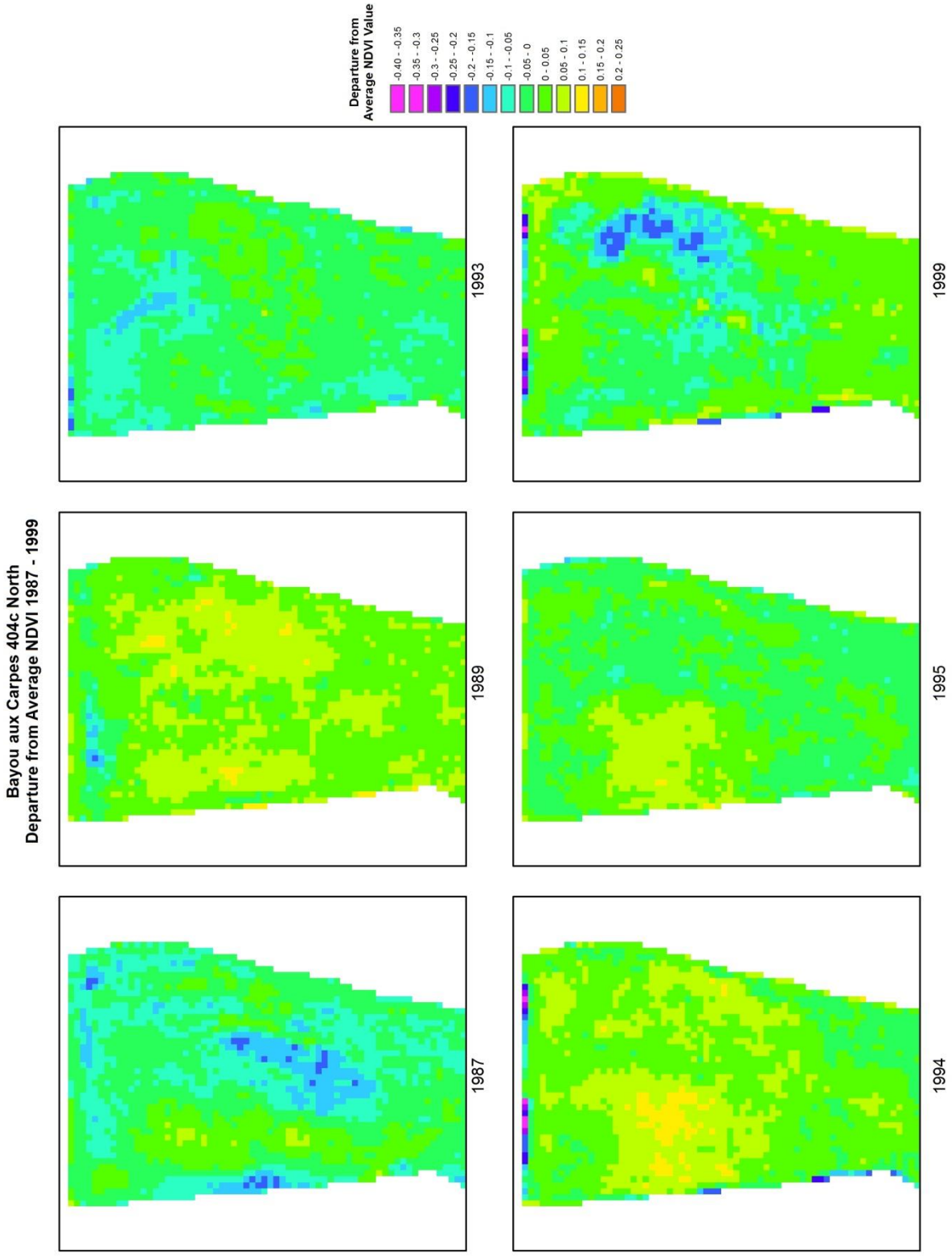


Figure 12. Departure from average baseline NDVI values for Bayou aux Carpes north from 1987-1999.

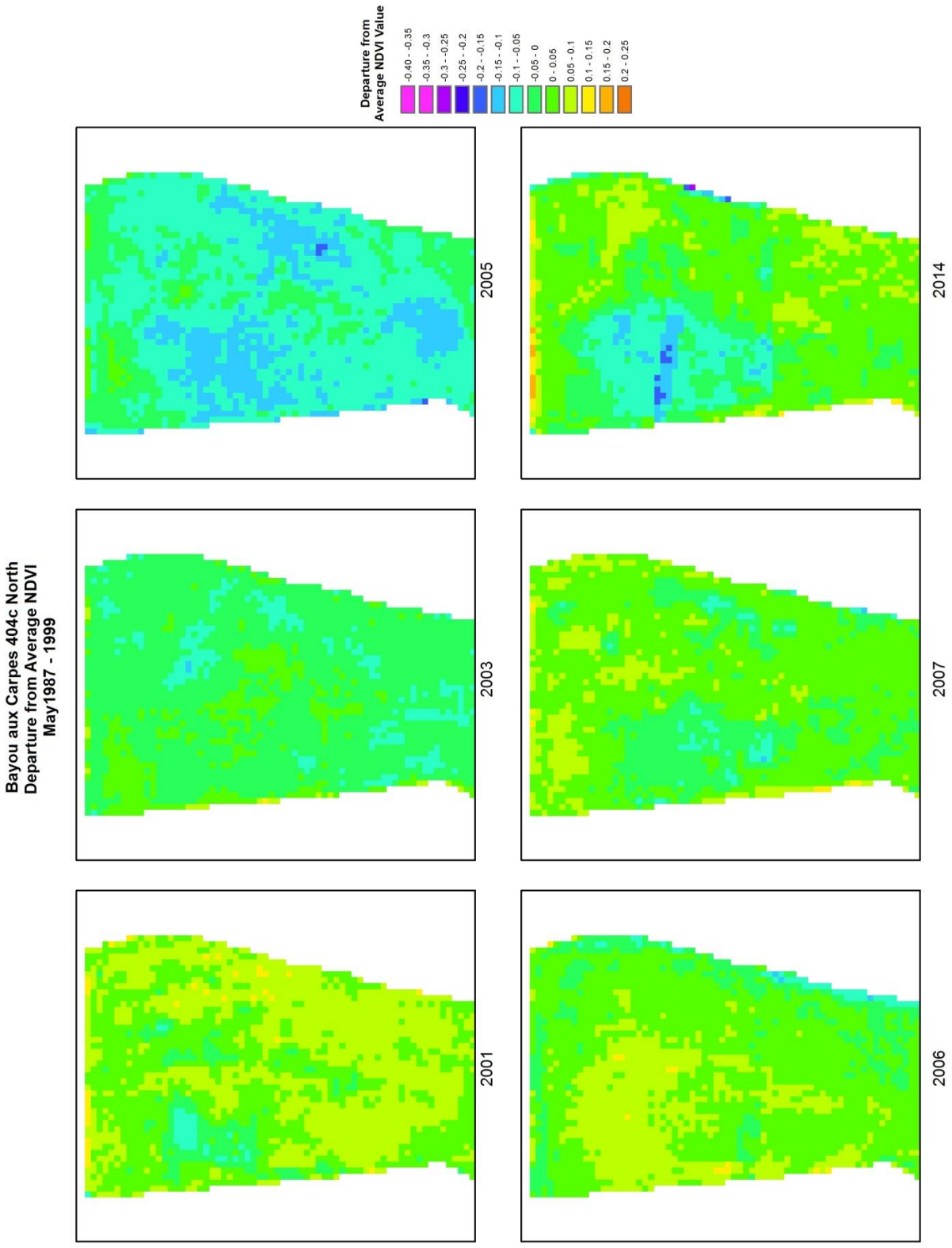


Figure 13. Departure from average baseline for Bayou aux Carpes north from 2001-2014.

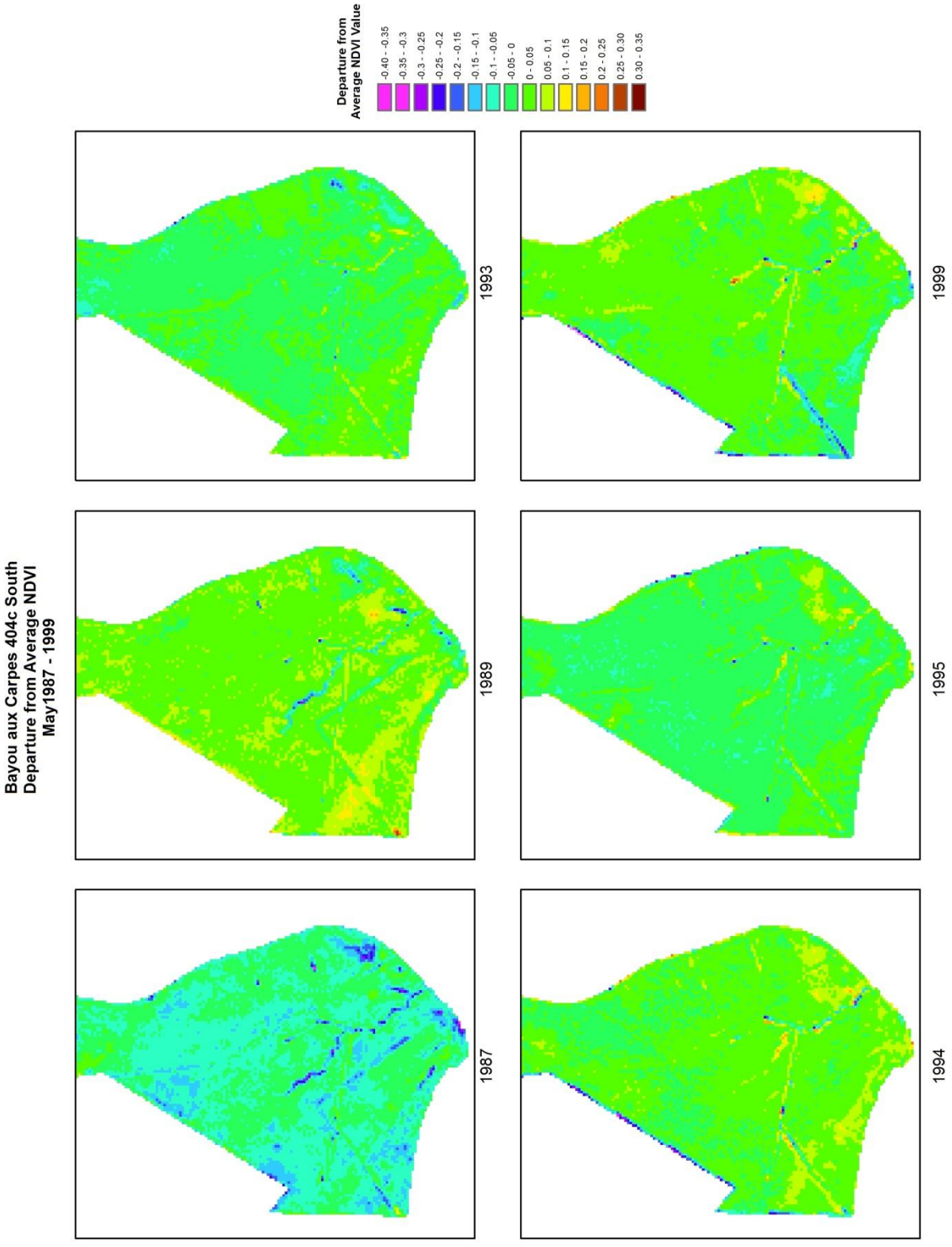


Figure 14. Departure from average baseline for Bayou aux Carpes south from 1987-1999.

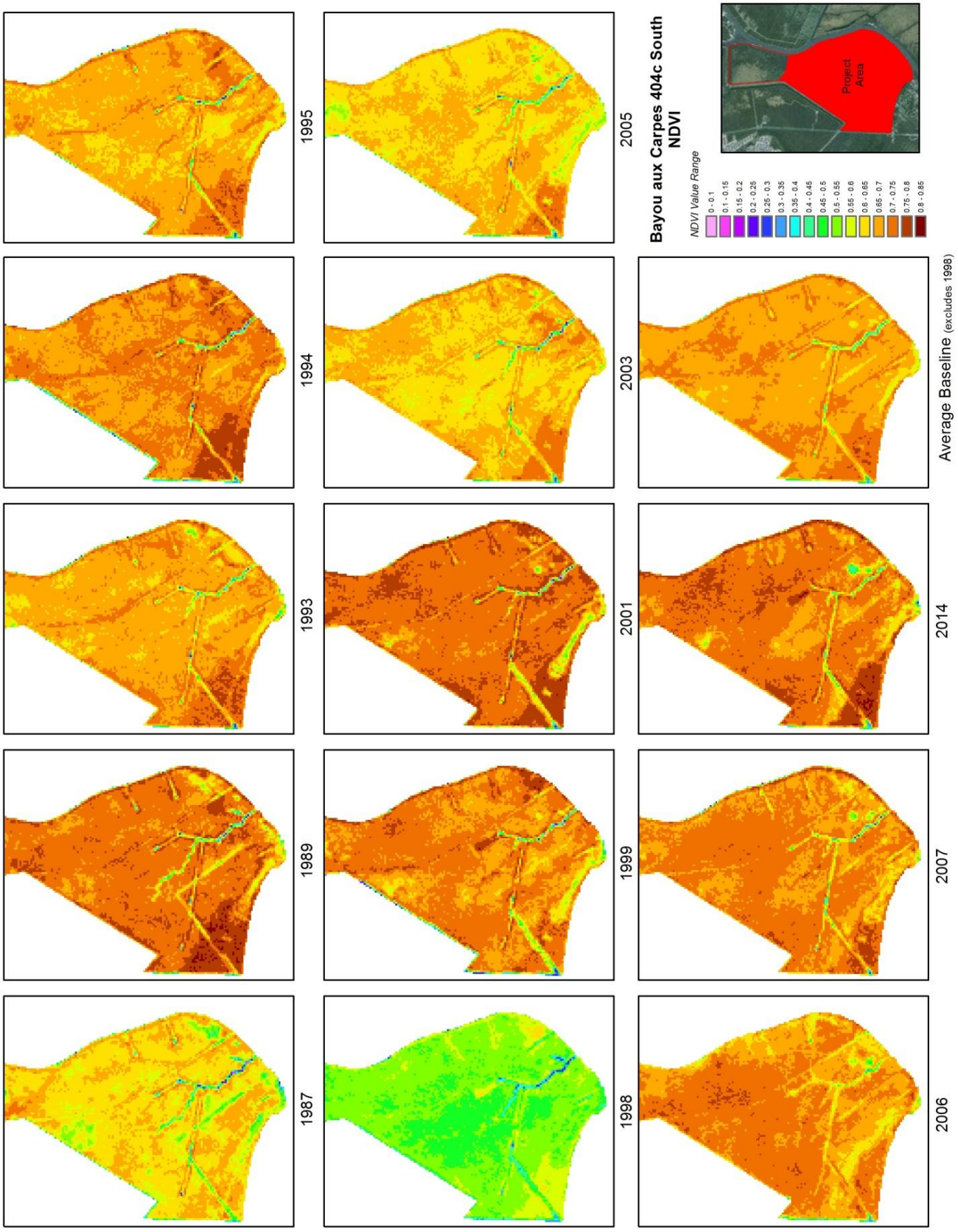
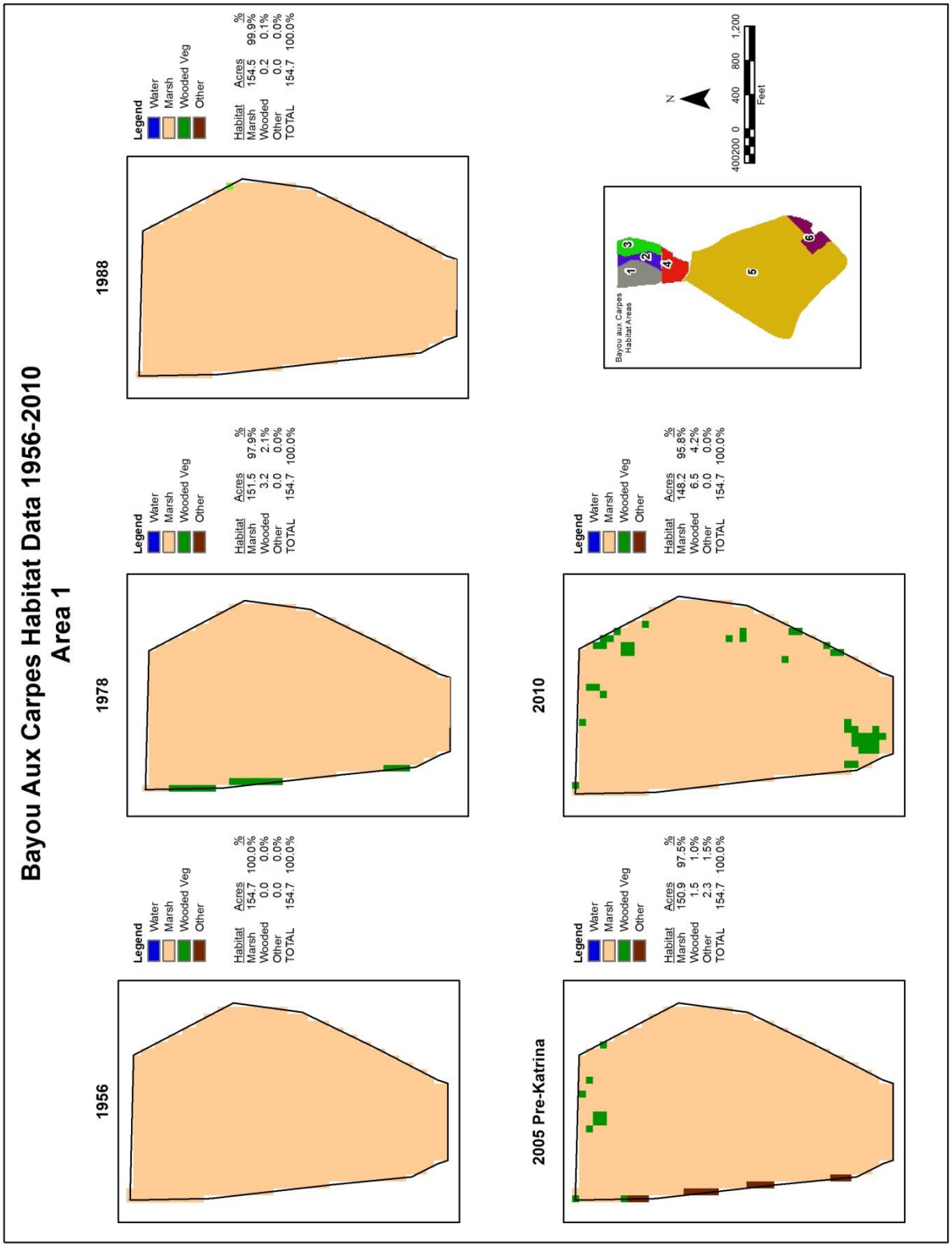


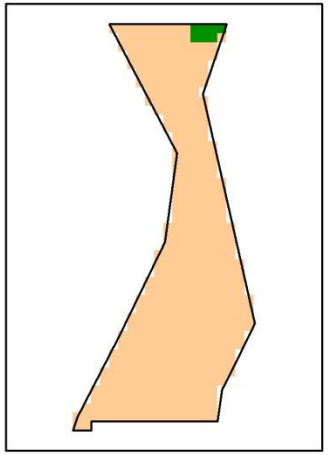
Figure 15. Departure from average baseline for Bayou aux Carpes south from 2001-2014.

Vegetative Habitat Analysis 1956-2010



Bayou Aux Carpes Habitat Data 1956-2010
Area 2

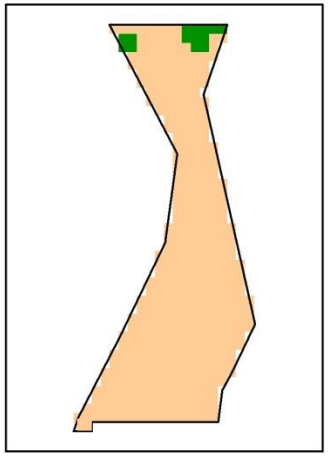
1956



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	65.2	98.4%
Wooded	1.1	1.6%
Other	0.0	0.0%
TOTAL	66.3	100.0%

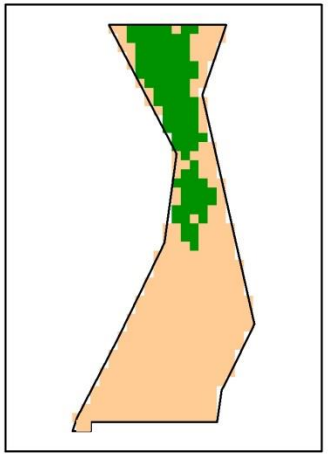
1978



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	64.1	96.7%
Wooded	2.2	3.3%
Other	0.0	0.0%
TOTAL	66.3	100.0%

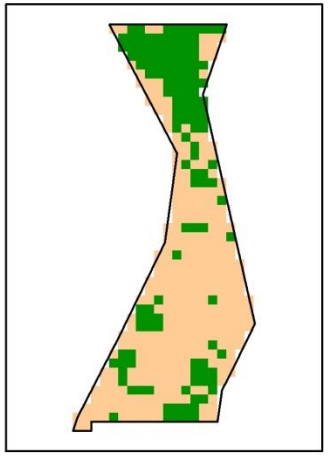
1988



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	50.7	76.5%
Wooded	15.6	23.5%
Other	0.0	0.0%
TOTAL	66.3	100.0%

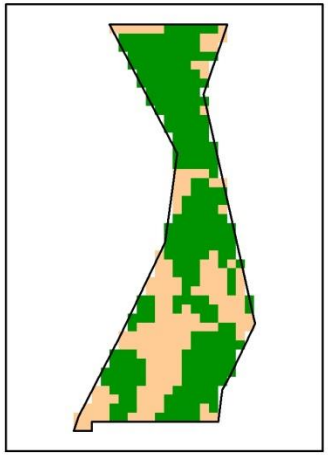
2005 Pre-Katrina



Legend
- Water
- Marsh
- Wooded Veg
- Other

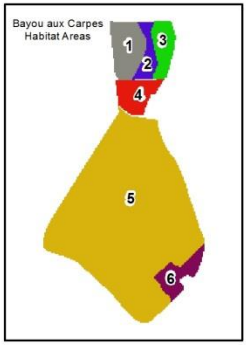
Habitat	Acres	%
Marsh	45.9	69.2%
Wooded	20.4	30.8%
Other	0.0	0.0%
TOTAL	66.3	100.0%

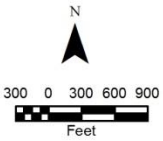
2010



Legend
- Water
- Marsh
- Wooded Veg
- Other

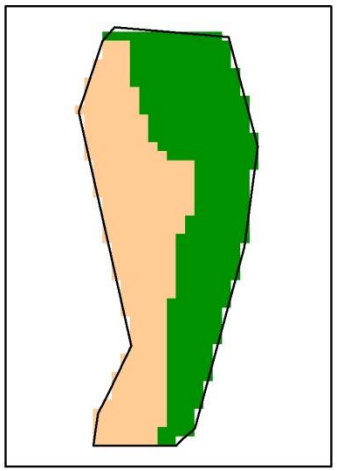
Habitat	Acres	%
Marsh	23.9	36.1%
Wooded	42.4	63.9%
Other	0.0	0.0%
TOTAL	66.3	100.0%





Bayou Aux Carpes Habitat Data 1956-2010
Area 3

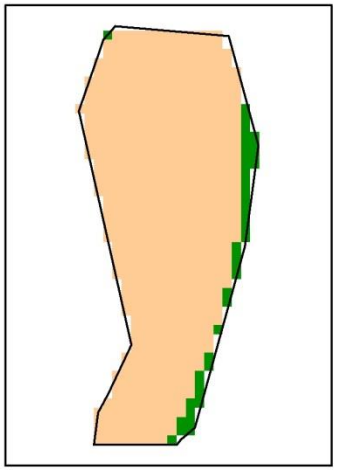
1956



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	45.9	47.1%
Wooded	51.6	52.9%
Other	0.0	0.0%
TOTAL	97.5	100.0%

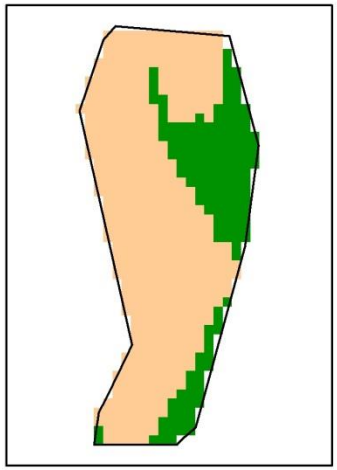
1978



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	91.2	93.5%
Wooded	6.3	6.5%
Other	0.0	0.0%
TOTAL	97.5	100.0%

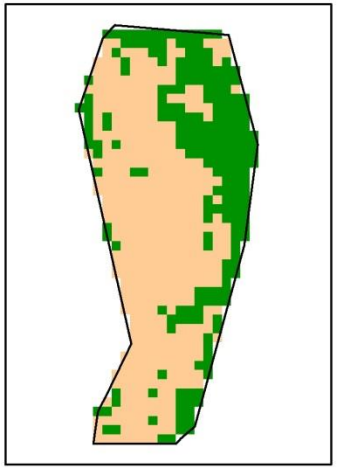
1988



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	72.6	74.5%
Wooded	24.9	25.5%
Other	0.0	0.0%
TOTAL	97.5	100.0%

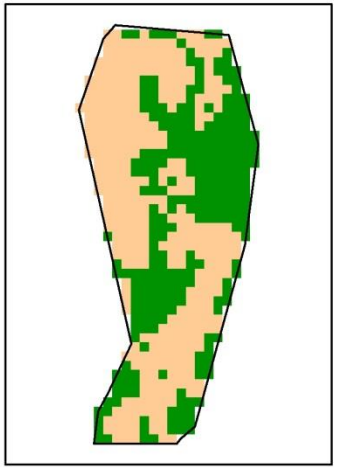
2005 Pre-Katrina



Legend
- Water
- Marsh
- Wooded Veg
- Other

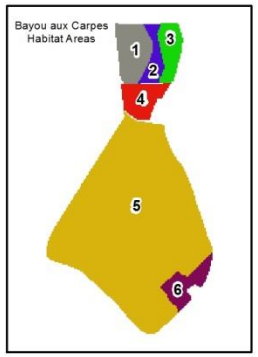
Habitat	Acres	%
Marsh	63.4	65.0%
Wooded	34.1	35.0%
Other	0.0	0.0%
TOTAL	97.5	100.0%

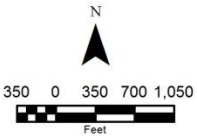
2010



Legend
- Water
- Marsh
- Wooded Veg
- Other

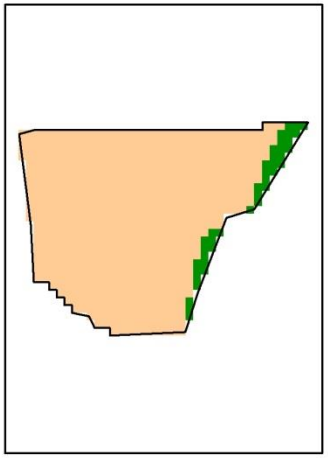
Habitat	Acres	%
Marsh	55.6	57.1%
Wooded	41.9	42.9%
Other	0.0	0.0%
TOTAL	97.5	100.0%





Bayou Aux Carpes Habitat Data 1956-2010
Area 4

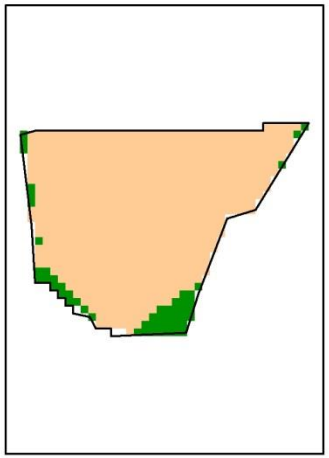
1956



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	101.2	94.2%
Wooded	6.3	5.8%
Other	0.0	0.0%
TOTAL	107.3	100.0%

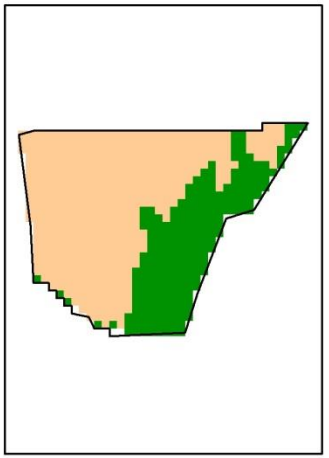
1978



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	98.8	92.1%
Wooded	8.5	7.9%
Other	0.0	0.0%
TOTAL	107.3	100.0%

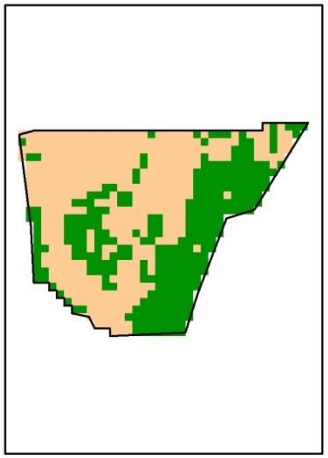
1988



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Marsh	71.2	66.3%
Wooded	36.1	33.7%
Other	0.0	0.0%
TOTAL	107.3	100.0%

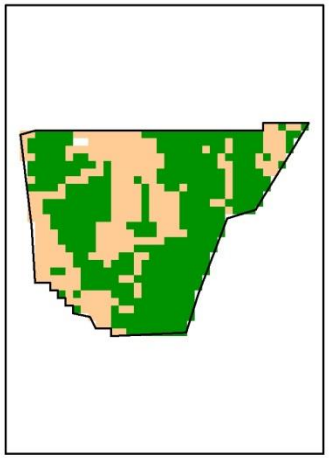
2005 Pre-Katrina



Legend
- Water
- Marsh
- Wooded Veg
- Other

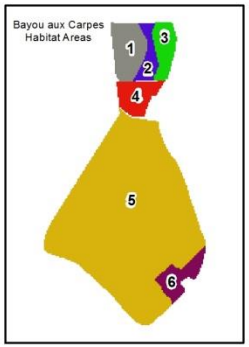
Habitat	Acres	%
Marsh	61.9	57.6%
Wooded	45.6	42.4%
Other	0.0	0.0%
TOTAL	107.3	100.0%

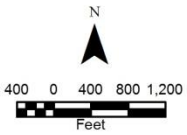
2010



Legend
- Water
- Marsh
- Wooded Veg
- Other

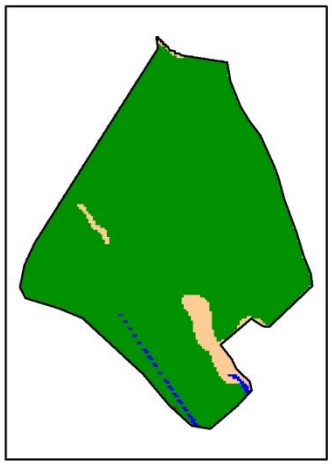
Habitat	Acres	%
Marsh	40.6	37.8%
Wooded	66.7	62.2%
Other	0.0	0.0%
TOTAL	107.3	100.0%





Bayou Aux Carpes Habitat Data 1956-2010
Area 5

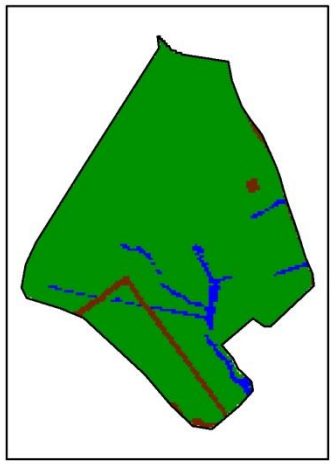
1956



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	12.0	0.7%
Marsh	66.6	3.7%
Wooded	1709.7	95.6%
Other	0.6	0.0%
TOTAL	1788.9	100.0%

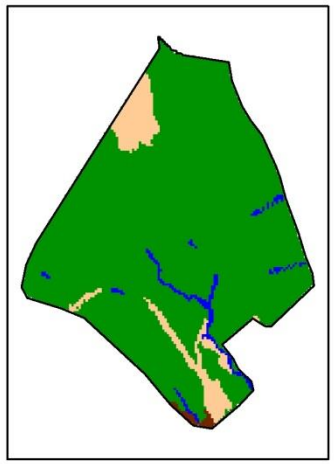
1978



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	58.8	3.3%
Marsh	1.1	0.1%
Wooded	1674.8	93.6%
Other	54.2	3.0%
TOTAL	1788.9	100.0%

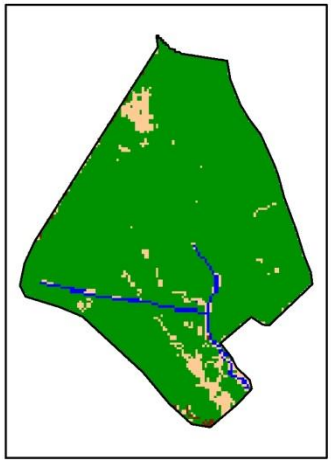
1988



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	37.8	2.1%
Marsh	127.0	7.1%
Wooded	1614.2	90.2%
Other	9.9	0.6%
TOTAL	1788.9	100.0%

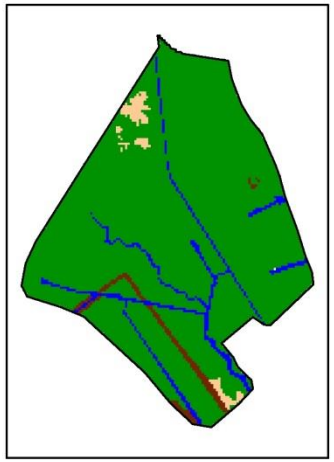
2005 Pre-Katrina



Legend
- Water
- Marsh
- Wooded Veg
- Other

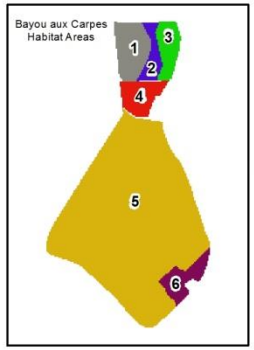
Habitat	Acres	%
Water	28.8	1.6%
Marsh	102.1	5.7%
Wooded	1647.0	92.1%
Other	11.0	0.6%
TOTAL	1788.9	100.0%

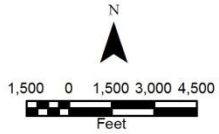
2010



Legend
- Water
- Marsh
- Wooded Veg
- Other

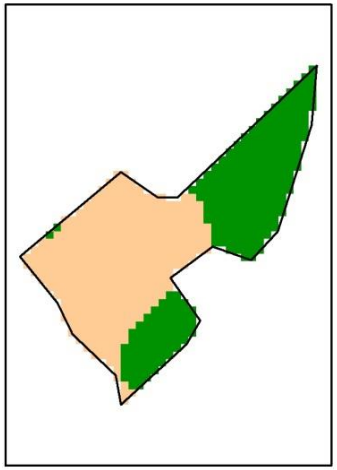
Habitat	Acres	%
Water	87.3	4.9%
Marsh	30.9	1.7%
Wooded	1630.9	91.2%
Other	39.8	2.2%
TOTAL	1788.9	100.0%





Bayou Aux Carpes Habitat Data 1956-2010
Area 6

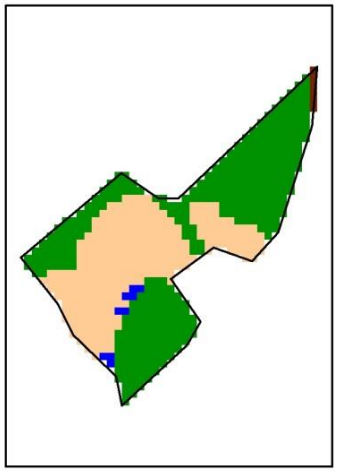
1956



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	0.0	0.0%
Marsh	54.8	55.5%
Wooded	44.0	44.5%
Other	0.0	0.0%
TOTAL	98.8	100.0%

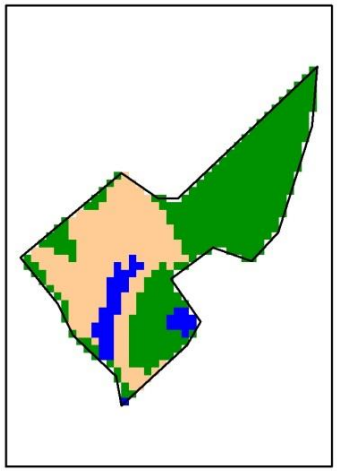
1978



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	1.4	1.4%
Marsh	40.6	41.1%
Wooded	55.9	56.6%
Other	0.9	0.9%
TOTAL	98.8	100.0%

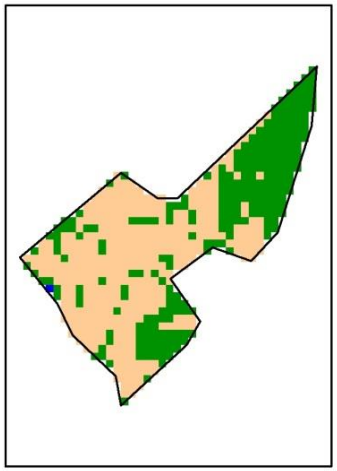
1988



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	7.1	7.2%
Marsh	34.9	35.3%
Wooded	56.8	57.5%
Other	0.0	0.0%
TOTAL	98.8	100.0%

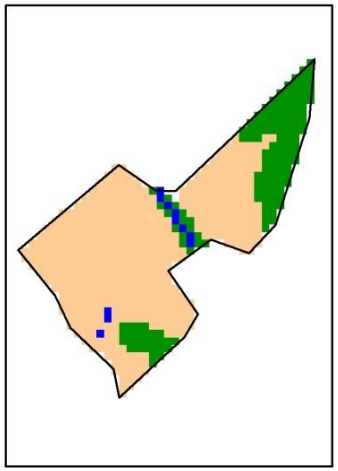
2005 Pre-Katrina



Legend
- Water
- Marsh
- Wooded Veg
- Other

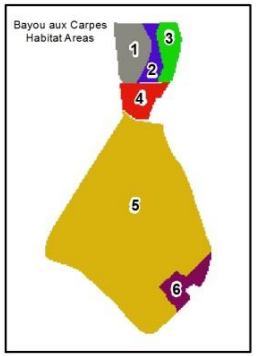
Habitat	Acres	%
Water	0.2	0.2%
Marsh	58.7	59.4%
Wooded	39.9	40.4%
Other	0.0	0.0%
TOTAL	98.8	100.0%

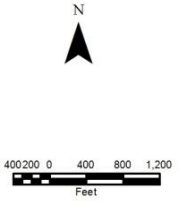
2010



Legend
- Water
- Marsh
- Wooded Veg
- Other

Habitat	Acres	%
Water	1.7	1.7%
Marsh	74.9	75.8%
Wooded	22.2	22.5%
Other	0.0	0.0%
TOTAL	98.8	100.0%





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CULTURAL RESOURCES
Existing Conditions

Section 106 of the National Historic Preservation Act of 1966, as amended and codified in Title 54 of the United States Code; NEPA of 1969 (Public Law 91-190), as amended; and other applicable laws and regulations require Federal agencies to take into account the effects of their undertaking on the environment and any significant cultural resources within the project area of the proposed undertaking, as well as its area of potential effect (APE). Typically, these studies require archival searches and field surveys to identify any cultural resources. When significant sites are recorded, efforts are made to minimize adverse effects and preserve the site(s) in place. If any significant sites cannot be avoided and would be adversely impacted, an appropriate mitigation plan would be implemented to recover data that would be otherwise lost due to the undertaking.

The project area is a man-made, bayou plug located on National Park Service lands and approximately 3-kilometers from the Barataria Unit of the Jean Lafitte National Historical Park and Preserve, National Register District. A review of the Louisiana Cultural Resources Map (on-line) indicates that there are three archaeological sites within 1-kilometer of the proposed project. Site 16JE234 and 16PL260 are identified as prehistoric shell middens and neither would be impacted by the proposed project. The third archaeological site, 16JE233, is located in the project area and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a prehistoric Rangia shell midden and possible historic two-track road existing on the west bank of Bayou Barataria and a natural levee.

Contradicting the site form information, background research revealed that in 1964, the US Army Corps of Engineers (USACE) approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, the USACE completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. The USACE began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1973 and 1974, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill.

Also contra-indicating the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without “plug” or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5’ USGS map in 1980, which is consistent with the construction timeline. Finally, a site visit conducted by USACE Archaeologist in July of 2019 identified no artifacts and

determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location. In summary, archaeological site 16JE233, appears to have been placed as part of a "plug" constructed in the early 1970's to close-off Bayou aux Carpes from Bayou Barataria.

Based on the evidence provided in this discussion, the USACE has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell as recorded during the 2006 boat survey is the result of levee construction and the plugging of Bayou aux Carpes that occurred between 1971 and 1974. The USACE has concluded that there are no historic properties in the project area, and that none would be affected by the proposed project. Coordination with SHPO and federally-recognized Tribes is underway with letters dated November XX, 2020, regarding this.

Additionally, there are no tribal lands, nor are there specific tribal treaty rights related to access or traditional use of the natural resources in Jefferson Parish. However, there are many protected tribal resources within the parish. For example there are many recorded pre-contact archaeological sites that contain human burials along Bayou Barataria. Additionally, there are contact and historic period (1718 A.D.-1860 A.D.) occupations documented along the natural levee of the Mississippi River, along Bayou Barataria and on Grand Isle and Grand Terre. However there is no evidence of them being in the study area.

Future Conditions with No-Action

Without implementation of the proposed action, the plug at the confluence of Bayou aux Carpes and Bayou Barataria would remain in-place and there would be no impacts to previously recorded or unknown cultural resources within the area. Cultural resources would continue to be subject to the impacts of human and natural land use patterns and processes that have dominated the area in the past.

Future Conditions with the Proposed Action

With implementation of the proposed action, the plug at the confluence of Bayou aux Carpes and Bayou Barataria would be removed. All excavation to remove the plug and the placement of the excavated material would take place in the immediate vicinity of the plug, and would not impact any known or unknown cultural resources that exist in the project area.

While Jefferson Parish has a long history of occupation by Native American communities, prior to its establishment and throughout its history, there are currently no protected tribal resources, trial rights, or Indian lands that have the potential to be significantly affected by the proposed actions within in the study area. Therefore, CEMVN has determined that no tribal resources, rights, or lands will be significantly affected by implementing this action.

COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

7.10 National Historic Preservation Act of 1966

In compliance with Section 106 of the National Historic Preservation Act and its implementing regulation found at 36 CFR Part 800, Federal agencies must take into account the effects of their actions on historic properties. Historic properties include any prehistoric or historic district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register of Historic Places. A Federal agency shall consult with any Federally-recognized Indian Tribe that attaches religious and cultural significance to such properties. Agencies shall afford the State Historic Preservation Officer (SHPO) and Indian tribes a reasonable opportunity to comment before decisions are made. The CEMVN has determined that no significant historic properties are present within the Area of Potential Effect for the proposed action. Letters with a determination of no historic properties affected were sent to the Louisiana SHPO and federally-recognized Tribes on November XX, 2020 for a 30-day review period.

7.11 Tribal Consultation

It is the policy of the federal government to consult with Federally-recognized Tribal Governments on a Government-to-Government basis as required in EO 13175 ("Consultation and Coordination with Indian Tribal Governments;" U.S. President 2000). The requirement to conduct coordination and consultation with Federally-recognized Tribes on and off of Tribal lands for "any activity that has the potential to significantly affect protected tribal resources, tribal rights (including treaty rights), and Indian lands" finds its basis in the constitution, Supreme Court cases, and is clarified in later planning laws. The USACE Tribal Consultation Policy, 1 Nov 2012, specifically implemented this E.O. and later Presidential guidance. The 2012 USACE Tribal Consultation Policy and Related Documents provide definitions for key terms, such as tribal resources, tribal rights, Indian lands, consultation, as well as guidance on the specific trigger for consultation.

While Jefferson Parish has a long history of occupation by Native American communities, prior to its establishment and throughout its history, there are currently no protected tribal resources, trial rights, or Indian lands that have the potential to be significantly affected by the proposed actions within in the study area. However, in accordance with CEMVN's responsibilities under the NHPA Section 106 process, CEMVN will offer the following Federally-recognized Indian tribes the opportunity to review and comment on the proposed action: Alabama-Coushatta Tribe of Texas, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Mississippi Band of Choctaw Indians, Muscogee (Creek) Nation, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and Tunica-Biloxi Tribe of Louisiana. The outcome of this consultation will be included in the Final EA.

BAYOU AUX CARPES EPA CLEAN WATER ACT SECTION 404(c) SITE:
IMPROVED CIRCULATION STUDY

1. INTRODUCTION

The Bayou aux Carpes (BAC) 404c site is located south of New Orleans, LA, along the Westbank Metro area (Figure 1). As part of the US Army Corps of Engineers (USACE) West Bank & Vicinity (WBV) Hurricane and Storm Damage Risk Reduction System (HSDRRS), the Westbank New Orleans area includes significant new construction for storm surge and flood protection. The BAC 404c site borders a portion of this new line of surge and flood defense, and this report describes results from a model study evaluation to improve water circulation in BAC 404c site wetlands, based on interagency collaboration between the Environmental Protection Agency (EPA), the USACE, the National Park Service (NPS), and other members of the state and federal review team. To construct WBV HSDRRS features along and within a portion of the BAC 404c site, the EPA allowed modifications the BAC 404c site. Prior to finalizing the BAC 404c site modifications, the EPA requested and received commitments from the USACE to study and evaluate potential impacts to the 404c from the proposed construction activities and commitments to implement mitigation measures to compensate for direct wetland impacts. The USACE commitments also included implementing augmentation features within the 404c site to "enhance the wetlands functions and values of the site" and to conduct long-term monitoring of the area. Some potentially beneficial augmentation features were set forth in the "Individual Environmental Report (IER) 12" (USACE, 2009). The prioritized augmentation features (augmentation alternatives) from IER 12 are presented in Table 1, and general location information within the BAC 404c site is shown in Figure 2.

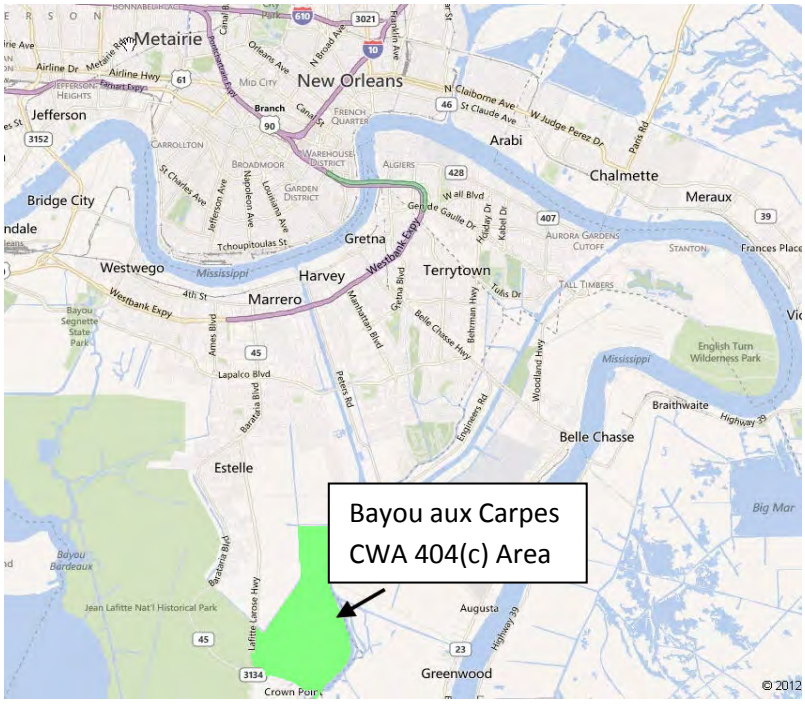


Figure 1. Area location map showing Bayou aux Carpes 404c site.

Table 1. Prioritized Augmentation Alternatives from IER 12

Alternative 1: Gapping the dredged material bank along the southern side of the Old Estelle Outfall Canal (Old Estelle Discharge Canal) to provide historic sheet flow regime to the BAC 404c area, and to provide a dedicated source of freshwater that could provide additional nutrients to the 404c area.

Alternative 2: Modify the dredged material bank along the Southern Natural Gas Pipeline Canal to provide hydrologic exchange between the northern and southern sections of the BAC 404c area, thereby partially restoring the historic sheet flow regime.

Alternative 3: Modify the shell plug at Bayou aux Carpes to provide hydrologic exchange between the Gulf Intracoastal Waterway (GIWW) and the BAC 404c area, thereby partially restoring the historic sheet flow regime.

Alternative 4: Close the Southern Natural Gas Pipeline Canal to promote hydrologic flow within the BAC 404c area, thereby partially restoring historic sheet flow regime.

Alternative 5: Gapping or grading down drill hole access canal (keyhole canal) banks to promote hydrologic flow within the BAC 404c area, thereby partially restoring historic sheet flow regime.

Alternative 6: Gapping or grading down oil well access roads (old access roads) to promote hydrologic flow within the BAC 404c area, thereby partially restoring historic sheet flow regime.

In terms of the USACE plan formulation process for civil works projects, it is noted that the "alternatives" discussed herein are really considered to be "measures" rather than alternatives. The ultimate Bayou aux Carpes 404c Augmentation Plan will likely consist of one or more of these measures. The Tentatively Selected Augmentation Plan determined by the USACE in coordination with the interagency team and Non-Federal Sponsor would become the Tentatively Selected Augmentation Plan Alternative (TSAPA). Since the potential augmentation plan measures have thus far been referred to as alternatives by the Project Delivery Team, these measures are still referred to as alternatives in this document.

Figure 2. General location of IER 12 study alternative locations in the BAC 404c site.

2. EVALUATION STRATEGY

A Computer Model code with features for simulating wetlands was developed to evaluate the various augmentation alternatives. The 2-Dimensional Free Surface Finite Element Code (RMA2) was used with the *Marsh Porosity* wetland simulation feature activated, allowing marsh areas to gain/lose water surface gradually over a vertical interval and always retain a small sub-mesh-scale wetted area. The elements representing the densely vegetated and flotant marsh areas are allowed to maintain varying levels of saturation, figuratively like a sponge that can be damp to fully saturated if it is submerged. RMA2 is a depth-averaged code, and, in addition to discharge and tidal boundary conditions, it can apply rainfall. Uniform, high intensity rain conditions, matching similar coastal Louisiana climate events, were also included in the simulations.

The project alternatives were evaluated with the same time series (unsteady) tidal boundary, a 15-minute time step for a slow rising tide from +0.7 ft that peaks at +1.6 ft and then falls to 0.1 ft. Tidal records indicate that high tides at the BAC wetlands reach around 2.0 ft a few times per year, but the more frequent high tide is around 1.5 ft. The GIWW borders the eastern boundary of the BAC 404c site, and the BAC 404c

wetlands have historically been open to the GIWW at the Old Estelle Discharge Canal, at the northeast corner of the 404c site. The BAC 404c site is also connected to the GIWW via the Southern Natural Gas Pipeline (SNGP) near its southeastern limit. Bayou aux Carpes is also along the southeastern 404c wetland area, but the outfall of this bayou has long been plugged at what would be another historic connection to the GIWW. As defined for the adjacent T-Wall, navigation sector gate, and pump station complex (the West Closure Complex), tidal fluctuations are uniform (like a standing wave) along the length of the BAC 404c site border with the GIWW. More simply, a tidal boundary condition developed from one of the gages located just upstream on the GIWW (Harvey Canal) can be used as a boundary condition for the entire BAC wetland. Since new storm and flood projects included a floodwall along a portion of the upper eastern wetland boundary that extended across the Old Estelle Discharge Canal, a gated structure was incorporated there to maintain this historical outlet into the GIWW.

To gage the effect of flow modifications, water movement, defined by velocity through the marsh, was contoured and summed as acreages. Flow movement outside of the channels is very slow, and acreage calculations were based on selecting the contour limit between 0.05 and 0.1 fps. Additional seepage through soils and root systems is understood, so the acreage comparisons are not presented as a "wet versus dry" interface. Rather this approach provides a relative comparison for the existing and plan modification simulations. Flow rates at key locations were also used.

Model bathymetry was developed using a LIDAR survey data set, and during some of the initial meetings of the project team in 2007-2008, it was noted that some of the low, flotant marsh areas were represented with erroneously high elevations. These data were corrected with GPS-based field spot checks. Figure 3 (left) shows the initial model domain (from 2007), and Figure 3 (right) shows the full domain with elevation corrections that was used for all simulations in this study. The model bathymetry shown in Figure 3 and Figure 4 was developed with the USACE Surface Water Modeling System (SMS) software package.

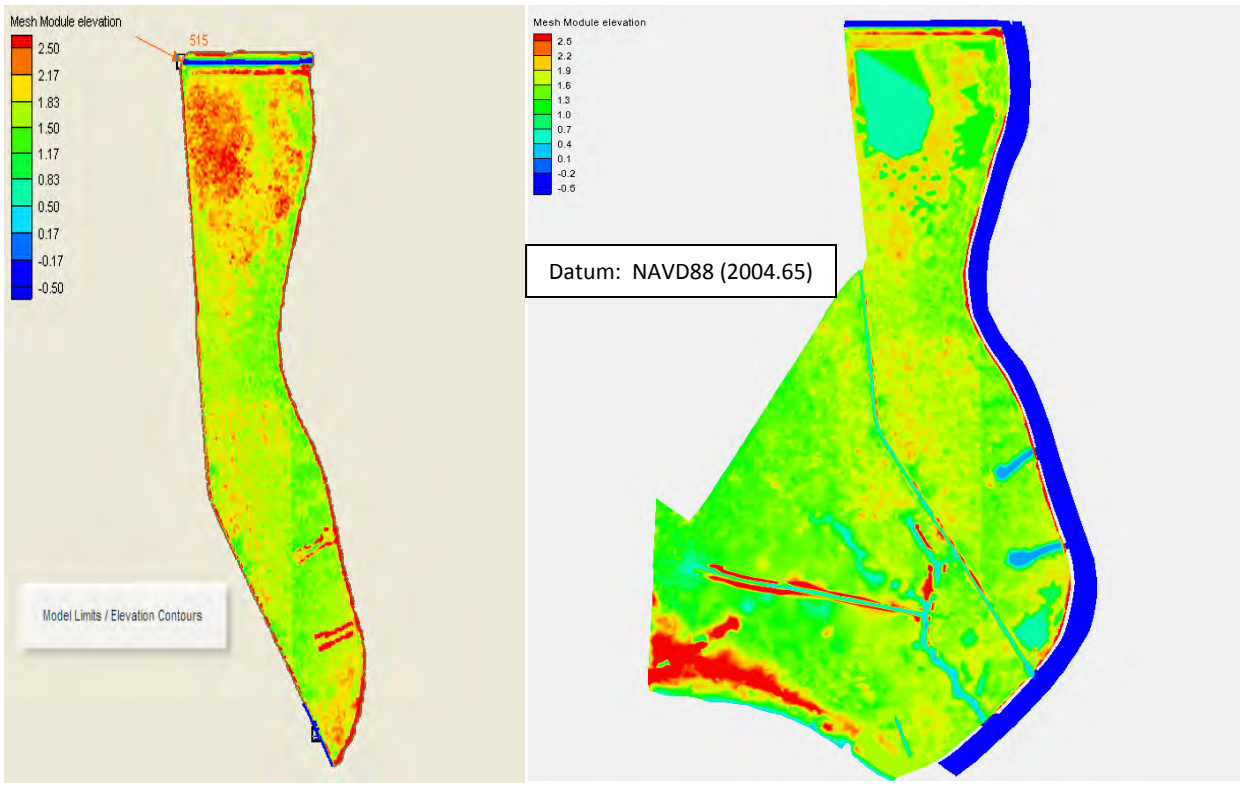


Figure 3. Initial model bathymetry (left) and later, adjusted domain with elevation corrections (right).

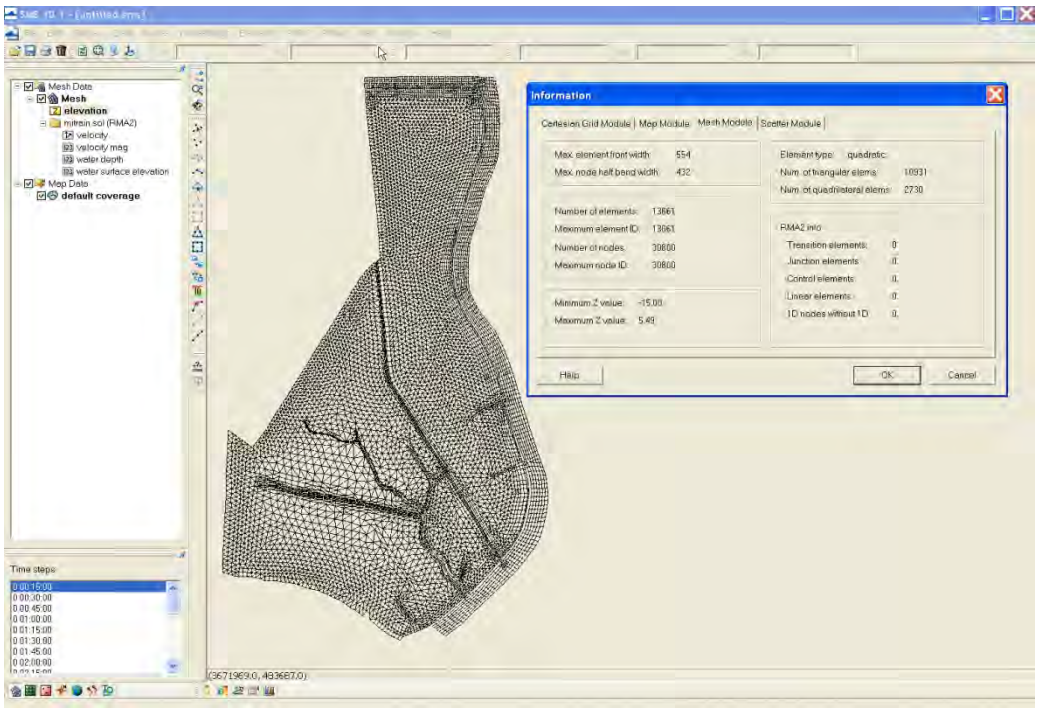


Figure 4. Developed model bathymetry in SMS.

3. EVALUATION OF AUGMENTATION ALTERNATIVES

3.1 Alternative 1

Alternative 1 investigates using the Old Estelle Pump Station discharge to circulate south into the BAC wetlands with a closed structure condition in the Old Estelle Discharge Canal. The referenced "structure" is the Old Estelle Water Control Structure (OEWCS) which consists of two 8'x8' sluice gates provided in the constructed T-wall (the 404c floodwall) at the outfall of the discharge canal. Under this alternative, discharge from the Pump Station would flow into the 404c site either through existing breaks in the canal's southern bankline or through gaps constructed in the southern bankline. Figure 5 shows the location of the pump station and the now completed T-wall across the former opening to the GIWW.

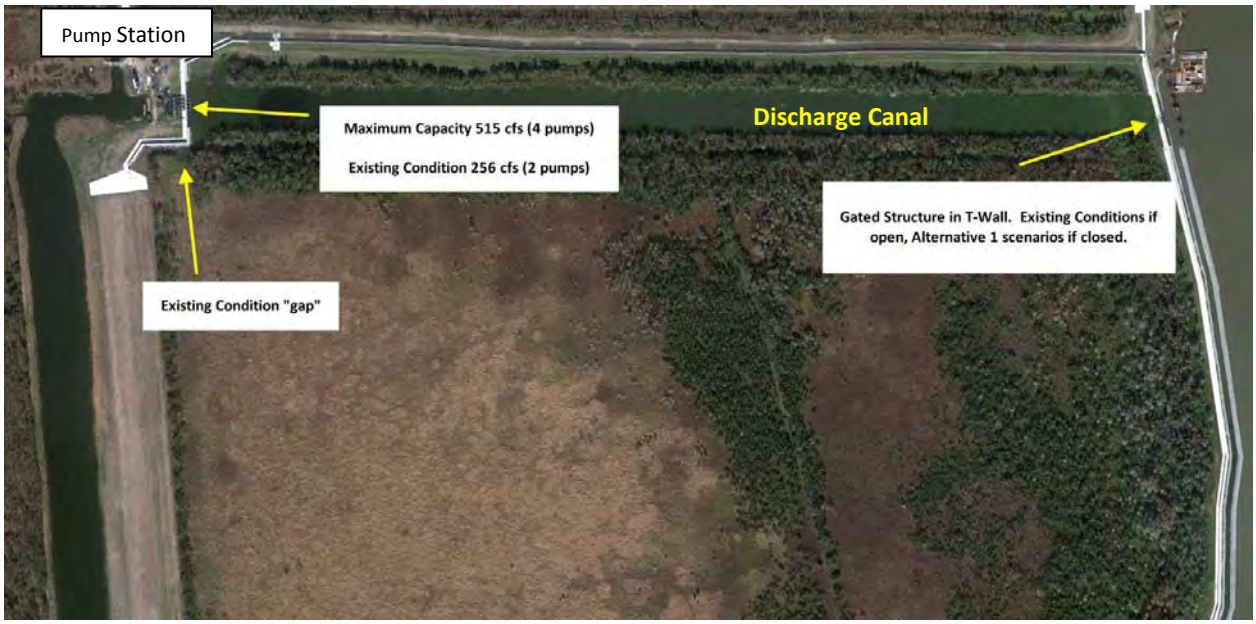


Figure 5. Old Estelle Pump Station, discharge canal, and gated structure location in the new T-Wall.

Historically, the maximum pump discharge capacity from Old Estelle Pump Station was 515 cfs, with four pumps running. In recent years, two of the four pumps are operated, and the present/typical discharge is 256 cfs. The Old Estelle pump station discharge requirements were lowered with the construction of the New Estelle pump station just upstream on the GIWW. However, the Old Estelle Pump Station is slated for improvements that will include restoring all four pumps, which will thereby restore the maximum pump discharge capacity to roughly 515 cfs.

As part of Alternative 1 evaluations various plans were evaluated to identify the optimum gapping locations for the existing berm (spoil bank) along the south side of the existing Old Estelle Discharge Canal, with the goal of delivering a uniform distribution of flow covering as much of the surface area as possible. Figure 6 shows the simulated velocity contours for the existing flow pathway gaps that are near the pump station. This simulation was completed using the unsteady tidal boundary condition defined in the *Evaluation Strategy* section. The existing gap is a channel that bifurcates as it enters the wetland, but the effective

width is about 100 ft. Flow records from 2002-2007 were available for the Old Estelle Pump Station, and the length of a typical pumping event was up to 10 hours using 2 pumps for the 256 cfs flow. Considering the terrain is generally flat south of the discharge canal but with a slight ridge across the middle, the optimum gap locations were defined as shown in Figure 7.

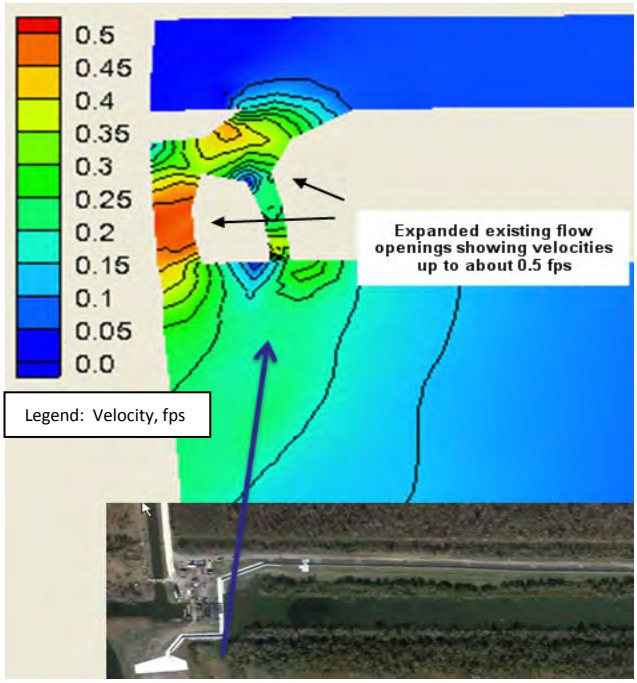


Figure 6. Existing gap location and maximum tidal velocities.

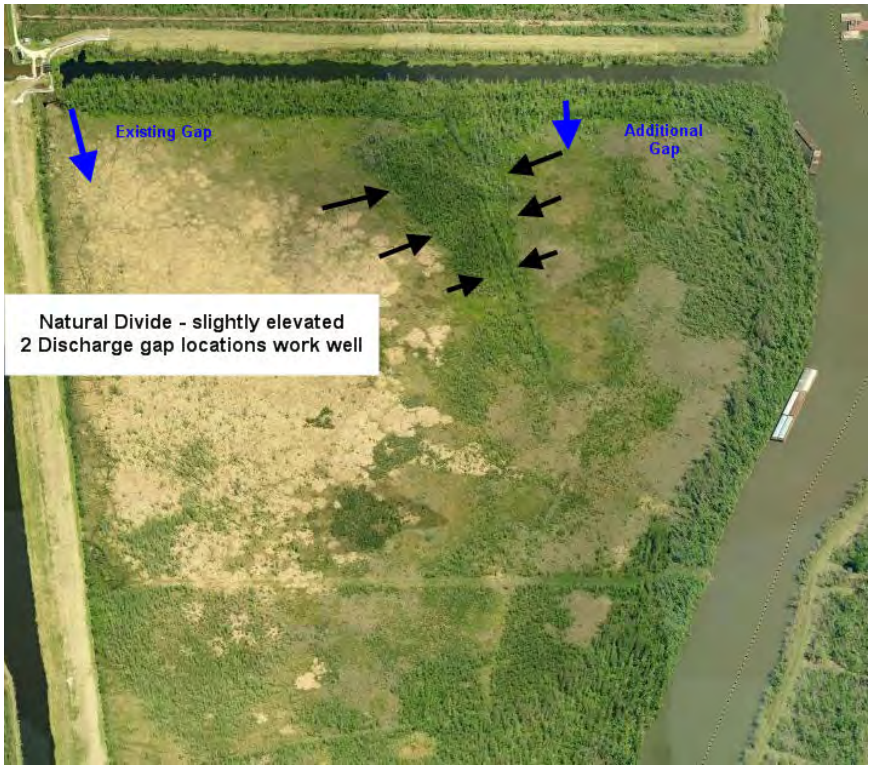


Figure 7. Aerial photograph highlighting the small rise with the 2-Gap scenario.

The existing channel gaps near the pump station plus an additional new 250 ft gap about 2/3rds of the distance to the eastern boundary of the BAC 404c site showed the most effective circulation and flow coverage. Model results (Figure 8, left side)) show how the divide pictured in Figure 7 baffles flow, but with a gap on either side, efficient flow spread is shown. Wetted acreages for comparison are also shown in Figure 8. Dividing the new 250 ft gap into smaller increments or adding gaps on the west side of the divide did not show any significant increase in circulation.

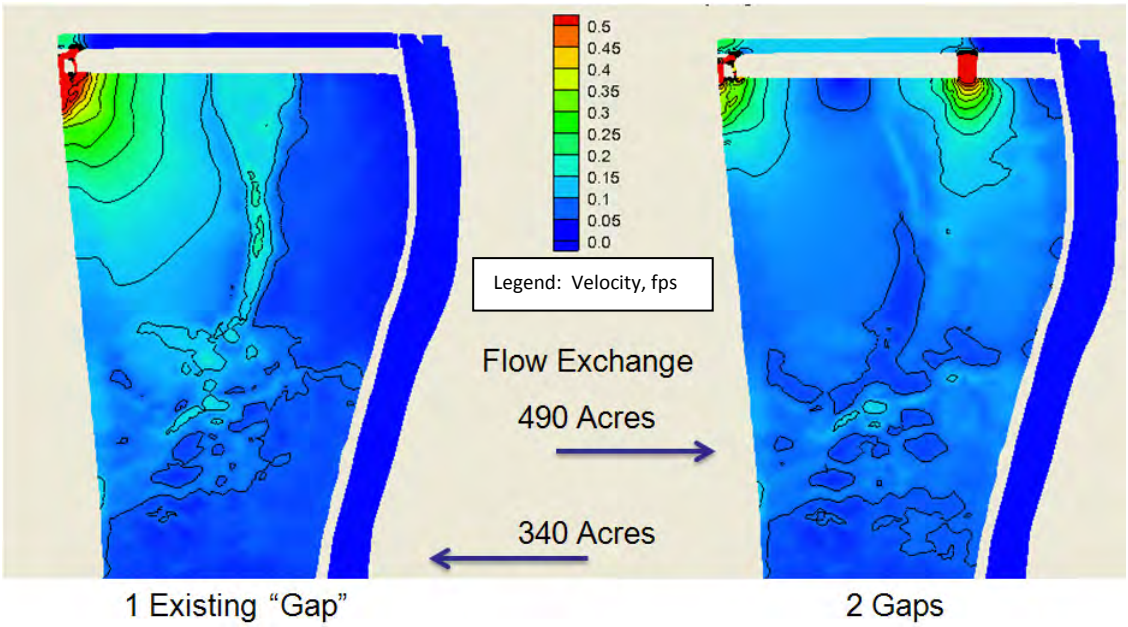


Figure 8. Flow movement defined by model simulation velocity contours for a 256 cfs pump station discharge with the structure in the T-Wall closed, diverting pump station flow into the BAC 404c site.

Potential scour was a concern for the Alternative 1 gap designs, and the model simulations completed with 256 cfs pump station discharge were repeated for the Old Estelle Pump Station maximum capacity, 515 cfs. The 515 cfs discharge simulation was included for comparison based on existing potential, but any future capacity increases that might cause scour could be controlled by opening the structure at the T-wall. Figure 9 (left side) shows the 2 gap configuration simulation with the full 515 cfs discharge capacity. The Figure 9 (right side) figure shows the single, existing gap outlet velocities (peak at about 2 fps) for the full capacity of 515 cfs. Flow velocities reached 0.5 fps for the 256 cfs pump station discharge, while the 515 cfs pump station discharge increased velocities to around 1.1 fps. These velocities are low and do not present scour concerns. The 515 cfs simulation in Figure 9 shows a generally higher velocity field, but note that the contour intervals in the figure are in a tight range and that differences from the 256 cfs simulation in Figure 8 are only about 0.2 fps greater as the sheet flow in the simulation moves south through the wetland.

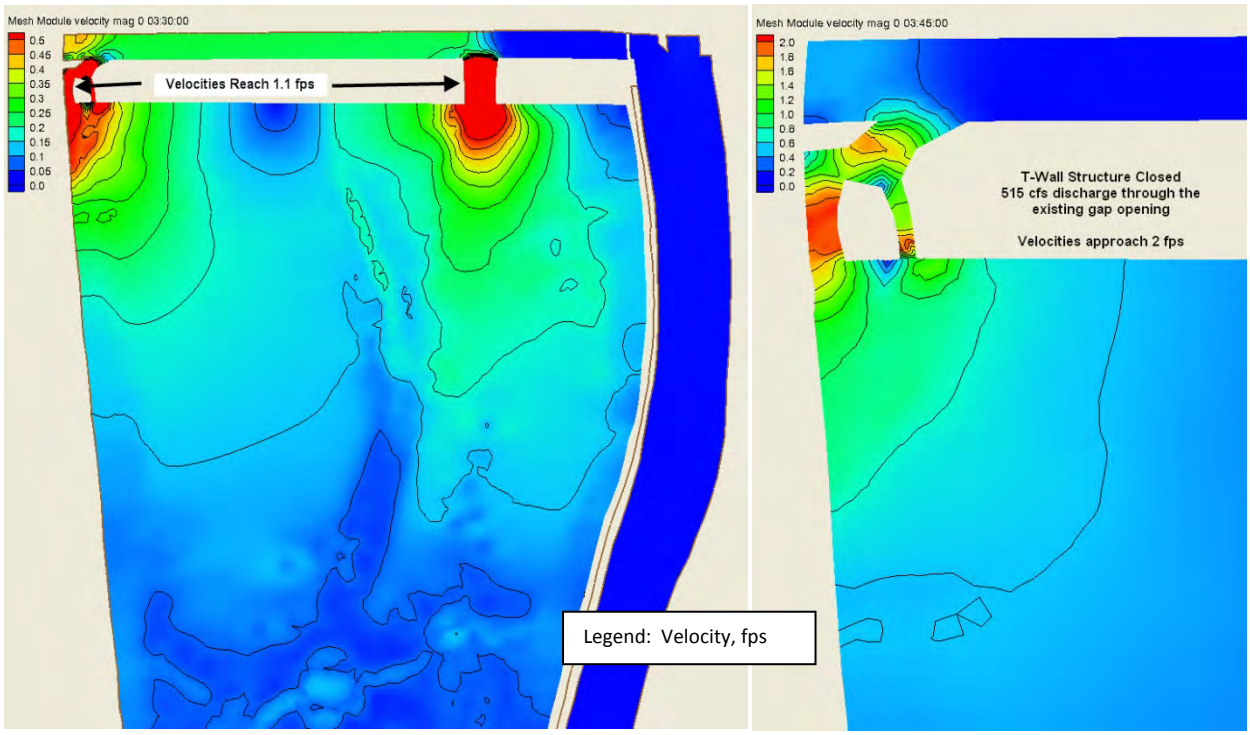


Figure 9. Flow movement defined by model simulation velocity contours for the 515 cfs pump station discharge. A scale change was applied to show peak velocity zones in red. Note that the peak existing condition gap velocities are about twice those in the new, 2-gap simulation.

Additional simulations were completed for Alternative 1 with rainfall. Figure 10 contrasts a heavy rain (1.75 inches/hour intensity) with and without pump station discharge. For both simulations, the discharge canal structure at the T-Wall was closed. Rainfall duration was selected to match a typical 10-hour pumping event, but no statistical hydrology was applied. The simulations shown in Figure 10 were developed to show the combined effect of diverted pump station discharge plus a heavy rain. Flow velocities are significantly higher for this scenario, but still small, rising from around 0.05 fps to 0.1 fps in the central 404c area as shown in Figure 10.

The left side of Figure 10 shows rainfall with pump station discharge (256 cfs), and the right side of Figure 10 shows rainfall only. With the T-Wall structure closed, the northern BAC wetland area can develop a flow-driving head that would not be possible without the closure structure. Although relatively flat, ground elevations have a gentle slope north toward the discharge canal in the northern BAC wetland. Figure 11 shows this flow-driving condition: when the discharge canal is filled from pump discharge or rainfall, the water level rises, overcoming the slight ground slope north, driving flow southward into the BAC wetland.

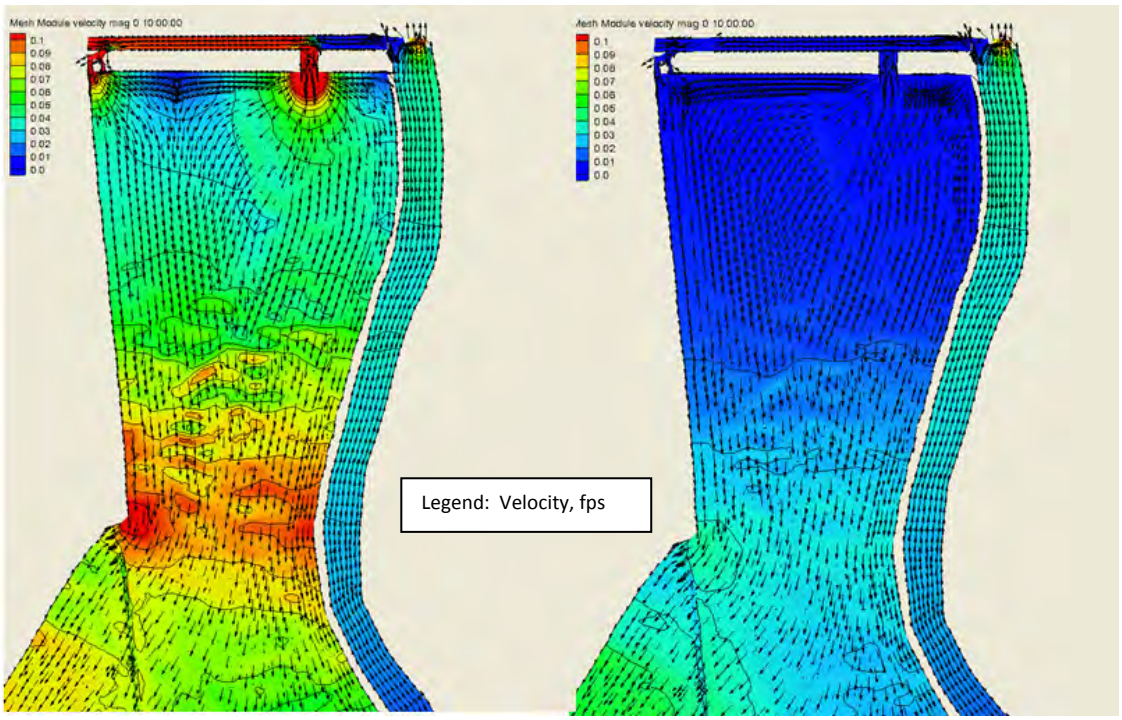


Figure 10. Old Estelle discharge canal structure closed at T-Wall, pump flow + rainfall on left, rainfall only on right.

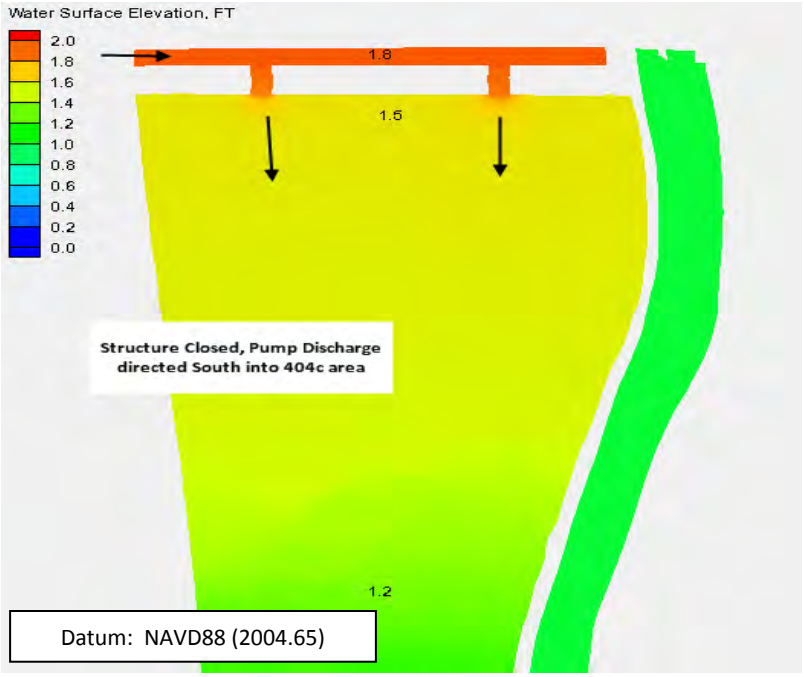


Figure 11. Closed Structure allows water surface elevation to rise in the Old Estelle Outfall Canal to the point of establishing flow-driving head in the northern BAC wetland. (Note that this simulation was completed during a conceptual/developmental phase with a simplified 2-gap configuration of Alternative 1, which was later refined.)

3.2 Alternatives 2, 3, and 4

Alternatives 2 and 3

As evaluated herein, Alternative 2 involved establishing gaps in the existing spoil berms bordering the Southern Natural Gas Pipeline (SNGP) Canal, Alternative 3 involved removing the existing shell plug from the historic outfall of Bayou aux Carpes as well as establishing gaps in the existing spoil berms bordering this bayou, and Alternative 4 involved closing (plugging) a portion of the SNGP Canal. These 3 alternatives are inter-related and in close proximity, so the model simulations and results are presented together.

Gapping options began with reviewing the ground elevations with respect to the tidally-influenced range of water surface elevations along the GIWW. A key component was the time factor associated with rising and peak tide. Since much of the BAC wetland elevations are between 0.7 ft and 1.5 ft NAVD88, increasing water movement with available tide depends on the duration of rising and peak levels. General gap locations were strategically placed in areas along the canals with the lowest ground elevations. Figure 12 (left side) is a topographic contour plot showing areas at elevation +1.5 ft and higher in red. Figure 12 (right side) shows the tidal water level in feet, NAVD88 (2004.64). This illustrates two issues for a typical high tide above 1.5 feet: (1) only a few hours of the high tide event would be available to generate flow into the BAC 404c site, and; (2) most of the elevations in the BAC 404c site are higher than a typical high tide. High tides between 1.5 ft and 2.0 ft NAVD88 (2004.65) occur 1-2 times per year, offering limited potential for improving circulation with tidal flows, but nonetheless some gains are possible.

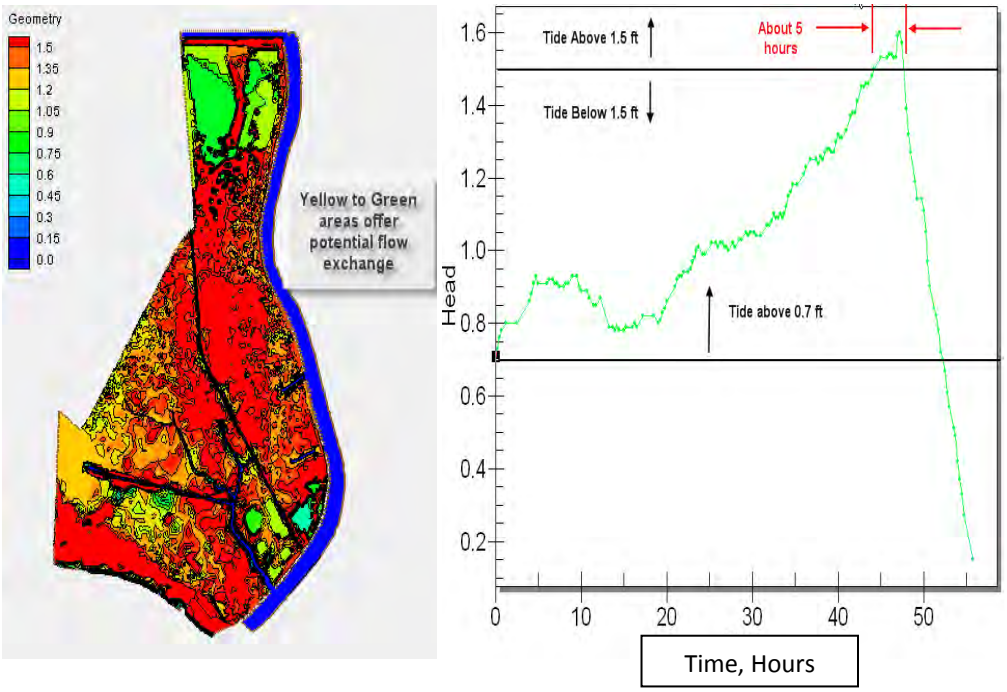


Figure 12. Contour map (left) showing elevations (feet NAVD88) and tidal flow potential. The water surface elevation graph (right) was selected from Boomtown Casino gage data (on Harvey Canal near the BAC 404(c) site).

The SNGP Canal connection with the GIWW is close to the shell plug in Bayou Aux Carpes, and removing the existing Bayou aux Carpes plug would result in two inlets that are about 1500 ft apart. The close proximity raised the possibility of limited inflow because of drawdown effects in this localized area of the GIWW. There is also an interior connecting channel between the SNGP Canal and Bayou Aux Carpes. A series of simulations to define effects of the connecting channel, the location and opening width for gaps, any drawdown effect of removing the shell plug, and opening Bayou Aux Carpes to the GIWW was completed.

Gap scenarios for evaluation were based on 2 factors: 1) the extent of wetland elevation below available inflow water level and 2) GIWW tidal elevation duration. These factors defined an initial configuration and a few trial-and-error modifications resulted in optimizing water inflow with gap locations and opening widths. Figure 13 shows the optimized gap configuration. Figure 14 shows the existing condition with the optimized gap configuration plan, an obviously less effective flow exchange with the existing shell plug in Bayou aux Carpes. Simulations show removing the shell plug significantly increases flow conveyance in Bayou aux Carpes. With the shell plug in place, the interior connecting canal with the SNGP canal allows flow transfer into the Bayou aux Carpes channels, but at a much lower rate. The simulation shown in Figure 13 generated flows over 53 acres along Bayou aux Carpes while the simulation with the plug in place (Figure 14) limited flow movement to 19 acres.

The following sub-sections provide the total cumulative length of all gaps modeled for the SNGP Canal and Bayou aux Carpes, along with other data concerning how these gaps would affect flow exchange. Included are coordinates locating the approximate mid-point of the gap locations from the model bathymetry. The optimized plan includes removing the shell plug at Bayou aux Carpes and leaving the SNGP Canal open (e.g. optimized plan does not include implementation of Alternative 4).

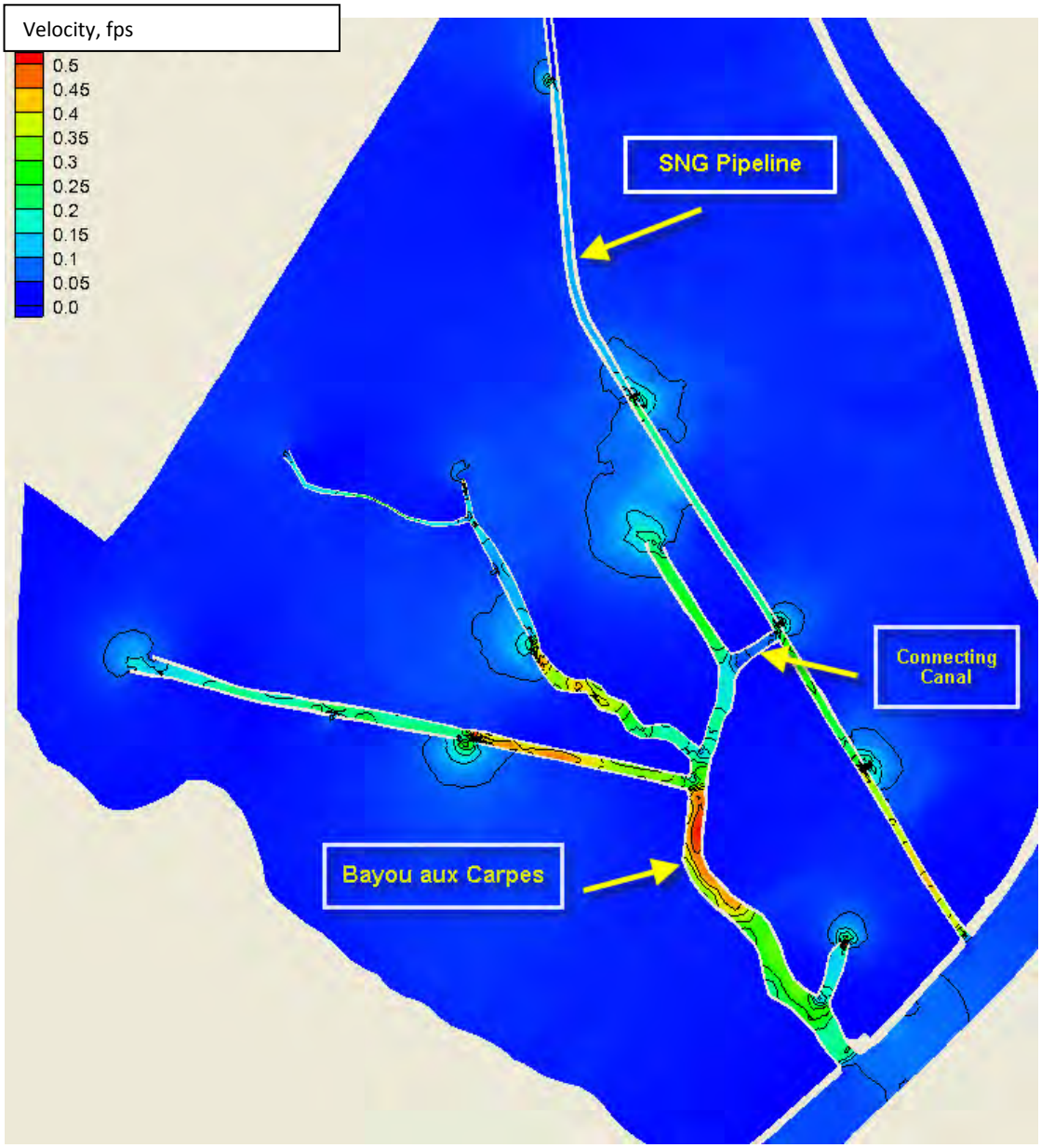


Figure 13. Optimized GAP Configuration with Bayou aux Carpes Shell Plug Removed.

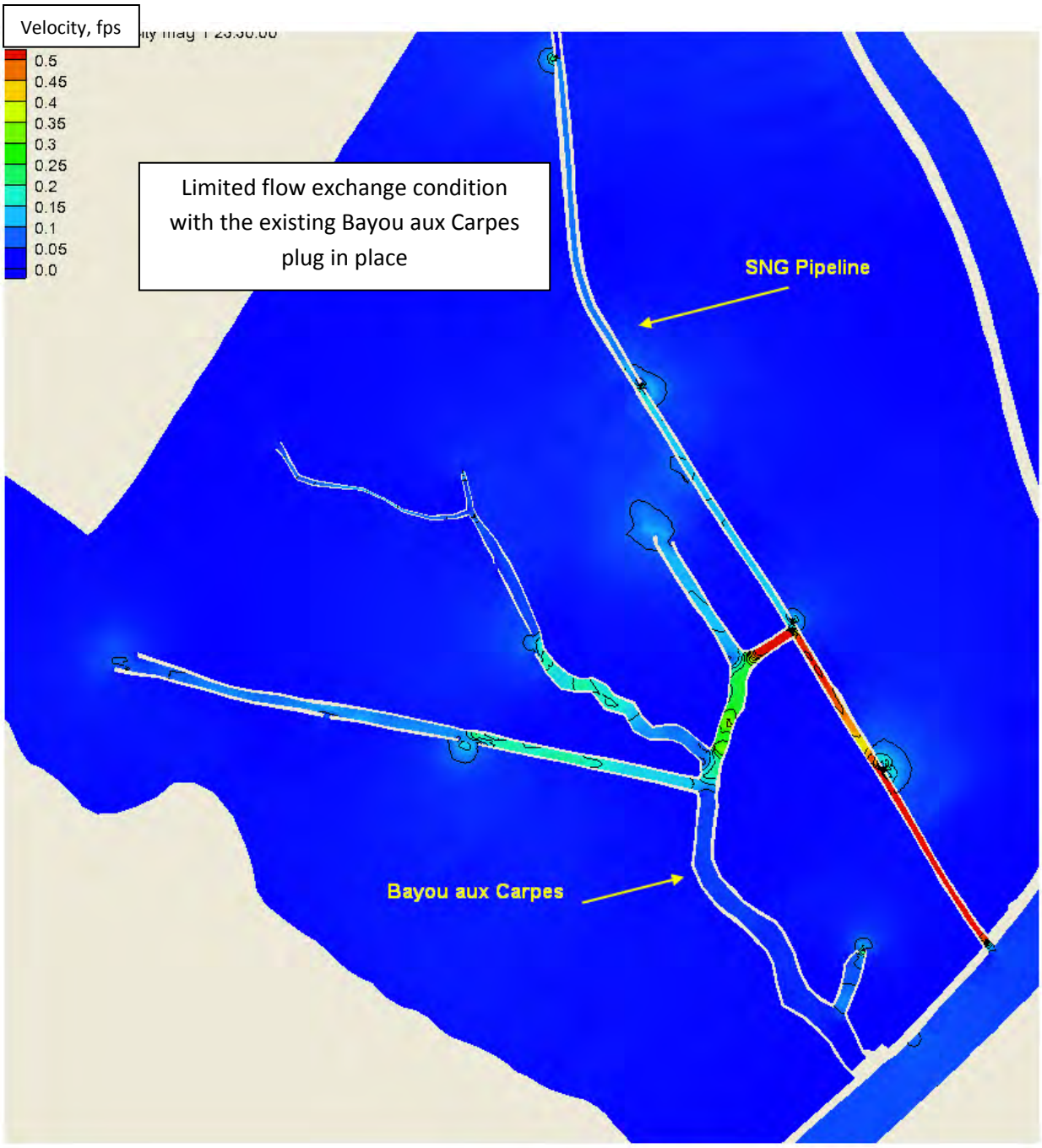


Figure 14. Flow movement with the existing Bayou aux Carpes plug in place. Proposed SNGP Canal and Bayou aux Carpes berm gaps were also included in this simulation.

SNGP Canal

- Total length of all gaps combined: 150 ft
- Inflow 14 cfs maximum covering 12 acres of BAC wetland, but only if removal of Bayou aux Carpes shell plug (Alternative 3) is included. Otherwise, gaps result in no significant inflows.
- Alternative 4 (SNGP Canal plug) would result in loss of this channel inflow and flow movement acreage.

Potential SNGP Canal Gap Locations: Gap lengths at these locations are recommended to be 30-60 ft wide. Visual inspection and layout with respect to these locations is recommended to minimize gap construction impacts or to avoid issues not detected from the survey used for model bathymetry. Figure 15 shows these potential locations. Note the arrows identifying locations are situated on the side of channel corresponding to the gap location (since this information would be difficult to discern at the figure's scale).

1-Easting: 3681076.95 ft Northing: 469307.65 ft
2-Easting: 3680190.45 ft Northing: 470768.3 ft
3-Easting: 3678699.5 ft Northing: 473083.6 ft
4-Easting: 3677863.9 ft Northing: 476320.25 ft

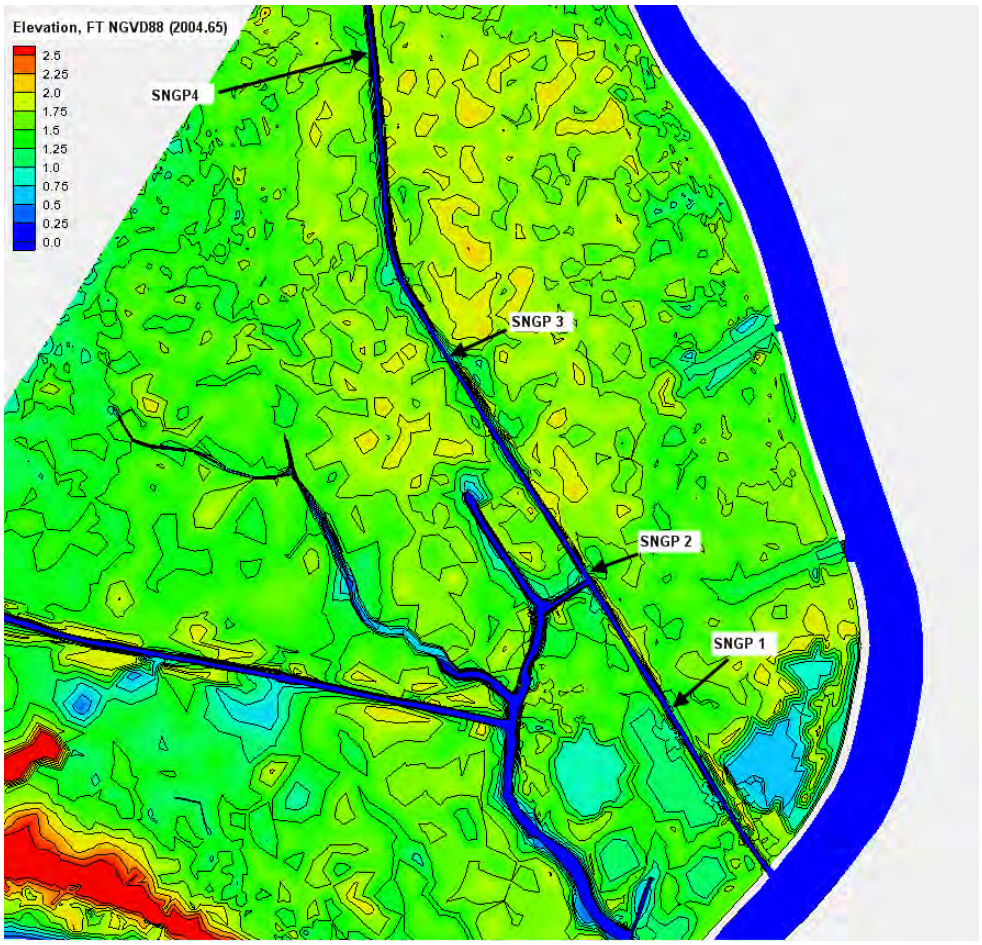


Figure 15. Potential SNGP Canal gap locations.

Bayou aux Carpes
Total length of all gaps combined: 500 ft
Inflow 26 cfs maximum covering 37 acres of wetland

Potential Bayou aux Carpes Gap Locations: Gap lengths at these locations are recommended to be 30-60 ft wide. Visual inspection and layout with respect to these locations is recommended to minimize gap construction impacts or to avoid issues not detected from the survey used for model bathymetry. Figure 16 shows these potential locations. Note the arrows identifying locations are situated on the side of channel corresponding to the gap location (since this information would be difficult to discern at the figure's scale), and also note that some of the BAC gaps are at the ends of the channels.

1-Easting: 3680876.4 ft Northing: 467509.1 ft
2-Easting: 3676988.45 ft Northing: 469596.6 ft
3-Easting: 3675601.45 ft Northing: 469853.65 ft
4-Easting: 3673619.05 ft Northing: 470391.35 ft
5-Easting: 3678902.30 ft Northing: 471616.27 ft
6-Easting: 3677645.6 ft Northing: 470528.3 ft
7-Easting: 3677285.9 ft Northing: 471320.45 ft
8-Easting: 3676935.35 ft Northing: 472238.65 ft
9-Easting: 3675096.2 ft Northing: 472508.75 ft

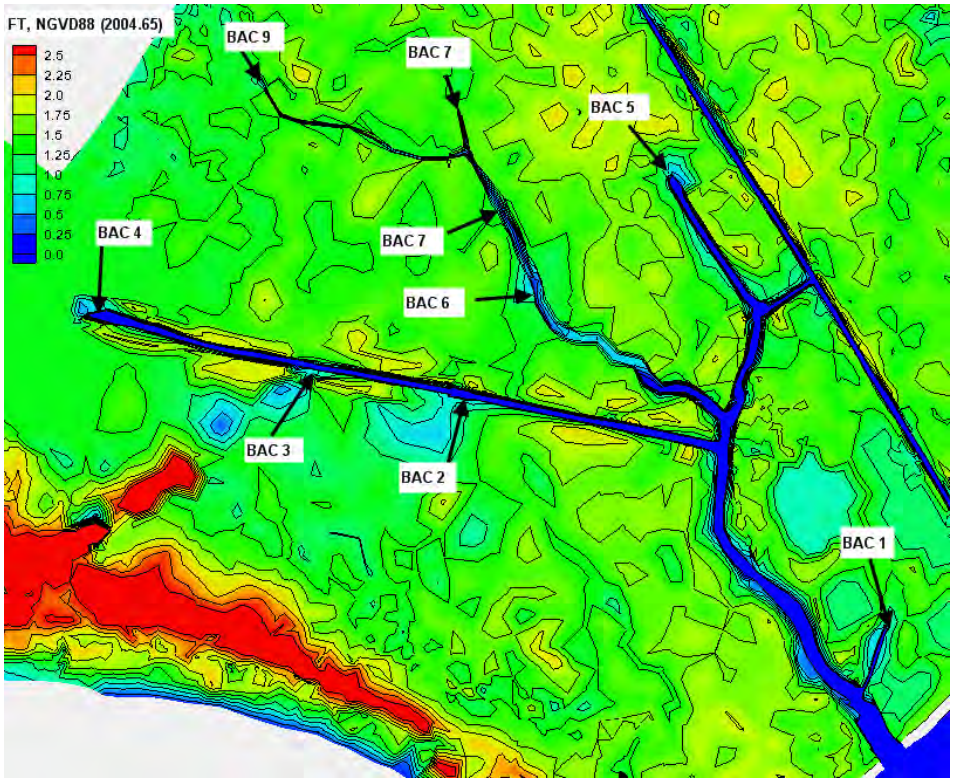


Figure 16. Potential BAC gap locations.

The typical volume of earthwork for a 30-ft Gap would be around 3-4 cubic yards. Figure 17 provides field dimensions. The level of effort to construct a gap may lend toward small-scale earthwork/manual labor, avoiding more intrusive, heavy equipment.

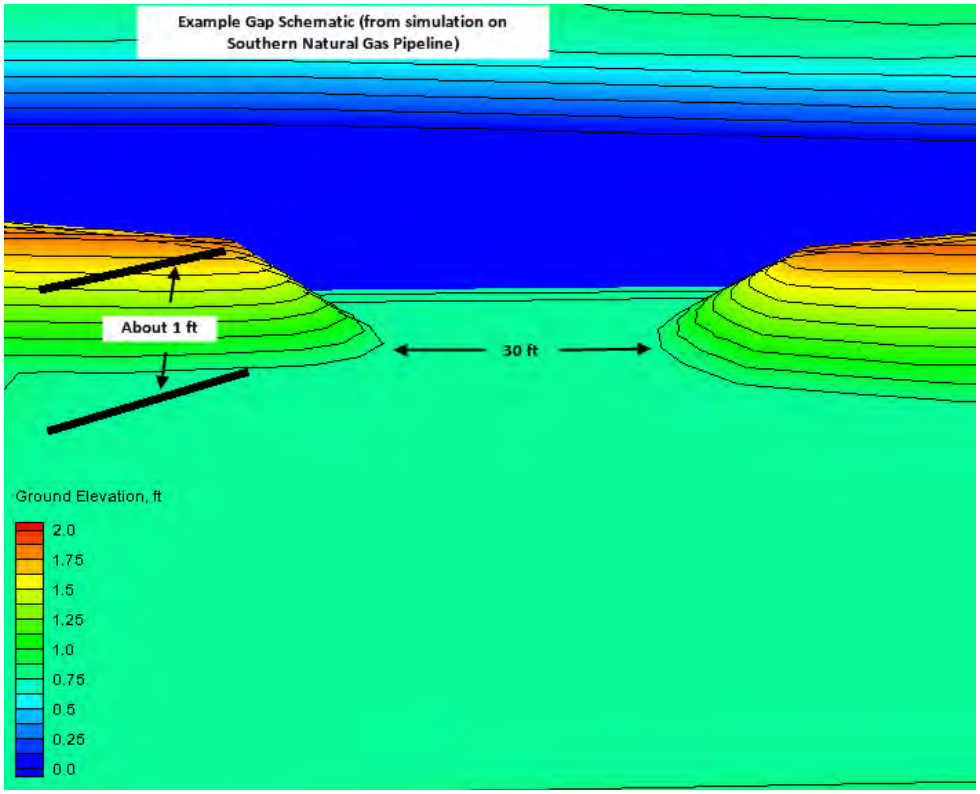


Figure 17. Conceptual Gap Schematic with earthwork around 3-4 cubic yards.

Sloped gaps (about 1 ft deeper on the channel side) were recommended to prevent fish and other aquatic species entrapment in overbank areas between higher water surface elevations. The increased cross sectional area results in slightly lower velocities (from around 0.4 to 0.3 fps) across the sloped gap openings. Sloped gap simulations were completed for a few locations, but results showed no measureable increases in flow exchange areas. However, the trend is toward increasing flow out into the marsh, and the small flow increases fell within the error margin of marsh area estimation.

Alternative 4

Simulations in the upper BAC wetland with the closed Old Estelle Discharge Canal Water Control Structure condition demonstrated how the buildup of water creates a driving head potentially moving water south toward the SNGP Canal. The wetland elevations around the northern segment of the SNGP Canal slope toward the Old Estelle Discharge canal vicinity, but the option to close the discharge canal's water control structure can allow pumping or heavy rainfall enough time to pond enough water to generate flow movement south, overcoming the ground slope. If this option is pursued (e.g. Alternative 1), the SNGP Canal and its associated spoil berms would then act as a divide across the middle of the BAC wetland. Figure 18 shows this area, and Figure 19 shows the boundaries of privately owned lands in the BAC wetland in

relation to the SNGP Canal. Figure 20 shows potential for flow transfer from a heavy rain and/or pumping event if a plug were constructed in the bend of the SNGP Canal where it turns to the north from the northwest. Plugging the SNGP Canal pipeline, as shown in Figure 20, or completing any earthwork/gapping to enhance flow in the "potential flow exchange" area as shown in Figure 18 could require considerations or negotiations with landowners and/or the pipeline company.

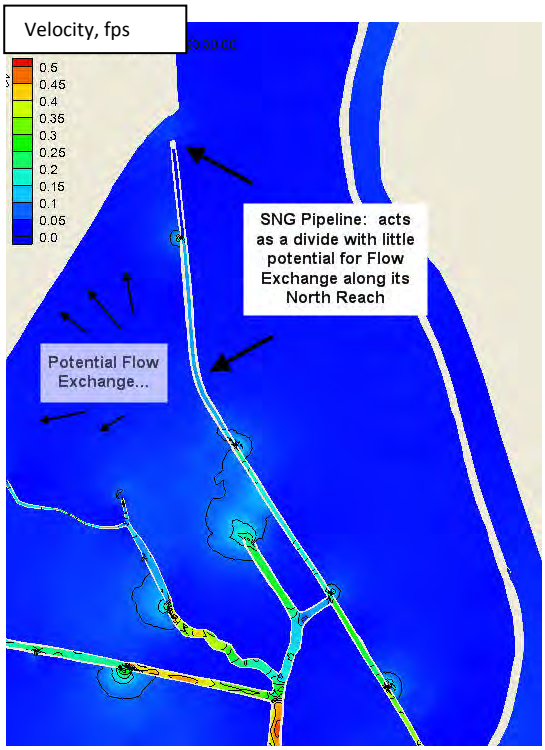


Figure 18. BAC area showing potential flow exchange location on the west side of the SNGP Canal.

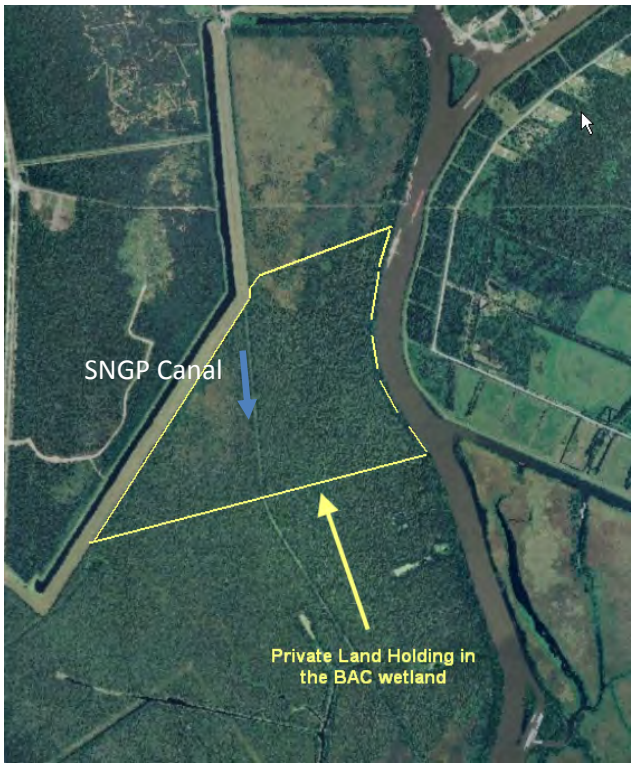


Figure 19. Private land holding (plat outlined in yellow) in the BAC wetland.

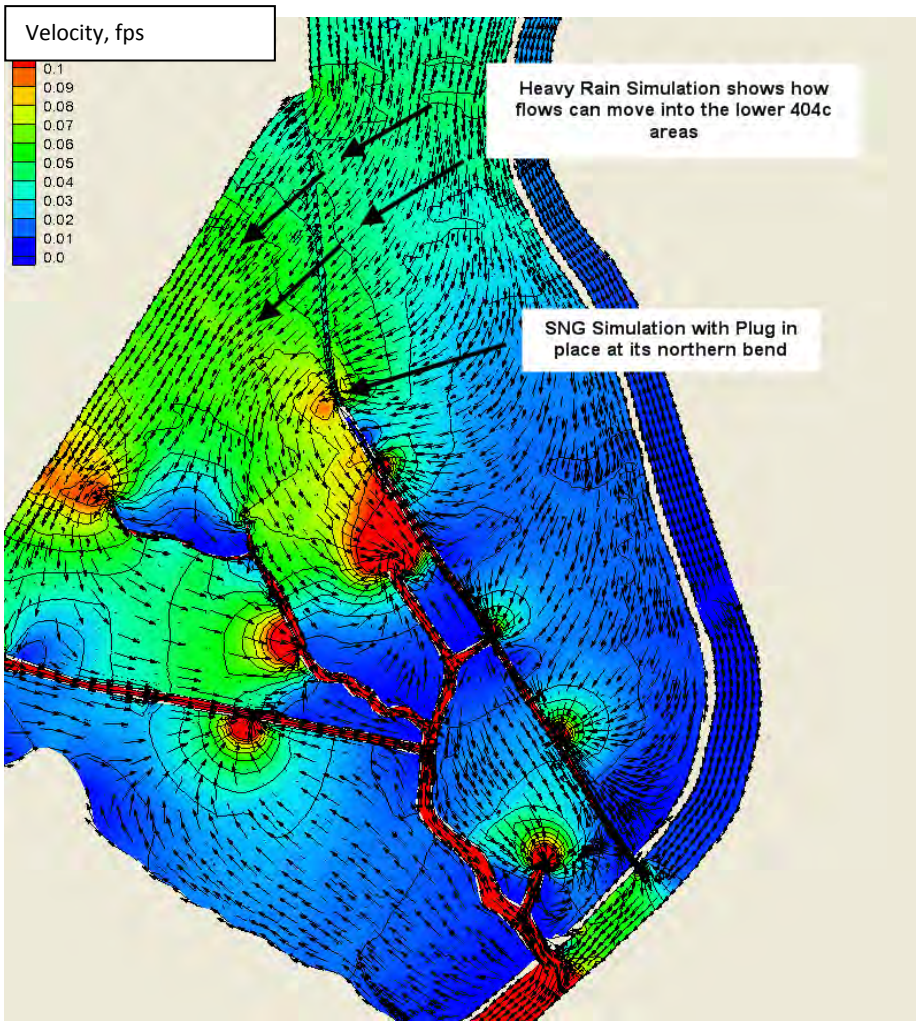


Figure 20. Potential flow movement across simulated plugged condition for the SNGP Canal. This simulation shows a heavy rainfall with flow moving from the interior wetlands through the gap configuration, and exiting into the GIWW.

3.3 Alternative 5

Two inactive industry access canals (keyhole canals) located along the lower east side of the BAC 404c area were identified for possible flow exchange. Figure 21 (left side) shows an aerial photo of the 2 keyhole canals, and Figure 21 (right side) shows the canals as constructed in the model bathymetry. Simulations were completed to remove the plugged ends of the canals, re-connecting them to the GIWW, allowing flow exchange. Figure 20 shows results from these simulations. Note that the flood tide used in the simulation had a slow rise and a more rapid fall. Therefore using water movement to define acreages of flow exchange, the ebb tide shows a greater flow exchange area (44 acres versus 33 acres for flood tide) even though the simulation flow volume was the same. The elevations around the keyhole canals offer a larger, more flat area sheet flow bathymetry, and the ebb and flood tide flow exchange area differences are much more noticeable.

Subsequent to the simulations discussed above, the 2 keyhole canals were identified as likely sites for mitigating some of the WBV HSDRRS direct impacts to swamp habitats in the 404c area. This mitigation plan

calls for restoring swamp habitat in each of the keyhole canals by filling them to an elevation typical of adjacent swamp habitats, planting the filled areas with native canopy and midstory plant species, and establishing gaps in the existing spoil berms present on the north and south sides of each keyhole canal. The mitigation plan identifies these swamp restoration features as JL8 (the northern keyhole canal) and JL9 (the southern keyhole canal). However, this mitigation plan does not include establishing gaps at the eastern end of each keyhole canal whereby a hydrologic connection between the canals and the GIWW would be re-established (i.e. the mitigation plan does not include the gaps called for under augmentation Alternative 5).

The Alternative 5 evaluation was adjusted to account for the filled conditions called for via the mitigation plan, and the simulation was repeated using the post-mitigation bathymetry. Figure 23 shows a much larger area of flow movement if the 2 openings remain at the former canal openings at the GIWW, indicating that sheet flow over a large area could be developed under the scenario whereby the Alternative 5 gaps are established together with the actions called for in the mitigation plan. The mitigation plan generates a much larger flow exchange area (128 acres versus 44 acres) because the large flat area bathymetry offers efficient sheet flow potential for higher tides, and none of the flow volume is "used" to fill a canal prior to overbank flow exchange. Also, during ebb tides, the efficient collection of water in a canal does not diminish sheet flows as much.

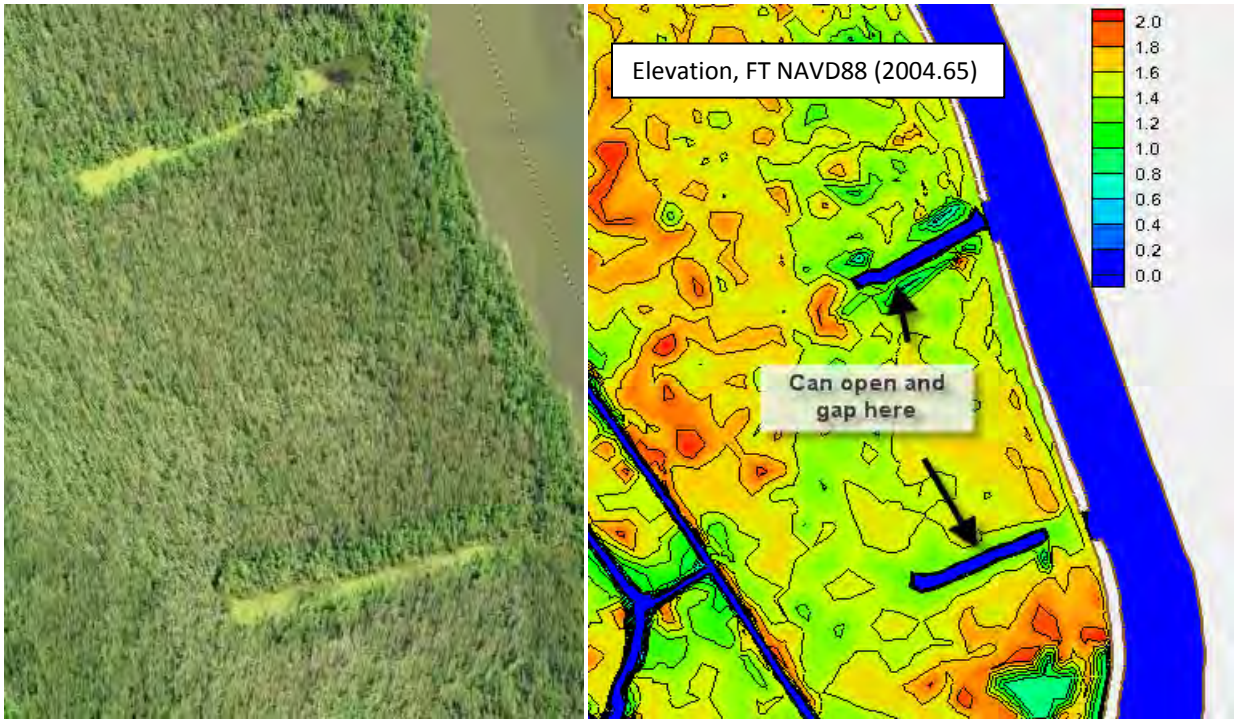


Figure 21. Alternative 5 Access Canals, aerial (left) and model bathymetry (right).

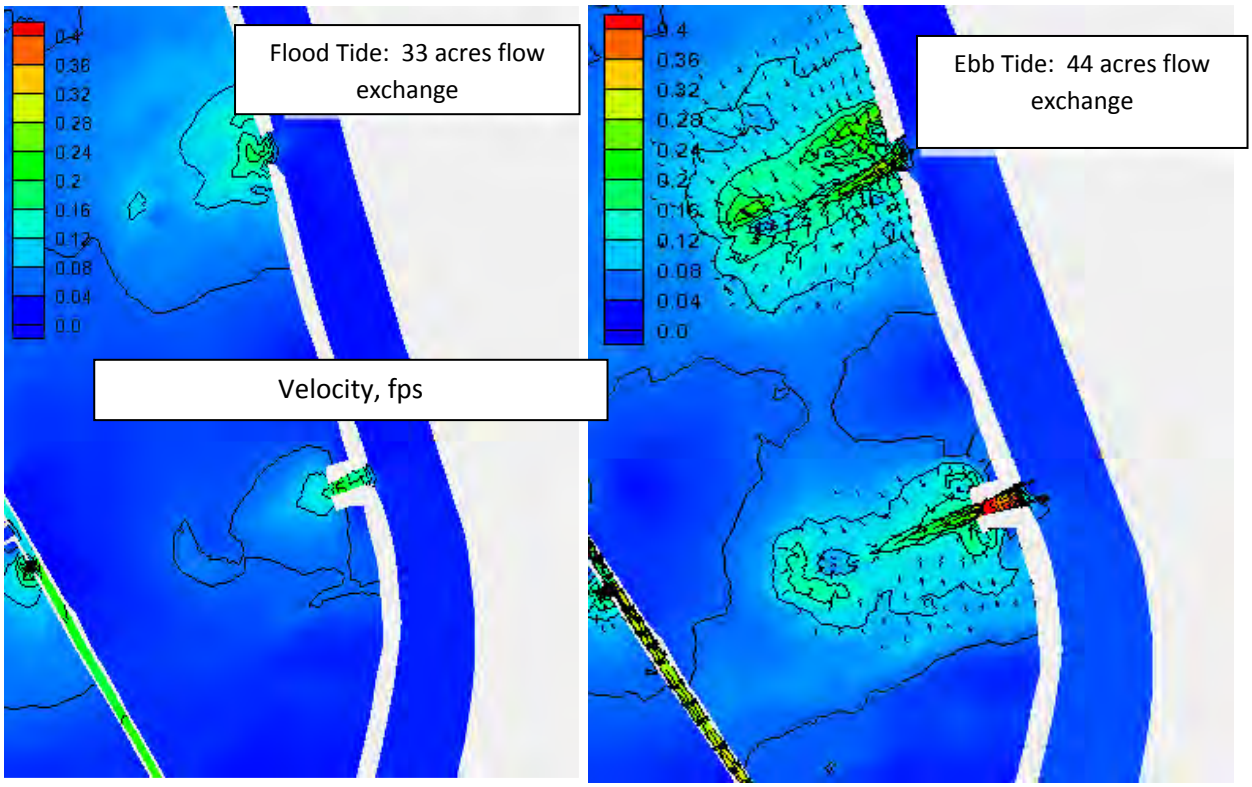


Figure 22. Peak flow velocities and flow area coverage for flood tide (left side) and for ebb tide (right side).

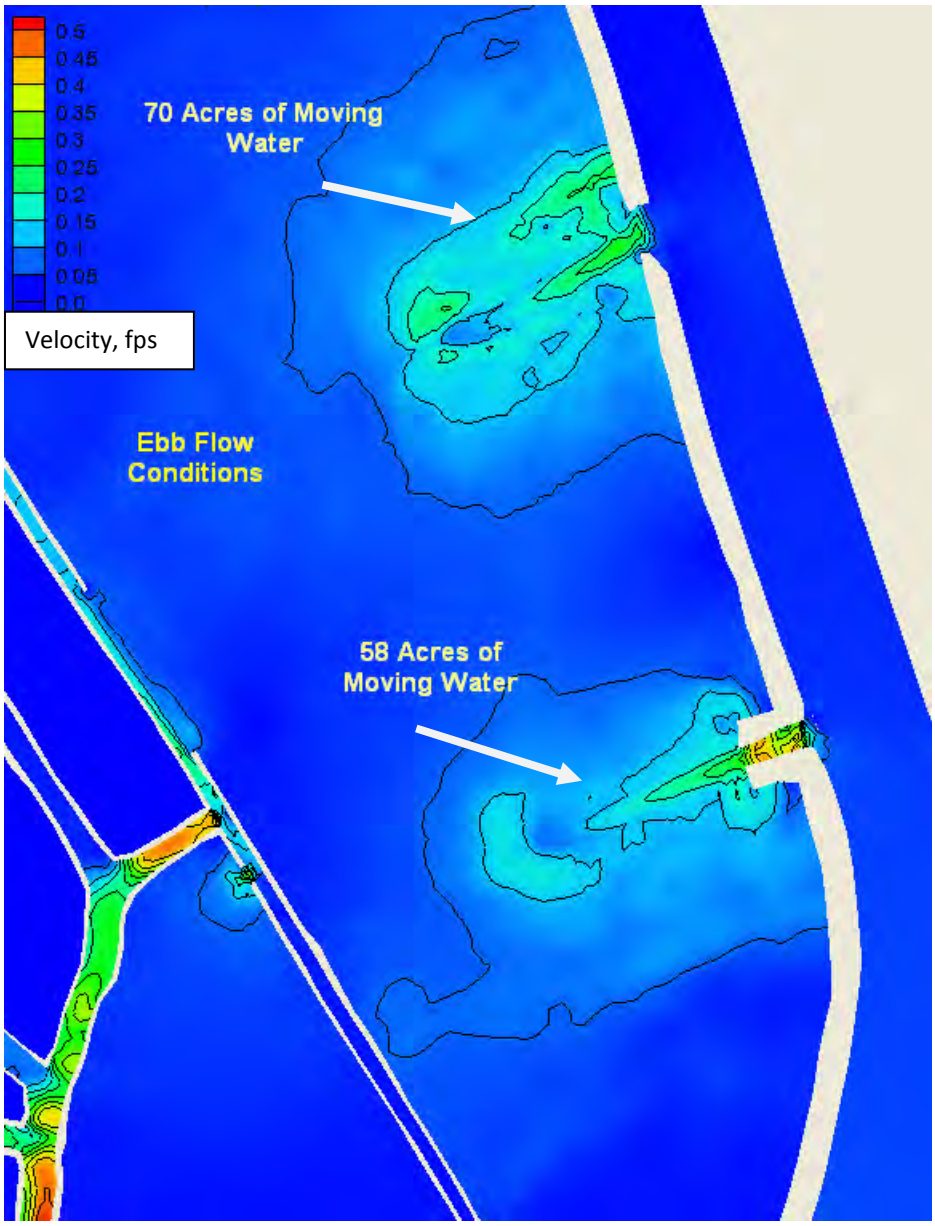


Figure 23. Potential flow area increases with the 2 canals restored for wetland mitigation. In this case flow movement is exiting the BAC wetland (ebb tide) showing a total of 128 acres of flow exchange as discussed in Section 3.3.

3.4 Alternative 6

A number of raised roadbeds were constructed mostly in the southern areas of the BAC 404c area. These were dirt or board roads, and 6 general locations were identified for increased flow evaluations. Figure 24 shows the locations, 5 are south of Bayou aux Carpes and 1 is situated north of the Alternative 5 access canals. These six locations can be considered as 6 different sub-alternatives or measures under the overall Alternative 6, whereby each sub-alternative (measure) would involve degrading portions of the existing roads to increase surface water flow/exchange. In addition, another measure or sub-alternative evaluated under Alternative 6 involved extending the "Old Canal" (see Figure 24) to once again connect with the

GIWW to enhance surface water flow/exchange. The 7 sub-alternatives (measures) are listed in Table 2 below.

Table 2. Sub-alternatives (measures) evaluated as part of Alternative 6.

Sub-Alternative	Description
6.1	Old GIWW access road along west side of GIWW; portion where road crosses the existing shell plug at the south end of Bayou aux Carpes. Degrade/gap road.
6.2	Old logging/spoilbank road adjacent to the east side (north side) of the "Old Canal" located in the far southeast portion of the BAC 404c area. Establish gaps in the road.
6.3	Old logging/spoilbank road adjacent to the west side (south side) of the"Old Canal".
6.4	Old pasture road/levee situated at the far south end of the BAC 404c area. Establish gaps in the road.
6.5	Old spoilbank road in the southwestern portion of the BAC 404c area; portion adjacent to the east bank of an unnamed canal. Degrade entire road or establish gaps in the road.
6.6	Old board road; located in the eastern portion of the BAC 404c area, north of the Alternative 5 keyhole canals. Degrade entire road or establish gaps in the road.
6.7	Extending the "Old Canal" such that it directly connects to the GIWW.

Based on general ground elevations, most of these sub-alternatives or measures could be ruled out without model simulations. Figure 25 shows the extent of model bathymetry prior to the modifications evaluated for the various Alternative 6 simulations. The board road in the vicinity of the 2 access canals (Sub-Alternative 6.6) was not discernible in the model bathymetry, indicating this road does not currently influence sheetflow to a significant degree. The old spoilbank road (Sub-Alternative 6.5) and the old pasture/levee road (Sub-Alternative 6.4) in the southwest area of the BAC 404c site are at high elevations and cannot encounter any inflow from the GIWW. The old GIWW access road that follows the GIWW over the existing shell plug in Bayou aux Carpes (Sub-Alternative 6.1) would be addressed with developing the Bayou aux Carpes shell plug removal (Alternative 3). Completely degrading or gapping either of the two old logging/spoilbank roads along the Old Canal (Sub-Alternatives 6.2 and 6.3) would not be beneficial due to the high elevations in this area (Figure 25). The elevations along Sub-Alternatives 6.2 and 6.3 are not as high as Sub-Alternative 6.4, but are still above significant tidal flow potential. Also, any gapping along these roads would not change rainfall runoff patterns since they are already part of a large area with slopes falling away from either side of the roadbeds.

The Old Canal location is close to the GIWW, and the model bathymetry along the GIWW was extended to pass this area and a direct hydraulic connection was made from the Old Canal to the GIWW (e.g. Sub-Alternative 6.7). Figure 26 shows the updated model simulation for connecting the Old Canal to the GIWW. This simulation indicated that extending the Old Canal to the GIWW would only increase inflow exchange within the BAC 404c area by approximately 3.3 acres. The Old Logging/Spoilbank roads (Sub-Alternatives 6.2 and 6.3) run parallel to the Old Canal along a somewhat raised bed (most likely an old constructed roadbed crown), and this confines the tidal inflows from the simulated connection to the confined area of just over 3 acres. As discussed previously, the overbank roadbeds (sub-alternatives 6.2 and 6.3) around the Old Canal appear too high to allow effective gapping. Lower elevations are close, offering flow exchange potential, but this would likely involve digging short channels rather than gaps.

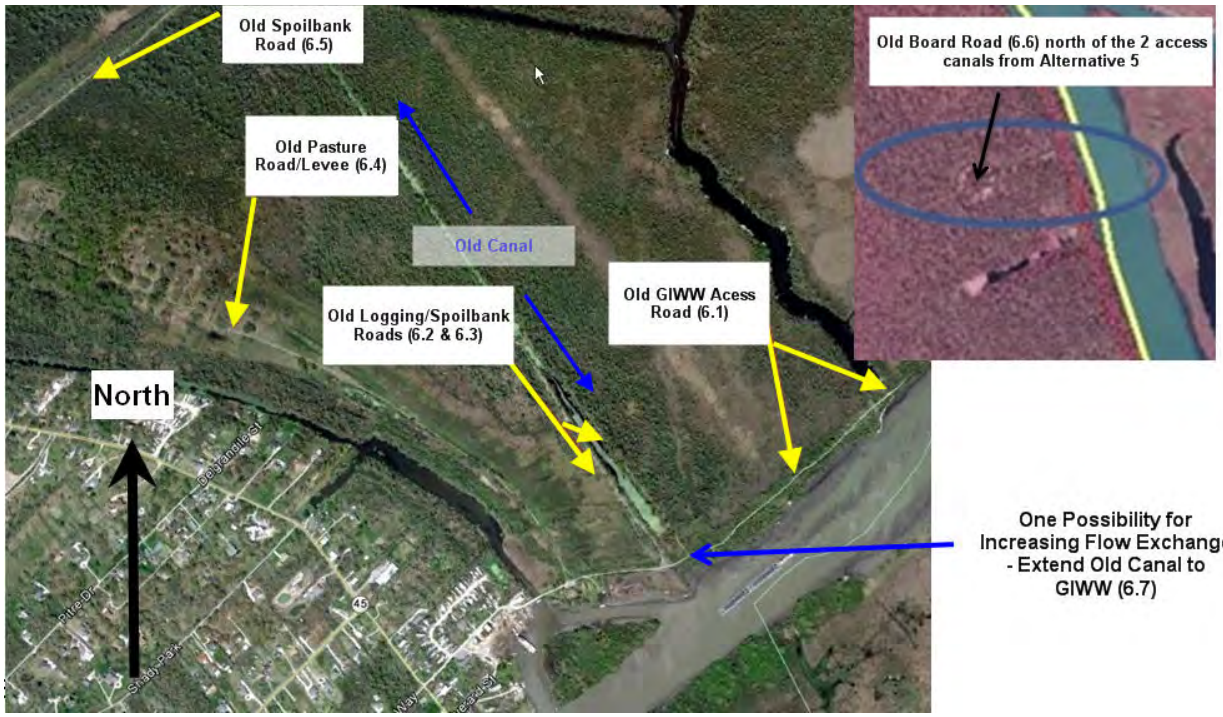


Figure 24. Locations of various measures considered under Alternative 6. Text in parentheses indicates the sub-alternative number.

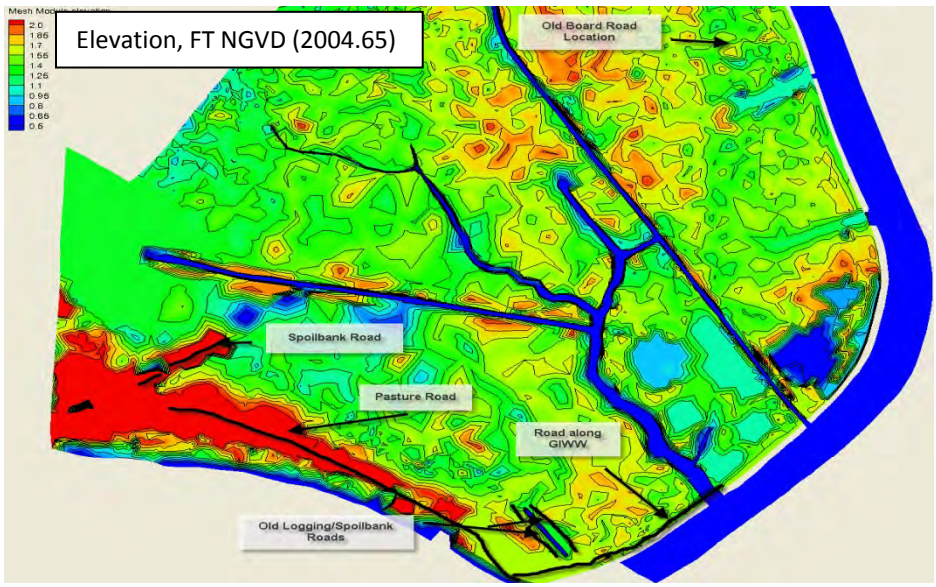


Figure 25. Model bathymetry showing high elevations for some of the road sites.

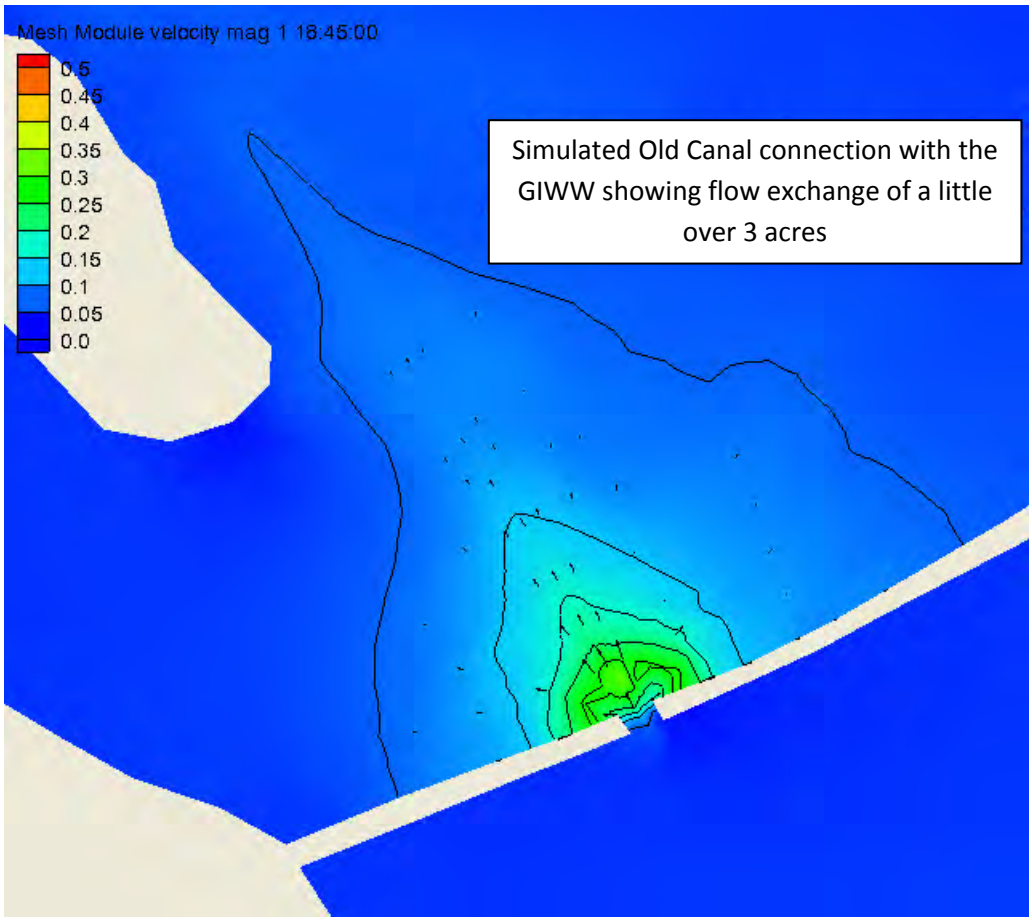


Figure 26. Simulation for sub-alternative 6.7, extending Old Canal to connect with the GIWW.

Scour Potential Evaluation

The alternatives evaluated in the model study include increasing flow and additional connections to the GIWW, and given the goal to improve wetland function and habitat, any flow velocities that might cause scour in the BAC 404c site would be critical information. Alternative 1 considerations addressed scour potential for the Old Estelle pump station discharges, but a higher risk option was applied to the model for the optimized configuration: storm surge with a rapid water surface elevation fall rate. Gage data along the GIWW at the Boomtown Casino Gage on Harvey Canal (near the BAC 404c wetland) were reviewed, and record surges were noted. Hurricane Katrina in 2005 caused the record high surge of +4.4 feet, and Hurricane Rita, also in 2005, reached +2.8 ft.

A storm surge elevation of +3.5 was selected with a fall rate that matched the Hurricane Katrina fall rate, 0.75 ft per day. Unsteady model run simulations were completed, and Figure 25 shows the peak Bayou aux Carpes and SNGP Canal velocities for this simulation. Figure 27 shows the region of velocities that are greater than 1.0 fps in red. Figure 28 shows the same flow simulation, except the contour range was changed from 0 to 2.0 fps. This change better defines the highest velocities, which are localized near the SNGP Canal outlet to the GIWW. These highest velocities cover a length of the SNGP Canal distance of about 600 ft, but do not exceed 2.0 fps. For the northern BAC 404c area, the outlet is through the Old Estelle Discharge Canal. Flows exiting through the discharge canal reach about 3.6 fps in the closure

structure through the concrete T-Wall. This region where model results showed the highest velocities would not be a scour issue because they occur through the concrete barrels of the structure.

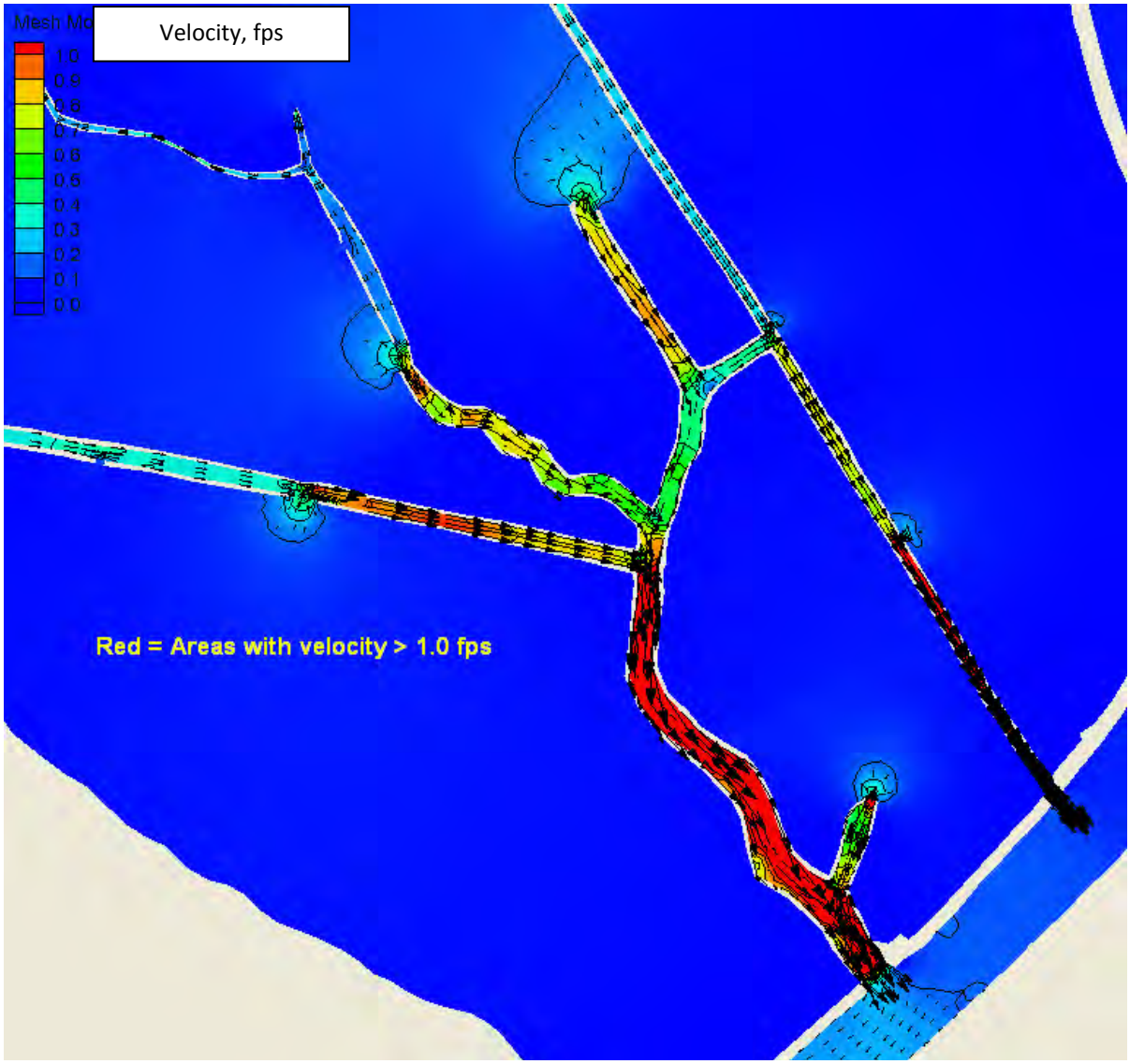


Figure 27. Scour evaluation simulation.

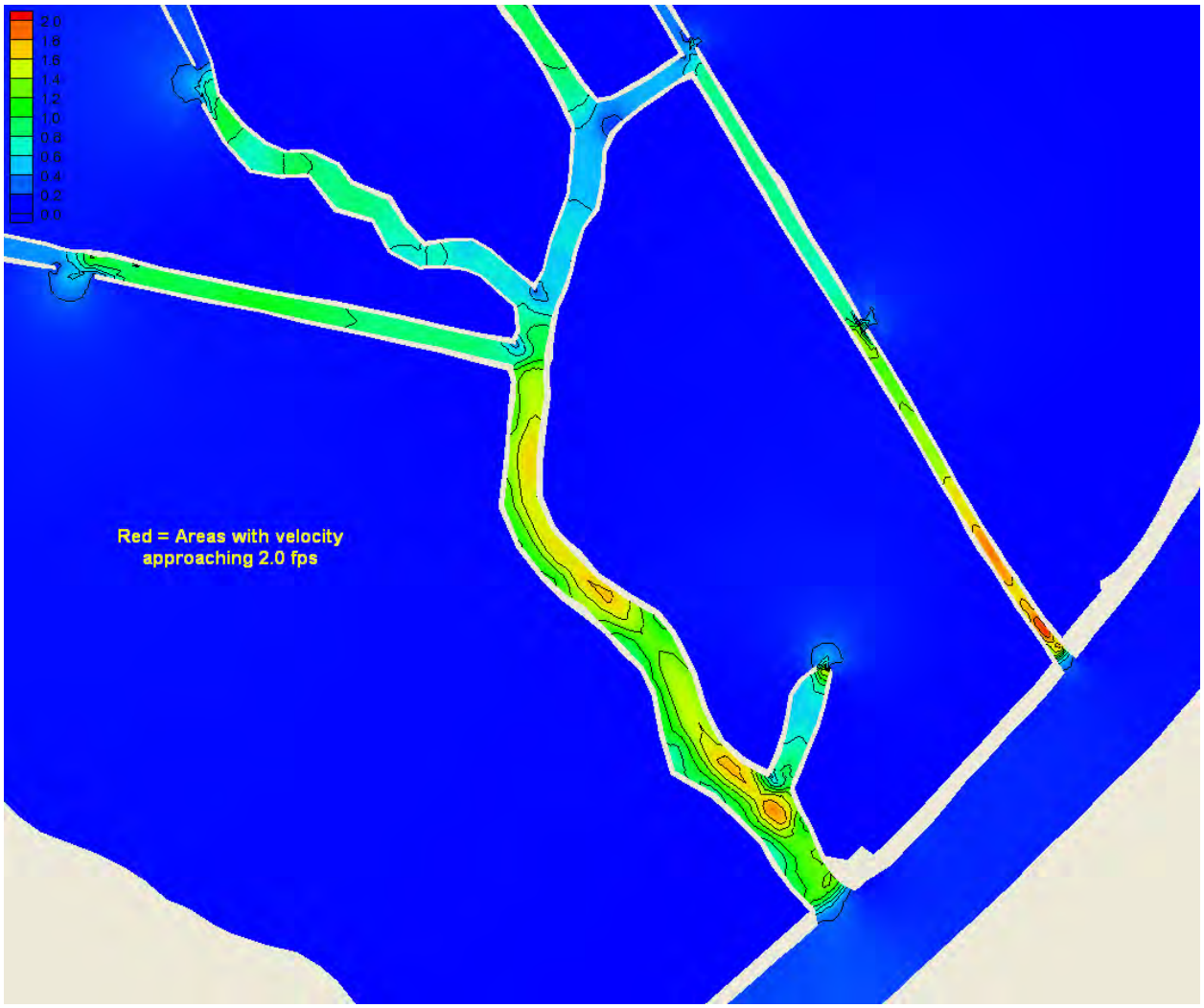


Figure 28. Scour evaluation simulation (same as Figure 25) with contouring from 0-2 fps. Only a small length of the SNGP canal velocities approach 2 fps.

If the Alternative 5 access canals location along the GIWW were opened following completion of their restoration as mitigation wetlands, the scour potential simulation shows a significantly reduced exit velocity in the SNG pipeline canal and Bayou aux Carpes. Figure 29 is a direct comparison to the results shown in Figure 27. The velocities approaching 2 fps (Figure 28) are not likely a problem, but additional openings to the GIWW (Figure 29) can further reduce velocities by offering additional cross-sectional area for exiting surge discharges.

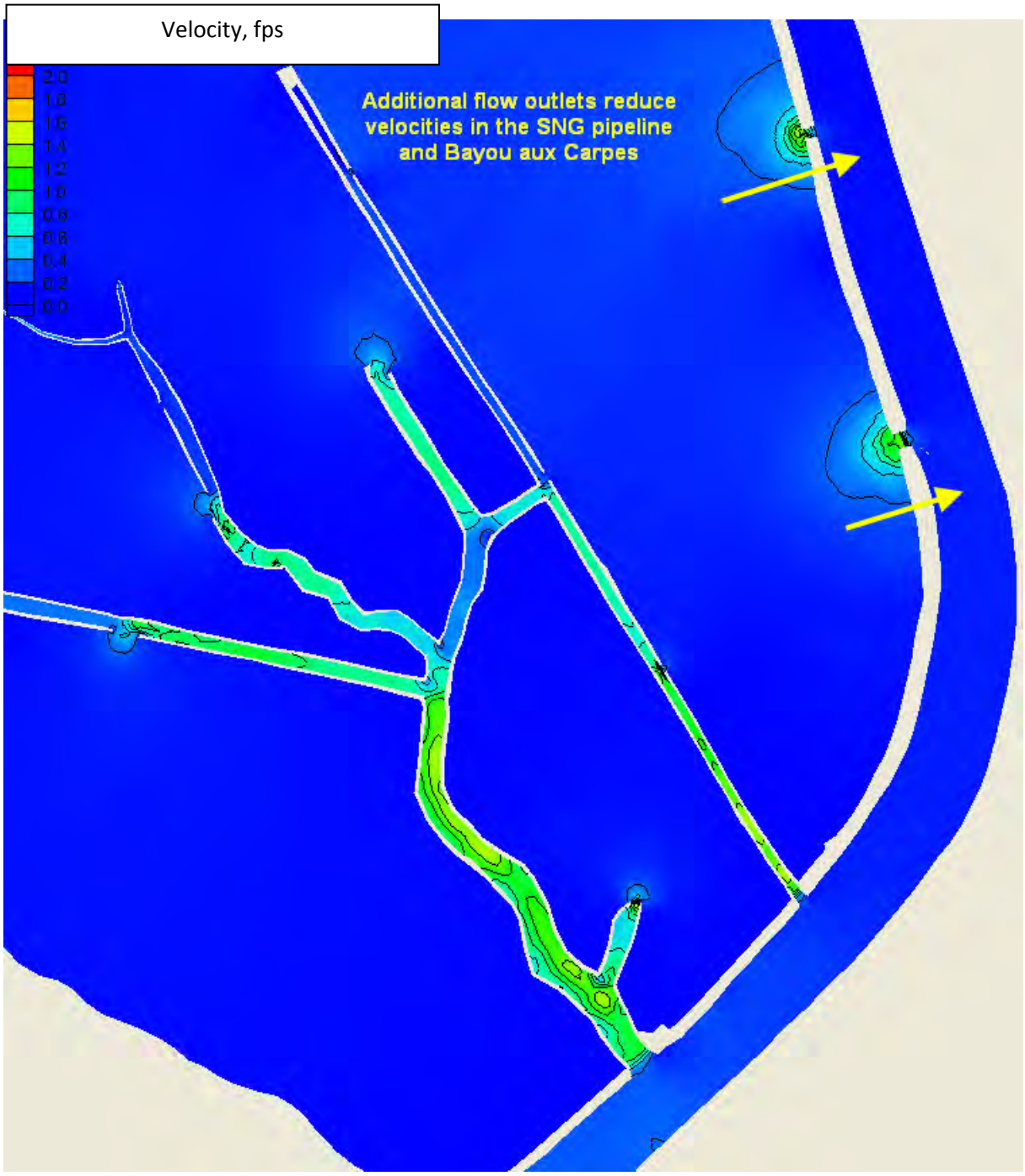


Figure 29. Scour simulation for the same conditions shown in Figure 28. The openings at the two access canals would reduce the flow volume for the SNG pipeline and Bayou aux Carpes.

4. SUMMARY

Table 3 provides a brief description of each of the augmentation alternatives evaluated along with a summary of the anticipated effects of implementing each of the alternatives. The following also provides similar information.

Alternative 1 – The existing gap in the Old Estelle Discharge Canal's southern spoil berm situated near the Old Estelle Pump station can allow pumping event flows to move southward into the BAC 404c wetlands if the Old Estelle Water Control Structure (two sluice gates) at the east end of the discharge canal are closed. Additional flow coverage in the BAC 404c wetlands could be achieved by establishing a second gap in the south berm adjacent to the discharge canal (e.g. Alternative 1), with flow exchange coverage increasing by a maximum of approximately 150 acres. Again, this increased flow exchange requires the Old Estelle Water Control Structure to be closed.

Alternative 2 – Establishing gaps in the spoil banks along the SNGP Canal (approximately 4 gaps, each 30 to 60 feet wide) could increase flow exchange by approximately 12 acres. This increased exchange could only be realized if the Bayou aux Carpes shell plug is also removed (e.g. implement Alternative 3) and the SNGP Canal remains open (e.g. Alternative 4 not implemented).

Alternative 3 – Removing the existing shell plug at the south end of Bayou aux Carpes so as to re-establish a direct hydraulic connection to the GIWW, combined with establishing gaps in the spoil banks along this bayou (approximately 9 gaps, each 30 to 60 feet wide) could increase flow exchange by approximately 37 acres. This increased exchange could only be realized if the SNGP Canal remains open (e.g. Alternative 4 not implemented).

Alternative 4 – Closing (plugging) the SNGP Canal would decrease existing flow in the canal and would eliminate the additional flow exchange benefits possible from the other gapping simulations presented in this report. Installing a plug in the SNGP Canal near the bend of the canal (e.g. Alternative 4; close northern portion of canal) could increase flow exchange by essentially eliminating the drainage divide formed by the canal and its berms. In essence, sheetflow moving southward through wetlands north of the plugged canal segment could theoretically "bypass" this canal segment and continue moving southward instead of being blocked and channelized by the SNGP Canal. It is likely, however, that this improved/increased flow exchange would only be realized if Alternative 1 is implemented. It is also extremely difficult to estimate how often flow exchange would be improved and the degree of this improvement (in terms of acreages). Furthermore, installing a plug in the SNGP Canal would require advance coordination with owner(s) of the Harvey Tract (e.g. the privately owned portion of the BAC 404c area) plus obtaining approval from the owner could be quite problematic. The entity retaining any pipeline and/or mineral rights to the canal would also have to be coordinated with before considering this alternative.

Alternative 5 – If gaps were established at the east end of each of the two keyhole access canals such that a direct hydrologic connection to the GIWW is re-established, flow exchange would be significantly increased within nearby BAC 404c wetlands. If the WBV HSDRRS mitigation plan for these keyhole canals is not implemented, then the inflow exchange would increase by approximately 33 acres while the outflow exchange would increase by approximately 44 acres. If the WBV HSDRRS mitigation plan for these keyhole canals is implemented, then the inflow exchange would increase by approximately 98 acres while the outflow exchange would increase by approximately 128 acres. While Alternative 5 would reduce velocities as shown in the scour potential simulations, implementation of this alternative would benefit flow exchange and it is not anticipated that scouring (up to 2 fps) would be a problem.

However, implementation of Alternative 5 could adversely affect the desired hydroperiod in the restored swamps proposed by the WBV HSDRRS mitigation plan. Outflows from the restored swamps could potentially not allow desired peak stages to be realized in the swamps and could also decrease the desired duration of inundation in these swamps. Such effects warrant further consideration, although any potential adverse effects could likely be negated through the installation of a weir or similar water control structures (such as a notched weir with flashboard risers) in each of the keyhole canal gaps. Note that installation of such water control structures would likely change the maximum inflow and maximum outflow acreages predicted by the model simulations contained in this report. This would need to be evaluated once the design and operational parameters of any water control structures are known.

Alternative 6 – The gapping of various roads considered as part of Alternative 6 (e.g. Sub-Alternatives 6.1 through 6.6) would not appreciably increase flow exchange within BAC 404c wetlands, primarily due to adjacent ground elevations. The only exception to this statement involves Sub-Alternative 6.1, the gapping of the old GIWW access road where it crosses the Bayou aux Carpes (BAC) shell plug. However, this "gapping" would automatically be achieved via implementation of Alternative 3 (removal of the BAC shell plug); hence Sub-Alternative 6.1 should not be considered as a viable alternative compared to Alternative 3. Sub-Alternative 6.7, the extension of the Old Canal to connect with the GIWW, could improve flow/exchange in the BAC 404c wetlands but the increased flow exchange would only cover approximately 3.3 acres.

Scour potential was evaluated for the augmentation alternatives, and the storm surge simulation shows no velocities exceeding 2 fps for any of the gap or canal areas. The BAC 404c wetlands are heavily vegetated, which naturally slows flow speeds, and the duration of surge levels that result in the highest velocities do not last long (1-2 hours at the higher velocities approaching 2 fps). Additional engineering evaluation including geotechnical soil analysis and shear threshold evaluations could be completed to further investigate localized armoring needs associated with alternatives selected for implementation. However, based on project flow rates, durations, and the heavy vegetation along spoil banklines, scour problems are not likely. Monitoring is recommended to identify problems *if they develop*, rather than initially designing and installing scour protection with any of the alternatives selected for implementation.

Table 3. Summary of surface water circulation improvement augmentation alternatives.

Alt. #	Description	Effects
1	**Gap spoil bank, south side Old Estelle Discharge Canal (OEDC).** One gap, 250 feet wide near east end of OEDC.	Flow exchange increase = **150 acres** (max). *Requires closure of OEWCS to work.*
2	**Gap spoil bank along SNGP Canal.** 4 gaps, each gap 30-60' wide.	Flow exchange increase = **12 acres** if BAC shell plug removed; no real benefit if shell plug not removed. *Assumes SNGP Canal remains open (e.g. Alt. 4 not implemented).*
3	**Remove shell plug at south end of Bayou aux Carpes (BAC) and gap spoil banks along BAC.** 9 gaps, each gap 30-60' wide.	Flow exchange increase = **37 acres**. *Assumes SNGP Canal remains open (e.g. Alt. 4 not implemented).*
4	**Close (plug) portion of SNGP Canal.** Plug canal where it bends northward (near south property boundary of private land within BAC 404c area).	Helps overcome drainage divide created by SNGP canal, allowing flow southward past canal. *Issues of private land owner and pipeline owner approval*.
5	**Gap western GIWW spoil bank adjacent to 2 access canals (keyhole canals; proposed WBV HSDRRS swamp mitigation features JL8 and JL9).** One gap in spoil bank by JL8 and one gap in spoil bank by JL9 to connect these areas to GIWW.	Max. inflow increase =**98 acres.** Max. outflow increase = **128 acres.** *Assumes WBV HSDRRS mitigation, including gapping of spoil berms adjacent to north and south sides of swamp mitigation features JL8 & JL9.* Min. inflow increase = **33 acres**. Min. outflow increase = **44 acres.** *Assumes no HSDRRS mitigation.*
6	6.1 – Gap/degrade road at BAC shell plug by GIWW (Old GIWW Access Road). 6.2 – Gap/degrade Old Logging/Spoilbank Road along east side of Old Canal. 6.3 – Gap/degrade Old Logging/Spoilbank Road along west side of Old Canal. 6.4 – Gap/degrade Old Pasture Road/Levee. 6.5 – Gap/degrade Old Spoilbank Road by unnamed canal. 6.6 – Gap/degrade Old Board Road (north of Alternative 5), 6.7 – Extend Old Canal to connect with GIWW.	6.1 would be achieved automatically if Alt. 3 implemented. 6.2 through 6.6 would not improve flow exchange. 6.7 would increase flow exchange by **3.3 acres**.

BAC = Bayou aux Carpes; WBV = West Bank & Vicinity; SNGP = Southern Natural Gas Pipeline; HSDRRS = Hurricane & Storm Damage Risk Reduction System; OEDC = Old Estelle Discharge Canal; GIWW = Gulf Intracoastal Waterway; OEWCS = Old Estelle Water Control Structure

Bayou aux Carpes EPA designated 404c Wetland

Model Study Revisions

General: This report presents revisions to the modeling effort completed for the "Bayou Aux Carpes EPA Clean Water Act Designated 404c Site Improved Circulation Study"report (2012 Report). These revisions are based on a field site evaluation to determine construction techniques and access methods for opening interior gaps based on the 2012 Report recommendations. Figure 1 shows the site location, south of New Orleans, LA.

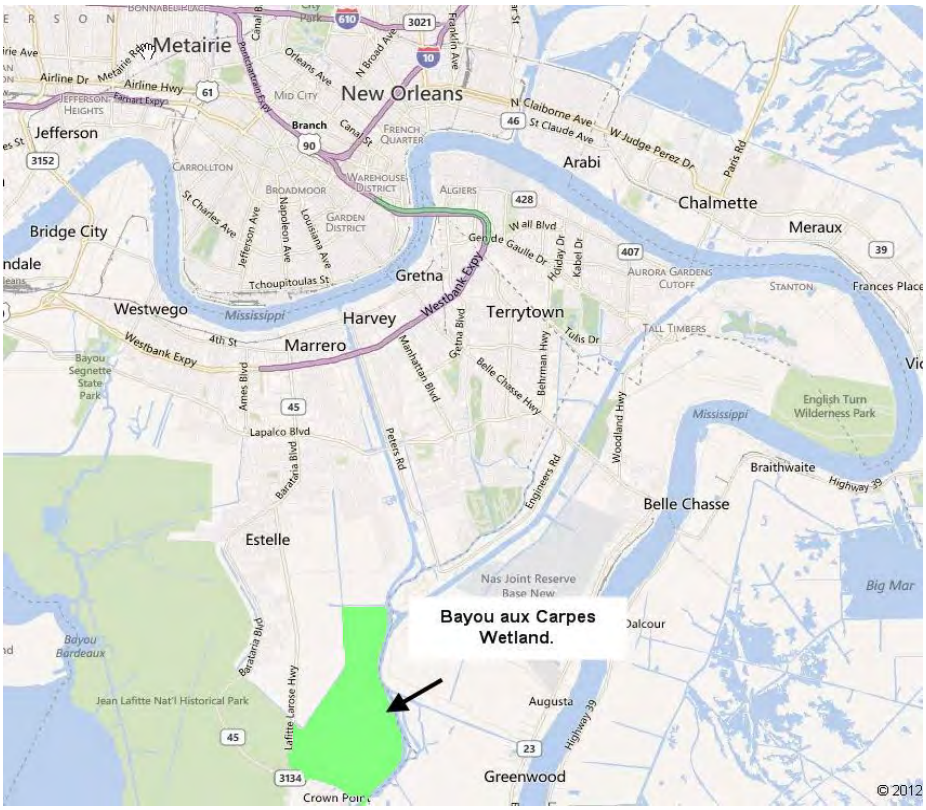


Figure 1. Bayou aux Carpes Section 404c wetland area.

During the site inspection on May 9, 2014, flows through a significant number of existing spoil bank gaps were discovered. GPS locations and width estimates for existing gaps were recorded along the Southern Natural Gas Pipeline (SNGP) canal and the Bayou aux Carpes (BAC) canals. A significant increase in the dimensions of the canal that connects the SNGP and BAC canals was also observed and recorded.

Standard model development practices begin with collecting and verifying adequate field survey data. During the 2012 Report modeling efforts, too many assumptions and estimates

were substituted for actual field data and applied to the 2012 Report work. A number of issues and alternatives were evaluated effectively during the 2012 Report modeling, but the plan conclusions drawn from the SNGP and BAC Canals were faulty since they relied on incorrect assumptions about existing conditions. As a result, circulation improvement plans that were moved forward by the Project Delivery Team (PDT) with Interagency input were re-evaluated. Deficiencies were corrected and new simulations were completed. This report summarizes corrections and presents revised conclusions to the SNGP and BAC canal modeling effort. Simulations expounding on the Old Estelle Pump Station (OEPS) Canal alternative are also included.

Revised Modeling Strategy: Figure 2 shows existing spoil bank gap locations used to update the existing condition model simulations. The 2012 Report simulations for the SNGP and BAC

Figure 2. Aerial showing locations of May 2014 field data updates.

canals had recommended gap openings at four locations on the SNGP canal and nine locations on the BAC canals. Comparing existing gap locations versus those recommended in the 2012 Report revealed that there were already existing gaps at recommended 2012 Report gap plan locations. Figure 3 and 4 show the 2012 Report recommendations for gaps on the SNGP and BAC canals, respectively. The updated base (i.e., existing) condition was merged with the 2012 Report gap location recommendations to remove duplication. Anywhere a proposed gap from the 2012 Report overlapped or occurred in close proximity to an existing gap, the gap was either relocated or removed. Figure 5 shows the updated base condition gap locations in red, and the proposed new gap locations, including BAC plug removal, in yellow.

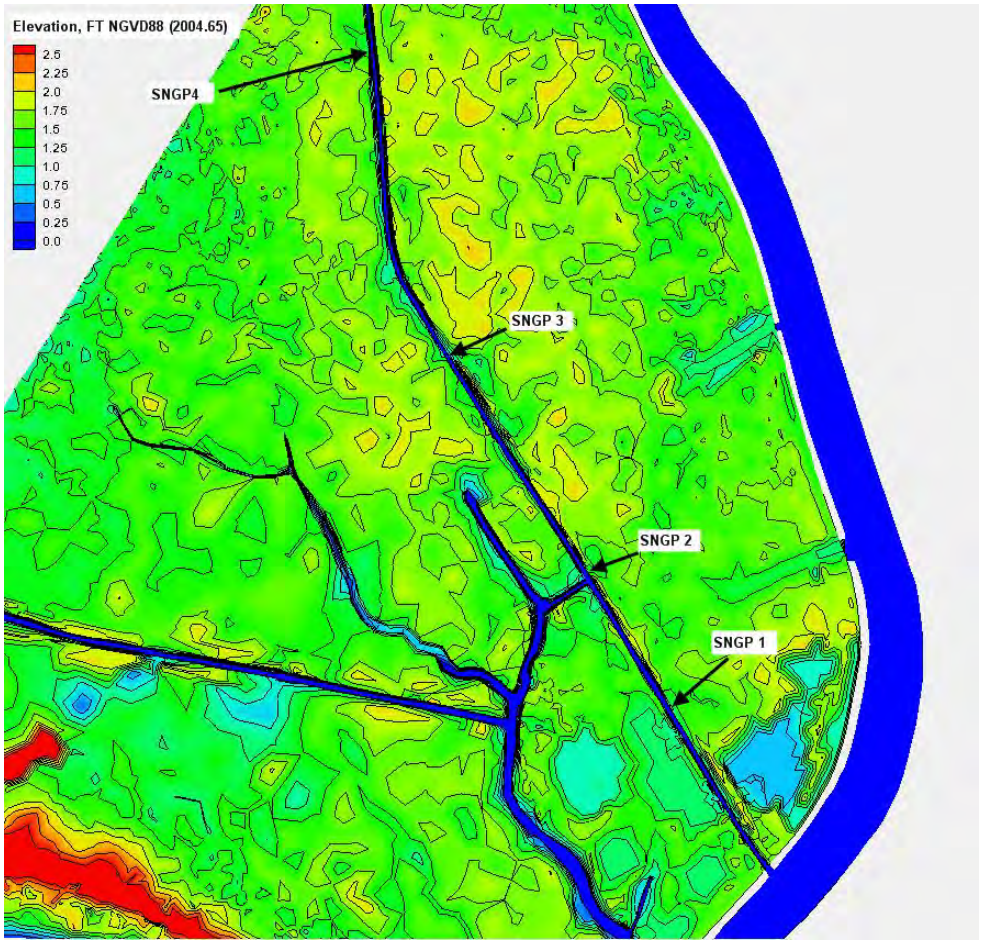


Figure 3. SNGP canal gap location recommendations from the 2012 Report.

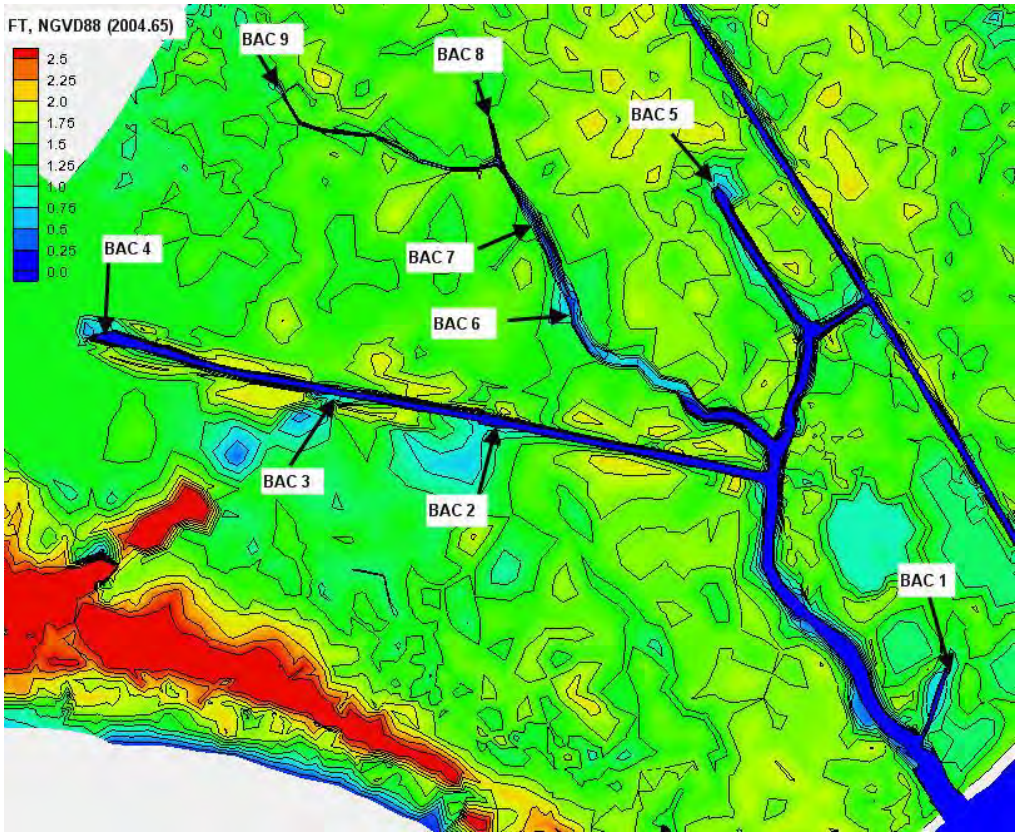


Figure 4. BAC canal gap location recommendations from the 2012 Report.

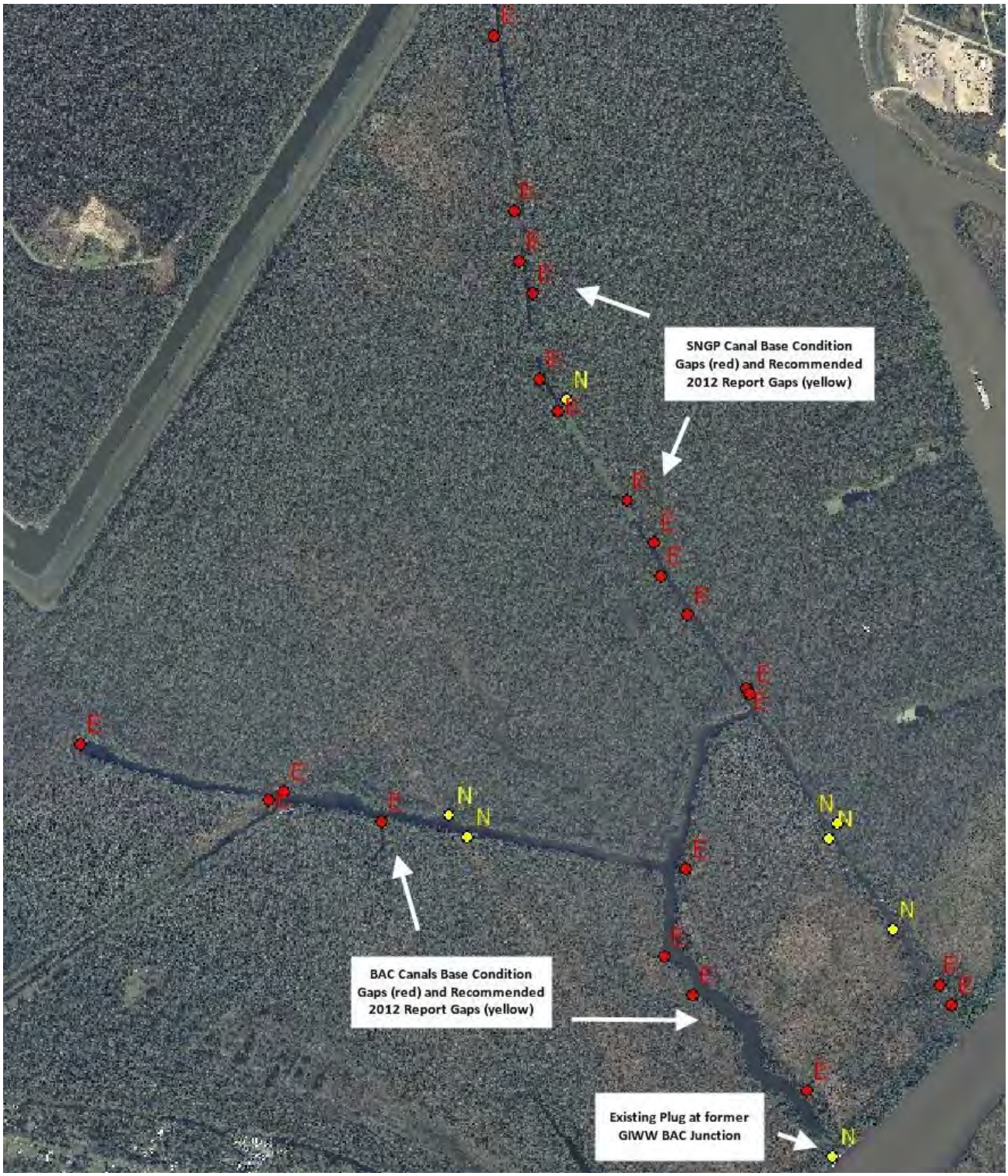


Figure 5. Existing Gaps with New Gap Recommendations.

Revised Simulations: Model bathymetry was updated using the May 2014 field information. Consistent with the 2012 Report, boundary conditions for the model were defined by water level on the adjacent GIWW. Figure 6 shows the 60 hour-long time series water level hydrograph applied. Much of the BAC 404c overland elevations are a few tenths under a +1 ft elevation, and a very slight velocity limit of 0.01 fps was used to define the extent of flow movement between base and plan simulations. Figure 7 shows flow movement (velocity) contours at the +1 ft water surface boundary condition (at time 25.5 hrs). The flow movement level of 0.01 fps is not practicable for field measurement, but it offered a high sensitivity to compare the computer simulations. The Figure 6 hydrograph is not a typical curve, but was selected because the pronounced rise and sudden drop provided opportunity to evaluate scour potential at canal openings along with water levels of interest.

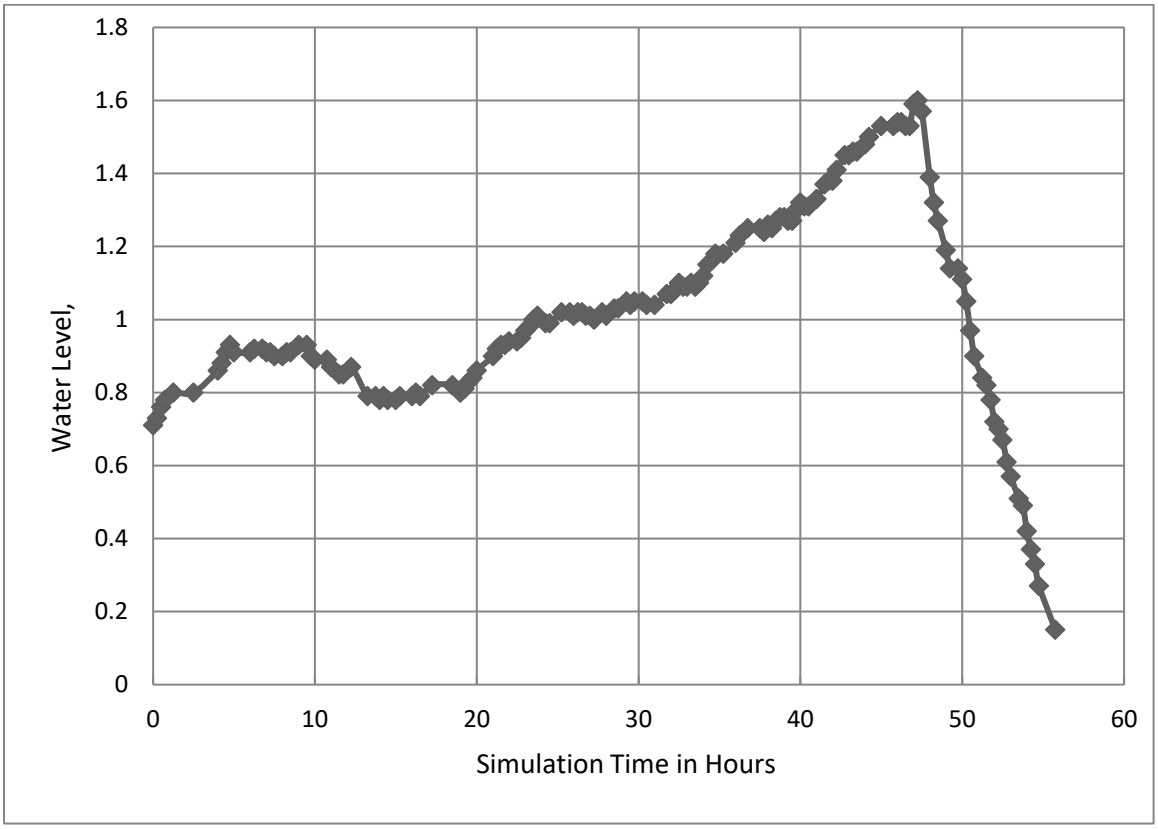


Figure 6. Boundary Condition hydrograph. Boundary Condition hydrograph. Source: Boomtown Casino Gage on GIWW near BAC 404c Wetland from 280615 Nov to 010530 Dec (NAVD88 2004.6).

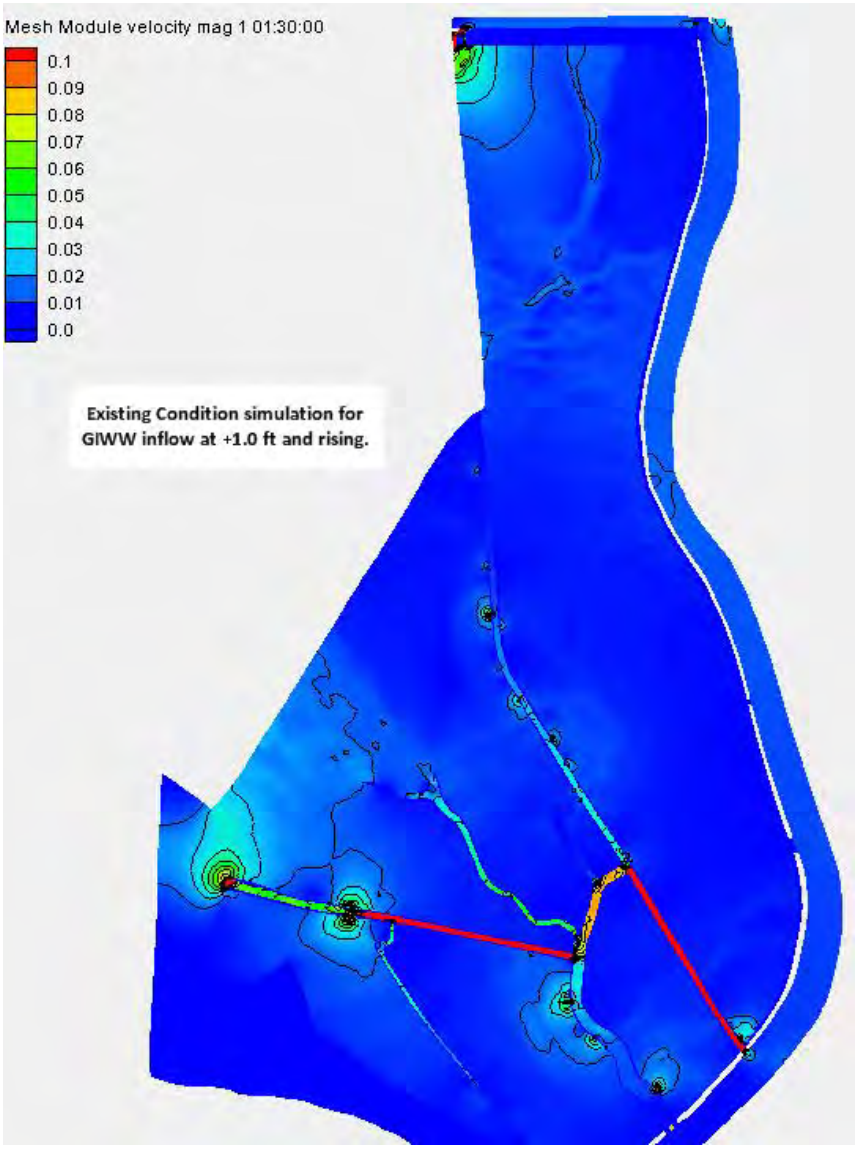


Figure 7. Existing Condition flow movement, GIWW boundary condition = +1.0 ft.

***Refined Simulations for the Old Estelle Pump Station Outfall Canal*:** Recognizing the unique project goals for the 404c site, the PDT established a tier of boundary conditions that defined the existing OEPS gap function with the simulated additional 250 ft gap (as defined in the 2012 Report) and with a smaller 75 ft wide gap in the same location. Model boundary conditions used for the 404c site differ from the adjacent West Bank and Vicinity Project storm surge and flood protection studies in that they are typical events and typical combinations of events that are expected multiple times each year. An OEPS discharge event was selected from existing OEPS data records, and simulations were repeated for the existing gap only, the 75 ft gap plan, and 250 ft gap plan. These OEPS discharge + gap alternative simulations were completed for the outfall canal open (T-wall structure open) and for the outfall canal closed (T-wall structure closed. Since the closed outfall canal was designed as an environmental enhancement option for the 404c site, it was incorporated into the refined simulations. The OEPS discharge event was recorded in April 2004, and it begins with a 105 cfs discharge for 3 hours and increases to a

250 cfs discharge for an additional 7 hours. The large drainage area leading into the Old Estelle Pump Station intake can trigger pump activation both with and without local rain over the 404c site, and therefore the OEPS activation event was applied with and without direct rainfall over the 404c site. The rainfall event used was recorded for a 24 hour duration on 30 April 2004.

The first series of OEPS outfall canal simulations were completed for the outfall canal structure open condition, evaluating alternative gap sizes of 75 ft and 250 ft without any OEPS discharge. Figures 8-10 depict these flow simulations at the +1.0 ft water level conditions at time 25.5 hrs. Note that the outfall canal serves as a water supply to the northern BAC wetland through the existing gap as rising GIWW water levels exceed the northern marsh elevations of around 0.7 ft and greater.

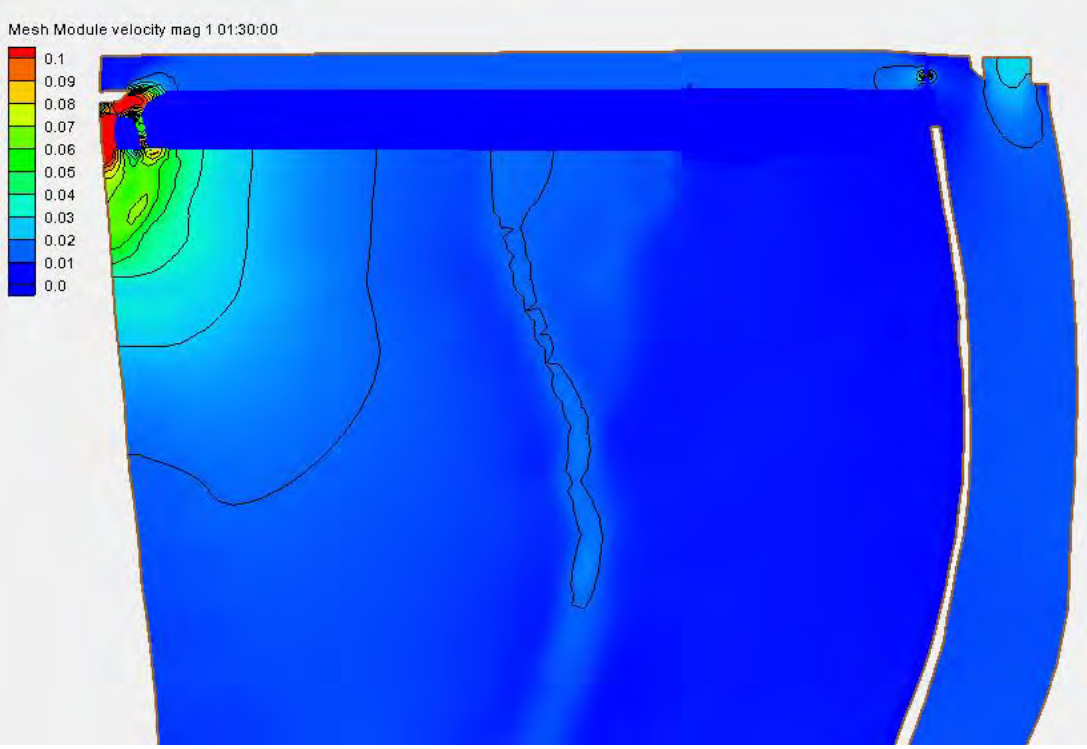


Figure 8. Existing condition flow movement at +1.0 ft GIWW.

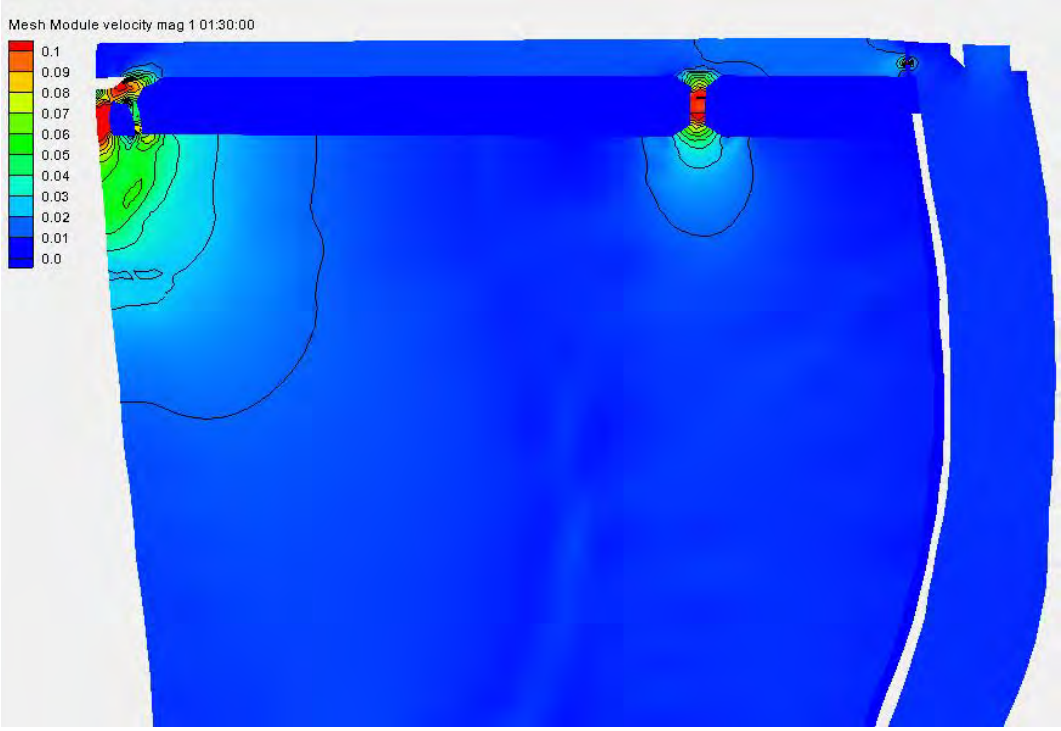


Figure 9. Existing + additional 75-ft gap plan flow movement at +1.0 GIWW.

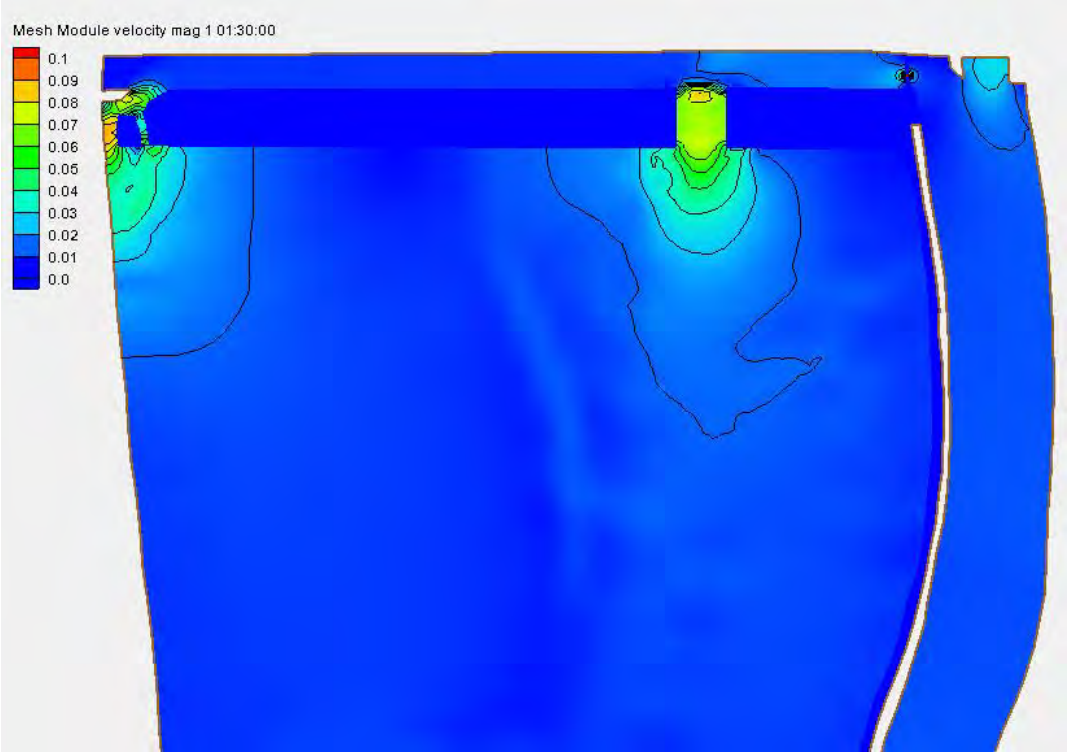


Figure 10. Existing + additional 250-ft gap plan flow movement at +1.0 GIWW

The second series of OEPS outfall canal simulations included the existing gap, the 75 ft wide gap alternative, and the 250 ft wide gap alternative under OEPS pump discharge conditions. The tiered boundary conditions of T-Wall structure open, T-Wall structure closed, rainfall over the 404c area, and no rainfall over the 404c area were then applied. To simplify presentation of these data, a series of water surface elevation plots were prepared from the model simulations. Key locations were selected in the OEPS outfall canal and in the upper 404c area interior as shown in Figure 11.

Figure 11. Locations for water level plots.

Figures 12-15 show the canal and interior water levels for the existing gap only simulations. The Figure captions define the boundary condition variables applied. Figures 12 and 13 show a slight rise in the outfall canal water levels with the closed structure condition, and more noticeable are the drawdown effects after the pumping event stops about half way through the simulation. When OEPS discharge stops, flows in the outfall canal will reverse and drain through the open structure. If the structure is closed, water levels remain higher for longer periods of time as shown in Figures 12 and 13 during the latter 10 hours of simulations. The added rain over the 404c site in Figures 14 and 15 result in higher peak flows as expected, and the same drawdown comparison is noted for the structure open versus closed. The Interior water level comparisons shows slightly higher values for the below existing gap location, but interior water levels plot as a single line with rainfall as shown in Figures 14 and 15.

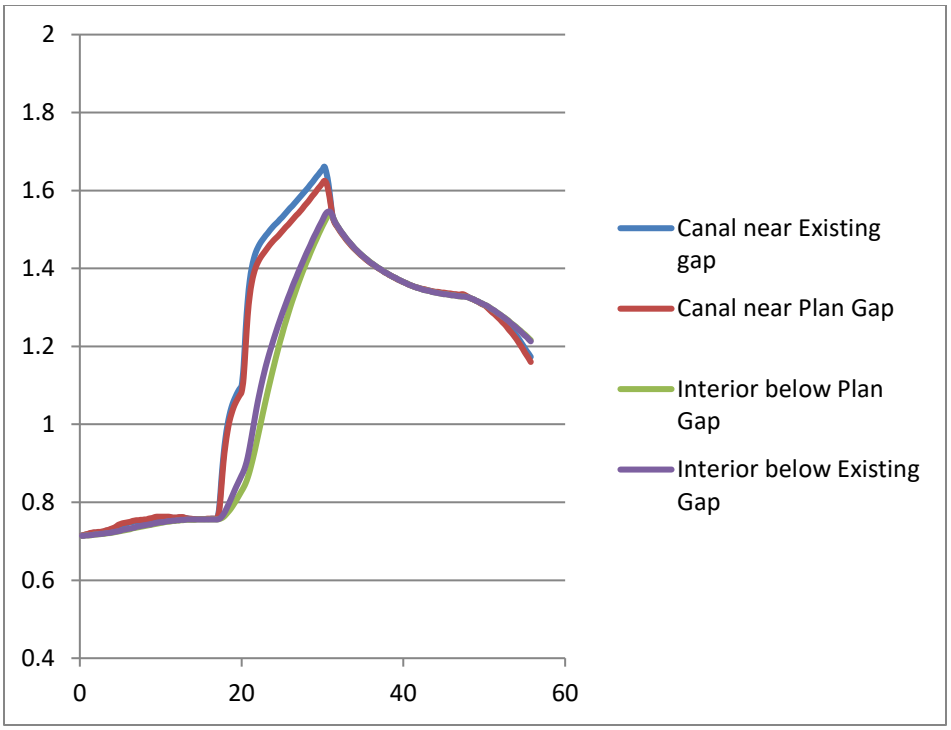


Figure 12 . Existing Gap Only, Pumping Event, No Rain, Structure Open.

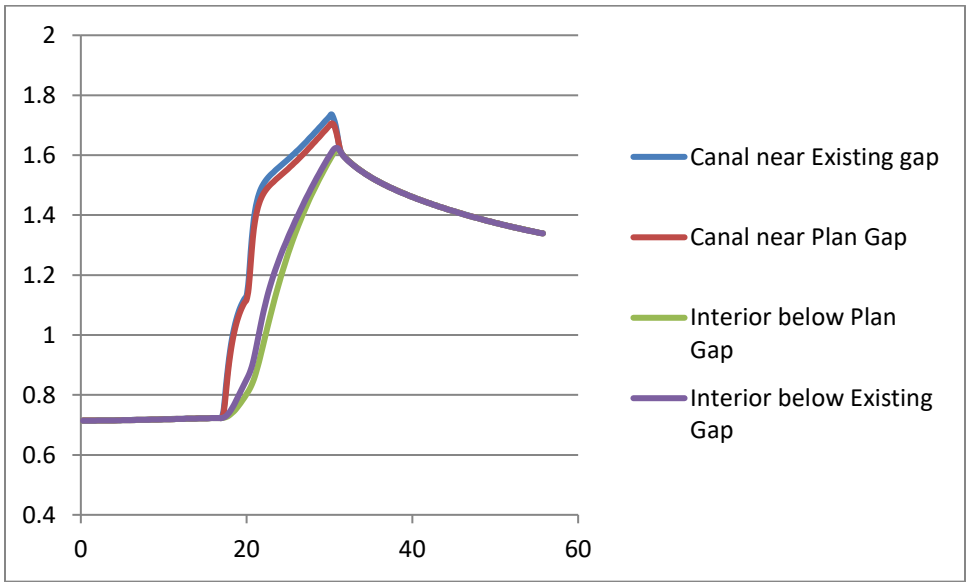


Figure 13. Existing Gap Only, Pumping Event, No Rain, Structure Closed.

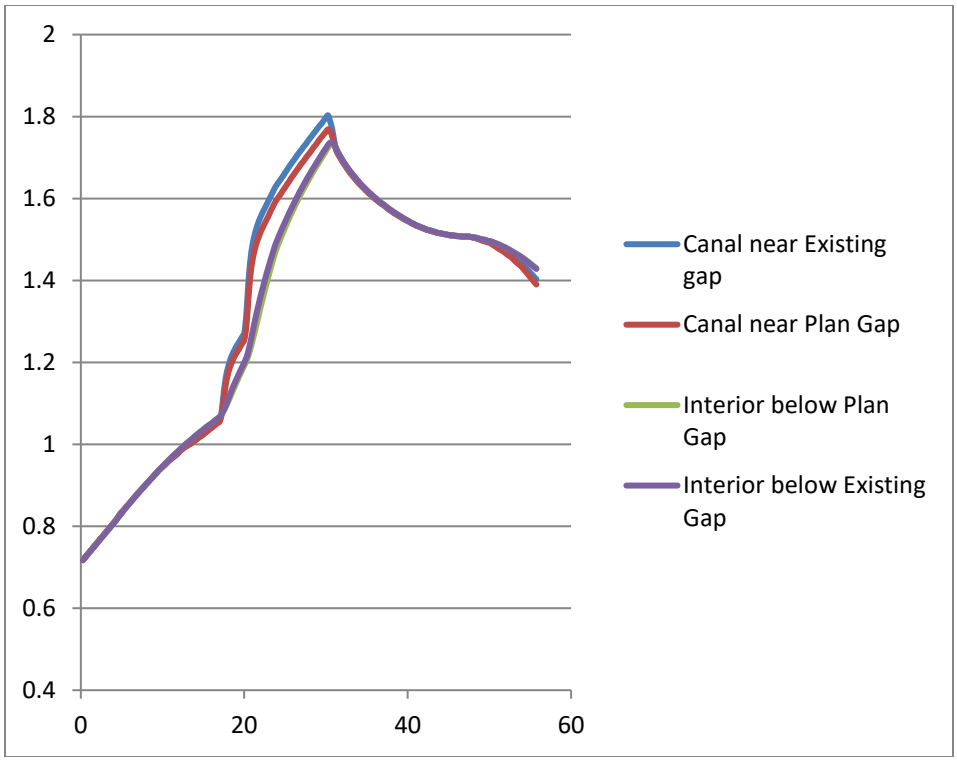


Figure 14. Existing Gap Only, Pumping Event, Rain, Structure Open.

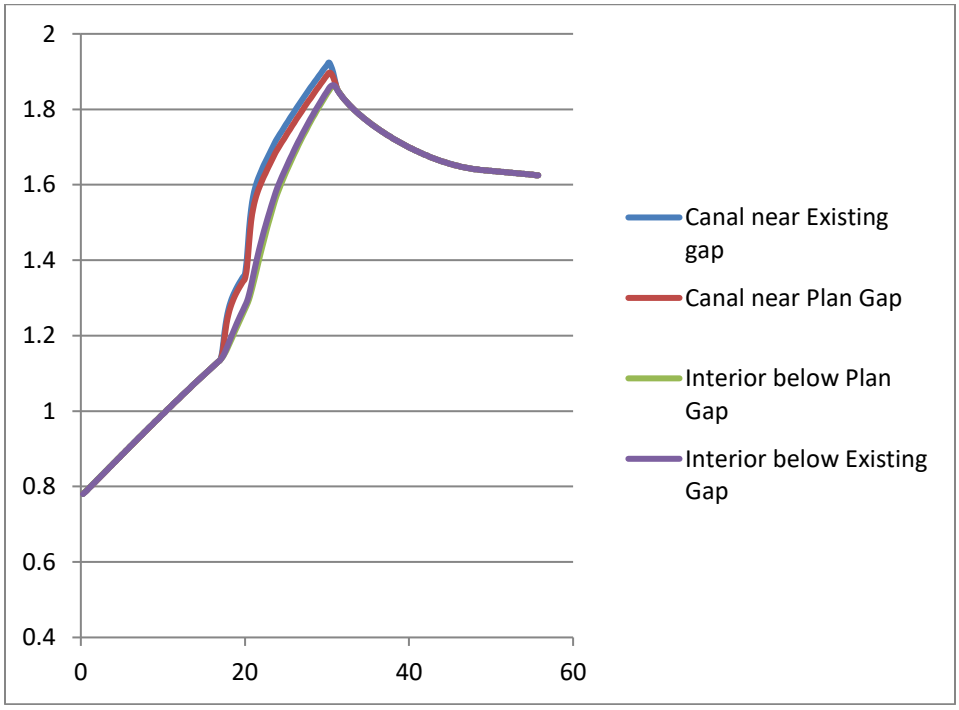


Figure 15. Existing Gap Only, Pumping Event, Rain, Structure Closed.

Figures 16 and 17 comparisons show the added 75 ft wide gap alternative. Peak values are slightly reduced in the outfall canal as flows enter the 404c site with increased efficiency due to the added gap. The slight water level difference shown for the existing gap only simulation without rain does not occur, indicating the added 75 ft gap allows an even inflow rate. The drawdown effects during the last 10 hours of the simulations show the same trends as the existing gap only simulations: the open structure condition allows a faster drawdown from the interior. With added rain as shown in Figure 19, results are practically the same as for the existing gap only simulation (Figure 15).

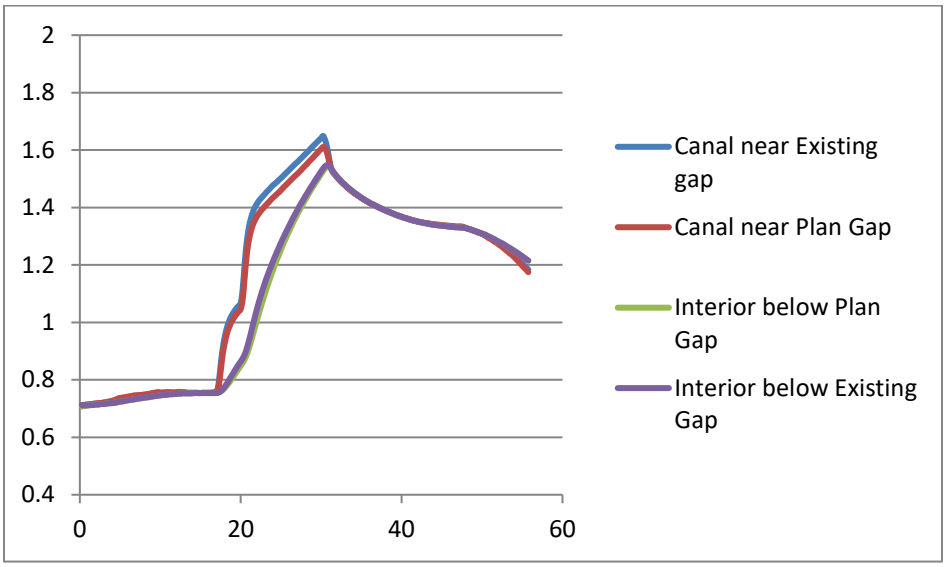
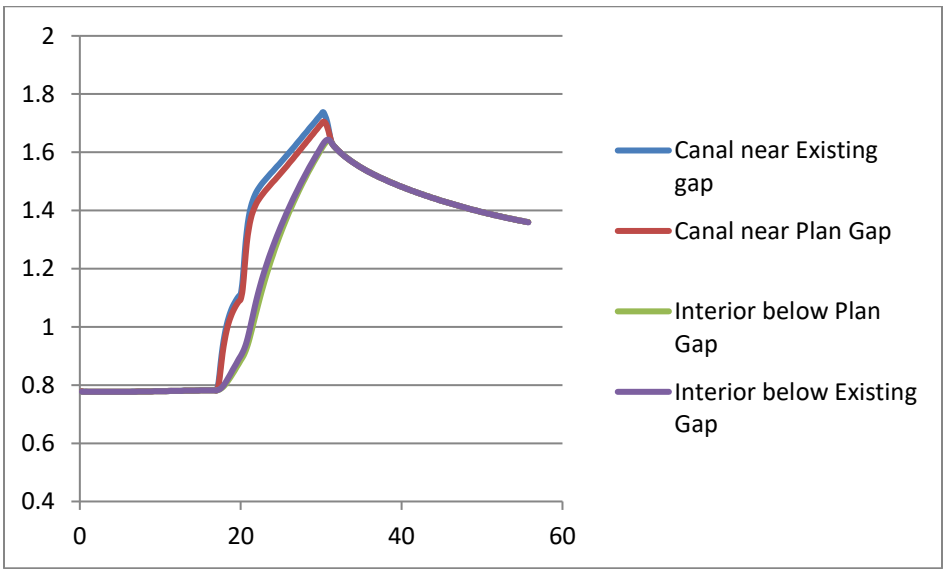


Figure 16 . Existing Gap, Additional 75 ft Gap, Pumping Event, No Rain, Structure Open.



Figures 17. Existing Gap, Additional 75 ft Gap, Pumping Event, No Rain, Structure Closed.

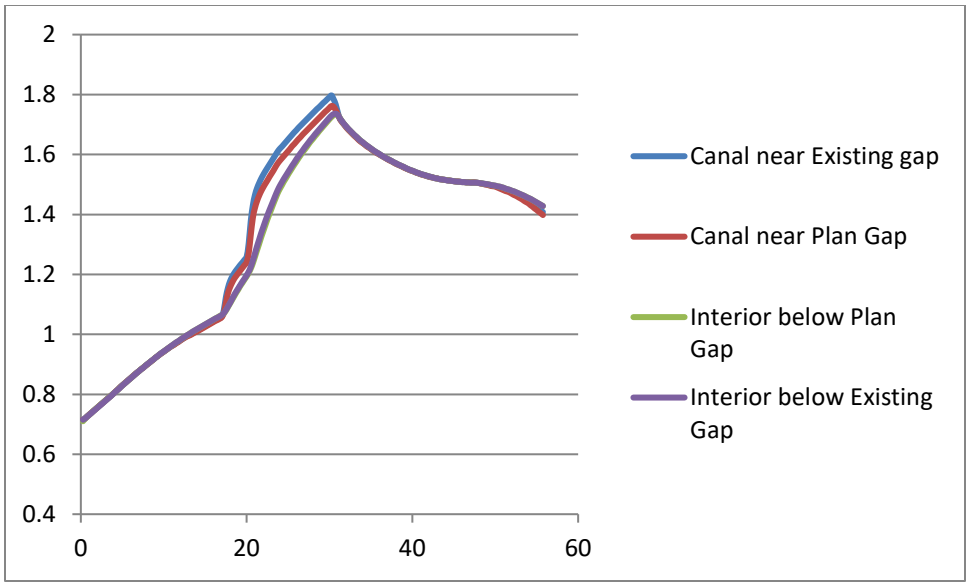


Figure 18 . Existing Gap, Additional 75 ft Gap, Pumping Event, Rain, Structure Open.

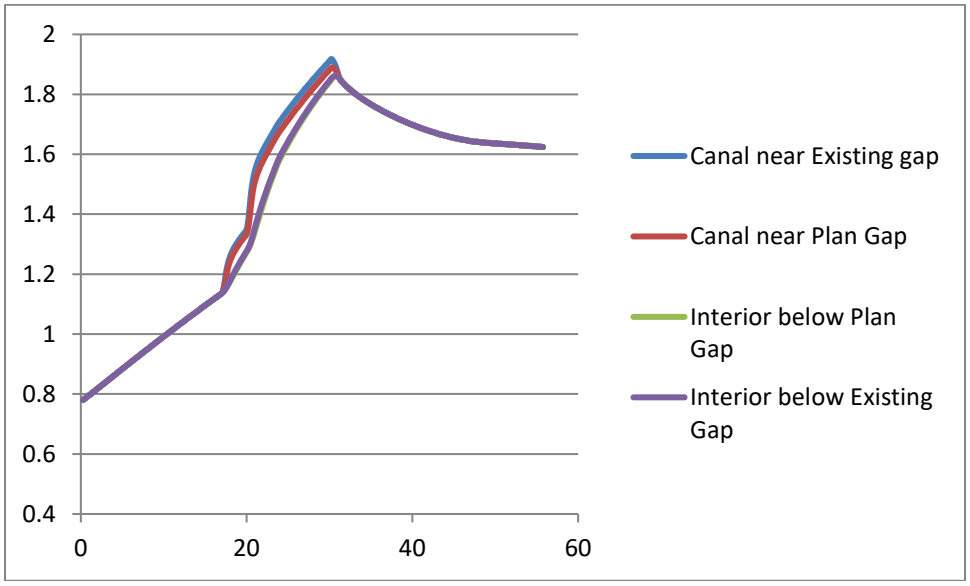


Figure 19 . Existing Gap, Additional 75 ft Gap, Pumping Event, Rain, Structure Closed.

Figures 20-23 show simulated results for the existing gap and additional 250 ft gap alternative, and they are essentially the same as those shown for the additional 75 ft gap alternative. These results indicate that increasing the additional gap width has no effect on water levels. Hydraulically, system topography and flow resistance (friction) are controlling the flow transfer across the OEPS outfall canal to about the same as level as those noted with the added 75 ft gap, even though additional opening is available.

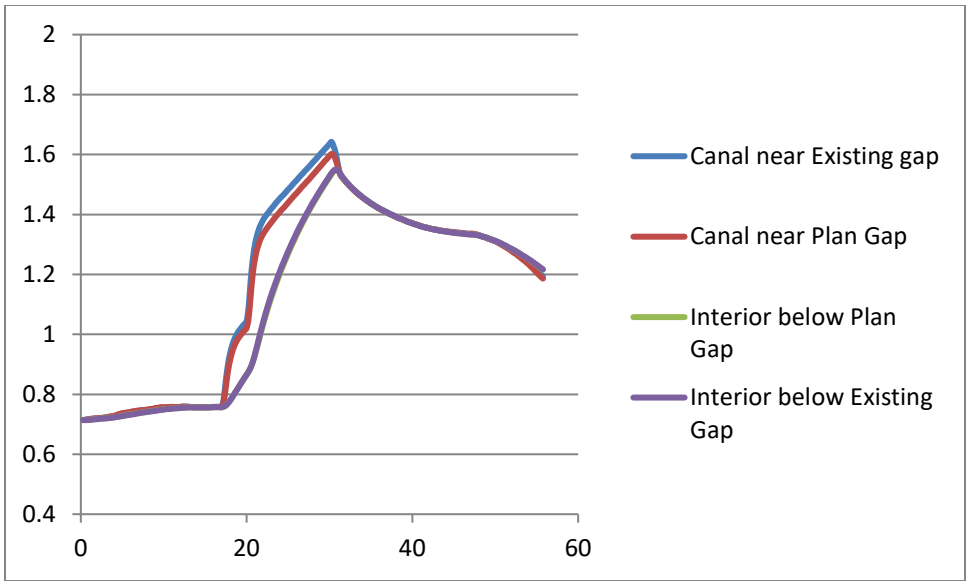


Figure 20. Existing Gap, Additional 250 ft Gap, Pumping Event, No Rain, Structure Open.

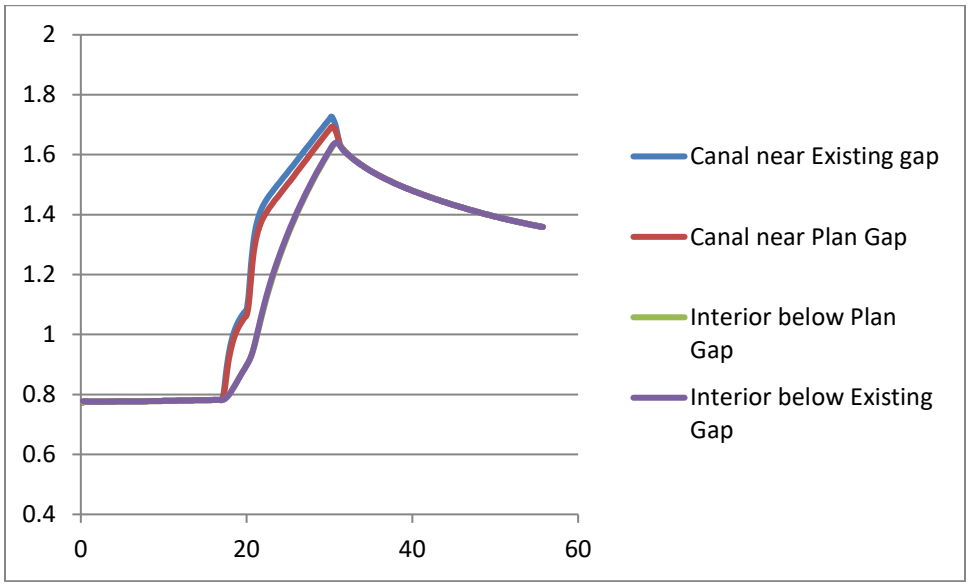


Figure 21. Existing Gap, Additional 250 ft Gap, Pumping Event, No Rain, Structure Closed.

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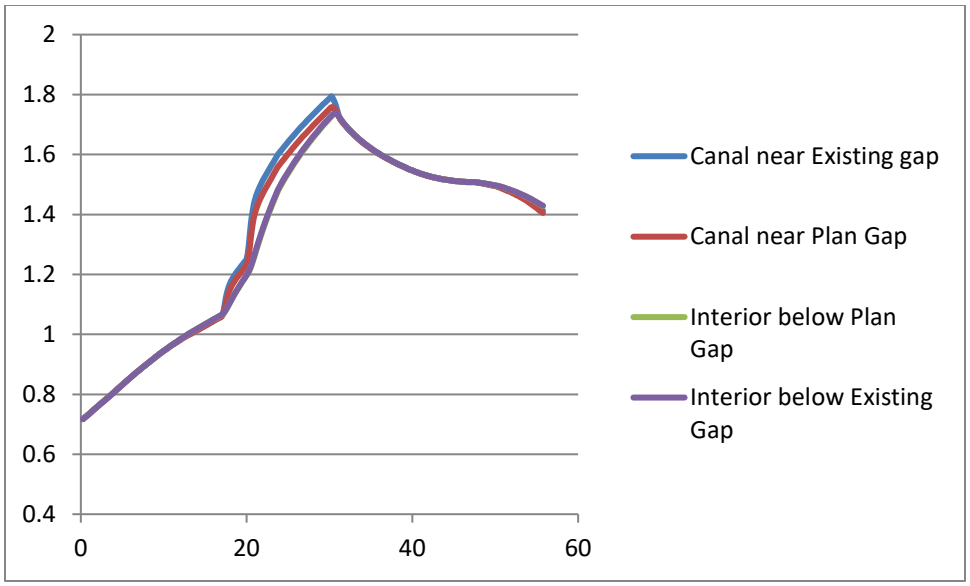


Figure 22. Existing Gap, Additional 250 ft Gap, Pumping Event, Rain, Structure Open.

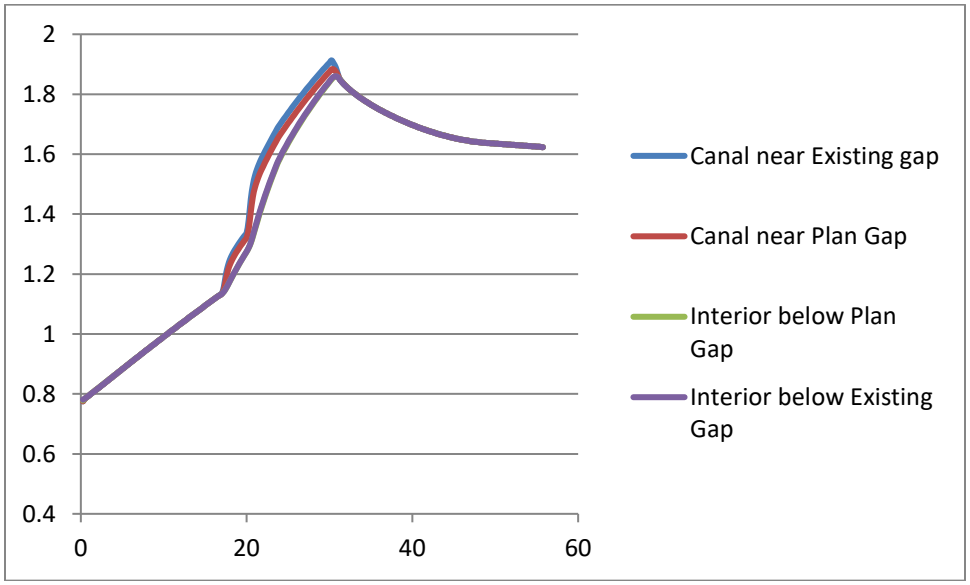


Figure 23. Existing Gap, Additional 250 ft Gap, Pumping Event, Rain, Structure Closed.

The highest water levels in the outfall canal were recorded with the structure closed, active OEPS discharge, and active rain event simulations. The highest water levels approach +2 ft as shown in previous figures, and, at this elevation, flows overtop portions of the outfall canal south spoil bank. Figure 24 shows a close-up view of the spoil bank elevations.

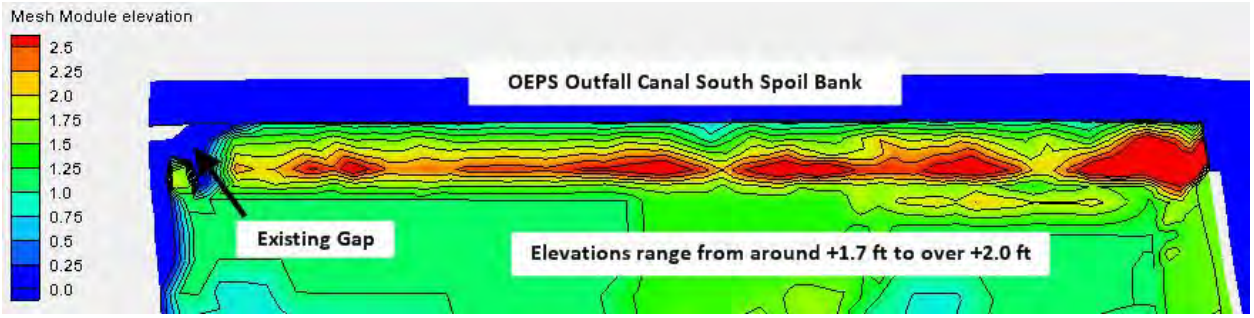


Figure 24. Contoured elevations, feet, across the OEPS outfall canal south spoil bank.

Figure 25 shows the flow movement over the spoil bank under overtopping flow conditions. The scale in Figure 25 was adjusted higher than previously shown in Figures 8-10 so that the peak velocities would be defined, but maximum flows over the spoil bank are still very low with peaks only reaching 0.2 fps. Figures 25 and 26 show the flow contours for the additional 75 ft gap and additional 250 ft gap, respectively, for the active pumping event, with rainfall, and closed structure condition.

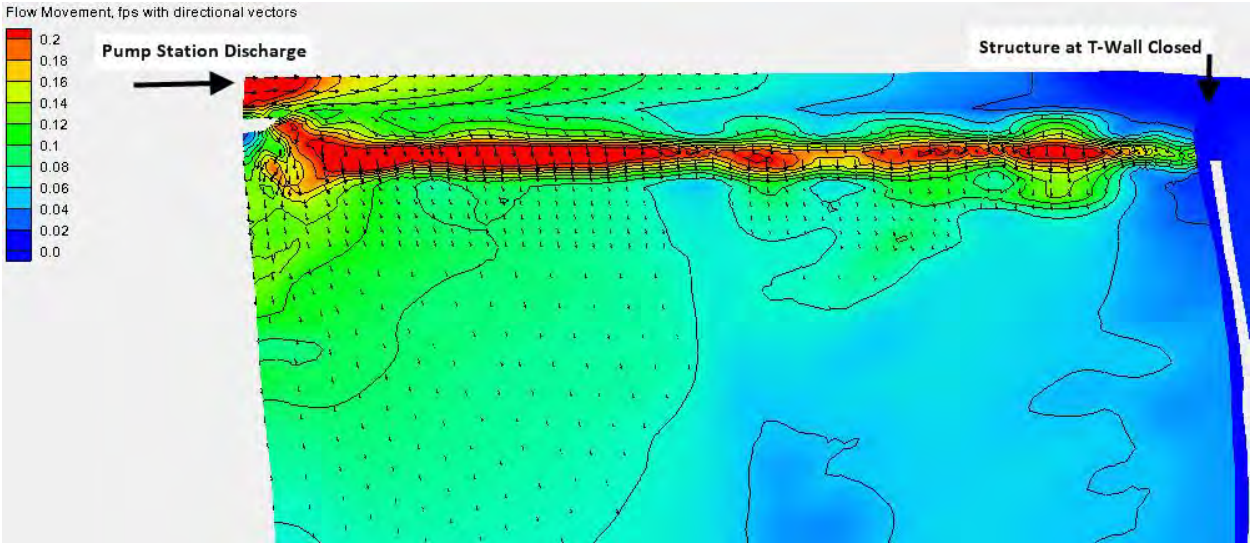


Figure 25. Overtopping flow movement patterns, fps, for existing gap only.

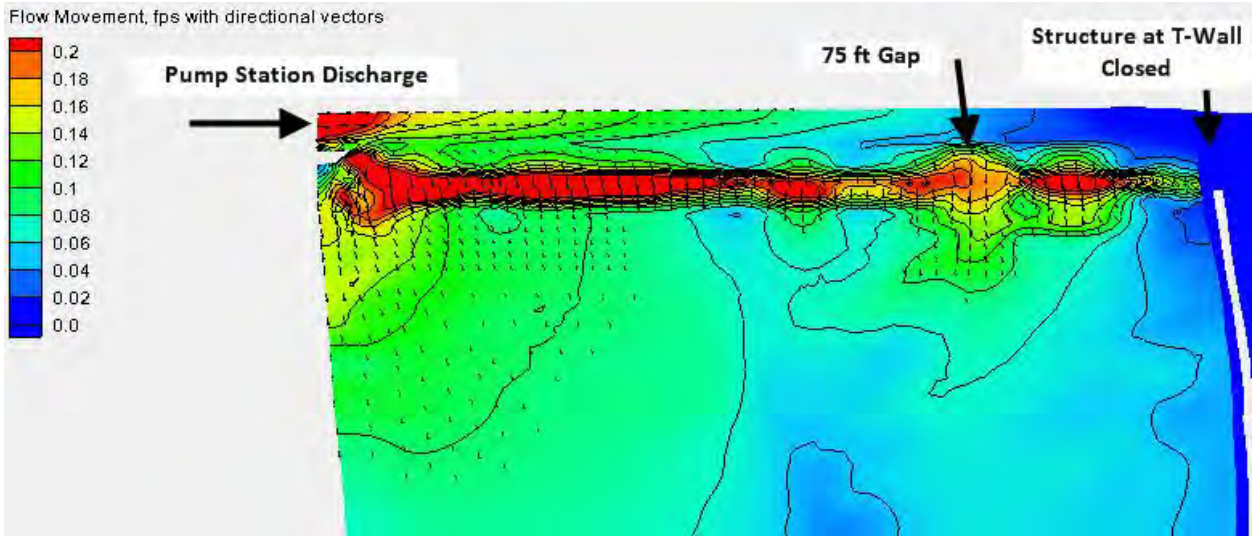


Figure 26. Overtopping flow movement patterns, fps, for existing gap only.

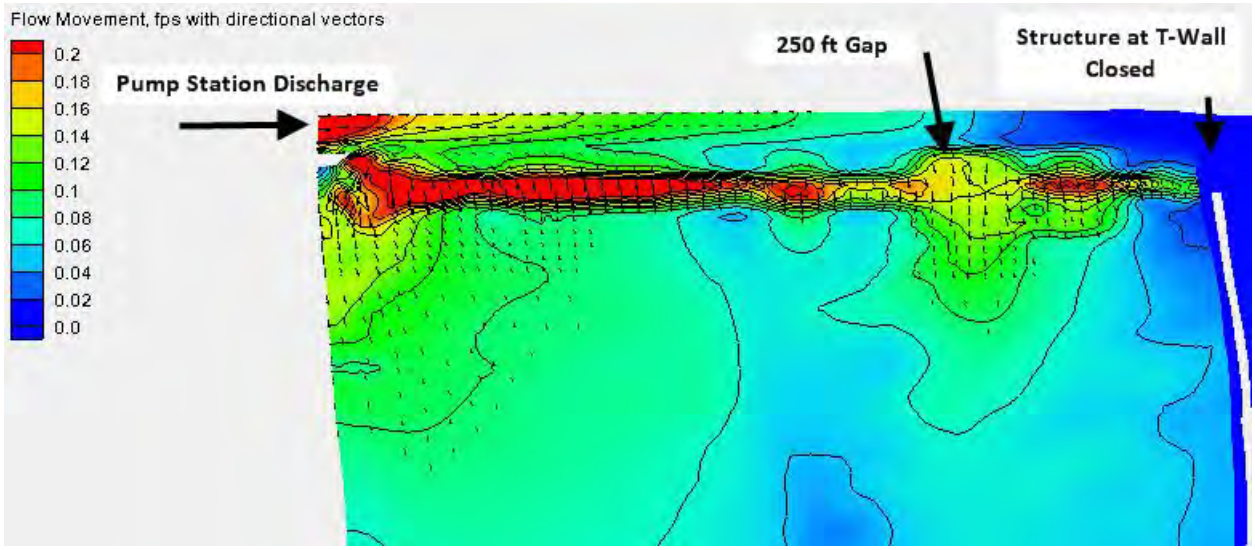


Figure 27. Overtopping flow movement patterns, fps, for existing gap only.

Water level plots were also generated for the first series of simulations using only GIWW water level (tidal) boundary conditions with the structure open, which is the only available entry for typical tidal inflow into the northern 404c area. Figures 28, 29, and 30 show the water level plots for the existing gap, the 75 ft gap and the 250 ft gap, respectively. These scenarios depict rising flows from the GIWW into the outfall canal and then into the wetland. The existing plus additional gap option simulations show reduced water levels in the outfall canal by up to 0.1 ft, a slight indication of increased flow into the wetland. The outfall canal water levels are slightly lower with the larger 250 ft wide gap, indicating a little more flow transfer into the wetland than with the 75 ft wide gap. However, the difference between the existing gap outfall canal

water levels and the 75 ft wide gap and 250 ft wide gap is only up to 0.04 ft. The water levels below either of the simulated gaps show an increase in rate of rise between simulation time 35 hours and 50 hours, but these differences of about 0.02 ft are even smaller than for the outfall canal. These model solution values offer definite trends, but values this small could be considered practically as “no change”.

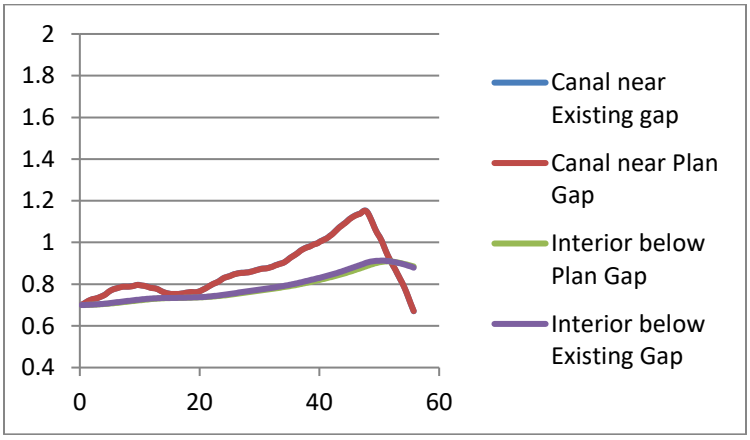


Figure 28. Existing Gap and Tide on GIWW Only.

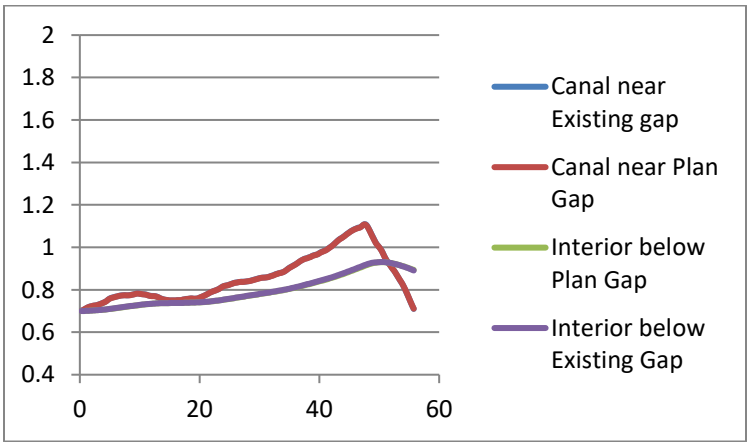


Figure 29. Existing Gap, Additional 75 ft Gap, and Tide on GIWW Only.

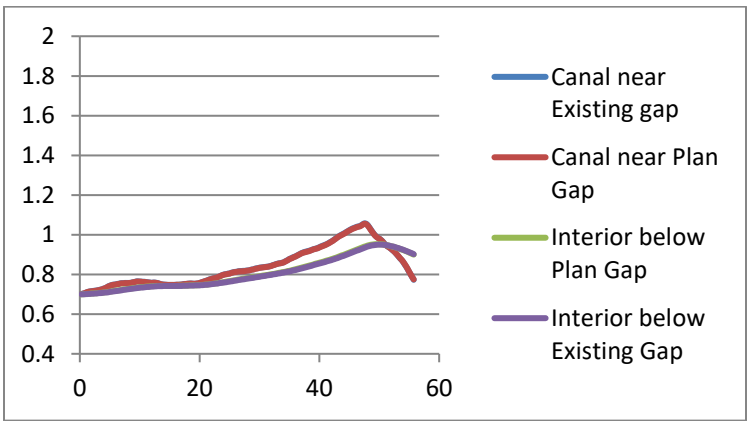


Figure 30. Existing Gap, Additional 250 ft Gap, and Tide on GIWW Only.

SNGP and BAC Canal System: As discussed and shown in Figure 5, there were four remaining plan gap locations for the SNGP (Plan M-2) and three for the BAC (Plan M-3) canals. One of the M-3 BAC plan gap locations, Plan M-3b, was to open the BAC-GIWW plug only at its former connection with the GIWW. Figure 31 shows a closer view of the existing condition simulation, and Figure 32 shows the same view with the additional four SNGP and additional three BAC plan gaps. The BAC plug opening only, Plan M-3b, is shown in Figure 33. Flow movement contours are shown for the +1.0 ft water level conditions at time 25.5 hrs into the 60 hour-long-simulation.

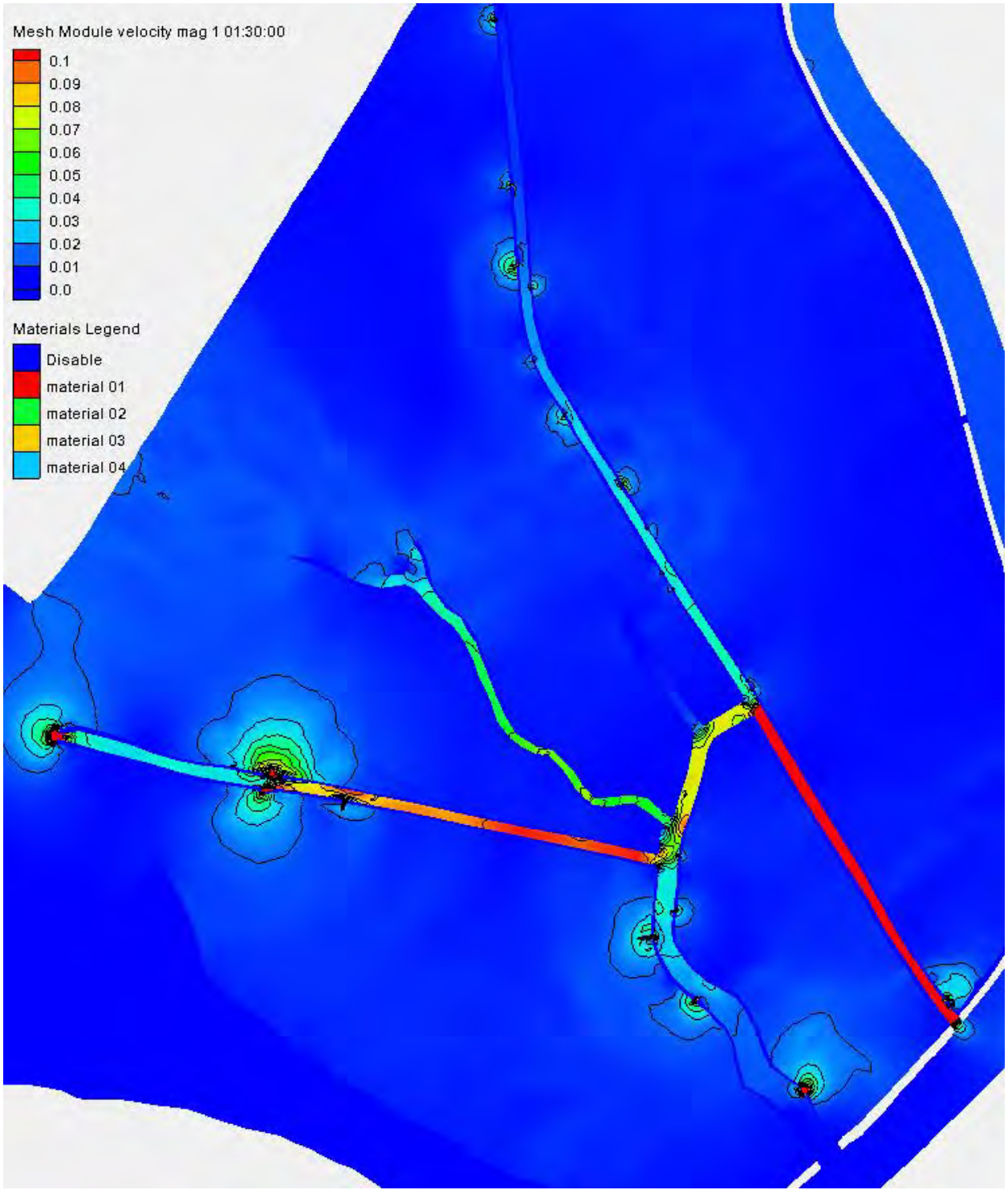


Figure 31. Existing Condition flow simulation for BAC and SNGP canals.

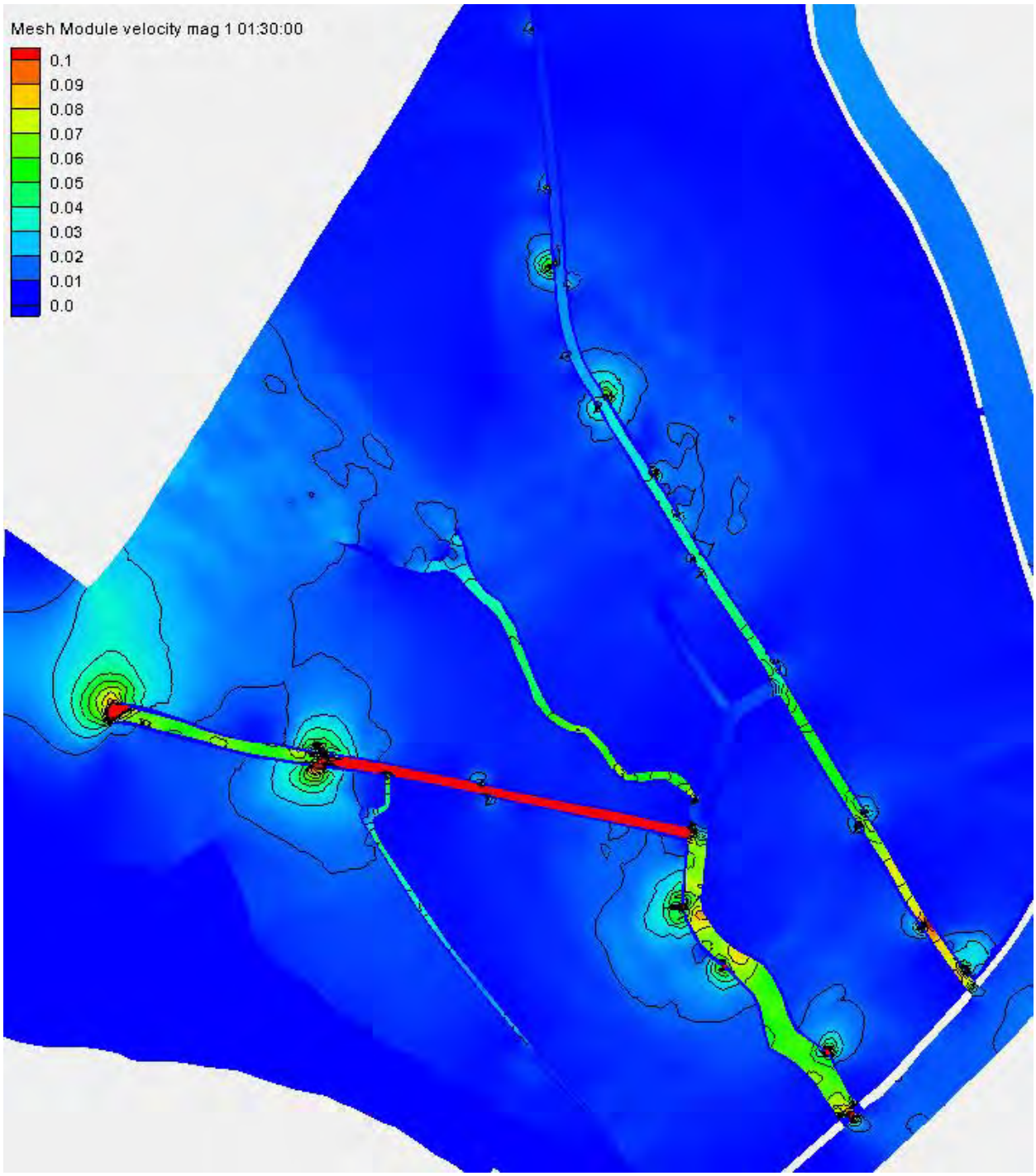


Figure 32. Plan simulation with all three remaining BAC and all four remaining SNGP canal gaps in place (i.e., all seven remaining 2012 gap locations as shown in Figure 5 in yellow).

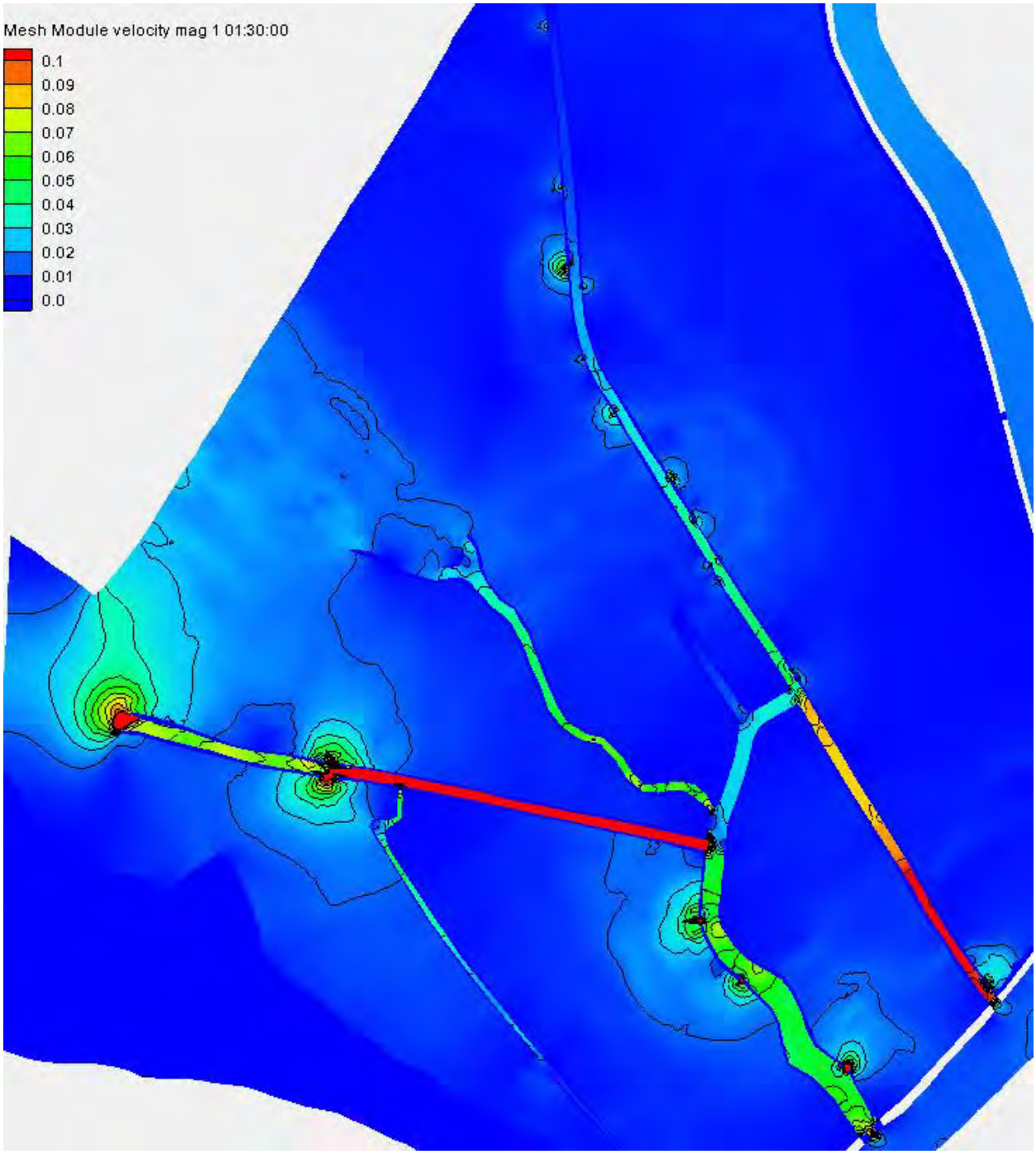


Figure 33. Plan simulation for BAC-GIWW plug open. (Existing Condition + only the BAC-GIWW shell plug opening, Plan M-3b.)

To better illustrate flow movement from the GIWW into the canals for Plan M3b, the BAC-GIWW plug opening, water level plots at selected locations were generated for the entire 60 hour simulation. Figure 34 shows the location of water surface elevation locations queried from the simulation to compare water levels at two interior locations.

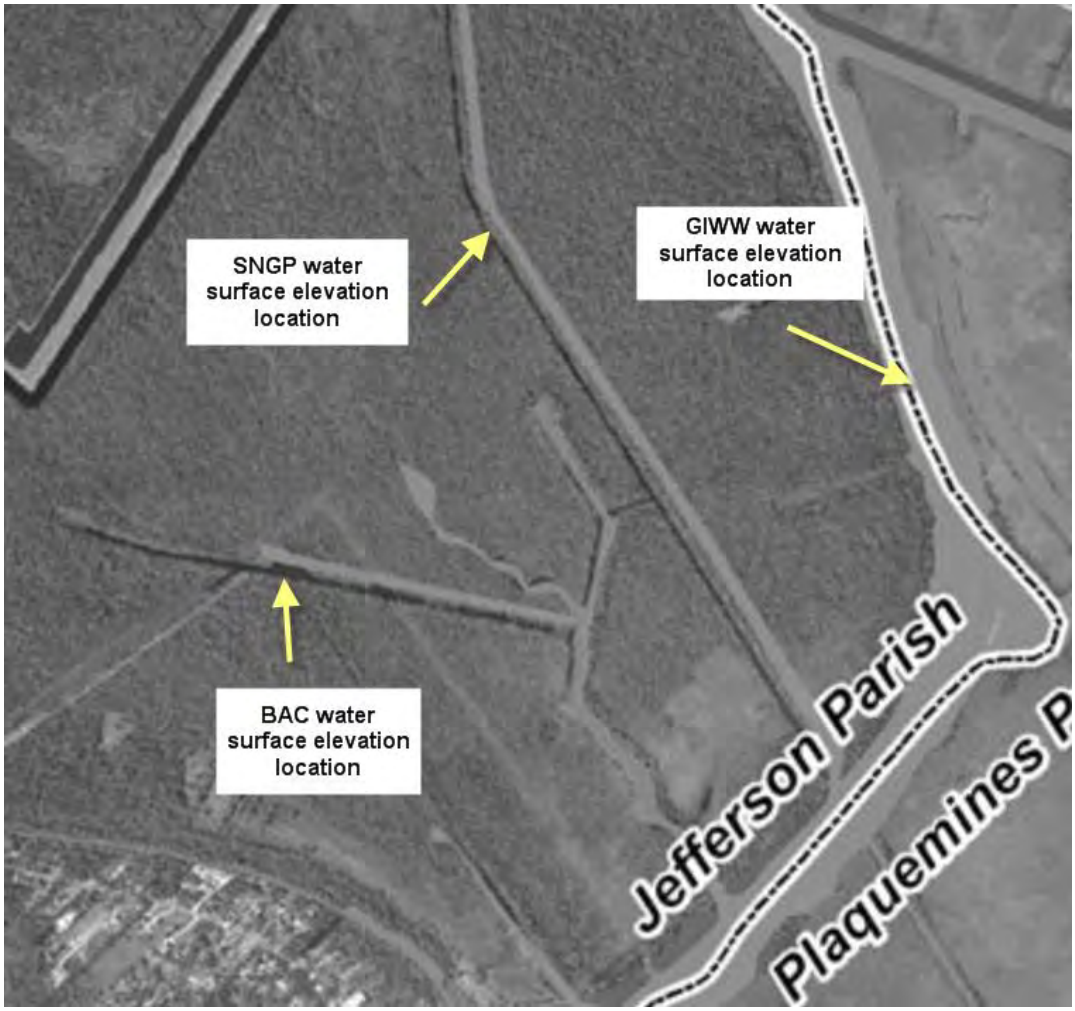


Figure 34. Water level locations showing where model data was processed for the plan profile comparisons shown in Figure 31.

Figure 35 shows the increased interior water levels for the existing condition and plan M-3b, gap at BAC-GIWW (opened plug) only simulations. Note that the existing condition and plan water levels on the GIWW were so close that only one profile could be distinguished on Figure 35, thus the water level on the GIWW was considered unchanged for the BAC-GIWW simulation.

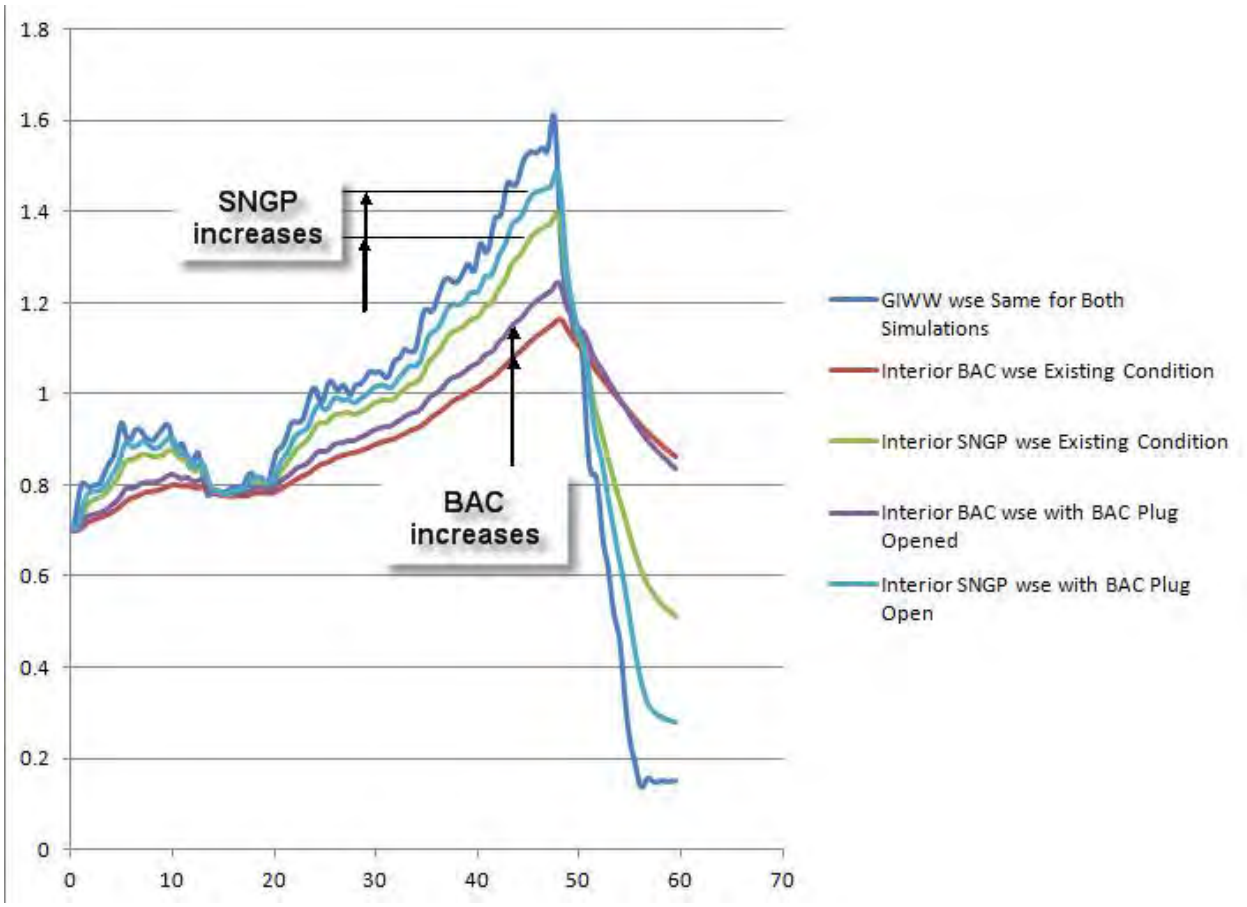


Figure 35. Comparative water level locations for the Interior locations for the existing condition simulation and the BAC-GIWW plug open only plan.

***Flow Exchange Summary*:** Flow movement at the +1 ft GIWW boundary condition for both OEPS outfall Canal and SNGP and BAC revised simulations was recorded from the model solution contour plots in acreages. Table 1 summarizes this information.

Measure	Description	Anticipated Effects
M-1 Old Estelle Outfall Canal		
M-1.a: Sluice gates open, no pumps operating (i.e., non-rain event)	**SCENARIO M-1.a.1: Existing condition (no additional gaps to be constructed)**	Flow exchange = 42 acres
	SCENARIO M-1.a.2: Construct 75' gap	Flow exchange = 35 acres ***(net loss 7 acres, -14 acres at existing gap and +7 acres at new gap)***
	SCENARIO M-1.a.3: Construct 250' gap	Flow exchange = 50 acres ***(gain of 8 acres, -30 acres at existing gap and +38 acres at new gap)***
M-1b: Sluice gates open, pumps operating at 250 cfs during peak condition after 6 hours.	**SCENARIO M-1.b.1: Existing condition (no additional gaps to be constructed)**	Flow exchange = 618 acres
	SCENARIO M-1.b.2: Construct 75' gap	Flow exchange = 633 acres
	SCENARIO M-1.b.3: Construct 250' gap	Flow exchange = 641 acres
M-1c: Sluice gates closed, pumps operating at 256 cfs during peak condition after 6 hours.	**SCENARIO M-1.c.1: Existing condition (no additional gaps to be constructed)**	Flow exchange = 661 acres
	SCENARIO M-1.c.2: Construct 75' gap	Flow exchange = 664 acres
	SCENARIO M-1.c.3: Construct 250' gap	Flow exchange = 664 acres
M-2 Southern Natural Gas Pipeline Canal		
M-2a Existing Condition **M-3b effect on SNGP**	With existing condition on BAC With BAC plug removed (only)	Flow exchange = 10 acres Flow exchange = 12 acres
M-2b Gap Spoil bank in four locations	**4 gaps 30-60' wide**	Flow exchange = 10 acres *(no net gain)*
M-3 Bayou aux Carpes		
M-3a: Existing Condition		Flow exchange = 216 acres
M-3b: BAC plug removed only. *(no additional gaps)*		Flow exchange = 302 acres (net gain of 86 acres)
M-3c: BAC plug removed and gap spoil bank in two locations	**BAC plug Gap + 2 additional gaps 30-60' wide**	Flow exchange = 252 acres *(net gain of 36 acres)*

Table 1. Area of Flow Movement for Existing and Plan Simulations.

Conclusions:

OEPS Outfall Canal

The OEPS outfall canal plans were evaluated under pumping and non-pumping conditions. The OEPS canal has an existing gap on the west end near the pump station, and simulations defined flow movement changes with and without the additional plan gap toward the east end of the outfall canal.

When pump discharge simulations were applied, the model defines a sheet flow movement generally covering northern 404c area, regardless of the additional gap size. Given the volume and duration of an OEPS discharge event, potential rainfall, and a rising tidal GIWW stage , the model demonstrates flow over the south spoil bank berm in additional to the existing or additional gap alternative scenarios.

Table 1 shows possibly more substantial variations for flow movement with no OEPS pump discharge and no rain event. The comparative impacts for alternatives during typical (tidal or wind+tidal) water levels with the outfall canal structure open show net gains in flow movement. However, the gains come at the expense of some existing flow movement into the flotant marsh areas, which are just south of the existing gap network on the west end of the outfall canal. It should be noted that although changes in flow movement are detected spatially, the change in flow velocities and the change in water elevations are negligible I the overall scheme.

SNGP and BAC

The SNGP and BAC canal network simulations show maximum gain in flow movement with a single gap opening, restoring the connection (opening the existing plug) with the BAC and GIWW. This would allow significantly more flow movement into the wetland than the present opening at the SNGP location, which presently has to work its way to BAC canals through the interior connecting canal. Simulations with additional interior gaps on these canals did not achieve flow movement increases.

Memorandum for Record

Date: 31 October 2020

Subject: Bayou aux Carpes 404(c) Augmentation Measure 85% design wetland impacts acreage calculation

Background: On 7 October 2020, The Environmental Protection Agency (EPA) requested that the New Orleans District of the US Army Corps of Engineers estimate wetland impact acreage of the subject design file.

Methodology: Information from recent field trips to the vicinity (2 OCT 2020 and 5 OCT 2020), a recent topographic survey (15 AUG 2020), Google Earth and ArcGIS imagery, the US Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) data, and the National Park Service's (NPS) Vegetation Monitoring Index (VMI) vegetation polygons (Hop et al., 2017) were used to estimate the portion of vegetation clearing area that were wetlands in the 85% design files. No prior wetland delineation had been conducted in this area. All sources of data were in general agreement, to the extent that it could be ascertained, except for the USFWS's NWI. USFWS's NWI data disagreed with the ArcGIS imagery, topographic survey, and VMI data. For instance, the NWI data indicated aquatic habitats where other sources (i.e., topographic surveys, ArcGIS imagery, and VIM data) indicated land habitats, and land habitats where these same sources indicated aquatic habitats. Ultimately, the NPS's VMI vegetation polygons were used to quantify an estimate of wetland acres, because it agreed with other data sources and provided quantifiable acreages by vegetation type.

Results: According to the NPS's VMI vegetation polygon data, approximately 0.35 acres of the 0.67 acre vegetation clearing area are wetlands. Four habitat types were delineated based on the 85% design NPS VMI vegetation polygons (Table 1).

Table 1: NPS VMI habitat within 85% design vegetation clearing area

VMI habitat characteristic	Acres
Floating & Submerged Aquatic Marsh	0.16
Developed Area	0.11
Ruderal Chinese Tallow Forest	0.05
Disturbed Woody Wetland	0.35
Total	0.67

Citation:

Hop, K., A. Strassman, S. Sattler, M. Pyne, J. Teague, R. White, J. Ruhser, E. Hlavacek, and J. Dieck. 2017. National Park Service Vegetation Mapping Inventory Program: Jean Lafitte National Historical Park and Preserve vegetation mapping project. Natural Resource Report NPS/GULN/NRR—2017/1528. National Park Service, Fort Collins, Colorado.

2020 – 12 – 04 MVN and NPS re-evaluation of wetland impacts

Background: On 7 October 2020, The Environmental Protection Agency (EPA) requested that the CEMVN estimate wetland impact acreage of the project. No prior wetland delineation had been conducted in the Limits of Construction area.

Patrick Smith, Biologist, CEMVN, conducted a desktop analysis using information from Smith's recent field trips to the vicinity (2 OCT 2020 and 5 OCT 2020), a recent topographic survey (15 AUG 2020), Google Earth and ArcGIS imagery, the US Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) data, and the National Park Service's (NPS) Vegetation Monitoring Index (VMI) vegetation polygons (Hop et al., 2017). Smith conducted field site visits prior to the desktop analysis but no wetlands delineation was performed.

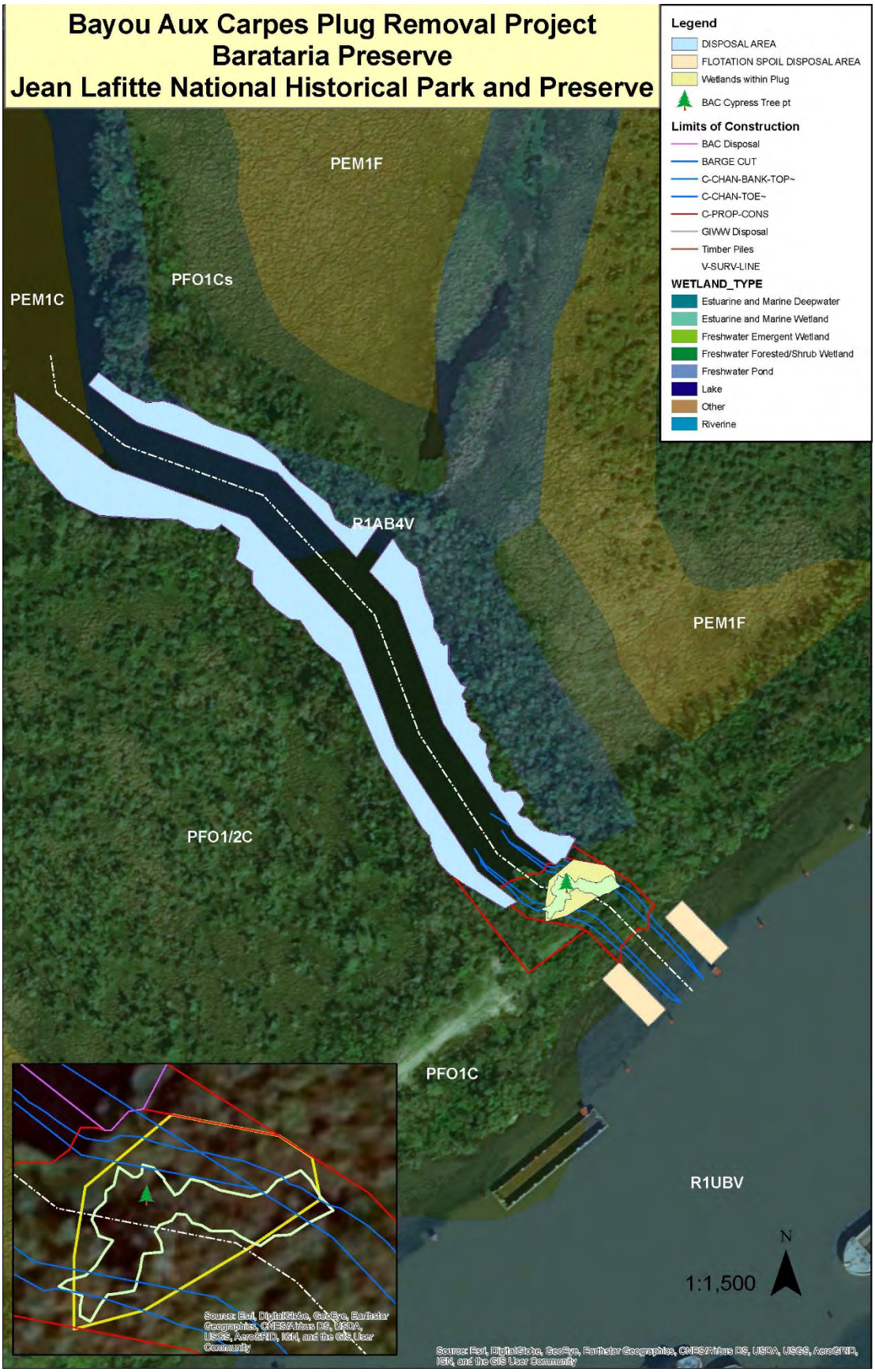
VMI indicated that the habitat characteristics in the plug excavation and vegetation clearing area consisted of 0.16 acres of floating and submerged aquatic marsh vegetation, 0.11 acres developed area, 0.05 acres ruderal Chinese tallow forest, and 0.35 acres of disturbed woody wetland. NWI indicated the type of wetland to be PFO1C Freshwater Forested/Shrub Wetland, with the open water within the bayou to be R1AB4V Riverine. All sources of data were in general agreement, to the extent that it could be ascertained, except for the USFWS's NWI, in which there was a mapping error. For instance, the NWI data indicated open water where other sources (i.e., topographic surveys, ArcGIS imagery, and VIM data) indicated land habitats, and land habitats where these same sources indicated open water.

Smith concluded approximately 0.35 acres was identified as disturbed woody wetland by referencing the VMI vegetation polygons. The field site visits were conducted prior to the desktop analysis and the acreage calculations were not ground truthed but were calculated using ArcGIS.

Re-evaluation: After further review of aerial imagery and field photos and extrapolation from NWI, Smith in cooperation with Jolene Williams, Environmental Protection Specialist, JELA, revised the acreage of the directly impacted wetlands within the plug, to a maximum of 0.144 acres with vegetation consisting of a lone mature bald cypress (*Taxodium distichtum*) and bulltongue (*Sagittaria lancifolia*). Williams referenced NWI and identified the wetland type as Freshwater Forested/Shrub Wetland (PFO1C).

In addition, the excavated material from the plug removal would be placed in open waters (R1AB4V Riverine) adjacent to and probably connected to the shorelines of the bayou within the JELA jurisdictional boundary, creating up to approximately 1.96 acres of shallow water and wetland habitat (Palustrine Emergent PEM1F) (See map). Excavated material to allow access of the work barge would be disposed within the floatation disposal areas within the GIWW creating up to 0.166 acres of additional disposal area outside of the JELA jurisdictional boundary. No planting would occur as part of the project.

Since the new adverse impacts are below the 0.25 acres noted in PM 77-1, an NPS wetlands statement of findings (WSOF) is no longer required. The restoration actions described are excepted under PM 77-1 Wetland Protection policy and do not require a WSOF.


Bayou Aux Carpes Plug Removal Project
Barataria Preserve
Jean Lafitte National Historical Park and Preserve
Legend
DISPOSAL AREA
FLOTATION SPOIL DISPOSAL AREA
Wetlands within Plug
BAC Cypress Tree pt
Limits of Construction
BAC Disposal
BARGE CUT
C-CHAN-BANK-TOP~
C-CHAN-TOE~
C-PROP-CONS
GIWW Disposal
Timber Piles
V-SURV-LINE
WETLAND_TYPE
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
PEM1F
PFO1Cs
PEM1C
R1AB4V
PEM1F
PFO1/2C
PFO1C
R1UBV
N
1:1,500
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix 13 –Draft Monitoring and Adaptive Management Plan
Bayou aux Carpes Plug Removal Project
West Bank and Vicinity Project

1. Introduction

1.1 Monitoring and Adaptive Management Plan Overview

The U.S. Army Corps of Engineers (USACE), Mississippi River Valley Division (MVD), Regional Planning and Environment Division South (RPEDS), developed this Monitoring and Adaptive Management (MAM) Plan for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) site (BAC Site) Augmentation Measure (Bayou aux Carpes Plug Removal Project), in coordination with Interagency Environmental Team (IET) agencies, which includes representatives from the Environmental Protection Agency (EPA), National Park Service (NPS), Louisiana Department of Natural Resources (LDNR), Coastal Protection and Restoration Authority of Louisiana (CPRA), US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of Environmental Quality (LDEQ), and the US Geological Survey (USGS).

This MAM Plan is Appendix 13 of the Jean Lafitte National Historical Park and Preserve (JELA) Augmentation Features Supplemental Environmental Assessment and National Historic Preservation Act Assessment of Effects, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation, Jefferson Parish, Louisiana (SEA 581).

This MAM Plan only focuses on monitoring and adaptive management of the Bayou aux Carpes Plug Removal Project (Project), for purposes of describing:

1. monitoring procedures that would demonstrate when the Project has achieved Augmentation Success (AS);
2. monitoring procedures to identify and assess potential Unintended Negative Consequences (UNCs) associated with the Project; and
3. the decision-making framework that would be used to assess and determine Project AS, UNCs, and future potential needs to implement adaptive management actions to insure AS and or address UNCs.

This MAM Plan is a living document and it may be updated as needed to reflect changes in site conditions, monitoring procedures (including data sampling, analysis, storage, and reporting), AS, UNCs, adaptive management actions, and the decision making-framework.

This MAM Plan would be executed and maintained by the Environmental Planning Branch of RPEDS through Year 3, which would begin following construction completion. If AS has been attained by the end of Year 3, then the Non-Federal sponsor (NFS), which is the CPRA, would assume responsibility for executing and maintaining the MAM Plan requirements beginning Year 4.

1.2 Project Background and History

As detailed in SEA 581, the EPA issued its CWA Section 404(c) Final Determination for Bayou aux Carpes, in accordance with 33 U.S.C. §1344(c), and 40 CFR Part 231, in 1985. Following Hurricanes Katrina and Rita in 2005, Congress authorized USACE to complete construction of an improved West Bank and Vicinity (WBV), Hurricane and Storm Damage Risk Reduction System (HSDRRS). This system includes the West Closure Complex (WCC) storm surge

barrier feature, which completed construction in 2014. The WCC includes the 404(c) floodwall that was constructed along the northeastern boundary of the BAC Site along the west bank of the Gulf Intra Coastal Waterway (GIWW). Approval to construct the 404(c) floodwall required the EPA to issue a Modification to the 1985 CWA Section 404(c) Final Determination for Bayou aux Carpes (Modification; SEA 581 Appendices 4 and 5). As a condition of the Modification, in addition to compensatory mitigation, and due to the unique status of the BAC Site, the USACE, New Orleans District (CEMVN), committed to evaluate and consider for implementation additional ecological augmentation features that would add an extra measure of environmental benefits.

The CEMVN also committed to coordinate development of a long-term site monitoring plan focused on monitoring both mitigation and augmentation features, as well as the impacts of the 404(c) floodwall. As stated in section 1.1, however, this MAM Plan only focuses on the Project. Separate monitoring plans would be developed for compensatory mitigation and impacts of the 404(c) floodwall.

1.3 Project Description

The Project, as fully described in SEA 581, would remove an earthen and shell embankment, identified as a "plug", where Bayou aux Carpes intersects the GIWW. Removal of the plug has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW (Figure 1) to partially restore hydrologic connectivity and increase wetland functions and values of the BAC Site, while minimizing erosion within the BAC Site from waves generated in the GIWW. The work would also include excavating material from within Bayou aux Capes and the GIWW, in proximity to the plug, to provide construction access and to improve channel conveyance as needed for AS. Some of the excavated material and cleared vegetation would be deposited beneficially in Bayou aux Carpes, as detailed in SEA 581, and shown in Figure 1.

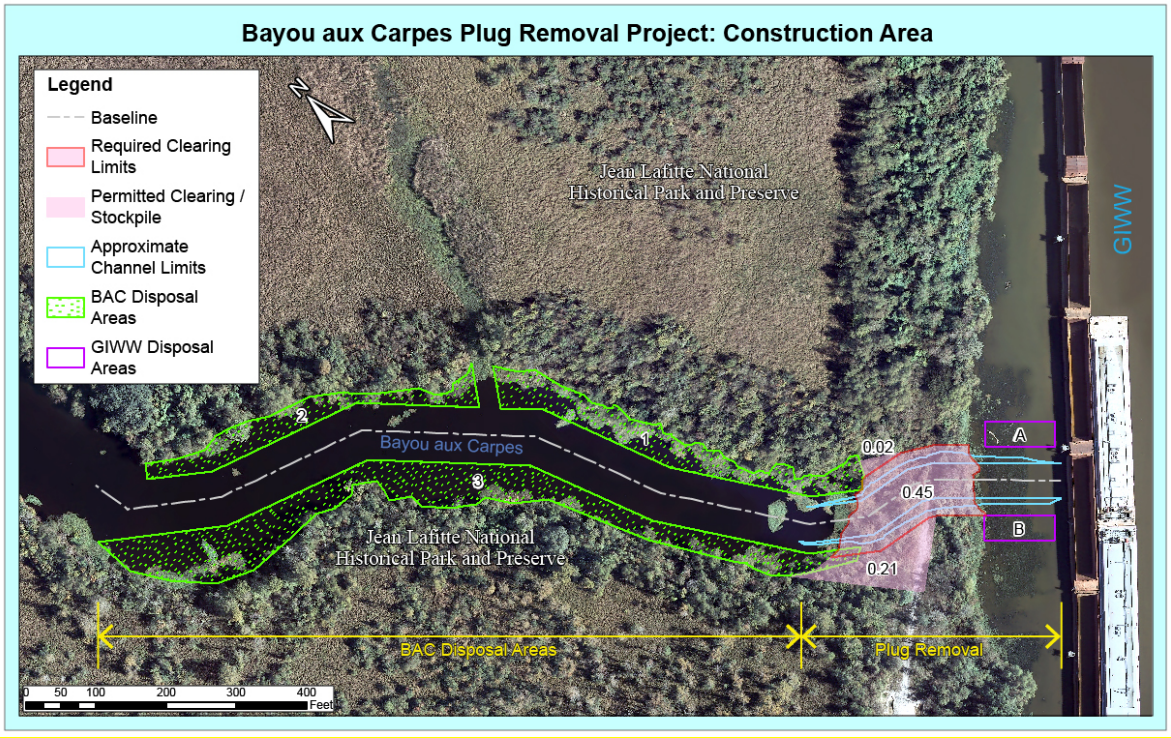


Figure 1. Project construction area

1.4 Project Location

Much of the BAC Site is now a part of the JELA Barataria Preserve. Most of the Project features and benefits would be located within the BAC Site and the Preserve, and a small portion of the Project features would be located immediately adjacent within the GIWW.

1.5 Project Objectives and Goals

The Project's objective, as discussed in the Modification, is to satisfy the CEMVN commitment made to EPA to implement additional ecological enhancement features that are determined by the IET to enhance the wetland functions and values of the BAC Site. Removing the plug would directly meet this objective because it would partially restore the hydrologic connection between Bayou aux Carpes and the GIWW, which is the Project's primary goal. Removing the plug is expected to increase exchange flow between Bayou aux Carpes and the GIWW, which is directly related to the increased hydrologic connection. This increase in exchange flow is the secondary goal of this Project. The primary and secondary project goals are assumed to enhance BAC Site wetland ecological functions and values in the Project Vicinity; however, these benefits would not be assessed as a measure of AS. Beneficial use of excavated material and vegetation debris is not a Project goal; however, this work is expected to provide wetland/aquatic habitat benefits.

2. MAM Plan Development and Purpose

2.1 MAM Plan Development

The CEVMN is developing and coordinating this MAM plan with IET agencies. The CEVMN has led meetings to document IET agency willingness to participate as members on a MAM Team to plan and execute this MAM Plan. To date, the EPA, NPS, USFWS, NMFS, and the CPRA have expressed an interest in being and have participated as members of the MAM Team. The CEMVN provided a MAM Plan outline to the MAM Team for comments on August 18, 2020, and a meeting to discuss the outline with the MAM Team was held on August 20, 2020. The CEMVN provided a preliminary draft MAM Plan to the MAM Team for review and comments on December 21, 2020. Two meetings to discuss the draft MAM Plan and MAM Team comments were held on January 11 and 13, 2021. The MAM Team's final comments and/or concurrence on this Draft MAM Plan will be solicited during the SEA 581 30-day public review period.

2.2 MAM Plan Purpose

The purpose of this MAM Plan is to describe

1. monitoring procedures that would assess if Project has achieved Augmentation Success (AS);
2. monitoring procedures to assess for potential Unintended Negative Consequences (UNCs) associated with the Project;
3. the decision-making framework for AS, UNCS, and adaptive management; and
4. the assessment framework for monitoring procedures and decision making

2.3 Augmentation Success

Augmentation success is defined as the degree to which the Project would meet its goals. Augmentation success of the Project's primary goal, as discussed in Section 1.5, would be demonstrated upon completion of construction by observing a new surface water connection

between the GIWW and Bayou aux Carpes where the earthen and shell plug currently exists, reviewing topographic and bathymetric elevation surveys that would include the construction area and adjacent bank lines of Bayou aux Carpes, a site visit by the MAM Team, and photographs.

Augmentation success of the Project's secondary goal, as discussed in Section 1.5, would be determined by comparing water surface elevation and discharge data collected prior to and following construction completion.

2.4 Adaptive Management

An adaptive management approach, consistent with the Modification to the 1985 CWA Section 404(c) Final Determination for Bayou aux Carpes (SEA 581 Appendix 5) would be utilized to provide evidence if Project goals are met and to reduce risks of UNCs associated with Project implementation, as described in SEA 581.

3.0 Monitoring Framework

Monitoring parameters include a post-construction site visit, water surface elevation (WSE), discharge, topographic and bathymetric elevation surveys, water column salinity, porewater salinity, establishment of woody invasive species, swamp vegetation, and marsh vegetation. Precise locations of monitoring stations are to be determined but would be based on where hydrodynamic modeling results (SEA 581, Appendices 7 and 12) indicated the Project would influence change. Monitoring parameter data would be compared to pre-construction Project site data and data available at reference sites.

A description of monitoring parameters is included in Tables 1 and 2. Table 1 describes the four AS monitoring parameters, including post-construction site visit, water surface elevation, discharge, and topographic and bathymetric elevation surveys. Data collected for these monitoring parameters could continue after AS is achieved to provide additional supporting information for assessing UNCs and adaptive management decisions. Table 2 describes the five UNC monitoring parameters, including water column salinity, soil porewater salinity, establishment of woody invasive species, marsh vegetation, and swamp vegetation. Data collected for these monitoring parameters would continue until a decision is made to no longer considered adaptive management actions for the Project.

Many nearby reference sites would be available. References sites would include nearby Coastal Reference Monitoring Stations (CRMS) such as CRMS 0185, which is within the BAC Site, and CRMS 0234 and CRMS 0188, which are within JELA but outside of the BAC Site. CRMS station vegetation, salinity (both WS and porewater), and water surface elevation data would be used. The JELA staff maintain Elevation & Hydrology Monitoring Array sites, which include observations of subsidence, water level, accretion, and plant community or ecosystem property assessment within the JELA Barataria Preserve. Water level, salinity, and plant community assessments would be used, as available.

Table 1. Augmentation Success Monitoring Parameters				
Parameter	Description	Purpose	When	Where
Post-construction Site Visit	IET members would attend a Project construction final inspection; expected to be a one-time event	to determine if the Project's primary goal has been met	after the majority of construction has occurred, but prior to demobilization	Project construction area
Water Surface Elevation (WSE), also known as water level	monitoring station; continuous at hourly interval	to determine if the Project's secondary goal to increase exchange flow has been met; would provide supporting information after AS is demonstrated	until a decision is made to no longer considered adaptive management actions for this project (as early as Year 7)	waterways where H&H modeling data suggested an increased exchange flow would occur; if only one station, it would be where old gage infrastructure is in Bayou aux Carpes
Discharge	Acoustic Doppler Current Profiler transects; discrete;	to determine if the Project's secondary goal to increase exchange flow has been met; provide supporting information after AS is demonstrated	Pre-construction (one event); Post-construction Year 1 (multiple events; 2 to 3 times); could be re-run at Year 3 even if AS already demonstrated, depending on usefulness of Year 1 post construction surveys	three transects located within the Bayou aux Carpes and potentially in connecting channels where H&H modeling data suggested an increase in exchange flow would occur
Topographic and Bathymetric Elevation Surveys	elevation surveys; discrete	to determine if Project primary goal has been met and to verify that construction is complete (i.e., "As-built Surveys"); would provide supporting information to monitor for uncertainties associated with potential channel and bankline evolution post construction	until a decision is made to no longer considered adaptive management actions for this Project (as early as Year 7)	construction footprint (cut and disposal areas) within Bayou aux Carpes, GIWW and adjacent banklines.

Table 2. Unintended Negative Consequences Monitoring Parameters				
Parameter	Description	Purpose	When	Where
Water Column Salinity	monitoring station; continuous at hourly interval	to reduce the risk of increased salinity associated with Project implementation that could cause UNCs in BAC Site wetland plant communities	until a decision is made to no longer considered adaptive management actions for this project (as early as Year 7)	waterways where H&H modeling data suggested an increased exchange flow would occur; if only one station, it would be where old gage infrastructure is in Bayou aux Carpes; co-located with WSE
Porewater Salinity	grab samples of porewater at to-be-determined depths; discrete; quarterly each year	risk associated with project implementation causing increased salinity in the BAC Site that could negatively impact BAC Site wetland plant communities	until a decision is made to no longer considered adaptive management actions for this project (as early as Year 7)	marsh and swamp habitats near the project construction footprint where H&H modeling data suggested an increased exchange flow
Establishment of Woody Invasive Species	qualitative monitoring surveys; walking and boat based surveys with photographs and GPS points taken	to reduce risk of invasive woody species establishing in the Project construction footprint within the BAC Site.	Through Year 3	within the construction footprint in the BAC Site
Marsh Vegetation	community structure (species presence/absence) and % cover for all strata; discrete; yearly; total number of sites and exact methodology to be determined; methods would be complimentary with reference sites (Folse et al., 2020) to allow for comparison	to reduce the risk of UNCs as a result of Project implementation	until a decision is made to no longer considered adaptive management actions for this project (as early as Year 7)	marsh habitats near the project construction footprint where H&H modeling data suggested an increased exchange flow would occur
Swamp Vegetation	community structure (species presence/absence) and % cover for all strata; discrete; yearly; total number of sites and exact methodology to be determined; methods would be complimentary with reference sites (Folse et al., 2020) to allow for comparison	to reduce the risk of UNCs as a result of Project implementation	until a decision is made to no longer considered adaptive management actions for this project (as early as Year 7)	swamp habitats near the project construction footprint where H&H modeling data suggested an increased exchange flow would occur

4.0 Decision-Making Framework

Decision making for AS, UNCs, adaptive management, and invasive species would be consistent with the Modification to the 1985 CWA Section 404(c) Final Determination for Bayou aux Carpes (SEA 581 Appendix 5). Recommendations on determining AS, UNCs, adaptive management actions and MAM Plan close out would be made by the MAM Team after data are presented at assessment meetings. These recommendations would be documented in subsequent reports. The purpose of this decision-making framework is to facilitate discussions among MAM Team members regarding monitoring data, AS, UNCs and associated proximal causes, and adaptive management actions. It is not intended to be prescriptive as to when or why adaptive management action decisions should be made.

4.1 Decision Criteria

Decision criteria are presented here as conditional questions related to AS and potential UNCs.

4.1.1 Augmentation Success

Determining whether Project goals and AS are achieved would be relatively straightforward. Decisions regarding AS would follow a three-step deliberative process, which is generalized as follows:

1. Do all monitoring parameters demonstrate that the Project goals have been met?
    a. If Yes, then AS achieved. Stop here.
    b. If no, then continue to 2.
2. Should adaptive management be considered?
    a. If yes, then continue to 3.
    b. If no, then re-asses AS. Stop here.
3. What adaptive management action(s) should be implemented?
    a. The MAM Team would identify and describe a proposed adaptive management action.

Specific criteria for assessing monitoring parameters, to collectively inform decisions on whether Project primary and secondary goals are met, are as follows:

1. Post Construction Site Visit – Is there a newly created water surface connection between Bayou aux Carpes and the GIWW?
2. Topographic and Bathymetric Elevation Surveys – Do these data match plans and specifications?
   Water Surface Elevation – Has WSE variance increased in Bayou aux Carpes post-construction, as compared to pre-construction?
3. Water Surface Elevation – Has WSE variance increased in Bayou aux Carpes post-construction, as compared to pre-construction?

    NOTE: There is a concern that differences in meteorological and tidal conditions pre and post construction would influence this analysis. Reference sites would be used to understand regional differences with respect to WSE and would be used to select periods of similar tidal and meteorological conditions from pre and post construction data prior to comparison. Data collected during unusual meteorological and or tidal events (e.g., high rainfall or tropical storms) should be removed prior to analysis.

4. Discharge – Are up and down channel current velocities and discharges higher post-construction as compared to pre-construction?

4.1.2 Unintended Negative Consequences

Determining whether Project implementation could result in UNCs would be less than straightforward. Decisions regarding UNCs would follow a four-step deliberative process, which is generalized as follows:

1. Has something been observed that could cause UNCs to BAC Site wetlands?
    a. If yes, then continue to 2.
    b. If no, then stop here.
2. Does the Project contribute to what has been observed?
    a. If yes, then continue to 3.
    b. If no, then stop here.
3. Should Adaptive management be considered?
    a. If yes, then continue to 2.
    b. If no, then stop here.
4. What adaptive management action(s) should be implemented?
    a. The MAM Team would identify and describe a proposed adaptive management action.

Specific criteria for assessing monitoring parameters to collectively inform decisions on whether the Project is causing UNCs, are as follows:

1. Water column salinity - Has Project implementation caused an increase in water column salinity in the BAC Site?
    a. If water column salinities measured by the BAC Site gauges are higher post-construction than pre-construction, and higher than what would be expected based on data from reference sites, then the MAM Team would determine if the Project contributed to this.
    b. If it is determined that the Project contributed to the increase, then the MAM Team would determine if it could potentially cause UNCs to BAC Site wetland vegetation.
    c. If it is determined that the increase would likely cause UNCs to BAC Site wetland vegetation, then the MAM Team would determine if an adaptive management action should occur.
    d. If an adaptive management action should occur, then the MAM Team would identify and describe a proposed action.

Porewater salinity – Has Project implementation contributed to an increase in porewater salinity in the BAC Site?

1. If porewater salinities are higher in the BAC Site post-construction than pre-construction, and higher than what would be expected based on data from reference sites, then the MAM Team would determine if the Project contributed to this.
2. If it is determined that Project implementation contributed to this increase, then the MAM Team would determine if it could potentially cause UNCs to BAC Site wetland vegetation.

3. If it is determined that the increase would likely cause UNCs to BAC Site wetland vegetation, then the MAM Team would determine if an adaptive management action should occur.
4. If an adaptive management action should occur, then the MAM Team would identify and describe a proposed action.

2. Establishment of woody invasive species – Are invasive woody species becoming established within the Project construction footprint in the BAC Site?
    a. If yes, then the MAM Team would determine if an invasive species management action should be considered.
    b. If a management action is necessary, then the MAM Team would identify and describe a invasive wood species management action.

3. Marsh and Swamp Vegetation – Has Project implementation caused UNCs to BAC Site wetland vegetation?
    a. If a change in marsh and/or swamp vegetation trend is observed, then the MAM Team would determine if the trend is positive or negative and if it is due to Project implementation, based on data from reference sites.
    b. If the trend is positive, then the MAM Team would document whether it is due to Project implementation and no further action would be necessary.
    c. If the trend is negative, and due to Project implementation, then the MAM Team would determine if any adaptive management action should occur.
    d. If an adaptive management action should occur, then the MAM Team would identify and describe that action.

4.2 Potential Adaptive Management Actions

Four potential adaptive management actions have been identified, as follows:

1. Re-plug the Bayou aux Carpes confluence with new material.
2. Modify channel geometry.
3. Install a water control structure at the Bayou aux Carpes confluence.
4. Allow natural channel attenuation processes to proceed without action.

4.3 MAM Plan Close-Out

MAM Plan Close-Out would signify that no further Project related monitoring, reporting, and/or adaptive management actions would occur. MAM Plan Close-Out could occur as soon as Year 7. Concurrence or non-concurrence of participating MAM Team members regarding MAM Plan Close-Out would be documented at each assessment meeting starting Year 7. Assessments and documentation would be presented to the CEMVN Commander and EPA Region 6 for determination of whether MAM Plan Close-Out should occur.

5.0 Assessment Framework

5.1 Assessment Process

The MAM Team would conduct periodic assessments of monitoring data, as described in section 5.2.

Periodic assessments for AS would be conducted until such time as the MAM Team determines that AS has been achieved. This could be as soon as one year after Project construction is completed. Continuing discussions regarding Project performance, relative to Project goals, even after AS has been achieved, may be appropriate and could be included in subsequent reporting.

Periodic assessments of monitoring data for UNCs would be presented to the MAM Team by responsible agencies, as identified in the following sections, until MAM Plan Close-Out. This could occur as soon as 7 years after Project construction is completed.

5.2 Assessment Meeting Frequencies and Requirements

Project-relevant timing, the responsible agency (included in parenthesis), and presentation and reporting requirements for MAM Team assessment meetings are listed below. A report would be written following each monitoring assessment. The report should be completed within 3 months following the assessment meeting date.

Assessment timelines may need to be adjusted to address stochastic events, such as a tropical storms, that may impact the Project. A hypothetical schedule of assessment monitoring periods and meeting dates, which assumes construction complete June 1, 2021, is included as Table 3.

- Pre-final construction field visit – prior notification of construction complete (CEMVN)
- Final Construction meeting – within a year following construction complete
    - Post-construction elevation data and photos of construction; presentation of pre-construction monitoring
- Year 1 starts after construction complete (CEMVN)
    - Pre-construction, post-construction, and reference site data for AS and UNC monitoring parameters
    - MAM Team decision regarding AS
    - MAM Team decision regarding UNCs
    - Invasive species monitoring, assessment, and treatment if necessary
    - Status and update of previous reports and database management
- Year 2 after construction complete (CEMVN)
    - Pre-construction, post-construction, and reference site data for AS and UNC monitoring parameters
    - MAM Team decision regarding UNCs
    - MAM Team decision regarding AS, if not met previously
    - Invasive species monitoring, assessment, and treatment if necessary
    - Status and update of previous reports and database management
- Year 3 after construction complete (CEMVN)
    - Pre-construction, post-construction, and reference site data for AS and UNC monitoring parameters
    - MAM Team decision regarding UNCs
    - MAM Team decision regarding AS, if not met previously
    - Invasive species monitoring, assessment, and treatment if necessary
    - Status and update of previous reports and database management
- Year 5 after construction complete (NFS)
    - Pre-construction, post-construction, and reference site data for AS and UNC monitoring parameters

    - MAM Team decision regarding UNCs
    - MAM Team decision regarding AS, if not met previously
    - Status and update of previous reports and database management
- Year 7 after construction complete (NFS)
    - Pre-construction, post-construction, and reference site data for AS and UNC monitoring parameters
    - MAM Team decision regarding adaptive management action, if required due to UNCs
    - MAM Team decision regarding AS, if not met previously
    - Status and update of previous reports and database management
    - Decision regarding MAM Plan Close-Out
    - NFS would no longer be responsible for maintaining monitoring station(s)

Table 3: Hypothetical MAM Plan assessment schedule; assumes 6/1/2021 construction complete

Assessment	Assessment Monitoring Period	Assessment Meeting Date
Pre-final Construction Field Visit	N/A	5/1/2021-6/1/2021
Final Construction Meeting	N/A	6/1/2021-5/31/2022
Year 1	6/1/2021*-5/31/2022	6/1/2022-5/31/2023
Year 2	6/1/2021*-5/31/2023	6/1/2023-5/31/2024
Year 3	6/1/2021*-5/31/2024	6/1/2024-5/31/2025
Year 5	6/1/2021*-5/31/2026	6/1/2026-5/31/2027
Year 7	6/1/2021*-5/31/2028	6/1/2028-5/31/2029

*Note that pre-construction data would also be presented.

7.0 Database Management

Data and reports would be stored in the NPS Integrated Resource Management Application (IRMA) database (https://irma.nps.gov/content/portal/about/), which would be available to the public. Data would be stored in a readable format (e.g., comma separated value), and reports would be stored as PDF files.

7.1 Data Storage and Retrieval

The responsible agency (CEMVN or the NFS) would collect data, write reports, and distribute the reports to the MAM Team. The NPS would be responsible for uploading the data to the NPS IRMA database.

The CEMVN would be responsible for transmitting data to the NSP for upload for Year 1 through Year 3. The NFS would be responsible for providing NPS all data after Year 3.

7.2 Analyses, Summarizing and Reporting

The CEMVN would be responsible for periodic assessments (to include analyses, summary, reporting, and presentation of the information to the IET) through Year 3. The NFS would be responsible starting with Year 4.

8.0 Literature Cited

Todd M. Folse, Thomas E. McGinnis, Leigh A. Sharp, Jonathan L. West, Melissa K. Hymel, John P. Troutman, Dona Weifenbach, William M. Boshart, Laurie B. Rodrigue, Danielle C. Richardi, W. Bernard Wood, C. Mike Miller, Elizabeth M. Robinson, Angelina M. Freeman, Camille L. Stagg, Brady R. Couvillion, and Holly J. Beck. 2020. A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-*Wetlands* and the System-Wide Assessment and Monitoring Program: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA. 252 pp.

Swarzenski, C.M., T.W. Doyle, B. Fry and T.G. Hargis, 2008, Biogeochemical Response of Organic-rich Freshwater Marshes in the Louisiana Delta Plain to Chronic River Water Influx, Biogeochemistry 90(1) p. 49-63.

Annex A: Fish and Wildlife Coordination Act Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
200 Dulles Drive
Lafayette, Louisiana 70506

November 03, 2020

Colonel Stephen Murphy
District Commander
U.S. Army Corps of Engineers
7400 Leake Avenue
New Orleans, LA 701118-3651

Dear Colonel Murphy:

The U.S. Army Corps of Engineers' (USACE), New Orleans District (CEMVN) agreed to evaluate and consider for implementation additional ecological augmentation features that would add an extra measure of environmental benefits to the Bayou aux Carpes Clean Water Act Section 404(c) area (BAC) to offset any potential impacts due to construction of the WBV 404(c) flood wall component of the West Bank and Vicinity (WBV) Project, West Closure Complex (WCC). This letter is provided to USACE under the authority of the Fish and Wildlife Coordination Act (FWCA, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

In 1985, the Environmental Protection Agency (EPA) issued its CWA Section 404(c) Final Determination for Bayou aux Carpes, in accordance with 33 U.S.C. §1344(c), and 40 CFR Part 231 (Appendix 1). The EPA took the action to designate the BAC Site as CWA, Section 404(c) due to concerns that construction of the Harvey Canal – Bayou Barataria Levee Project, would have resulted in future land reclamation proposals involving discharge of fill material into the BAC Site by private property owners. Such discharge could have resulted in the eventual loss of BAC Site wetlands to development.

The CWA Section 404(c) designation restricts or otherwise prohibits the site for use as a disposal area for dredged or fill material because it was determined that such activities would have unacceptable adverse effects on shellfish beds, fishery areas (including spawning and breeding areas), wildlife, and recreational areas.

The BAC Site, located in Jefferson Parish, Louisiana, is an approximately 3,000 acre complex with unique and productive wetland habitat. The majority is managed and owned by the NPS as part of the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve (JLNHPP). Tidal connectivity within the BAC Site is now maintained through the Southern Natural Gas Pipeline (SNGP) canal that courses through the site. The BAC Site, is plugged at its connection with the GIWW limiting hydrologic exchange.

The USACE identified six augmentation measures that could potentially improve existing hydrology and enhance wetland functions and value. Measure 3, the removal of the shell plug, was determined to provide the highest net increase in flow exchange and was chosen as the

augmentation measure with the greatest benefit. It would restore a more natural connection between Bayou aux Carpes and the GIWW by removing the man-made shell plug. Hydrodynamic modeling results suggest it would have the highest positive impact.

After reviewing the proposed action, its impacts to fish and wildlife resources, the Service does not object to the proposed augmentation measure and supports the USACE's efforts in restoring the hydrologic connectivity to Bayou aux Carpes. An adaptive management and monitoring plan will be developed between the NPS, EPA, CPRA, CEMVN, and the Service prior to construction. The Service looks forward to continued coordination.

We appreciate the opportunity to provide comments on the proposed action, as well as the USACE's continued cooperation during the project planning process. If you have any questions or require additional information, please contact Ms. Hannah Sprinkle (337-291-3121) of this office.

Sincerely,

Joseph A. Ranson
Field Supervisor
Louisiana Ecological Services Office

Attachment

Copies provided via electronic mail:

USACE, New Orleans, LA (Attn: Patrick Smith, Elizabeth Behrens)

Annex B: Department of Environmental Quality, Water Quality Certificate - in accordance with Section 401, a Water Quality Certificate is being prepared for the Proposed Action and will be finalized prior to signing of the FONSI.

Annex C: Draft 404(b)(1) determination

The following short form 404(b)(1) evaluation follows the format designed by the U.S. Army Corps of Engineers, New Orleans District, Office of the Chief of Engineers (CEMVN-OCE). As a measure to avoid unnecessary paperwork, and to streamline regulation procedures, while fulfilling the spirit and intent of environmental statues, CEMVN is using this format for all proposed project elements requiring a 404(b)(1) evaluation but involving no adverse significant impacts.

PROJECT DESCRIPTION. The proposed project, referred to as the Bayou aux Carpes (BAC) plug removal project, consists of the removal of an earthen embankment, known as a "plug", at the intersection of BAC and the Gulf Intracoastal Waterway (GIWW), for the purpose of re-establishing hydraulic connectivity between the BAC and GIWW. The project is located within the BAC 404(c) site, which is within Barataria Preserve unit of the Jean Lafitte National Historic Park and Preserve, in Jefferson, Louisiana (Figures 1 and 2).

The existing plug would be excavated to a depth of -4 ft NAVD88, bottom width of 50 ft, and side slopes of 1v:2.5h. Up to approximately 3,500 cubic yards of material would be excavated for plug removal, and excavated material would be placed along the banklines of BAC, resulting in the creation up to 1.95 acres of shallow water habitat along a 1,000 ft reach of BAC near the GIWW (Figures 3-7). Disposal height would be no greater than elevation +0.5 feet NAVD88 or 0.5 feet below the existing bank line, whichever is lower (Figure 7).

Construction access would be via land using the existing unpaved road along the GIWW bankline (Orleans Way), and/or by barge using the GIWW. Prior to construction, approximately 0.68 acres of vegetation would be cleared within the footprint of the plug and in a designated staging and material stockpiling area immediately south of the plug (see Figure 3 for clearing limits). Approximately 900 cubic yards of waterbottom materials would be excavated from the GIWW with dimensions identical to the plug excavation to allow for hydraulic conveyance (Figures 3, 5). Additionally, up to approximately 500 cubic yards of material could be temporarily excavated along the east bankline of BAC for barge access, and material would be backfilled following construction activities (Figure 6).

Figure 1. Project vicinity map

Figure 2. Project area map

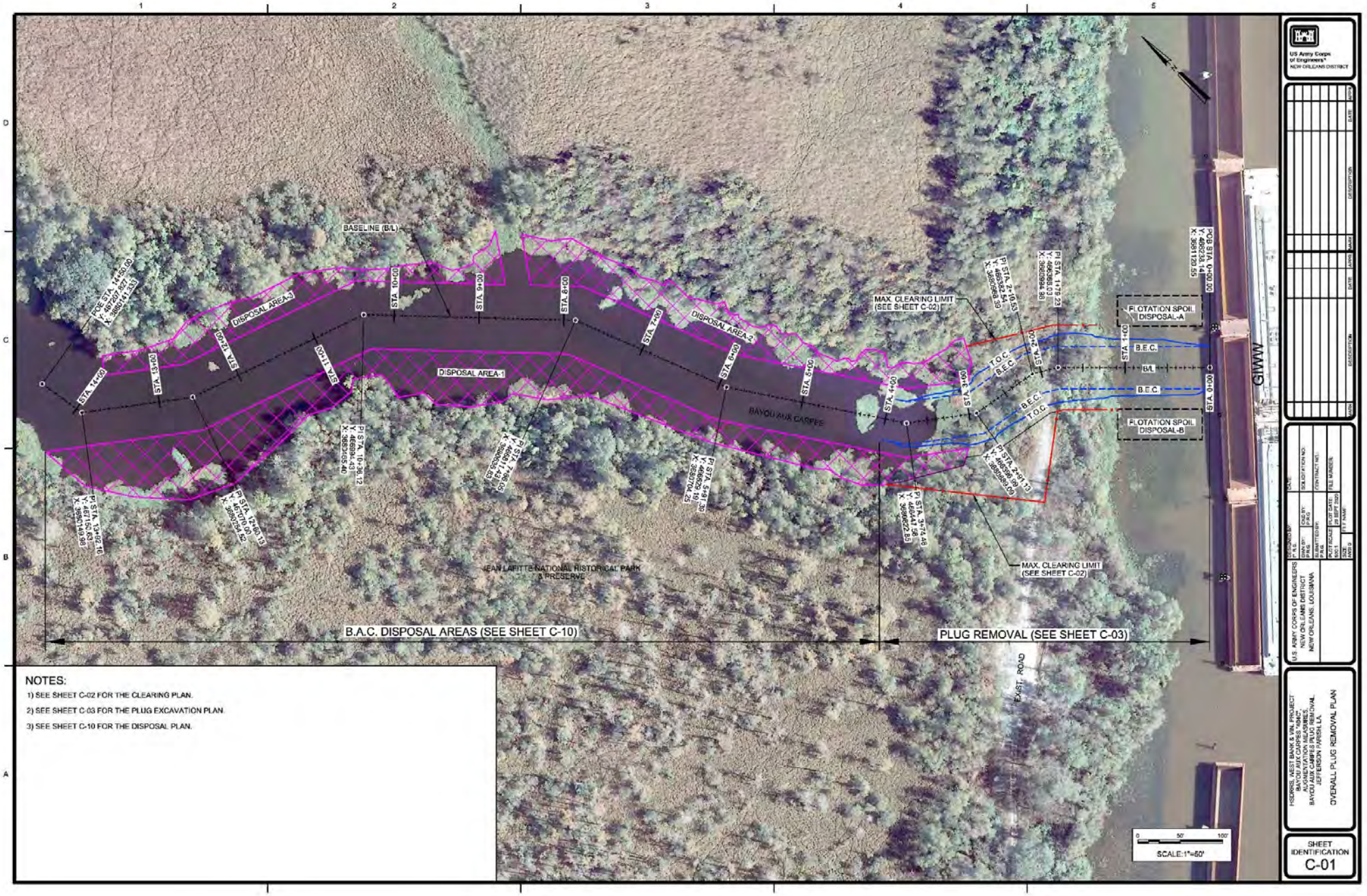


Figure 3. Project plan view

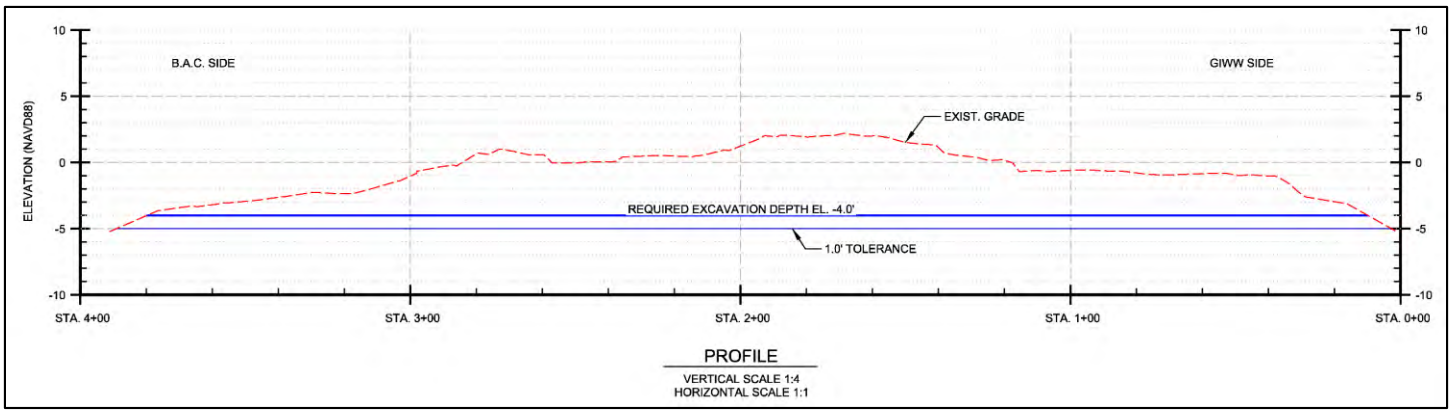


Figure 4. Plug excavation profile view

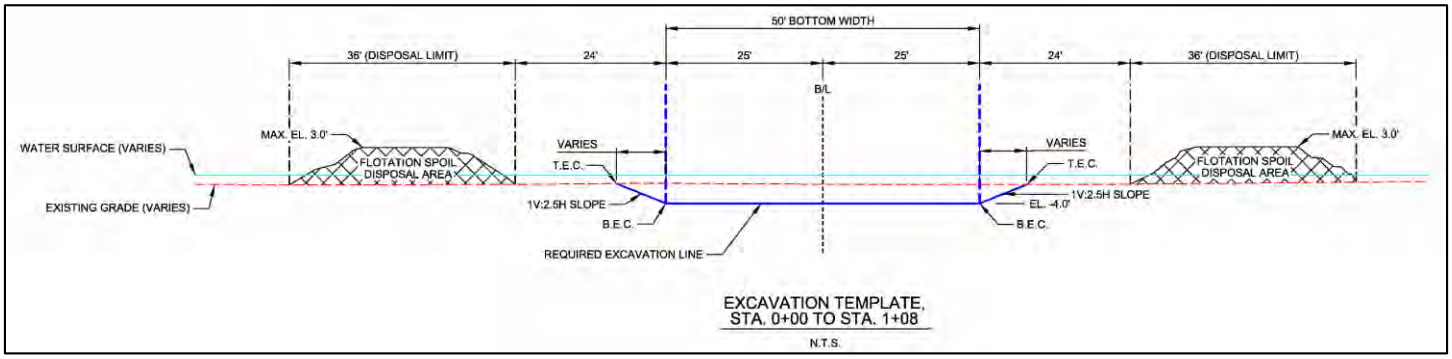


Figure 5. Plug excavation, access channel, and access channel stockpile areas cross-section view

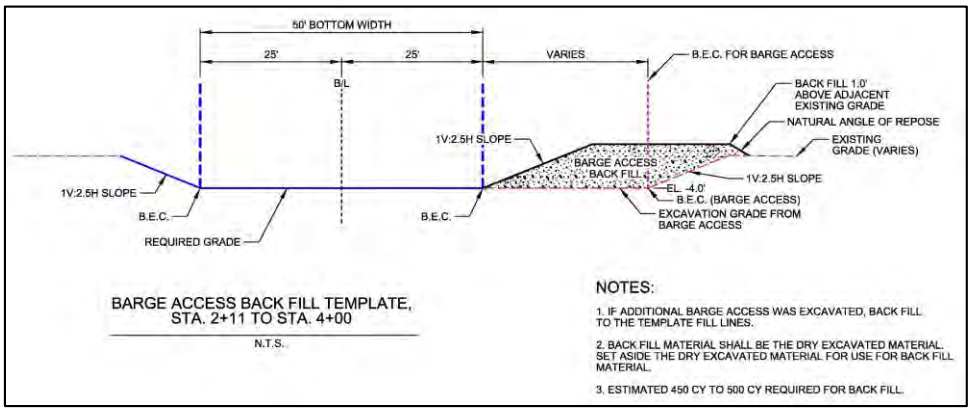


Figure 6. Bayou aux Carpes access channel backfill cross-section view

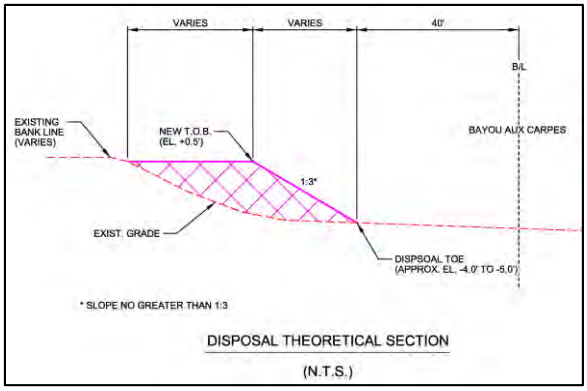


Figure 7. Bankline disposal cross-section view

1. Review of Compliance (§230.10 (a)-(d))

A review of this project indicates that:

	Preliminary[1]		Final[2]	
	Yes	No	Yes	No
a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for environmental assessment alternative)	x			
b. The activity does not appear to: **i.** violate applicable state water quality standards or effluent standards prohibited under Section 307 of the Clean Water Act; **ii.** jeopardize the existence of Federally listed endangered or threatened species or their habitat; and **iii.** violate requirements of any Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies)	x[4]			
c. The activity will not cause or contribute to significant degradation of waters of the United States including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values (if no, see section 2)	x			
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5)	x			

2. Technical Evaluation Factors (Subparts C-F)

a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)

	N/A	Not Significant	Significant [3,5]
i. Substrate impacts		x	
ii. Suspended particulates/turbidity impacts.		x	
iii. Water column impacts		x	
iv. Alteration of current patterns and water circulation		x	
v. Alteration of normal water fluctuations/ hydroperiod		x	
vi. Alteration of salinity gradients		x	

b. Biological Characteristics of the Aquatic Ecosystem (Subpart D)

i. Effect on threatened/endangered species and their habitat		x	
ii. Effect on the aquatic food web		x	
iii. Effect on other wildlife (mammals, birds, reptiles, and amphibians)		x	

c. Special Aquatic Sites (Subpart E)

i. Sanctuaries and refuges		x	
ii. Wetlands		x	
iii. Mud flats		x	
iv. Vegetated shallows		x	
v. Coral reefs	x		
vi. Riffle and pool complexes	x		

d. Human Use Characteristics (Subpart F)

i. Effects on municipal and private water supplies	x		
ii. Recreational and commercial fisheries impacts		x	
iii. Effects on water-related recreation.		x	
iv. Esthetic impacts		x	
v. Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves		x	

3. Evaluation of Dredged or Fill Material (Subpart G)

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material.

i.	Physical characteristics	x
ii.	Hydrography in relation to known or anticipated sources of contaminants	x
iii.	Known, significant sources of persistent pesticides from land runoff or percolation	x
iv.	Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances	
v.	Other public records of significant introduction of contaminants from industries, municipalities, or other sources	x
vi.	Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	
vii.	Other sources (specify)	

Appropriate references: See Encl 2

b. An evaluation of the appropriate information in 3.a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or the material meets the testing exclusion criteria.[6]

Yes	No[3]
x	

4. Disposal Site Delineation (§230.11(f))

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

i. Depth of water at disposal site	x
ii. Current velocity, direction, and variability at disposal site	x
iii. Degree of turbulence	x
iv. Water column stratification	x
v. Discharge vessel speed and direction	x
vi. Rate of discharge	x
vii. Dredged or fill material characteristics (constituents, amount, and type of material, settling velocities)	x
viii. Number of discharges per unit of time	
ix. Other factors affecting rates and patterns of mixing (specify)	

Appropriate references: See Encl 2

	Yes	No[3]
b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable	x	

5. Actions to Minimize Adverse Effects (Subpart H)

	Yes	No[3]
All appropriate and practicable steps have been taken, through application of the recommendations of §230.70-230.77, to ensure minimal adverse effects of the proposed discharge	x	

Actions taken: Material would be excavated and disposed using a mechanical dredge, which would minimize water column impacts in comparison to using a hydraulic dredge. Material would be disposed along existing banklines in a manner that does not impede channel flows between BAC and the GIWW after these waterbodies are reconnected.

6. Factual Determination (§230.11)

A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge as related to:

	Yes	No[3]
a. Physical substrate at the disposal site (review sections 2a, 3, 4, and 5 above)	x	
b. Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5)	x	
c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5)	x	
d. Contaminant availability (review sections 2a, 3, and 4)	x	
e. Aquatic ecosystem structure and function (review sections 2b and c, 3, and 5)	x	
f. Disposal site (review sections 2, 4, and 5)	x	
g. Cumulative impact on the aquatic ecosystem	x	
h. Secondary impacts on the aquatic ecosystem	x	

[1] Negative responses to three or more of the compliance criteria at this stage indicates that the proposed projects may not be evaluated using this "short form procedure". Care should be used in assessing pertinent portions of the technical information of items 2a-d, before completing the final review of compliance.

[2] Negative responses to one of the compliance criteria at this stage indicates that the proposed project does not comply with the guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short form" evaluation process is inappropriate.

[3] A negative, significant, or unknown response indicates that the project may not be in compliance with the Section 404(b)(1) Guidelines.

[4] For 1.b., review is for i. only (i.e., The activity does not appear to violate applicable state water quality standards or effluent standards prohibited under Section 307 of the Clean Water Act)

[5] Where a check is placed under the significant category, the preparer has attached explanation.

[6] If the dredged or fill material cannot be excluded from individual testing, the "short form" evaluation process is inappropriate.

7. Evaluation Responsibility

a. Prepared by:

Eric Glisch
Environmental Engineer
U.S. Army Corps of Engineers, New Orleans District
January 13, 2021

b. Reviewed by:

Jerry Shih
Supervisor Hydraulic Engineer
U.S. Army Corps of Engineers, New Orleans District
January 14, 2021

c. Prepared by:

Patrick Smith
Biologist
U.S. Army Corps of Engineers, New Orleans District
January 23, 2021

8. Findings

a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines	x
b. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines with the inclusion of the following conditions	
c. The proposed disposal site for discharge of dredged or fill material does not comply with the Section 404(b)(1) guidelines for the following reason(s):	
i. There is a less damaging practicable alternative	
ii. The proposed discharge will result in significant degradation of the aquatic ecosystem	
iii. The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem	

Date: _____

_____
Chief, Environmental Planning and
Compliance Branch

Annex D: Department of Natural Resources, Coastal Zone Consistency – In accordance with Section 307, a Consistency Determination is being prepared for the Proposed Action and will be finalized prior to signing of the FONSI.

Annex E: Endangered Species Act

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Louisiana Ecological Services Field Office
200 Dulles Drive
Lafayette, LA 70506
Phone: (337) 291-3100 Fax: (337) 291-3139

In Reply Refer To: November 12, 2020
Consultation Code: 04EL1000-2021-I-0319
Event Code: 04EL1000-2021-E-00871
Project Name: Bayou aux Carpes Augmentation

Subject: Verification letter for the project named 'Bayou aux Carpes Augmentation' for specified threatened and endangered species that may occur in your proposed project location pursuant to the Louisiana Endangered Species Act project review and guidance for other federal trust resources determination key (Louisiana DKey).

Dear Patrick Smith:

The U.S. Fish and Wildlife Service (Service) received on November 12, 2020 your effects determination(s) for the 'Bayou aux Carpes Augmentation' (the Action) using the Louisiana DKey within the Information for Planning and Consultation (IPaC) system. The Service developed this system in accordance with the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Based on your answers, and the assistance in the Service's Louisiana DKey, you made the following effect determination(s) for the proposed Action:

Species	**Determination**
Threatened West Indian Manatee (*Trichechus manatus*)	NLAA

Consultation Status

Species protective measures (contained within this application) will be used by the applicant and will be incorporated into any special conditions of a DA permit; therefore the Service concurs with the U.S. Army Corps of Engineers "may affect, not likely to adversely affect" determination(s) for the species listed above. Your agency has met consultation requirements by informing the Service of your "No Effect" determinations. No consultation for this project is required for species that you determined will not be affected by this action.

This concurrence verification letter confirms you may rely on effect determinations you reached by considering the Louisiana DKey to satisfy agency consultation requirements under Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended 16 U.S.C. 1531 et seq.;

ESA). No further consultation for this project is required for species that you determined will not be affected by this action.

The Service recommends that your agency contact the Louisiana Ecological Services Field Office or re-evaluate the project in IPaC if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation with the Louisiana Ecological Services Field Office should take place before project changes are final or resources committed.

Please Note: If the Federal Action may impact bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d) may be required. Please contact Ulgonda Kirkpatrick (phone: 321/972-9089, e-mail: ulgonda_kirkpatrick@fws.gov) with any questions regarding potential impacts to bald or golden eagles.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Bayou aux Carpes Augmentation

2. Description

The following description was provided for the project 'Bayou aux Carpes Augmentation':

> The Bayou aux Carpes plug removal project (Project) consists of the removal of an earthen embankment, identified as a “plug”, which was placed within Bayou Aux Carpes (BAC) where BAC intersects the Gulf Intercostal Water Way (GIWW) in 1974. Removal of this earthen embankment would create a sinuous connection between BAC and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) site (BAC Site). Construction duration would be anticipated to last approximately 90 days.
>
> Construction access to the Project area would be by barge and watercraft via the GIWW or by truck and trailer via land.
>
> The maximum extent of vegetation to be cleared would be approximately 0.68 acres (approximately 0.35 acres of wetlands).
>
> A total of approximately 3,500 cubic yards would be excavated and redistributed nearby to create up to approximately 2 acres of high quality shallow water habitat.

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/29.777147584040506N90.07283094360754W

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the project will have "no effect" on federally listed species? (If unsure select "No")

   No

3. Are you with the U.S. Army Corps of Engineers Regulatory Division?

   No

4. Are you with the U.S. Army Corps of Engineers Planning Division?

   Yes

5. Is the action part of a Civil Works project?

   Yes

6. Does the action result in the discharge of fill into wetlands that meets the *de minis* standard?

   Yes

7. [Hidden Semantic] Does the project intersect the west indian manatee AOI?

   Automatically answered
   Yes

8. (Semantic) Is the project located within the manatee consultation zone, excluding the Mississippi River?

   Automatically answered
   Yes

9. Is the project footprint entirely on land?

   No

10. Is the water depth within the project greater than 2 feet (at mean high tide)?

    Yes

11. Will the project occur during the months of June through November?

    No

12. [Semantic] Does the project intersect the Northern Long-eared bat AOI?

    Automatically answered

    No

13. (Semantic) Does the project intersect the Louisiana black bear Range?

    Automatically answered

    No

Annex F: Environmental Protection Agency 404(c) Exception under Exception 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 ELM STREET, SUITE 500
DALLAS, TEXAS 75270

Office of the Regional Administrator

December 10, 2020

Colonel Stephen F. Murphy
U.S. Army Corps of Engineers
New Orleans District
7400 Leake Avenue
New Orleans, Louisiana 70118-3651

RE: Bayou aux Carpes Clean Water Act Section 404(c) Final Determination
Request for Exception 3 Consistency Determination (Bayou aux Carpes Augmentation Project)

Dear Colonel Murphy:

This letter is in response to the February 11, 2020, letter from the U.S. Army Corps of Engineers (Corps), New Orleans District (District) proposing a project to enhance the hydrology, fisheries habitat, and aquatic organism access in the Bayou aux Carpes Clean Water Act (CWA) Section 404(c) site. The project would offset potential secondary impacts that may result due to the Corps' construction of the floodwall component of the West Bank and Vicinity Project, West Closure Complex. The District requested that the Environmental Protection Agency (EPA) approve the proposed project under the 1985 Bayou aux Carpes Final Determination (FD) Exception 3. Exception 3 removes from prohibition "…discharges associated with projects with the sole purpose of habitat enhancement and specifically approved by the EPA." After reviewing the District's proposed project, EPA has determined that the work associated with the proposed project will satisfy Exception 3.

EPA issued the October 16, 1985, Bayou aux Carpes Section 404(c) FD for approximately 3000 acres of wetlands that comprised the location of a proposed Corps of Engineers (Corps) flood control project—the Harvey Canal-Bayou Barataria Levee Project. EPA based its 1985 FD on unacceptable adverse effects to shellfish beds, fishery areas (including spawning and breeding areas), wildlife, and recreational areas. In the 1985 FD, EPA determined the Bayou aux Carpes site provided valuable habitat for fish and wildlife, contributed organic material that fed fish and shellfish communities in the adjacent estuary, acted as a pollutant filtering mechanism to reduce degradation of water quality in adjacent waters, and provided opportunities for public recreation.

The completion of the original Corps flood control project and subsequent filling activities would have caused the loss of the wetland site and the wildlife habitat it provided to the American alligator (which was a threatened species in Louisiana), the osprey and the wood duck (which were National Species of Special Emphasis) as well as a number of other species. The loss of the wetland also would have eliminated fisheries habitat utilized by estuarine species of commercial importance, including the blue crab, and recreational value, including the blue catfish. The loss of wetlands would also have reduced the production and export of detritus consumed by fish species of commercial and recreational

importance. In addition, the site would no longer have been able to filter pollutants and excess nutrients to protect the downstream water quality. EPA also noted in the FD that the significance of these impacts was even greater in the context of wetlands alterations within coastal Louisiana, which had lost over 800,000 acres of land during the 80 years prior to 1985.

The 1985 Bayou aux Carpes Section 404(c) FD prohibits the discharge of dredged or fill material into waters of the United States, including wetlands within the Bayou aux Carpes site, unless a proposed discharge satisfies one of three exceptions. The FD noted that discharges meeting any of these exceptions "are unlikely to result in significant adverse effects to the aquatic environment as long as they are performed in accordance with these restrictions and as well as any permit conditions which may be imposed by the Corps of Engineers through the permit process." The three exceptions include:

Exception 1: "discharges associated with completion of a modified Harvey Canal-Bayou Barataria Levee Project,"

Exception 2: "discharges associated with routine operation and maintenance of the Southern Natural Gas Pipeline Company," and

Exception 3: "discharges associated with projects with the sole purpose of habitat enhancement and specifically approved by EPA."

In 2009, EPA modified the 1985 FD to allow for the Corps' construction of the floodwall component of the West Bank and Vicinity Project, West Closure Complex. The 2009 modification required that the Corps provide, in addition to mitigation for the direct impacts from the wall construction to Bayou aux Carpes wetland resources, a project with habitat benefits to the Bayou aux Carpes site for expected secondary impacts to the Bayou aux Carpes aquatic resources.

The hydrology and topography in the Bayou aux Carpes site and vicinity has been highly altered through a variety of actions, such as the construction of roads, levees, spoil banks, canals, and transmission rights-of-way. For example, historically, Bayou aux Carpes was the major natural waterway draining and providing a tidal exchange for the site. In 1974, Jefferson Parish severed this waterway's connection to Bayou Barataria, its historic receiving waterway, by constructing an earthen and shell plug at the confluence of Bayou aux Carpes and Bayou Barataria. This hydrologic alteration limited sediment deposition to combat natural subsidence, resulting in marsh deterioration and restricting the movement of nutrients and aquatic species into and out of the Bayou aux Carpes site. The 1974 Jefferson Parish plug adversely impacted tidal connectivity within the site, and today the primary connectivity is maintained through the Southern Natural Gas Pipeline (SNGP) canal that courses through the site and a few oil and gas canals that connect the SNGP canal with Bayou aux Carpes.

To address the Corps' 2009 modification commitment to provide a habitat-benefit project to Bayou aux Carpes, the District proposed to enhance the hydrology, fisheries habitat, and aquatic organism access in the site by restoring a more natural connection between Bayou aux Carpes and Bayou Barataria. (Figure 1). The District's proposed plan would involve clearing, excavation of the Jefferson Parish plug, and disposal of excavated material. The site work would encompass an area of approximately 2.5 acres; in total, approximately 3,000 cubic yards of material would be excavated and deposited on both sides of the Bayou aux Carpes waterway from the mouth of Bayou aux Carpes at Bayou Barataria upstream approximately 1500 feet. (Figure 2).

The District conducted hydrodynamic modeling on the effects of removing the Jefferson Parish plug. This modeling demonstrated that removing the plug at the historic confluence of the Bayou aux Carpes natural waterway with Bayou Barataria would increase sheet flow through the area's wetlands and improve drainage, thereby benefiting the existing swamps and marshes found within the Bayou aux Carpes site, as well as benefitting fishery and aquatic organism access into Bayou aux Carpes.

Additionally, any excavated plug material deposited on either side of the Bayou aux Carpes waterway, as depicted in Figure 2, would create shallow water habitat. This shallow water habitat could be used as a spawning and nursery habitat for many fish species and other aquatic organisms.

Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife like estuarine organisms, wintering waterfowl, and neotropical migrant birds. Absent adequate reclamation measures such as removing the Jefferson Parish plug, the Bayou aux Carpes site would continue to stress the site's aquatic resources and values, thereby causing adverse impacts on natural hydrology, ecology, water quality, and wetland functions.

The District proposes to remove the Jefferson Parish plug, restoring the natural connection of Bayou aux Carpes to Bayou Barataria, and place the excavated material from the plug along a portion of the Bayou aux Carpes waterway to create shallow water habitat. A barge-mounted excavator would remove the plug from the Bayou Barataria side. Plug material will either be stored on the barge until the barge can break through to the Bayou side or be placed temporarily on the adjacent ridge/levee. The excavated plug material will then be used beneficially to create improved shallow water habitat inside of Bayou aux Carpes. This plan has been closely coordinated with the Interagency Environmental Team (IET) and has been received favorably. The IET is comprised of federal representatives from the New Orleans Corps District, National Park Service (NPS), US Fish and Wildlife Service, and EPA, as well as representatives from state partners.

EPA Region 6 conducted a review of the information provided by the District in the February 11, 2020, letter, the District's October 2019 Bayou Aux Carpes Section 404(c) Augmentation Measures Evaluation, and the District's September 2020 Bayou aux Capes Section 404(c) Augmentation Measures Plug Removal Plans. EPA also participated in a February 19, 2020 site visit with the NPS and the District. EPA also reviewed research on the effects to wetlands, water quality, and aquatic organisms caused by non-natural waterway restrictions, such as the plug in Bayou aux Carpes (Enclosure 1).

After reviewing the District's proposed project, EPA has determined that the work associated with the proposed project will satisfy Exception 3 of the 1985 Bayou aux Carpes CWA Section 404(c) FD. The sole purpose of the District's proposed project is to enhance the hydrology, fisheries habitat, and aquatic organism access in the site by restoring a more natural connection between Bayou aux Carpes and Bayou Barataria, thereby benefitting the restoration and maintenance of the integrity of the ecological and biological processes of Bayou aux Carpes aquatic resources. EPA approves the proposed discharges provided that such discharges comply with the conditions and best management practices identified in Enclosure 2 consistent with the District's proposal. Furthermore, it is the responsibility of the District to obtain all necessary federal, state, and/or local authorizations and conducting all required regulatory coordination and approvals prior to implementing the proposed project.

Any discharges of dredged or fill material within the Bayou aux Carpes site that are inconsistent with the February 11, 2020, District proposal or the September 2020 Bayou aux Capes Section 404(c) Augmentation Measures Plug Removal Plans, or that fail to implement the conditions and best management practices provided in this letter are not approved as qualifying for the exception. EPA's

technical analysis of the proposal (Enclosure 1), the required conditions and best management practices for EPA's project approval (Enclosure 2), and a copy of the 1985 FD (Enclosure 3) are enclosed.

EPA appreciates the efforts of the District to address the requirements of the 1985 Bayou aux Carpes CWA Section 404(c) FD. We also recognize and appreciate the efforts of the District to reclaim and restore the aquatic resources of the Bayou aux Carpes site. If we may be of further assistance, please feel free to contact Dr. Raul Gutierrez in the EPA Region 6 Wetland Review Section at (214) 665-6697.

Sincerely,

Ken McQueen
Regional Administrator

Figures 1 and 2
Enclosures 1, 2, and 3

cc: Lee Forsgren, EPA
Ryan Fisher, Department of the Army

VICINITY MAP
N.T.S.

GENERAL NOTES:

1) THE HORIZONTAL DATUM IS NAD 1983 STATE PLANE LOUISIANA SOUTH EXPRESSED IN SURVEY FOOT. ALL XY COORDINATES SHOWN ARE LOUISIANA STATE PLANE SOUTH, ZONE 1702.

2) THE VERTICAL DATUM IN NAVD88 (2009.55). SURVEYS FOR DESIGN AND SPOT ELEVATIONS SHOWN, WAS COMPLETED IN AUGUST 2020. JOB NUMBER 20-005C.

3) AERIAL IMAGE FLOWN 2019.

ABBREVIATIONS	
APPROX.	APPROXIMATE
B.A.C.	BAYOU AUX CARPES
B.E.C.	BOTTOM EDGE OF CUT
B/L	BASELINE
CA	CUT AREA
EXIST	EXISTING
FT	FOOT
N.T.S.	NOT TO SCALE
PT	POINT
PI	POINT OF INTERSECTION
POB	POINT OF BEGINNING
POE	POINT OF END
R.O.E.	RIGHT OF ENTRY
STA.	STATION
SF	SQUARE FOOT
T.E.C.	TOP EDGE OF CUT
T.O.C.	TOP OF BANK

GENERAL LEGEND

- BASELINE
- BOTTOM EDGE OF CUT
- TOP EDGE OF CUT
- CLEARING LIMITS
- FLOTATION DISPOSAL AREAS
- B.E.C. DISPOSAL AREAS
- STOCKPILE LIMITS
- FILL SLOPE
- CUT SLOPE
- + 15' SPOT ELEVATION

Figure 1

SHEET IDENTIFICATION
G-02

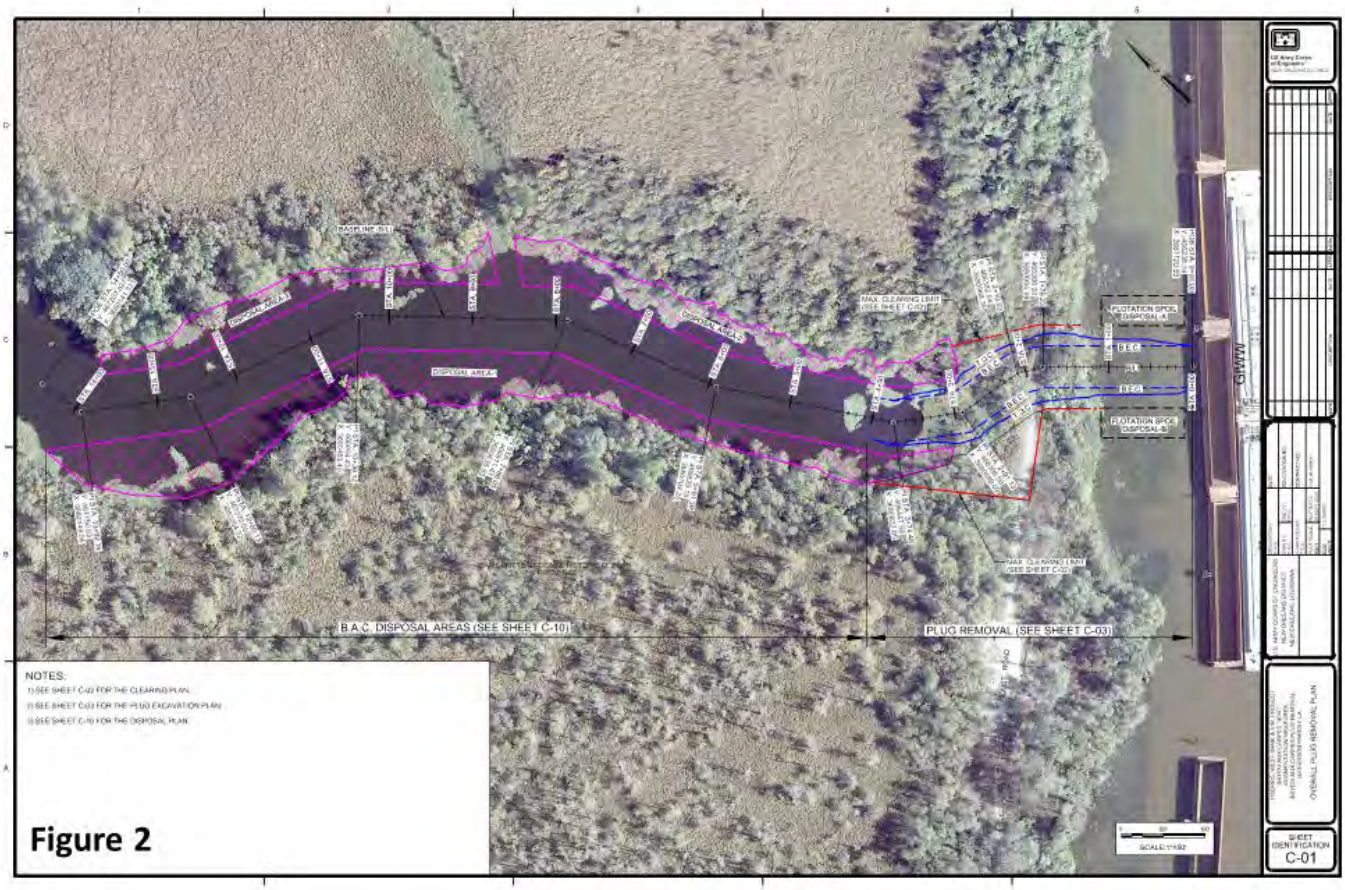

BASELINE SET
DISPOSAL AREA 1
DISPOSAL AREA 2
DISPOSAL AREA 3
MAX. CLEARING LIMIT (SEE SHEET C-02)
FLOTATION SPOIL DISPOSAL A-E
FLOTATION SPOIL DISPOSAL B
B.E.C.
B.A.C. DISPOSAL AREAS (SEE SHEET C-10)
PLUG REMOVAL (SEE SHEET C-03)
NOTES:
1) SEE SHEET C-02 FOR THE CLEARING PLAN.
2) SEE SHEET C-03 FOR THE PLUG EXCAVATION PLAN.
3) SEE SHEET C-10 FOR THE DISPOSAL PLAN.
OVERALL PLUG REMOVAL PLAN
SHEET IDENTIFICATION
C-01

Figure 2

Enclosure 1

Environmental Protection Agency
Technical Analysis of Proposed
US Army Corps of Engineers, New Orleans District
Bayou aux Carpes Augmentation Project
Removal of Jefferson Parish Plug in Bayou aux Carpes Waterway

Background

As noted in the cover letter, the 1985 Bayou aux Carpes Clean Water Act Section 404(c) Final Determination (FD) placed prohibitions on the discharge of dredged or fill material into waters of the United States, including wetlands within the Bayou aux Carpes site, unless the proposed discharge is covered under one of the exceptions stated in the FD. The FD provided three exceptions to the prohibition of discharges of dredged or fill material in the Bayou aux Carpes site. Discharges of dredged or fill material would be allowable for:

Exception 1: discharges associated with the completion of a modified Harvey Canal-Bayou Barataria Levee Project,

Exception 2: discharges associated with routine operation and maintenance of the Southern Natural Gas Pipeline Company, and

Exception 3: discharges associated with projects with the sole purpose of habitat enhancement and specifically approved by EPA.

The District has requested EPA's approval of a proposal to discharge dredged and/or fill material into waters of the U.S. within the Bayou aux Carpes 404(c) site. The discharges are proposed as a response to satisfy the habitat augmentation requirements of the 2009 modification to the FD that allowed not only for discharges associated with the construction of flood wall in Jefferson Parish, but also required the District to plan, design, fund, implement, and monitor augmentation measures that would enhance wetland functions and values within the Bayou aux Carpes site. The District's request is for EPA to review the proposed project and determine if it would be consistent with 1985 Bayou aux Carpes Section 404(c) FD Exception 3.

Proposed Project Description

The District's Bayou aux Carpes plug removal project involves excavating a man-made shell plug at the mouth of Bayou aux Carpes, where it empties in Bayou Barataria. The plug was constructed by Jefferson Parish in the mid-1970s and severed the natural connection between the two waterways. It remains an impediment to the exchange of water, nutrient, and aquatic wildlife. The purpose of the proposed project is to restore flow exchange between Bayou aux Carpes and Bayou Barataria, allowing for better ingress and egress of water and aquatic organisms.

The shell plug has altered the hydrology of the area by restricting water flow between Bayou aux Carpes and Bayou Barataria, leading to a limited exchange of sediments, nutrients, and aquatic organisms thereby, stressing the wetland vegetation, increasing subsidence, and leading to swamp and marsh deterioration. Other significant impacts attributed to the plug include increased retention of saltwater intrusion, stressed wetland vegetation, and deterioration of swamp and marsh habitats adjacent to the Bayou aux Carpes. These wetlands provide habitat for fish, shellfish, and wildlife, including estuarine

organisms, wintering waterfowl, and neotropical migrant birds. The diminished wetland functions caused by the severed connection between the two waterways continues to adversely impact the entire Bayou aux Carpes site.

Approximately 3000 cubic yards covering a footprint of 0.7 acres at the confluence of the Bayou aux Carpes with the Bayou Barataria are proposed to be removed. The resulting material will be placed along the banks of the Bayou aux Carpes upstream of its confluence with the Bayou Barataria. The material will be placed at or below the level of the surrounding wetlands and partially fill the open water of the Bayou aux Carpes.

EPA Review for Consistency with FD Exception 3 Determination

For the discharges to be approved under Exception 3, they must be associated with a project with the sole purpose of habitat enhancement, meaning the project will result in habitat enhancement. EPA reviewed the information provided by the District, as well as participated in an onsite field visit facilitated by the District and the National Park Service. Additionally, EPA conducted a review of the current research on restoring hydrologic connections between two formerly interacting waterways and the expected effects of these activities on wetlands. The following is a list of expected benefits associated with the proposed project.

1. **Benefit: Restoration of hydrologic connectivity.**
   The removal of the plug is expected to improve hydrologic conditions by allowing natural ingress and egress of water between the Bayou aux Carpes and Bayou Barataria, as well as improving the hydrologic connection of the adjacent Bayou aux Carpes wetlands to Bayou Barataria. The plug currently acts to retain water, which leads to stagnation where the bayou forms a dead end at the plug, as normal flushing of the bayou no longer occurs. Stagnation can result in higher water temperatures and lower dissolved oxygen (Mason et al., 2007) and can stress native wetland vegetation in the swamps and marshes adjacent to the Bayou aux Carpes. Unimpeded ingress and egress of water into Bayou aux Carpes and onto the adjacent wetlands will reduce stagnation and will ultimately lead to healthier marsh and swamp habitats.

2. **Benefit: Increased fish and shellfish access.**
   The plug at the mouth of the Bayou aux Carpes acts as a barrier or impediment to fish and shellfish access to the site. Removal of barriers such as the plug would restore the connectivity between both bayous and wetlands adjacent to the Bayou aux Carpes, increasing the importance of the site as valuable spawning and breeding areas for species of commercial and recreational concern (Neill & Turner, 1987b).

3. **Benefit: Decreased retention times for saltwater intrusion.**
   The plug at the mouth of the Bayou aux Carpes is an impediment to access into the interior of the site, and it holds water back on the site after high water events. Of particular interest are high waters associated with storm events, which have the potential to push saltwater over the plug and into the freshwater marshes and cypress swamps of the site. Surface and pore water salinities can increase, which can result in stress to freshwater wetland vegetation if the exposure is prolonged (Swenson & Turner 1987). Research has shown that the removal of the hydrologic impediments such as the plug at the mouth of the Bayou aux Carpes will reduce prolonged flooding of adjacent marsh and swamp habitat (Neill and Turner, 1987a; Swenson and Turner, 1987) and decrease stress to marsh vegetation (Baustian and Turner, 2006; Turner, 1987; Turner and McClenachan, 2018). The removal

of the plug would allow for improved connectivity between the Bayou aux Carpes, Bayou Barataria, and adjacent wetlands, increasing the rate at which saltwater can drain from the site and allowing these waterbodies to return to pre-storm surge condition at a faster rate (Craig et al., 1979).

4. **Benefit: Partial to complete restoration of wetland habitat along the banks of Bayou aux Carpes.**
   The placement of the excavated material from the Jefferson Parish plug in the Bayou aux Carpes waterway will become shallow along the banks where the resulting plug material will be placed beneficially, allowing for marsh edge habitat to be created where the adjacent wetlands will transition more naturally into the Bayou. This shallow transition zone will provide habitat and access to adjacent wetlands for various wildlife such as waterfowl, fish, and other aquatic species (Baustian and Turner, 2006; Neill and Turner, 1987a; Peterson and Turner, 1994).

Conclusion

After a review of information provided by the District, participation in an onsite field visit, and review of the research pertinent to the removal of flow impediments and restoration of hydrologic connectivity, EPA has determined that the District's proposal to remove the plug at the mouth of Bayou aux Carpes, as described in the District's February 11, 2020, request is solely for the purpose of and will result in habitat enhancement for the Bayou aux Carpes site and is consistent with the 1985 Bayou aux Carpes Final Determination's Exception 3, subject to the Conditions and Best Management Practices in Enclosure 2.

Literature Cited

Baustian, J. J., and R. E. Turner. 2006. Restoration success of backfilling canals in coastal Louisiana marshes. *Restoration Ecology* 14: 636-644.

Craig, N. J., R. E Turner, and J. W. Day, Jr. 1979. Land loss in coastal Louisiana (U.S.A). *Environmental Management* 3: 133-144.

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Peterson, G. W., and R. E. Turner. 1994. The value of salt marsh edge vs. interior habitat for fish and decapod crustaceans in a Louisiana tidal marsh. *Estuaries* 17: 235-262.

Swenson, E. M., and R. E. Turner. 1987. Spoil banks: effects on a coastal marsh water-level regime. *Estuarine, Coastal and Shelf Science* 24: 599-609.

Turner, R. E. 1987. Relationship between canal and levee density and coastal land loss in Louisiana. U. S. Fish and Wildlife Service Biological Report, Washington, D. C.

Turner, R. E., and G. McClenachan. 2018. Reversing wetland death from 35,000 cuts: opportunities to restore Louisiana's dredged canals. *PLoS ONE* 13(12): e0207717. https://doi.org/10.1371/journal.pone.0207717

Enclosure 2

Conditions and Best Management Practices
for the Proposed
US Army Corps of Engineers, New Orleans District
Bayou aux Carpes Augmentation Project
Removal of Jefferson Parish Plug in Bayou aux Carpes Waterway

Any augmentation project activities associated with the proposed Jefferson Parish plug removal shall not cause more than minimal and temporary water quality impacts to any adjacent wetland, stream, or water body. EPA determined that the following conditions and best management practices (BMPs) are necessary to ensure that any discharges of dredged or fill material to comply with the terms of the 1985 Bayou aux Carpes 404(c) Final Determination:

1. The US Army Corps of Engineers, New Orleans District (District) must confirm in writing with any contractors conducting work as a part of this project the boundaries of the project worksite, per District proposal, so as to prevent unapproved impacts to adjacent wetlands through unauthorized machinery/equipment access or unapproved discharges of dredged or fill material. Discharges of dredged or fill material are restricted to those areas specified in the project proposal.
2. During final project design, the District shall utilize all feasible engineering and construction practices to minimize the potential for impacts to the Bayou aux Carpes wetlands outside the project footprint.
3. The approved mode of transportation of excavated material to the final discharge site, as proposed by the District, is for barge transport. Should other means of transport be proposed, the District must seek approval from EPA Region 6 prior to implementation.
4. Prior to project implementation, the District shall confer with the U.S. Fish and Wildlife Service (USFWS) and comply with any specified endangered species requirements identified by the USFWS.
5. The District shall be responsible for obtaining all necessary federal, state and/or local authorizations and conducting all required regulatory coordination and approvals prior to implementing proposed project.
6. Throughout the life of the project, the District shall ensure that any necessary adaptive construction modifications that significantly deviate from the proposed District plan shall be approved by EPA Region 6 prior to implementation.
7. The District shall be responsible for ensuring compliance with the terms of this approval, including the conditions and BMPs. The District shall be responsible for ensuring that all employees and contractors working within the Bayou aux Carpes CWA Section 404(c) site understand the terms and extent of this approval.
8. Any violation of the terms of this approval shall be reported by the District to EPA Region 6 by telephone immediately upon discovery, followed by a written report by District describing the circumstances and ecological impacts. In this event, all related work activities shall cease until resolution is reached with EPA.

In the event that EPA determines during the life of the project that construction of the approved project is causing unanticipated and unacceptable wetland impacts in the Bayou aux Carpes site, EPA may modify the terms of these conditions and BMPs.

Enclosure 3

Copy of 1985 Bayou aux Carpes CWA 404(c) Final Determination

[pdf to be attached]

From:	Smith, Patrick W CIV USARMY CEMVN (US)
To:	Gutierrez, Raul; Miller, Clay; Martinez, Maria; Hayes, Mark
Cc:	Goodman, Melanie L CIV USARMY CEMVN (US); Behrens, Elizabeth H CIV USARMY CEMVN (USA); Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA)
Subject:	Bayou aux Carpes Augmentation Project Consistency Review Request Package
Date:	Wednesday, February 12, 2020 10:55:00 AM
Attachments:	Consistency Request Documentation.pdf Appendix 2 2019-09-24 meeting notes.pdf Appendix 1 Bayou aux Carpes Augmentation Measures Evaluation Report.pdf Consistency Request Letter Signed.pdf

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Hello all,

Please see attached letter and associated documentation addressed to Mr. Ken McQueen, Regional Administrator for Environmental Protection Agency Region 6, requesting the EPA review the Bayou aux Carpes Augmentation Project for consistency with the 1985 Bayou aux Carpes CWA 404(c) exception #3.

There should be four items attached:

1. Signed Formal Request Letter
2. Consistency Request Documentation
3. Appendix I - Bayou aux Carpes Augmentation Measures Evaluation Report
4. Appendix 2 - September 24, 2019 meeting notes

Printed copies of items 1,2, and 4, and a CD including item 3 and associated appendices were mailed to the following address:

Mr. Ken McQueen
Regional Administrator
Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

Appendices associated with item 3 can be made electronically available to the EPA. These appendices are the same as those made available to the Bayou aux Carpes Interagency Environmental Team, including Raul Gutierrez, in September of 2019.

Please call or email with any questions or concerns.

Thanks,
Patrick

Patrick Smith, PhD
Biologist
Environmental Studies Section, RPEDS
US Army Corps of Engineers, New Orleans District
Office: (504) 862-1583

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS, LA 70118-3651

Regional Planning and Environment
Division South

11 FEB 2020

Ken McQueen
Regional Administrator
Environmental Protection Agency, Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

Dear Mr. McQueen:

This letter is to formally request Environmental Protection Agency (EPA) concurrence that a U.S. Army Corps of Engineers (USACE) tentatively selected plan to remove a shell plug at the mouth of Bayou aux Carpes, in Jefferson Parish, Louisiana, is consistent with Exception 3 of the 1985 EPA Clean Water Act (CWA), 404(c) Final Determination for Bayou aux Carpes. The proposed work would be performed as an augmentation measure that would enhance hydrology, habitat, and fisheries and aquatic organism access in the Bayou aux Carpes CWA 404(c) Area to offset any future potential unintended secondary impacts that may result due to USACE construction of the 404(c) floodwall component of the West Bank and Vicinity Project, West Closure Complex. Enclosed is information requested by EPA staff for your review and consideration (Encl. 1).

If you have any questions or concerns please contact Patrick Smith, PhD by email at Patrick.W.Smith@usace.army.mil or by phone at (504) 862-1583.

Marshall K. Harper

1 Encl

MARSHALL K. HARPER
Chief, Environmental Planning Branch

Bayou aux Carpes 404(c) Consistency under Exception 3 Concurrence Documentation

On December 2, 2019, the Environmental Protection Agency (EPA) requested CEMVN to describe seven items associated with the Bayou aux Carpes Augmentation Measure Tentatively Selected Plan (Proposed Project). This document addresses the seven descriptions. Further descriptions, an explanation of the planning process, and an evaluation of the Proposed Project can be found in the Bayou aux Carpes Augmentation Measures Evaluation Report (Appendix I). This Report was presented to the Interagency Environmental Team (IET) and the EPA on September 24, 2019. The IET concurred with CEMVN's evaluation and selection of the Proposed Project as the Tentatively Selected Plan at this meeting (Appendix II). The IET includes the National Park Service, US Fish and Wildlife Service, National Marine Fisheries Service, US Geological Survey, Louisiana Department of Natural Resources, Louisiana Department of Environmental Quality, and Louisiana Department of Wildlife and Fisheries.

I. Description of project purpose:

The purpose of the Proposed Project described herein is to partially fulfill conditions described in the EPA's May 28, 2009 Modification of the 1985 Final Determination of the Bayou aux Carpes Clean Water Act (CWA) Section 404(c) Site (BAC Site) status to allow for the discharge of fill associated with construction of the 404(c) flood wall component of the West Closure Complex (WCC) of the West Bank and Vicinity (WBV) Hurricane and Storm Damage Risk Reduction System (HSDDRS).

II. Description of the site:

The BAC Site is in Jefferson Parish, Louisiana, and is bounded on the north by the Old Estelle Pumping Station (OEPS) outfall canal, on the east by Bayou Barataria (Gulf Intracoastal Waterway, or GIWW), on the south by the GIWW and Bayou des Familles, and on the west by State Highway 3134 and the "V-line Levee" (Figure 1). It lies in the upper Barataria Basin within the Mississippi deltaic plain. The majority is managed and owned by the National Park Service as part of the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve; however, there is a privately owned parcel of land known as the Harvey Tract that bisects the BAC Site.

Bayou aux Carpes, a natural waterway within the BAC Site, is plugged at its connection with GIWW (Figure 2). This plug is a manmade feature installed between August 27 and October 31, 1974 by the Jefferson Parish Government. Tidal connectivity within the BAC Site is now maintained through the Southern Natural Gas Pipeline (SNGP) canal that courses through the BAC Site. A few oil and gas canals connect the SNGP canal with Bayou aux Carpes.

III. Description of the current condition, functions, and values of the adjacent wetlands and bayou to the proposed work site:

Approximately 3,000 acres of unique and productive wetlands within the BAC Site are an important regional and national asset providing ecological, flood storage, and water quality benefits to the watershed. Two unique and ecologically valuable wetland habitat types within the BAC Site, naturally regenerating cypress swamp and flotant marsh, are specified in EPA's Modification to the 1985 CWA 404(c) Final Determination. Much less cypress swamp exists in Louisiana today than in the past. This is in part due to large-scale cypress tree harvesting.

Some of the cypress swamp in the BAC Site is naturally regenerating, as saplings have been recently observed in the understory. Flotant marsh is a colloquial term for floating marsh, which is characterized by vegetation that occurs as a buoyant mat floating over water for at least part of the time. This marsh type is sensitive to environmental change and in Louisiana may exist exclusively in low energy environments.

Much of the hydrology and topography in the BAC Site and vicinity is highly altered through a variety of anthropogenic actions, such as construction of roads, levees, spoil banks, canals, and transmission right-of-ways. Historically (~1930s), Bayou aux Carpes was the major natural waterway draining and providing tidal exchange for the BAC Site. Currently, this Bayou is no longer connected to the GIWW, its historic receiving waterway.

See Appendix I for more details regarding current wetland conditions, and their functions and values.

IV. Description of expected habitat improvements to wetlands and or bayou within the Bayou aux Carpes site resulting from the proposed work:

The Proposed Plan would restore a more natural connection between Bayou aux Carpes and Bayou Barataria. Hydrodynamic modeling results suggest removal of the plug would increase sheet flow through area's wetlands and improve drainage, which would likely benefit the existing swamps and marshes found within the BAC Site. The Proposed Plan would also increase fishery and aquatic organism access. Furthermore, any excavated material would be deposited adjacent to the removed plug and used beneficially to create shallow water habitat to the greatest extent practicable. This shallow water habitat could be used as spawning and nursery habitat for many fish species and other aquatic organisms.

V. Description of the proposed work:

The Proposed Plan would involve clearing, excavation, and disposal, and would encompass an area of approximately 2.5 acres (Project Site). Any existing trees with the Project Site would be cleared prior to construction. Approximately 0.7 acres are forested, much of which occurs on the existing shell plug.

Construction access could be by existing road or waterways. Some excavation in the GIWW adjacent to the plug may be needed to provide depths suitable for barge access.

Construction would involve excavating an approximately 50 foot bottom width gap, with roughly 1:2.5 side slopes to the same elevation as the existing Bayou aux Carpes bed (approximately -4.0 feet NAVD88). The resulting top width of excavation would be approximately 100 feet based on an assumption that the existing plug crown elevation is +3.0 feet NAVD88. Excavated material is estimated to be approximately 2,000 cubic yards and would be re-distributed with the Project Site.

VI. Map with location of proposed work:

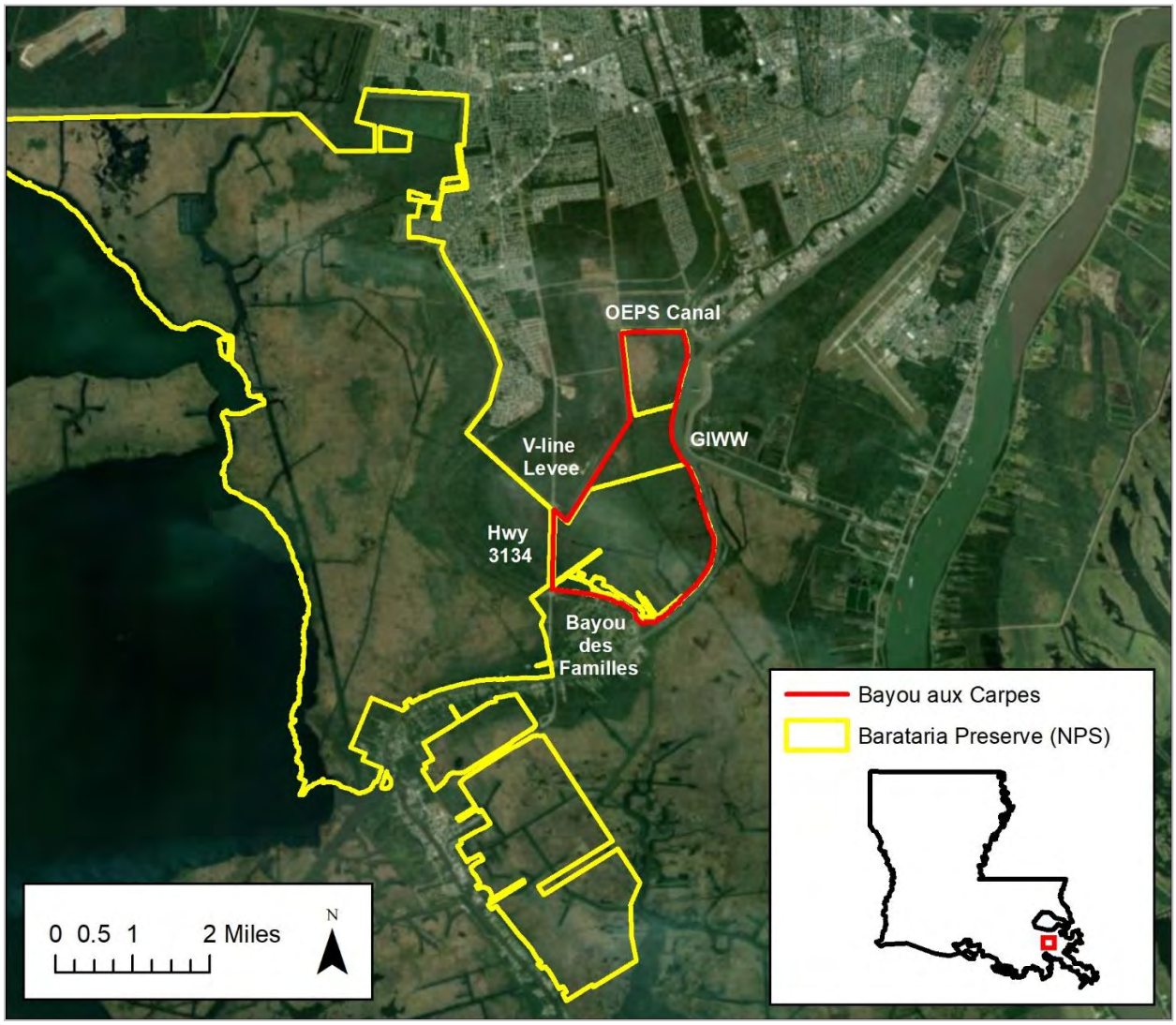

Figure 1. BAC Site and vicinity. The BAC Site is bounded on the north by the OEPS outfall canal, on the east by the GIWW, on the south by the GIWW and Bayou des Familles, and on the west by State Highway 3134 and the "V-line Levee".

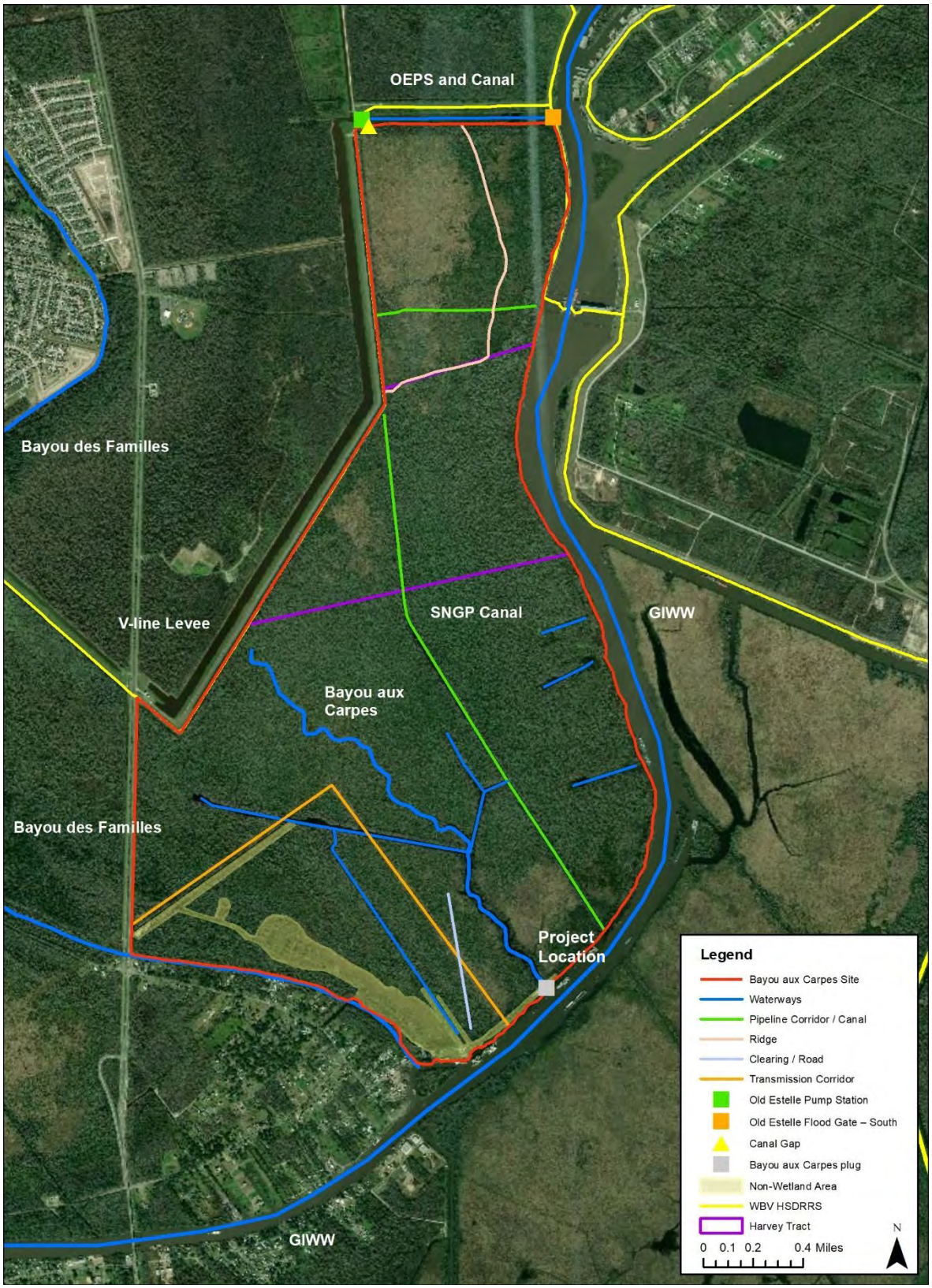

Figure 2. BAC Site and features

VII. Description and location of any discharge into Waters of the United States (WOTUS) associated with work:

In total, approximately 2,000 cubic yards of material would be excavated and discharged within a 2.5 acre Project Site (Latitude 29.77637, Longitude -90.07199; Figure 2). Approximately 0.7 acres would be shell plug, resulting in an estimated 1.8 acres of the construction limits being within the WOTUS.

Some or all of the excavated material may be deposited with the WOTUS at the Project Site. Any material deposited within the WOTUS would be used beneficially to create shallow water habitat to the greatest extent practicable. This shallow water habitat could be used as spawning or nursery habitat for many fishes and other aquatic organisms.

Some excavation in the GIWW adjacent to the plug may be needed to provide depths suitable for barge access. This excavation would be conducted within the WOTUS, but outside of the BAC Site. All material associated with this excavation would be side cast in the GIWW, within the 2.5 acre project area.

Prepared by/for:
U.S Army Corps of Engineers
Regional Planning and Environment Division South
New Orleans District

Bayou Aux Carpes 404(c) Augmentation Measures Evaluation

October 2019

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Appendices

1.0 Introduction

The purpose of this document is to describe and evaluate potential augmentation measures considered to offset any potential impacts due to construction of the WBV 404(c) flood wall component of the West Bank and Vicinity (WBV) Project, West Closure Complex (WCC) by enhancing the hydrology and habitat of Bayou aux Carpes.

The Bayou aux Carpes Clean Water Act (CWA), Section 404(c) site (BAC Site), located in Jefferson Parish, Louisiana, is an approximately 3,000 acre complex with unique and productive wetland habitat. This complex has been an important regional and national asset that provides ecological, flood storage and water quality benefits.

In 1985, the Environmental Protection Agency (EPA) issued its CWA Section 404(c) Final Determination for Bayou aux Carpes, in accordance with 33 U.S.C. §1344(c), and 40 CFR Part 231 (Appendix 1). The EPA took the action to designate the BAC Site as CWA, Section 404(c) due to concerns that construction of the Harvey Canal – Bayou Barataria Levee Project, whose purpose was to provide flood control and land reclamation benefits, would have resulted in additional future land reclamation proposals involving discharge of fill material into the BAC Site by private property owners. Such discharge could have resulted in the eventual loss of BAC Site wetlands to development. The CWA Section 404(c) designation restricts or otherwise prohibits the site for use as a disposal area for dredged or fill material because it was determined that such activities would have unacceptable adverse effects on shellfish beds, fishery areas (including spawning and breeding areas), wildlife, and recreational areas. However, the Section 404(c) designation did include three exceptions, one of which was a provision to allow discharges associated with the then original modified U.S. Army Corps of Engineers (USACE) Harvey Canal – Bayou Barataria Levee Project.

Following Hurricanes Katrina and Rita in 2005, Congress authorized USACE to complete construction of an improved WBV, Hurricane and Storm Damage Risk Reduction System (HSDRRS). This system would ultimately include construction of a storm surge barrier feature that would extend along the northeastern boundary of the BAC Site along the west bank of Bayou Barataria (Individual Environmental Report 12; Appendix 2). The USACE, New Orleans District (CEMVN) worked closely with the EPA and other Federal and state resource agencies to develop a plan to construct the WBV WCC, including the WBV 404(c) flood wall, in such a way as to minimize negative impacts to the BAC Site to the maximum extent possible.

In order to move forward with construction, the CEMVN made a formal request, by letter dated November 4, 2008, to the EPA to modify the Section 404(c) Final Determination for Bayou aux Carpes to include the 4,200 linear foot WBV 404(c) flood wall, including a 100-foot wide corridor (Appendix 3). This work would result in unavoidable permanent impacts to approximately 9.6 acres to forested wetlands (2.3 acres bottomland hardwoods (BLH) and 7.3 acres swamp).

Ultimately, the EPA issued the Modification to the 1985 CWA Section 404(c) Final Determination for Bayou aux Carpes to allow construction of the WBV 404(c) flood wall (Appendix 4). As part of the Modification, the CEMVN committed to fully mitigate and compensate for unavoidable impacts to the Bayou aux Carpes 404(c) area as a result of the flood wall construction, consistent with regulations. In addition to the compensatory mitigation,

the EPA requested (Appendix 5) and the CEMVN committed to evaluate and consider for implementation additional ecological augmentation features that would add an extra measure of environmental benefits due to the unique status of the BAC Site (the subject of this report; Appendix 6). The CEMVN agreed to document for EPA Region 6 the concurrence or non-concurrence on each augmentation feature by an Interagency Environmental Team (IET). The IET includes the National Park Service (NPS), US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), US Geological Society (USGS), Louisiana Department of Natural Resources (LDNR), Louisiana Department of Environmental Quality (LDEQ), and Louisiana Department of Wildlife and Fisheries (LDWF). The CEMVN agreed to fund and implement such ecological augmentation features as part of the WBV Project, if the results of investigations indicate that such augmentation would contribute environmental benefits. If any of the augmentation features are implemented, CEMVN would use an adaptive management approach to monitor changes over time, evaluate the observed results with respect to intended objectives, and apply any changes needed to achieve the desired outcome.

If any augmentation measures(s) are further considered for construction, CEMVN would follow relevant environmental laws, procedures, and policy. This would include the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's Regulations (40 CFR 1500-1508), as reflected in USACE Engineering Regulation ER 200-2-2. Other relevant environmental laws and regulations could include, but may not be limited to the Clean Air Act (CAA), Clean Water Act (CWA), Coastal Zone Management Act, Endangered Species Act (ESA), Bald and Golden Eagle Protection Act (BGEPA), Migratory Bird Treaty Act (MBTA), Fish and Wildlife Coordination Act, Magnuson-Stevens Fisheries Conservation and Management Act, Migratory Bird Treaty Act, and National Historic Preservation Act of 1966 (NHPA).

2.0 Existing Conditions

2.1 Project Area Description

The BAC Site is in Jefferson Parish, Louisiana, and is bounded on the north by the Old Estelle Pumping Station (OEPS) outfall canal, on the east by Bayou Barataria (Gulf Intracoastal Waterway, or GIWW), on the south by the GIWW and Bayou des Familles, and on the west by State Highway 3134 and the "V-line Levee" (Figure 1). It lies in the upper Barataria Basin within the Mississippi deltaic plain. The majority is managed and owned by the NPS as part of the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve (JLNHPP); however, there is a privately owned parcel of land known as the Harvey Tract that bisects the BAC Site.

Bayou aux Carpes, a natural waterway within the BAC Site, is plugged at its connection with the GIWW (Figure 2). This plug is a manmade feature and was installed between August 27 and October 31, 1974, by the Jefferson Parish Government possibly with Federal funding provided as part of the Harvey Canal – Bayou Barataria Levee Project (Appendix 7). Tidal connectivity within the BAC Site is now maintained through the Southern Natural Gas Pipeline (SNGP) canal that courses through the site. A few oil and gas canals connect the SNGP canal with Bayou aux Carpes. There are also several pipeline right-of-ways (ROWs) that traverse the area from east to west across the northern section of the drainage area. Two man-made "keyhole" (colloquial

term that describes the general shape of some oil and gas canals) canals are located perpendicular to the GIWW, but are no longer connected with the GIWW. Currently two hydrologic control devices are located in the OEPS outfall canal. On the west end, Jefferson Parish manages the Estelle Pump Station 1 for interior drainage. On the east end at the junction with the GIWW, the Old Estelle Flood Gate – South is managed by Southeast Louisiana Flood Protection Authority – West (SLFPA-W) for hurricane and storm surge risk reduction. See Figure 2 for a map of BAC Site features.

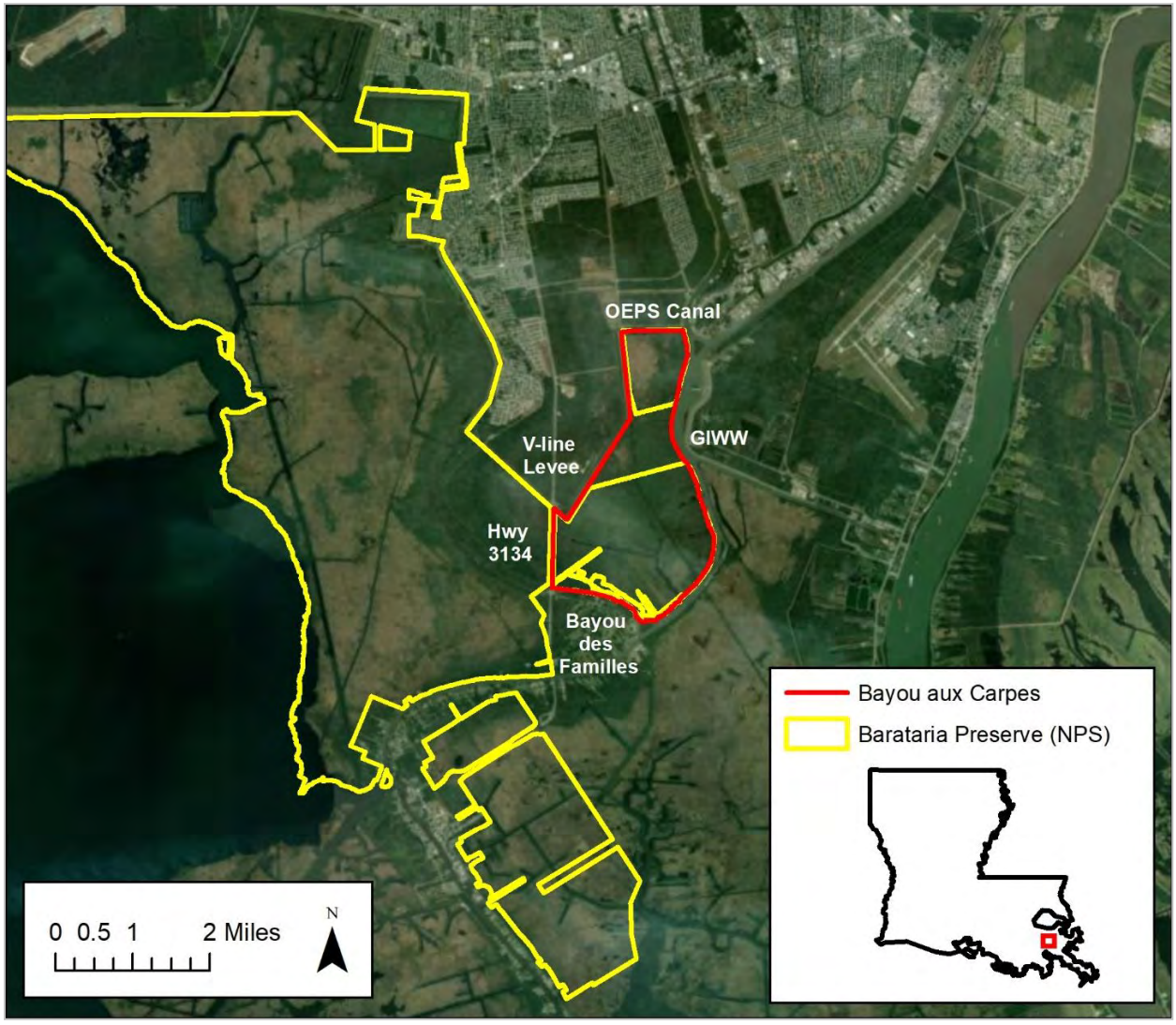

Figure 1. BAC Site and vicinity. The BAC Site is bounded on the north by the OEPS outfall canal, on the east by the GIWW, on the south by the GIWW and Bayou des Familles, and on the west by State Highway 3134 and the "V-line Levee".

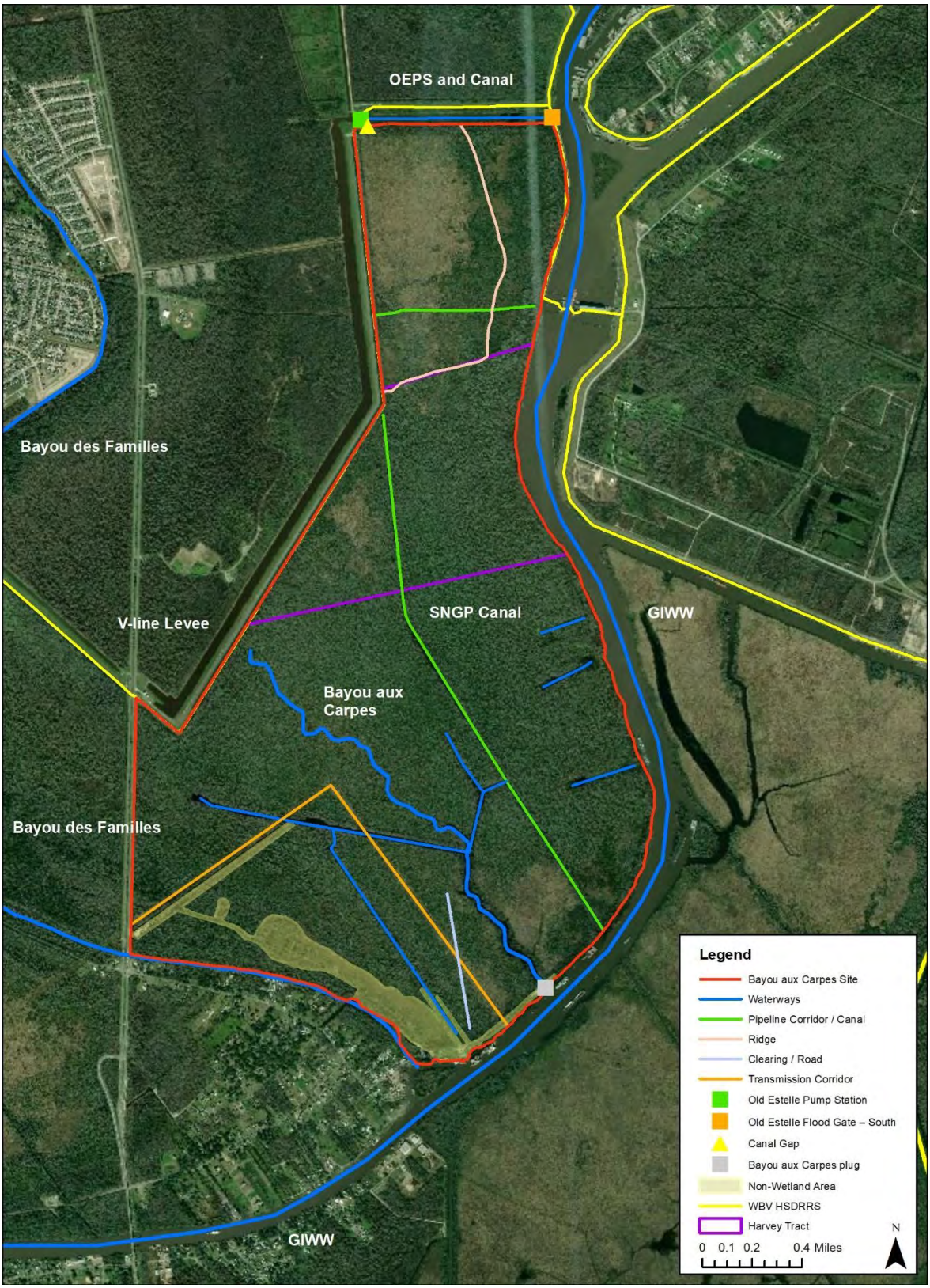

Figure 2. BAC Site and waterways and other features.

2.2 Relevant Resources

Wetlands, wildlife, aquatic resources and fisheries, and water quality have been determined by the EPA to be significant resources for the BAC Site (Appendix 1 and Appendix 5). Under CWA Section 404(c), a finding of unacceptable adverse effects must be based on one or more of the listed resources which include municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, and recreational areas. The CWA Section 404(c) Final Determination for Bayou aux Carpes concluded that it has significant value for all but municipal water supplies. The CWS 404(c) Final Determination also mentions that the BAC Site provides significant values to water quality. The EPA's Modification to the 1985 CWA Section 404(c) Final Determination for impacts related to fill associated with WBV designates BAC Site wetlands as unique and productive, and found two wetland types to be ecologically significant: 1) naturally generating bald cypress swamps; and 2) flotant marsh (Appendix 5).

2.2.1 Wetlands

Approximately 3,000 acres of unique and productive wetlands within the BAC Site are an important regional and national asset providing ecological, flood storage, and water quality benefits to the watershed. The NPS's Vegetation Mapping Inventory Program (VMI) report indicates 20 different habitat classifications, including open water, ruderal (habitat with vegetation indicative of high levels of anthropogenic disturbance), and natural vegetation types (Hop et al, 2017). Three of the top four habitat classifications, by area, are wetland habitat types, making up 52% of the total area (Table 1). Of the remaining 17 classifications, eight are marshes and two are forested wetlands (Figure 3).

Table 1. Top three wetland habitat classifications by area in the BAC Site from NPS's VMI report.

Habitat Type	Description	Acreage	Percent Coverage
Bald Cypress Wooded Marsh	woodlands (25-60% canopy cover) dominated by bald cypress that are inundated to flooded	1120	30%
Bald Cypress Tupelo Flooded Forest	Forests (≥ 60% canopy cover) dominated by bald cypress that are inundated to flooded	501	14%
Arrowhead-Spikerush-Maidencane Marsh	Herbaceous marsh community dominated by bultongue arrowhead (*Sagittaria lancifolia*) and spikerush (*Eleocharis* spp.), and occasionally by maidencane (*Panicum hemitomon*)	290	8%

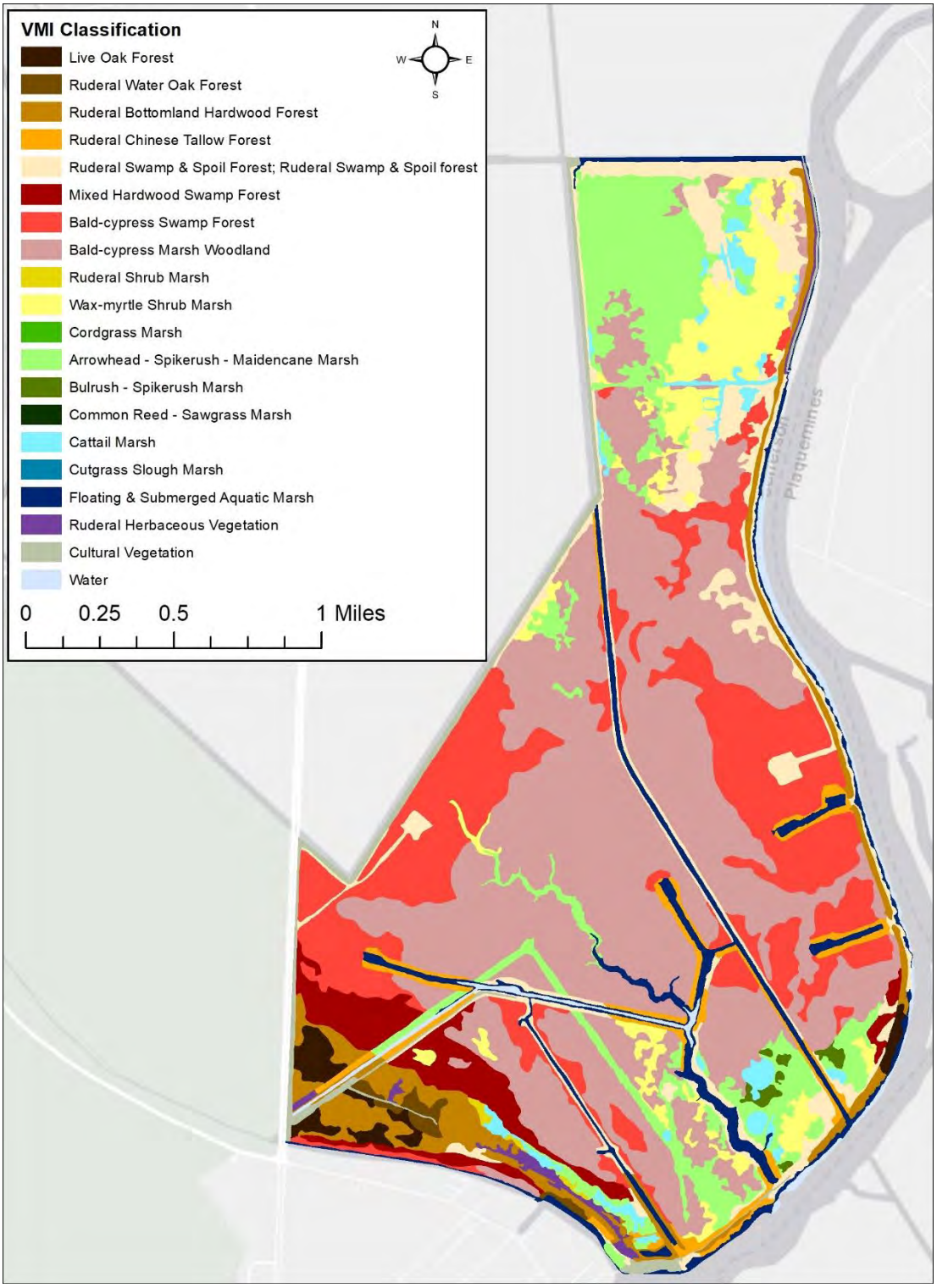

Figure 3. Map classifications based on the National Park Services (NPS) Vegetation Mapping Inventory Program (VMI: Hop et al, 2017).

2.2.1.2 Cypress Swamp

Naturally regenerating cypress swamp is specified in EPA's Modification to the 1985 CWA 404(c) Final Determination as one of two unique and ecologically valuable wetland habitat types found within the BAC Site (Figure 4; Appendix 5). Much less cypress swamp exists in Louisiana today than in the past. This is in part due to large-scale cypress tree harvesting that mainly occurred from 1890 - 1940. Despite being capable of coppice regeneration, natural regeneration of cypress swamps remains low in coastal Louisiana. There are several factors that may have contributed to this, including altered hydrology, subsidence, sea level rise, land loss, and herbivory (Conner and Toliver, 1990). Some of the cypress swamp in the BAC Site is naturally regenerating, as saplings have been recently observed in the understory.

2.2.1.3 Flotant Marsh

Flotant marsh is also specified in EPA's Modification to the 1985 CWA 404(c) Final Determination as one of the unique and ecologically valuable wetland habitat types found within the BAC Site (Figure 4; Appendix 5). Flotant marsh is a colloquial term for floating marsh, which is characterized by freshwater vegetation that occurs as a buoyant mat floating over water for at least part of the time. This mat, which includes the plant's roots and soil, remains on the water's surface by moving vertically as water level changes. This unique characteristic allows flotant marsh to be resilient to periodic flooding, but they may appear exclusively in low energy environments in Louisiana (Sasser et al, 1991, Sasser et al., 1996) and elsewhere (Junk and Howard-Williams, 1984; Azza et al., 2006). While many different vegetation communities occur in Louisiana's flotant marshes, in general they exhibit high plant diversity (Russell, 1942; Sasser et al., 1996). Unique hydrology influences the quality and health of these sensitive wetland habitats (Zhang and Nepf, 2011). For example, if water levels recede for an extended duration, flotant marsh vegetation may root into the underlying substrate. If the marsh vegetation becomes rooted into the underlying substrate and water level rises, vegetation could drown; or if water level rises too rapidly the marsh can break apart (Thompson 1985; Azza et al., 2006). As such, flotant marsh may be more susceptible to collapse following high energy events (e.g., tropical storms). There are several different ways in which flotant marsh may form, including expansion of root mats into open water and colonization of floating aquatic vegetation (FAV; Russell, 1942).

Figure 4. Swamp (left) and flotant marsh (right) within the BAC Site.

2.2.2 Wildlife Resources

The CWA Section 404(c) designation was based, in part, on significant values to wildlife.

During field studies in 1984 and 1985, at least 70 wildlife species were found within the BAC Site. The site provides valuable habitat for resident waterfowl and migratory game species (e.g., wood ducks (*Aix sponsa*), mallards (*Anas platyrynchos*), and other waterfowl) and non-game species (e.g., great blue herons (*Ardea herodias*) and great egrets (*Ardea alba*)). Bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) have been observed in the area as well. Several species of non-game, resident and migratory birds (e.g., red-headed woodpecker (*Melanerpes erythrocephalus)*, prothonotary warbler (*Protonotaria citrea*), and wood thrush (*Hylocichla mustelina*)) that are known or expected to utilize the project area have exhibited substantial population declines throughout their respective ranges over the last 30 years, primarily as the result of habitat loss and fragmentation.

The USFWS's 1985 Habitat Evaluation Procedures (HEP) analysis determined that BLH and wooded swamp habitats rated moderate to high value for all species evaluated (i.e., eastern gray squirrel (*Sciurus carolinensis*), pileated woodpecker (*Dryocopus pileatus*), American mink (*Neovison vison*), wood duck, great egret, American alligator (*Alligator mississippensis*), and muskrat (*Ondata zibethicus*)). Upland forested habitat rated low for gray squirrel and pileated woodpecker, but was found to be optimal for mink. Scrub-shrub wetlands rated high for wood duck wintering and alligator habitat, and moderate for mink, great egret, and muskrat. Fresh marsh rated high to moderate as alligator, mink, and muskrat habitat.

2.2.3 Aquatic Resources and Fisheries

The CWA Section 404(c) designation was based, in part, on significant values to shellfish beds and fishery areas (including spawning and breeding areas).

Twenty-three freshwater fish species, and 27 taxa of macroinvertebrates were observed during USFWS 1985 surveys. The field data showed the area supports species that can tolerate low salinities. Bayou aux Carpes has valuable spawning, feeding, and nursery habitat for recreationally important freshwater fish such as largemouth bass and various other sunfishes, crustaceans such as crawfish and grass shrimp, and estuarine species such as striped mullet and blue crab. Analysis of samples collected in 1985 indicated that forage species (e.g., western mosquitofish (*Gambusia affinis*), threadfin shad (*Dorosoma petenense*), and golden top minnow (*Fundulus chrysotus*)) were the most abundant fish species. The invasive Apple Snail (*Pomacea maculata*) has also colonized the area.

Aquatic vegetation, such as FAV and submerged aquatic vegetation (SAV) can be found in low energy waterways throughout the BAC Site. Generally, SAV are indicative of good water quality and provide important habitat for many fishes and macroinvertebrates (Rozas and Odum, 1987). However, based on personal observation, most of the FAV is non-native water hyacinth (*Eichhornia crassipes*) and *Salvinia* spp., which are considered to be nuisance species throughout the Southeastern US.

2.2.4 Recreational Resources

The CWA Section 404(c) designation was also based, in part, on significant values to recreation.

The NPS has an agreement with the EPA to manage the BAC Site as part of the Barataria Preserve. Many people use the area to view wildlife, hunt, fish, and enjoy nature in the BAC Site. In addition, at least one swamp tour business operates within the BAC Site. Access to the BAC Site is primarily via watercraft, with the major public access point being the juncture of the SNGP canal and the GIWW. This includes access to the Harvey Tract, a section of privately owned land within the BAC Site.

2.2.5 Water and Soil Quality

The CWA Section 404(c) designation was also based, in part, on significant values to water quality.

Water quality in the BAC Site is influenced by natural as well as anthropogenic controls. The hydrology in the area is highly altered due to many anthropogenic impacts (e.g., canals, spoil banks, pumping, and oil and gas infrastructure).

2.2.5.1 Surface Water Quality

A water quality report on all waters of the Barataria Preserve, excluding the BAC Site, indicated high fecal coliform counts associated with rain events, periodic low dissolved oxygen for some areas, low nitrate, normal pH, low extractable Phosphorus except following rain events, seasonal and meteorological changes in specific conductivity, generally low turbidity with some seasonal trends, and warm seasonal temperatures (Meiman, 2015). These findings may be indicative of the general water quality characteristics of the BAC Site, because of its proximity to Meiman's (2015) study area.

Many freshwater sources influence the BAC Site and vicinity. These may be generalized into three groups: 1) waters associated with the Mississippi River; 2) stormwater drainage; and 3) direct rainfall. The interaction between the BAC Site and all of these water sources varies as water follows an elevation gradient. The net effect of any one water source would depend on the contributions of all of the other sources.

Fresh water from the Mississippi River is periodically conveyed into the Barataria Basin near the BAC Site from sources including the Mississippi River via the Harvey and Algiers Locks, the Atchafalaya River via the GIWW, and potentially the Davis Pond Freshwater Diversion structure (Swarzenski, 2003a; Meiman, 2015). Many studies suggest that re-introduction of Mississippi River water into coastal freshwater wetlands would build land and improve wetland habitat (e.g., Lane and Day, 1999, Allison and Meselhe, 2010, Shaffer et al., 2016, Baustian et al., 2019), but there are some important concerns associated with increased nutrient loading and pollutants (e.g., Turner and Rabalias, 1991, Boyd et al., 2003, Zhang et al., 2012) that may reduce substrate and plant health (Swarzenski et al., 2008).

USGS collected and analyzed stormwater samples at three locations within the BAC site vicinity (Figure 5) during a period of high precipitation (more than four inches in three days) in March 2012 (Appendix 8). Atrazine and Fipronil were above detectable limits for all sites tested. The highest concentrations were found outside of the BAC Site (Site 3 in Figure 5), which was the only area sampled that was actively conveying stormwater. The pumps located at the OEPS outfall canal were not in use and stormwater was not being conveyed down OEPS outfall canal during this high rainwater event. See section 2.2.5.3 for more information on the recent operation of the OEPS.

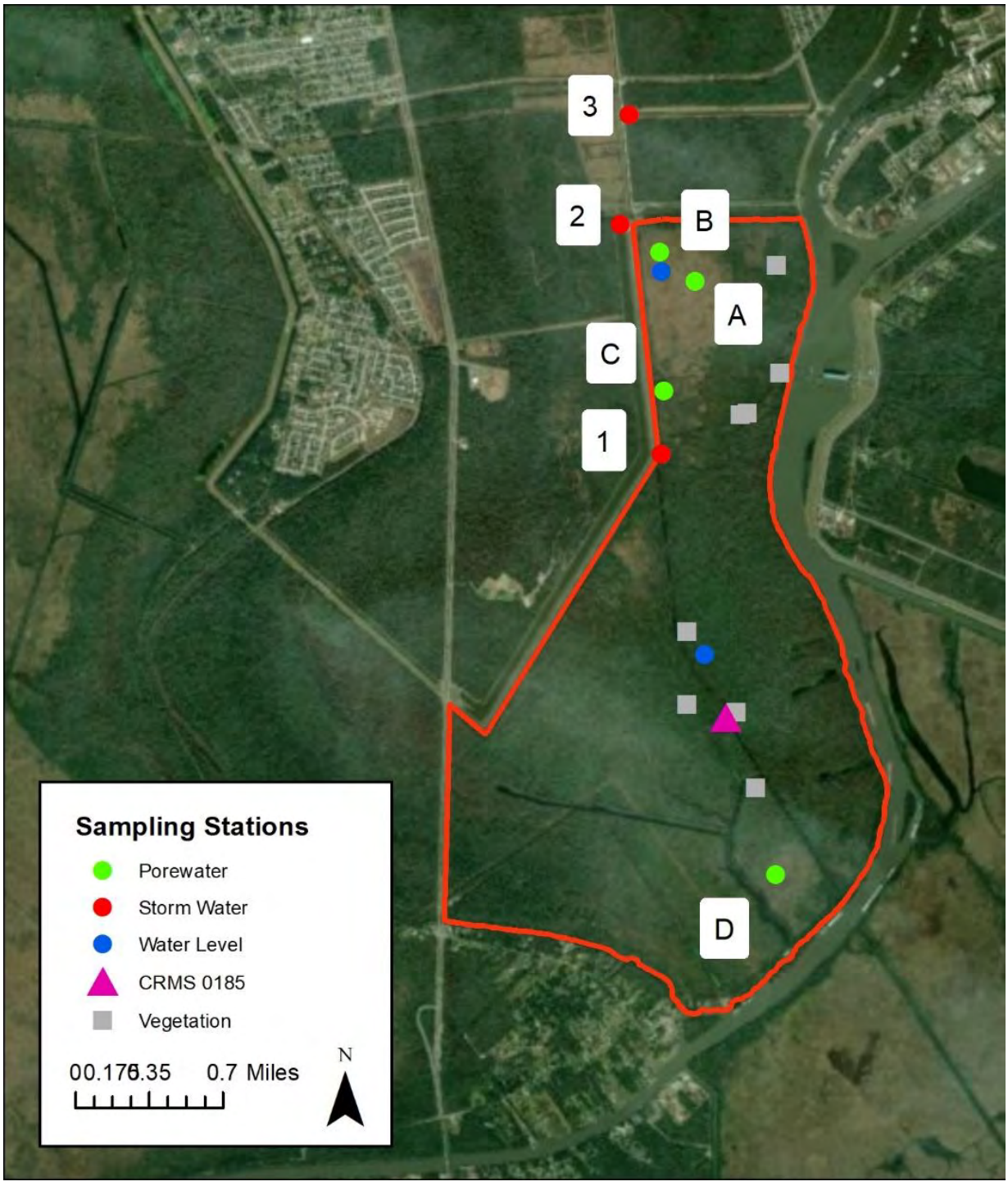

Figure 5. Monitoring stations from the Baseline Monitoring of Bayou aux Carpes (c) Marshes, Jefferson Parish, from 2009-2012 Report (porewater, stormwater, water level; Appendix 8) and the Bottomland Hardwood and Swamp Forest Monitoring Plan for the EPA CWA Bayou aux Carpes 404(c) Area (Vegetation; Appendix 15). Porewater sampling stations are labeled with letters and stormwater sampling stations are labeled with numbers. The Coastwide Reference Monitoring System (CRMS) Station 0185 is also shown.

Evidence suggests that rainwater may be one of the most influential water sources for the BAC Site. A water quality study of the nearby Barataria Preserve indicated that local rainfall, along with seasonality, may be the major components impacting water quality in these nearby marsh and swamp habitats (Meiman, 2015). Hydrodynamic modeling indicated that rainfall can significantly influence BAC Site hydrology (Appendix 9, Section 2.2.5.3).

Based on available data, BAC Site water surface salinities are typically less than 1.0 parts per thousand (ppt). However, there has been one recorded spike in salinity in the recent past. Coastwide Reference Monitoring System (CRMS) Station 0185 is located on the SNGP canal within the BAC Site (CPRA, 2017). This station's surface water salinity was analyzed from September 13, 2011 to March 31, 2017. These data suggest no obvious increasing or decreasing trends for surface water salinity during the period of analysis with consistently low salinities observed (mean = 0.34, standard deviation = 0.23; Figure 6). However, from October 23, 2015 to March 13, 2016 a period of high salinity was observed (red box in Figure 6), with a maximum salinity of 5.46 ppt recorded on October 26, 2015. There was no tropical system during this time period, and other nearby stations continuously recording salinity (i.e., nearby CRMS and National Oceanic and Atmospheric Administration stations) indicated similar trends. While the cause of increased salinity was not analyzed, it could have been due to wind patterns, low Mississippi River discharge, and/or drought conditions. It should be noted that two tropical storm systems, including Hurricane Isaac, affected the BAC Site and vicinity between September 13, 2011 and March 31, 2017. However, lower water surface salinities were observed during these tropical storm events compared to observations from the October 23, 2015 to March 13, 2016 time period.

Herbicides (BASF Plateau, BASF Overdrive Monsanto Round Up Pro Max, Dupont Pastora, Monsanto Outrider, and Weedestroy Am-40) are applied in the OEPS outfall canal by Jefferson Parish approximately three times per year (Mitchell Theriot, Director, Jefferson Parish Department of Drainage, October 2017).

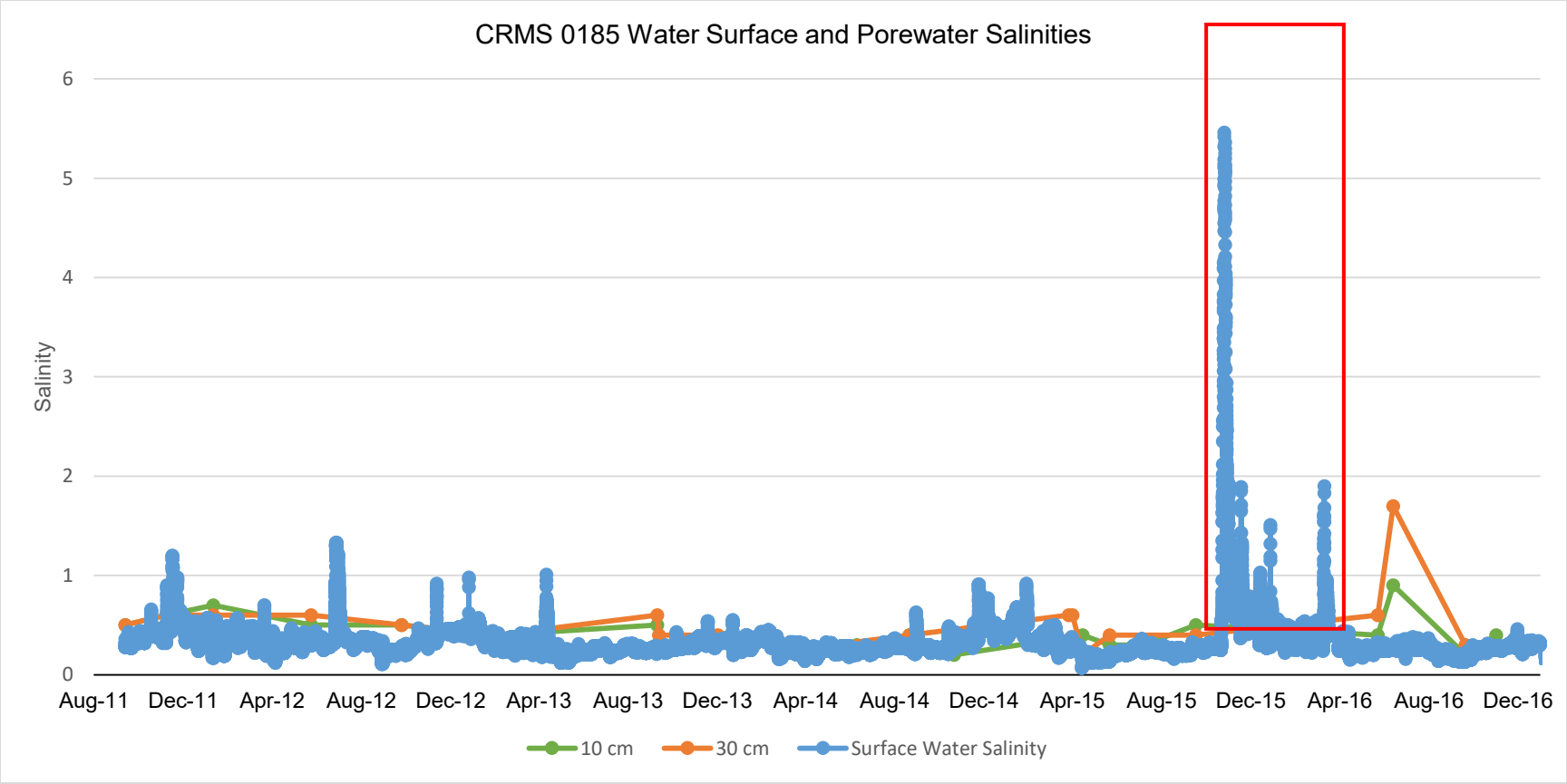

Figure 6. This plot shows surface water and porewater salinities from CRMS Station 0185, located on the SNGP canal. Mean porewater salinities are shown at depths of 10 cm and 30 cm below the surface of the substrate. A period of high surface water salinities from October 23, 2015 to March 13, 2016 is indicated by a red box.

2.2.5.2 Porewater and Soil Quality

The USGS performed porewater surveys for marsh sites within the BAC Site from 2009 to 2012, and compared them to nearby healthy reference sites located within the Barataria Preserve as a part of the Baseline Monitoring of Bayou aux Carpes 404(c) Marshes, Jefferson Parish, from 2009-2012 Report (Appendix 8). The goal was to analyze a variety of surface and porewater samples for indications of decomposed marsh soil organic matter. In addition, the USGS tested stormwater for contaminants (Section 2.2.5.1) and water levels (Section 2.2.5.3).

Porewater constituents [salinity, calcium, strontium, magnesium, alkalinity, dissolved organic carbon (DOC), total nitrogen (TN), ammonium, ortho-phosphate, pH, conductance, and temperature] were tested quarterly from December 2011 through September 2012 at the soil surface and below the soil surface at four locations within the BAC Site (Figure 4). Soil decomposition was also estimated by measuring the original volume, a non-fractionated volume, and a fractionated volume using methodology described by Swarzenski and others (2008).

Soil porewater analysis results from the Baseline Monitoring of Bayou aux Carpes 404(c) Marshes, Jefferson Parish, from 2009-2012 Report are summarized below, by site (Appendix 8)

Site A is located on the interior of the BAC Site near the OEPS outfall canal (Figure 4). It was composed of flotant marsh dominated by maidencane (*Panicum hemitomon*). Site A had relatively high DOC and TN values, but the ratio between the two did not differ from other sites. Calcium to strontium ratios (Ca:Sr) can be used to differentiate rainwater and Mississippi River water for this area (Swarzenski, 2003b). In addition, Ca:Sr decline as salinity increases. The Ca:Sr for Site A suggested that something other than rainwater or seawater was influencing soil porewater. There was nothing to suggest poor or decomposed soil based on any other analysis. It could be inferred that a source water other than rainwater or seawater is influencing Site A, but does not have a deleterious effect on the soil. Waters from the OEPS outfall canal could be influencing Site A based on its proximity to a cut and channel along the south side of this Canal (Figure 4).

Site B is located on the interior of the BAC site and is the closest site to the channel connecting the BAC Site with the OEPS outfall canal (Figure 4). It was composed of attached marsh dominated by maidencane, and a water level gage was installed nearby. The Ca:Sr suggested that this site was affected by source waters other than rainwater and seawater. There was high alkalinity and inorganic nutrients, and low salinity which suggest mineralized soils. These findings along with the Ca:Sr suggest that source waters' influence may have resulted in a relatively poor quality soil. This site had the lowest ratios of non-fractionated and fractionated soil volumes to original soil volume. It was interpreted to have the most decomposed soil further corroborating lower quality soil conditions. Site B is located adjacent to a large (approximately 100 feet wide) channel that connects the OEPS outfall canal with the interior BAC Site, suggesting it is more influenced by these source waters than other sites tested. Results for Site B suggest that OEPS outfall canal water may be negatively impacting marsh soils at Site B.

Site C is a mixed marsh and forested site located near the terminus of the SNGP canal at the V-line levee (Figure 4). Spike rushes (*Eleocharis* spp.) were the dominant marsh species present.

Ammonium was elevated at Site C, but this did not appear to be related to reactions with seawater because concentrations were not concomitant with elevated alkalinity and salinity values. The Ca:Sr did not suggest source water greatly affected the soil porewater. The ratios of fractionated and non-fractionated volumes to original soil volumes suggested that soil decomposition was low. Ortho-phosphate concentrations were not high. These findings suggest that source waters may be slightly affecting the soil at Site C, but that it was in better condition than Sites B and D.

Site D is a marsh site along Bayou aux Carpes near the plug at the GIWW composed primarily of Olney's three-square bulrush (*Schoenoplectus americanus*) and cattail (*Tyhpha* spp). It had the highest average porewater salinity (2.0 ppt, Site A was the next highest with 1.0 ppt) and the highest alkalinity. Ca:Sr did not suggest that waters other than seawater and rain water affected the soil porewater. Inorganic nutrients were elevated for Site D. The soil decomposition tests could not be performed at this site, because cattail confounds the results of this test. The results for Site D suggest that its soil is in relatively poor condition as a result of seawater impacts.

Soil porewater salinity from CRMS Station 0185 (Figure 4) was analyzed from September 13, 2011 – March 31, 2017 (Figure 5). Salinity for all but one sample was below 1.5 ppt. The highest measured values were in 2016, which followed a period of high surface water salinity (Figure 5). Soil porewater salinity appears to have decreased following the high values measured in 2016.

2.2.5.3 Hydrology

The hydrology in the BAC Site and vicinity was greatly modified prior to its CWA Section 404(c) designation, mainly through the construction of canals, placement of spoil material, levee construction, and oil and gas infrastructure (Figure 2). There are also several pipeline and power transmission ROWs that traverse the area from east to west across the northern section of the drainage area. Two man-made "keyhole" canals are located perpendicular to the GIWW, but are no longer connected to the GIWW.

The vicinity was historically mostly forested and natural drainage features included Bayou des Familles and Bayou aux Carpes. The upstream extents of both bayous were cut off by construction of the V-Line levee and canals. Hydrologic connection between Bayou aux Carpes and the GIWW was cut-off upon construction of a shell plug at the confluence of these two waterways. Currently the SNGP canal provides the only completely open exchange (i.e., without a control structure) between the BAC Site and the GIWW. The SNGP canal is connected to Bayou aux Carpes via old oil and gas access canals. There are many existing gaps in the spoil banks along Bayou aux Carpes and the SNGP canal (Appendix 9, Figure 7).

Figure 7. Location of gaps along the SNGP canal and Bayou aux Carpes.

Historically the northern section of the BAC Site was part of an expansive marsh complex (see Figures 9 and 10) and is now isolated from that complex due to construction of the hurricane protection levees to the north, east, and west of the site. Additionally, an area of slightly higher elevations near the center of the BAC Site may restrict water movement from the north to the south unless the area experiences high rainfall. The OEPS outfall canal is adjacent to and outside of the WBV levee system.

Currently two hydrologic control devices are located on the OEPS outfall canal. On the west end, Estelle Pump Station 1 is managed by Jefferson Parish and was activated less than once per month (16 total days) from January 2016 through September 2017 (Mitchell Theriot, Director, Jefferson Parish Department of Drainage, October 2017). A plot showing the number of hours/day the pump station was operated versus the number of inches of rain per day does not indicate a clear association with rainfall (Figure 8). This may be due to Estelle Pump Station 1 being operated less frequently since the installation of a newer pump farther north. A gap in the southern bank of the OEPS outfall canal near the pump station (approximately 100 feet wide) allows for flow exchange with the adjacent flotant marsh habitat. On the east end of the OEPS outfall canal, at the junction with the GIWW, the Old Estelle Flood Gate – South is managed by SLFPA-W. The gate currently remains in the open position except during threat of an approaching tropical storm. A large rain event co-occurred with baseline monitoring conducted by USGS in March 2012 (See Appendix 8). Despite receiving approximately six inches of rain in three days, the pumps at the OEPS were not activated during this event.

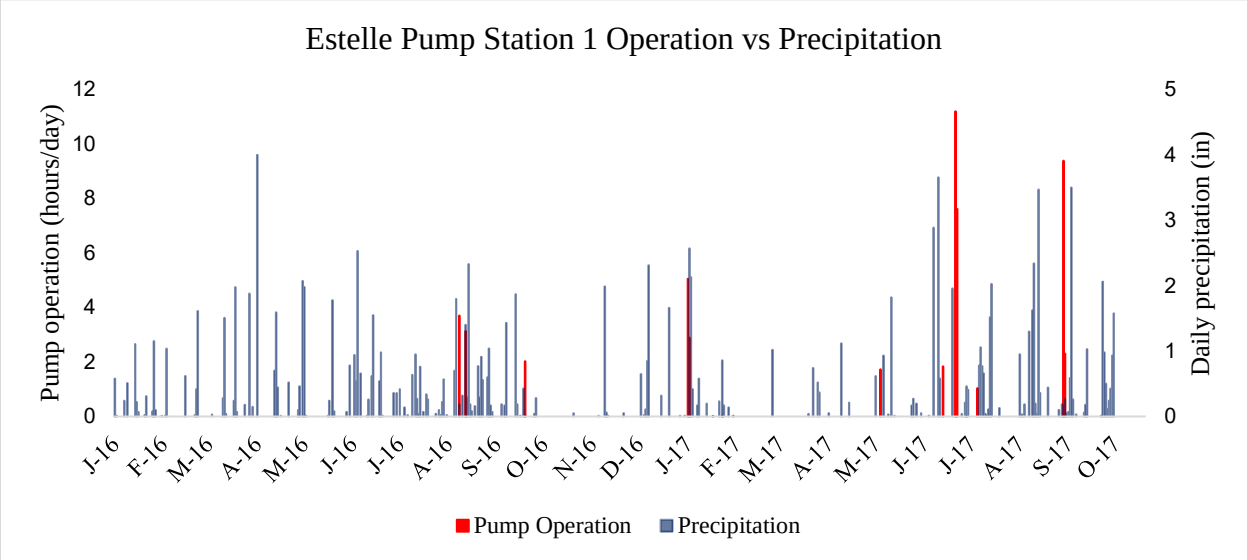

Figure 8. Estelle Pump Station 1 Operation vs. Precipitation. Jefferson Parrish provided pump operation in hours/day for each day from 1 January 2016 through 30 September 2017. These data were plotted and compared to daily precipitation totals for the New Orleans International Airport, which is approximately 15 miles northwest of the BAC Site.

The USACE 2013 model study evaluation, BAC Site: Improved Circulation Study (Appendix 9, annex 1), and subsequent Model Study Revisions (Appendix 9, annex 2) evaluated hydrodynamics and the potential impacts of various augmentation measures to the BAC Site. A

2-Dimensional Free Surface Finite Element Code (RMA2) hydrodynamic model with the Marsh Porosity wetland simulation feature was used. Model bathymetry and topography were developed using Light Detection and Ranging (LIDAR) data. LIDAR data that indicated erroneously high elevations in some of the marsh areas in the northern BAC section were used in the initial model, but were corrected with GPS-based field data for the model revision. A tidal signal from the nearby Boomtown Casino Gage on Harvey Canal was applied at the boundary. Initial modeling indicated that flow exchange within the BAC Site was tidally dependent. The model used a tidal signal with a slower rising tide and a quicker falling tide with similar changes in water surface elevation, and indicated that the quicker falling tide resulted in more flow exchange than the slower rising tide.

The initial model simulations for OEPS were run with 256 cubic feet per second (cfs) and 515 cfs discharges, with the T-Wall sluice gates closed and compared the existing condition to the optimized plan condition of a 250-foot wide gap in the spoil bank, with rainfall (1.75 inches per hour for 10 hours). The revised model refined simulations for OEPS outfall canal to include a 75-foot wide gap, the T-Wall sluice gates opened and closed, and with and with/out rainfall conditions over the BAC Site. The revised model used a 24 hour duration rainfall event from April 30, 2004 (approximately 4 – 6 inches total).

LIDAR data used in the initial Improved Circulation Study indicated a slight rising slope from the SNGP canal to the OEPS outfall canal (south to north) in the BAC Site. Despite this, modeling suggests that sheet flow from north to south may be possible during a rainfall event. Water elevation data from the Baseline Monitoring of Bayou aux Carpes 404(c) Marshes, Jefferson Parish, from 2009-2012 Report corroborated water flowing from north to south within the BAC Site (Appendix 8). Additionally, the hydrologic modeling indicated that the many gaps in the SNGP canal spoil banks should not inhibit sheet flow from the north to south (Appendix 9 Annex 2; Figure 4). There is a ridge oriented perpendicular to the OEPS outfall canal that may influence east to west flow exchange within that part of the BAC (Figure 2). There are several raised areas in the southern section of the BAC Site that influence hydrology (Figure 2).

Flow exchange area was estimated for each model run, because increased flow exchange in backwater swamps of Louisiana has been associated with benefits to water quality and plant health (Lane et al., 2015, Baustian et al., 2019). Flow exchange acres were calculated by a two-step process. First, flow velocity vectors were contoured. Then, all areas with flow velocity contours greater than 0.05 feet per second were summed. Flow exchange was used to compare existing conditions and the effects of augmentation measures in the final array (Section 5.2).

3.0 Habitat and Land Use Change

3.1 Aerial Photography

Historic aerial photography was assembled and visually analyzed for land use and habitat trends in the BAC Site and vicinity from over a 52 year period (1936-1987). Aerial photography from 1936 was provided to CEMVN by the NPS (Figure 9). The CEMVN maintains a historic aerial photography database which organizes photographs and mosaics by month and year. This entire database was visually scanned using GIS software (ESRI ArcMap 10.2.2) and high quality photographs and mosaics from select years between 1945 and 1987 are shown in

Figures 10 through 15. Figures 1 and 2 in Section 2.1 can be used to reference the location of BAC Site waterways and features. The keyhole canals, the SNGP canal, and the OEPS outfall canal can be first seen in 1965 photography, indicating these features were constructed between 1945 and 1965. The final canal connecting the SNGP canal with Bayou aux Carpes is first apparent in the March 1974 photography, indicating this connection was finished between 1968 and 1974. Highway 3134 can be first seen in 1987, suggesting it was constructed between 1974 and 1987. Widening of the GIWW is apparent throughout this time series, especially between 1936 and 1945. Circular areas along the western bank of the GIWW may be indicative of the deposition of dredged material from the widening and/or deepening of the channel and subsequent channel maintenance. Much of the area was historically drained by Bayou aux Carpes which was plugged from August 27, 1974 and October 31, 1974, according to a January 23, 1975 letter from the CEMVN District Engineer (Appendix 7). Aerial photography from March 1974 and May 1975 corroborates this letter (Figure 16).

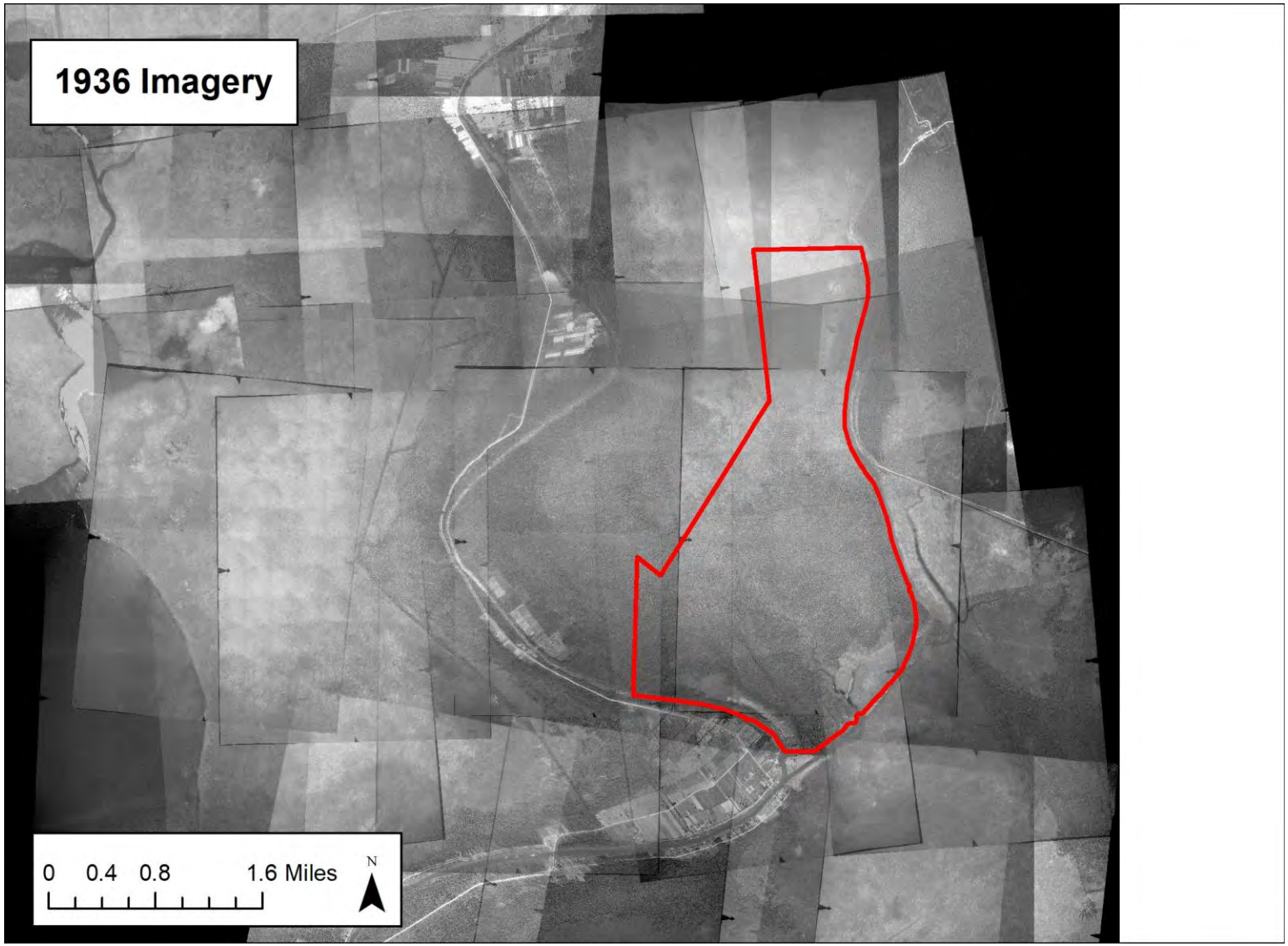

Figure 9. Aerial photography of the BAC Site (outlined in red) and vicinity from 1936 provided by the NPS.

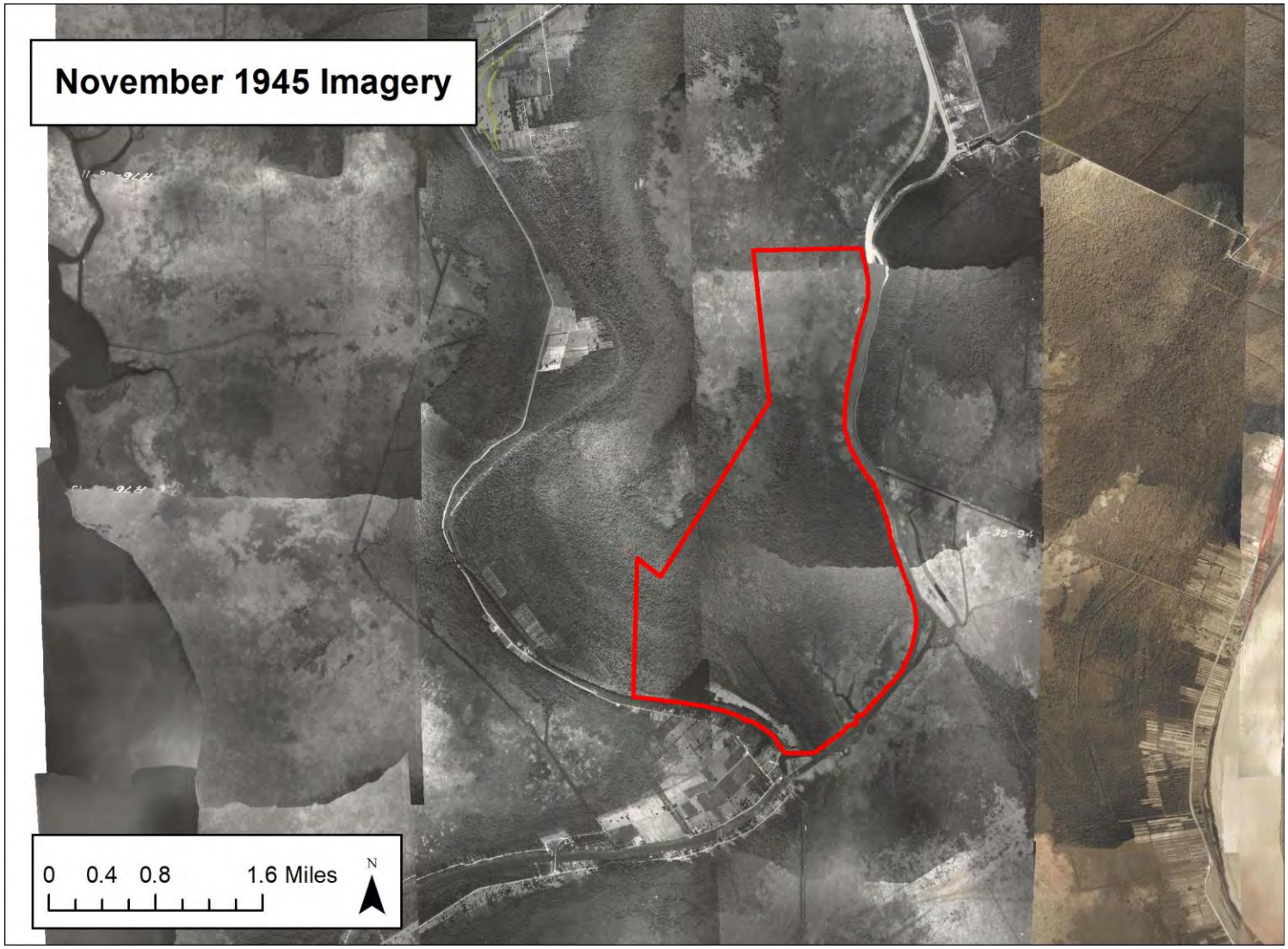

Figure 10. November 1945 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

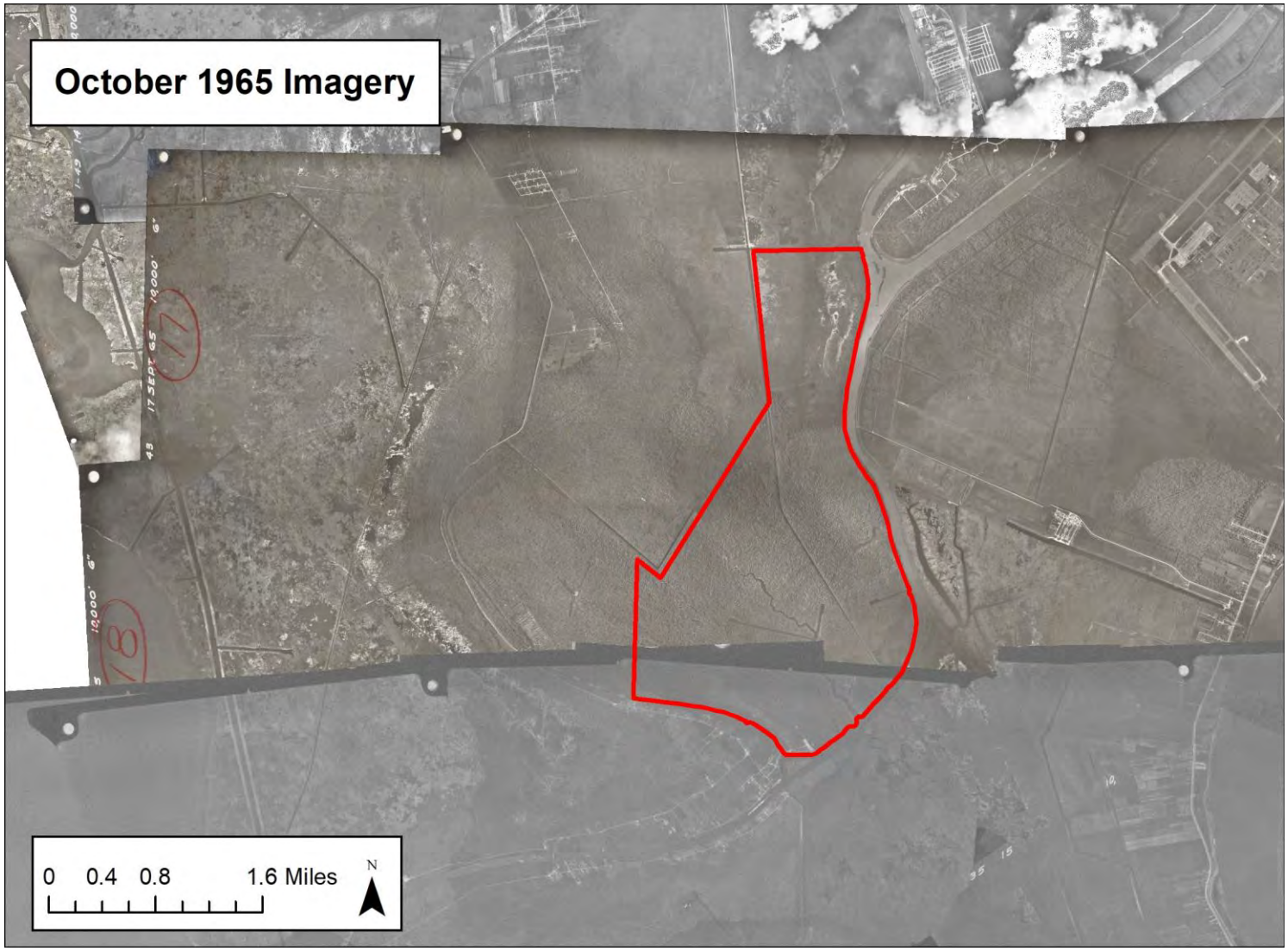

Figure 11. October 1965 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

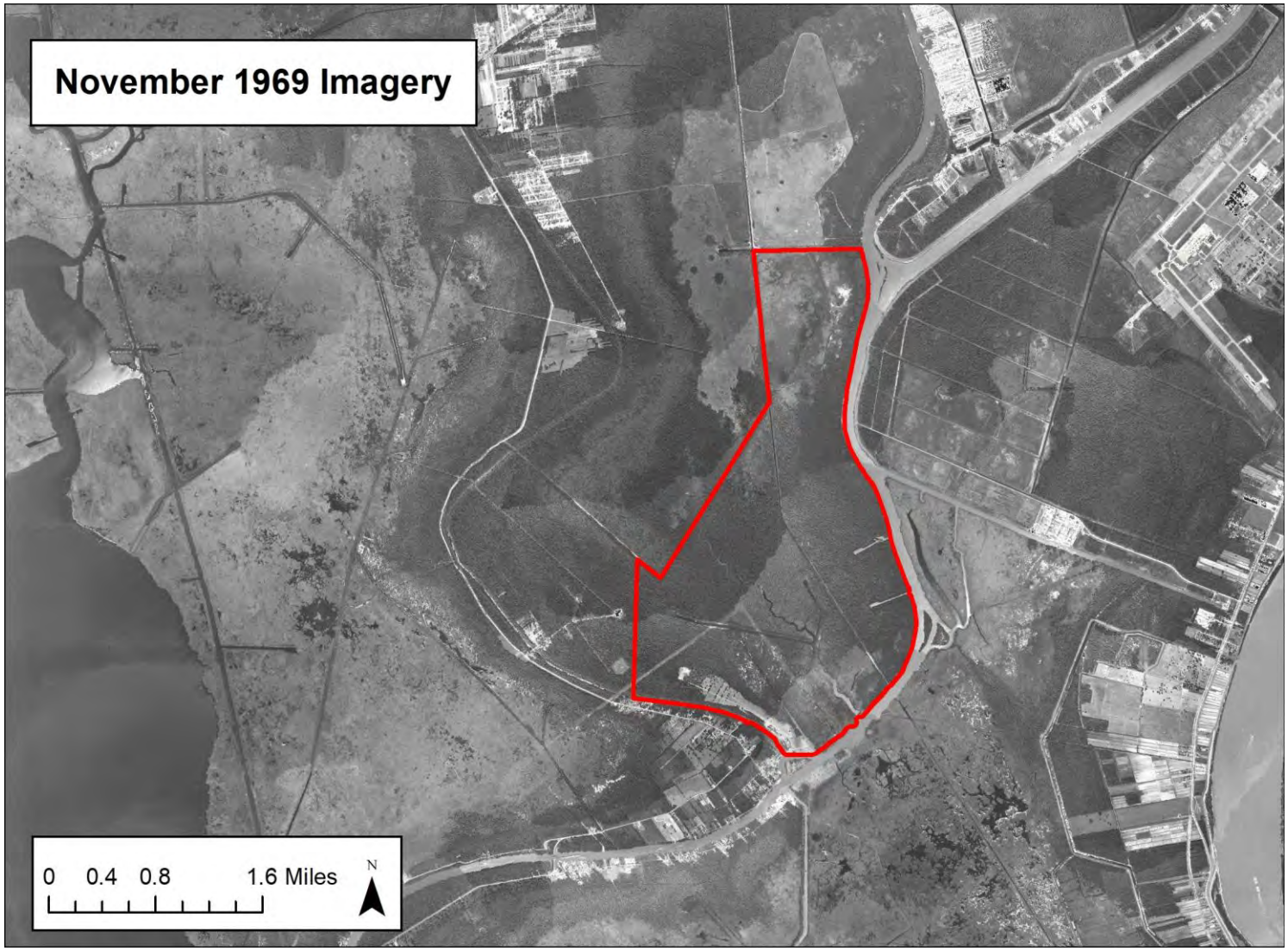

Figure 12. November 1969 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

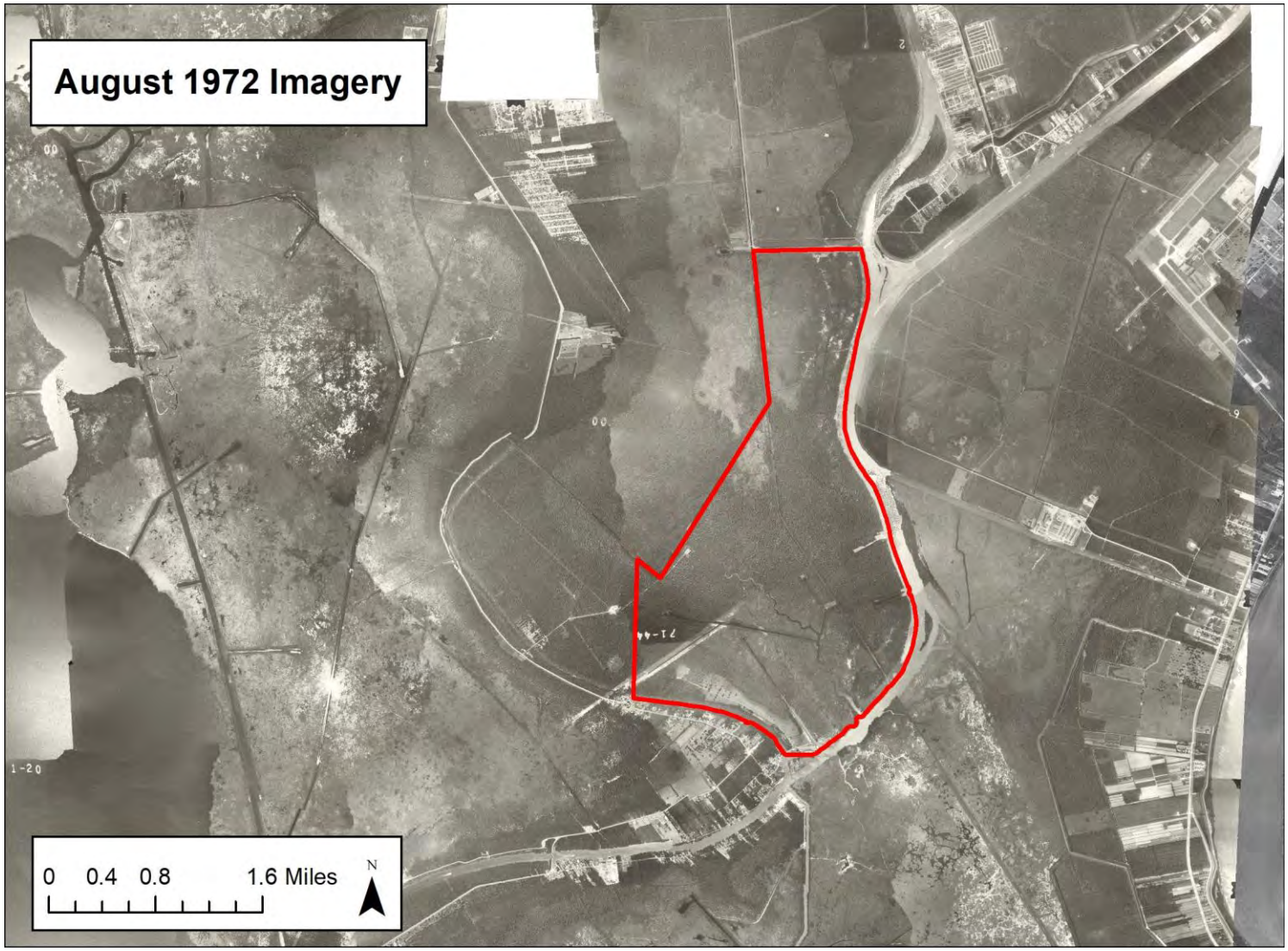

Figure 13. August 1972 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

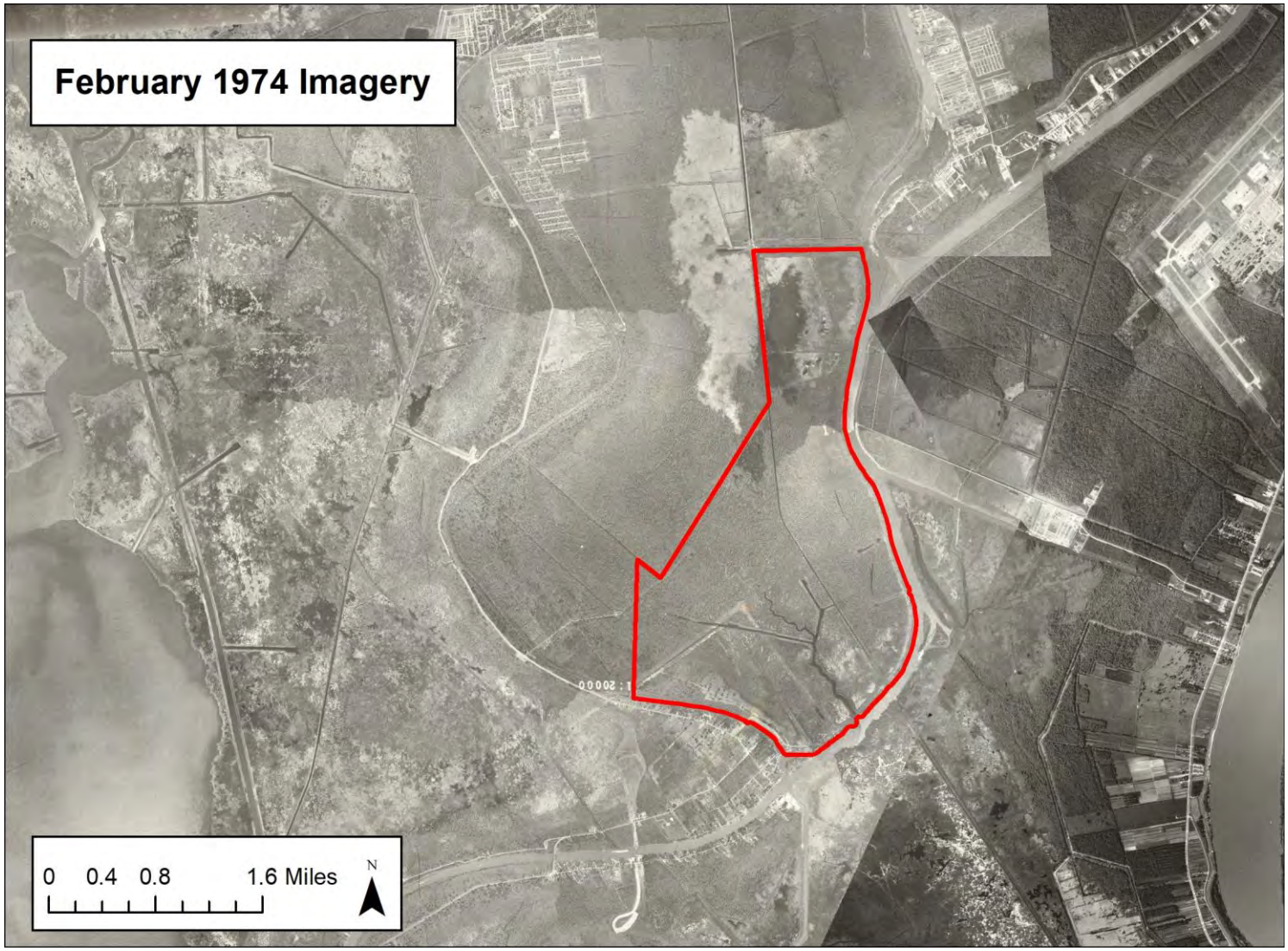

Figure 14. February 1974 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

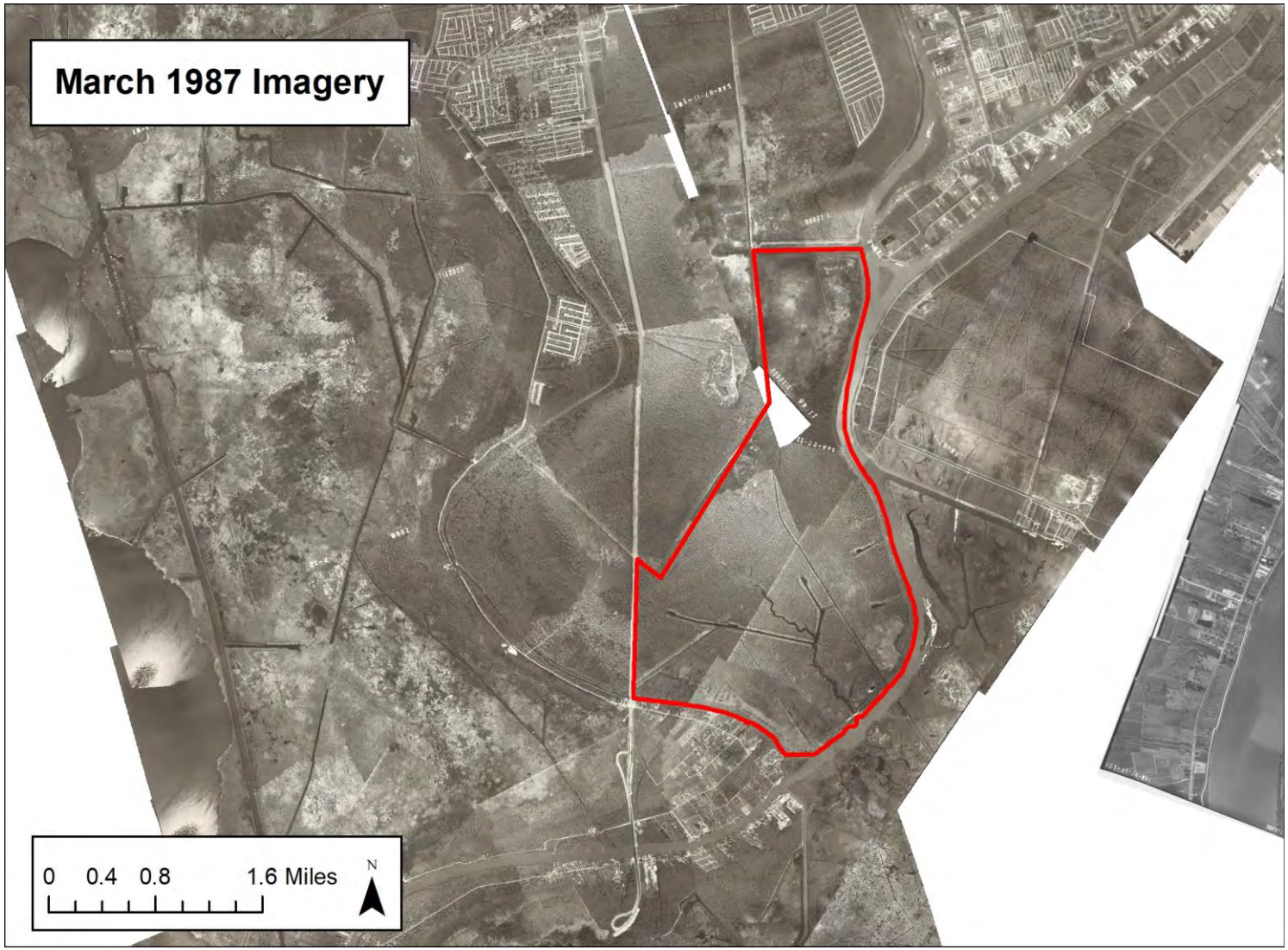

Figure 15. March 1987 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the BAC Site (outlined in red) and vicinity.

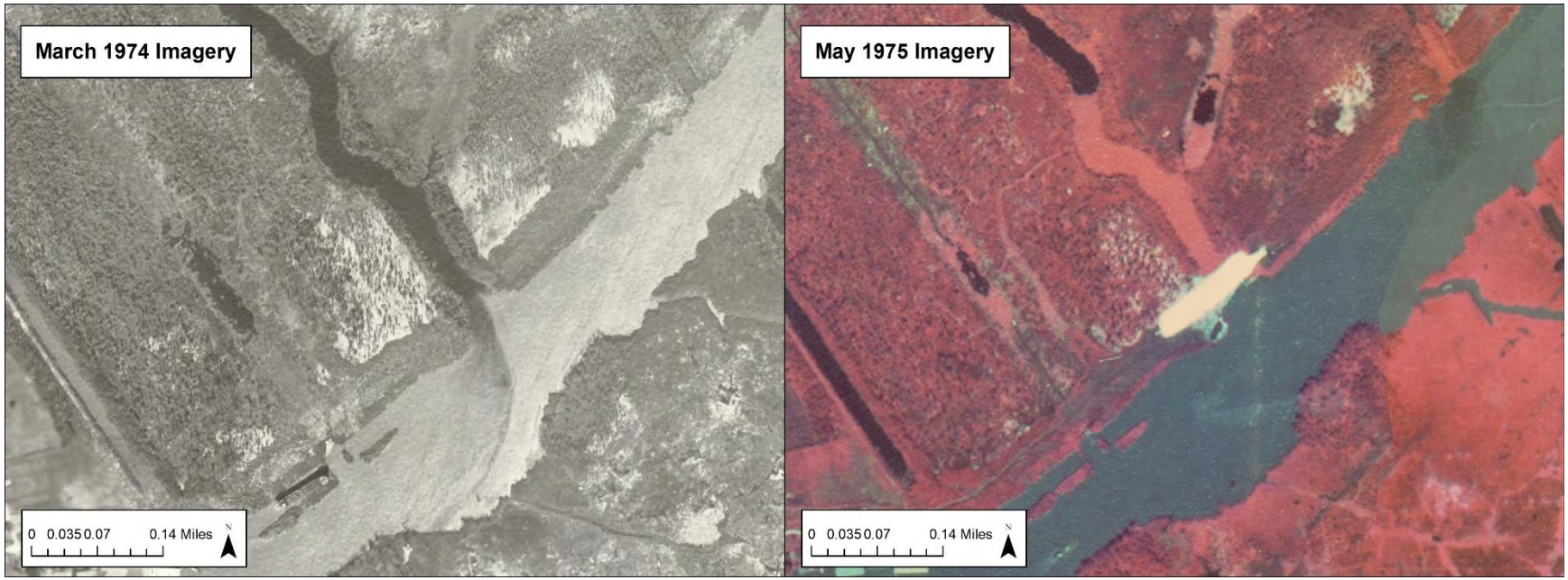

Figure 16. Side by side comparison of March 1974 and May 1975 aerial photography mosaic from CEMVN's Historic Aerial Photography database of the Bayou aux Carpes and GIWW junction.

3.2 Habitat Analyses

3.2.1 Normalized Difference Vegetation Index Analysis

Landsat satellites measure electromagnetic radiation as it reflects off the earth's surface. Healthy vegetation reflects more infrared radiation and absorbs more visible light. Normalized Difference Vegetation Index (NDVI) compares the ratio of infrared radiation and visible light reflection measured by satellite to estimate vegetation health. This NDVI analysis was performed using Landsat imagery data from April or May of 13 years between 1987 and 2014 for the BAC Site (Appendix 10). The goal of this analysis was to estimate the relative health across years of the marsh and forested habitats of the BAC Site. Results were indexed from between -1 to +1, with higher numbers representing healthier vegetation. Table 2 summarizes the results of this study by indicating the relative vegetative health estimated using NDVI across years. These results provide a better understanding of the interannual variation of vegetative health in the BAC site during the period of analysis, but do not indicate obvious trends of change or stasis over time. The results could be used as a baseline for the average existing vegetative heath for the BAC Site if subsequent NDVI analyses are performed.

Table 2. Summary of NDVI results from the NDVI and Habitat Change Analysis Report.

Years with highest departures		
Year	Northern	Southern
1987	-	-
1989	+	+
1993	0	0
1994	+	+
1995	+	0
1999	-	+
2001	+	+
2003	0	-
2005	-	-
2006	+	-
2007	n/a	+
2014	-	+

Note: A plus sign (+) indicates years where vegetative health was higher than the long-term mean, a minus sign (-) indicates years with vegetative health lower than long-term mean, and 0 indicates years that were close to the long-term mean.

3.2.2 Habitat Change Analysis

A habitat change analysis from 1956 through 2010 accompanied the NDVI analysis report (Appendix 10; Section 3.2.1). The analysis provided percent cover and total acres by habitat type for five years (1956, 1978, 1988, 2005, and 2010). Wooded habitats increased from 1978 to 2010. Marsh acres decreased from 1988 to 2010. The largest between year change was a 108 acre (23%) decrease in marsh acreage from 2005 (before Hurricane Katrina) to 2010. All other habitat types from 2005 (before

Hurricane Katrina) to 2010 increased. Time series analyses were not performed because there were limited data points (i.e., only five measurements). Figure 17 summarizes the results for each habitat type and year.

The BAC Site was divided into six discrete areas (Figure 18) and analyzed for the habitat change analysis. Each area was delineated based on apparent habitat/vegetation differences and/or topological separations as visually identified by examining aerial photography. Most areas analyzed followed the overall observation trend of decreases in marsh acreages and increases in wooded acreages, with three notable exceptions (Figure 15). A large south-central part of the BAC, Area 5, is wooded and was stable throughout the period of analysis. Area 5 represents approximately 77% of the BAC Site, and its stability may be driving the stable trend observed wooded habitats throughout the BAC Site. The northern section was divided into four unique areas (Areas 1-4), and all but one indicated a transition from marsh to wooded habitats for the period of analysis. Area 1, located in the northwest corner, remained marsh and was stable (Figure 18). Area 6, located near the plug at the confluence of Bayou aux Carpes and the GIWW, had a slight transition from wooded to marsh habitat (Figure 18).

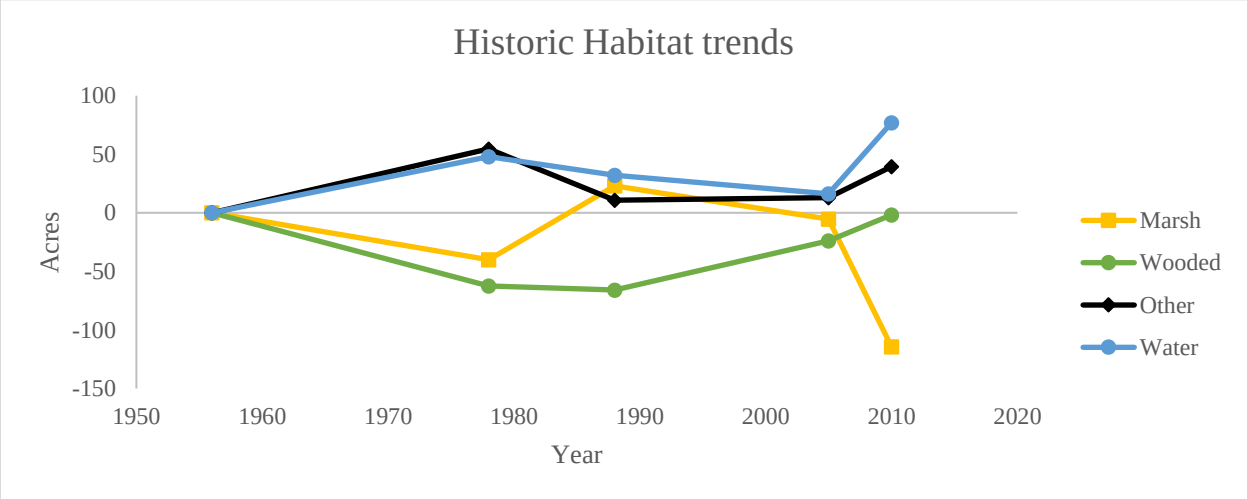

Figure 17. Results from the Vegetative Habitat Analysis from the Bayou aux Carpes 404c NDVI and Habitat Analysis Summary May 1987-2014 which mapped and calculated the percent coverage for marsh and wooded habitats from 1956, 1978, 1988, 2005, and 2010 (Appendix 10).

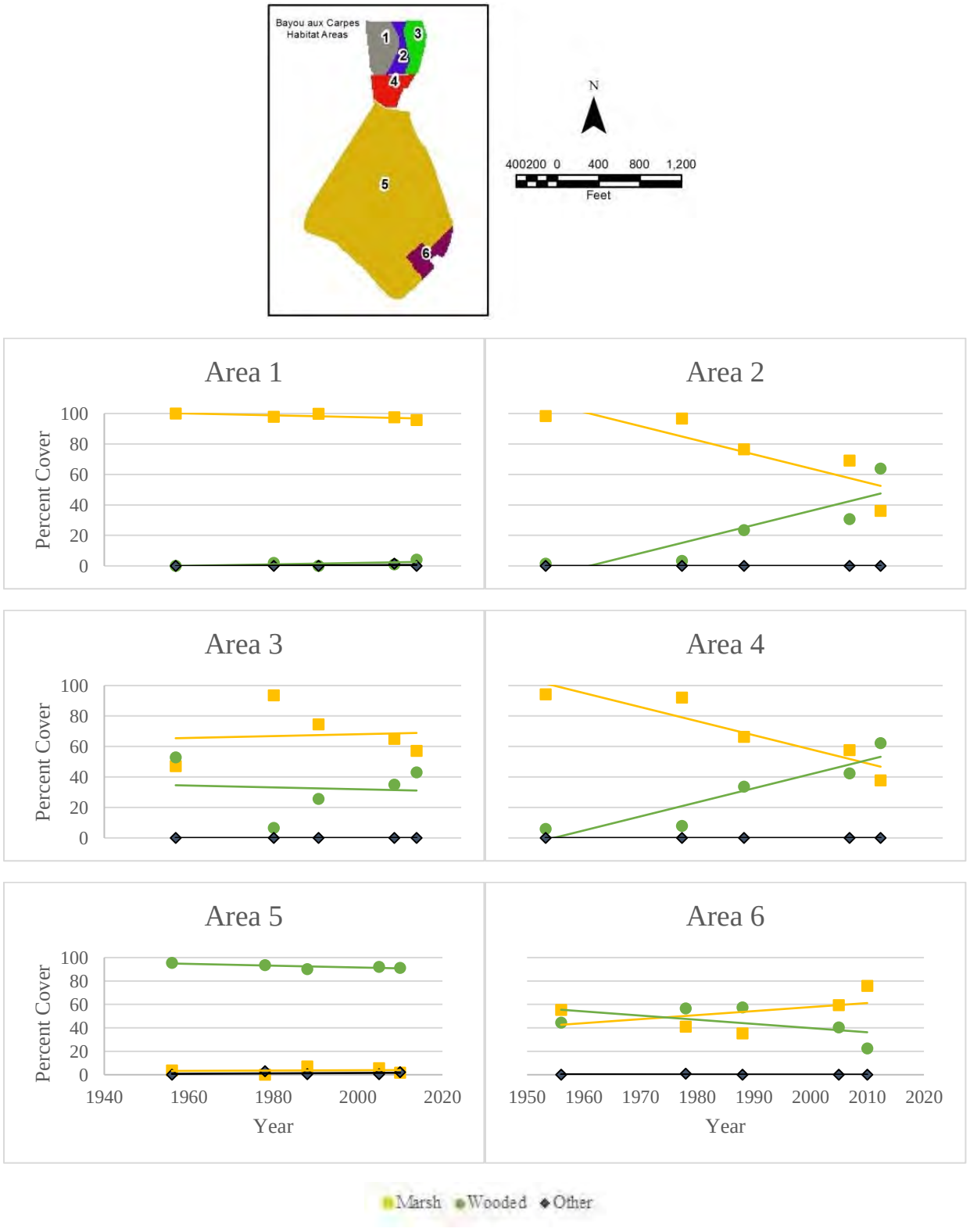

Figure 18. Results of the Vegetative Habitat Analysis from the Bayou aux Carpes 404c NDVI and Habitat Analysis Summary May 1987-2014 by area.

3.3 Flotant Marsh

Marsh has been present in the northern section of the BAC Site since at least 1936 (Figure 9). Currently much of the marsh in this section is classified as flotant and may have been flotant in 1936. The BAC Site marsh was isolated from the larger marsh complex in the 1950s or 1960s as a result of construction of the V-line levee and associated canals, as well as the OEPS outfall canal (Figures 9 and 10). In addition, the historic widening, deepening, and maintenance of the GIWW has produced spoil that has been placed along the channel resulting in direct and indirect negative impacts to adjacent sensitive marsh habitat.

Much of the historic marsh outside of the BAC Site has transitioned to other habitat types since 1945 (Figures 10 – 15). Much of the marsh that was historically contiguous with the flotant marsh in the BAC Site is now residential housing. Most of the remaining undeveloped land has transitioned from marsh to forest.

Within the BAC Site, much of the marsh has transitioned to forest. The habitat change analysis accompanying the NDVI Report (Section 3.2.2; Appendix 10) indicates that forest habitats increased from 1956 to 2010 across the BAC Site, except for the northwestern section which includes flotant marsh. This trend is also apparent in the aerial photography (Figures 9 – 15).

A relatively small area of marsh exists east of Bayou aux Carpes near its juncture with the GIWW. A visual comparison between aerial imagery from 1936 and 2015 indicates a conversion of marsh to open water or forest during this time period. However, the Vegetative Habitat Analysis from the Bayou aux Carpes 404c NDVI and Habitat Analysis Summary May 1987-2014 Report found a slight increase in marsh between 1956 and 2010 in this area, suggesting that a habitat shift from marsh to other habitats occurred between 1936 and 1956 (Appendix 10). A comparison between the November 1945 photography and the 1936 photography indicates that the GIWW may have been dredged and widened during this time. Spoil placement from these efforts may be responsible for the conversion of marsh to forested habitat. The dredging and widening could also have resulted in the increase in open water habitats within the BAC Site.

3.4 Forested Wetlands

Forested wetlands, predominantly swamp, have been present in the central and southern part of the BAC since the 1936 photography. A large expanse of forested wetlands (1,790 acres or approximately 77% of the total BAC area) remained stable from 1956 through 2010 (Section 3.2.2; Appendix 10). Data suggests that much of the northern section of the BAC Site has trended from marsh to forested wetlands throughout this period (Section 3.2.2; Appendix 10). However, these data indicate an opposite trend east of Bayou aux Carpes near the GIWW (Section 3.2.2; Appendix 10). Some of the marsh in this area appears to have converted to swamp and open water based on aerial photographs between 1936 and 1956 (Figures 9 and 11). Since 1956, habitat data suggests that some forested habitat east of Bayou aux Carpes near the GIWW has transitioned to marsh (Section 3.2.2; Appendix 10).

4.0 Purpose and Need for Augmentation

As part of the WBV Project USACE impacted 9.6 acres of wetlands on the Section 404(c) of the CWA designated Bayou aux Carpes area. EPA specified (via letter on May 28, 2009; Appendix 5) and USACE agreed (via letter on July 27, 2009; Appendix 6) to consider augmentation of area wetlands in addition to compensatory mitigation. Six augmentation measures were preliminarily identified that could potentially improve existing hydrology with the goal of enhancing wetland functions and values.

5.0 Augmentation Measures Evaluated

The Record of Decision for IER 12 identified six augmentation measures that would be considered (Figure 19). Each of these measures is independent of the others and considered on its own merit (i.e., not considered alternative to one another).

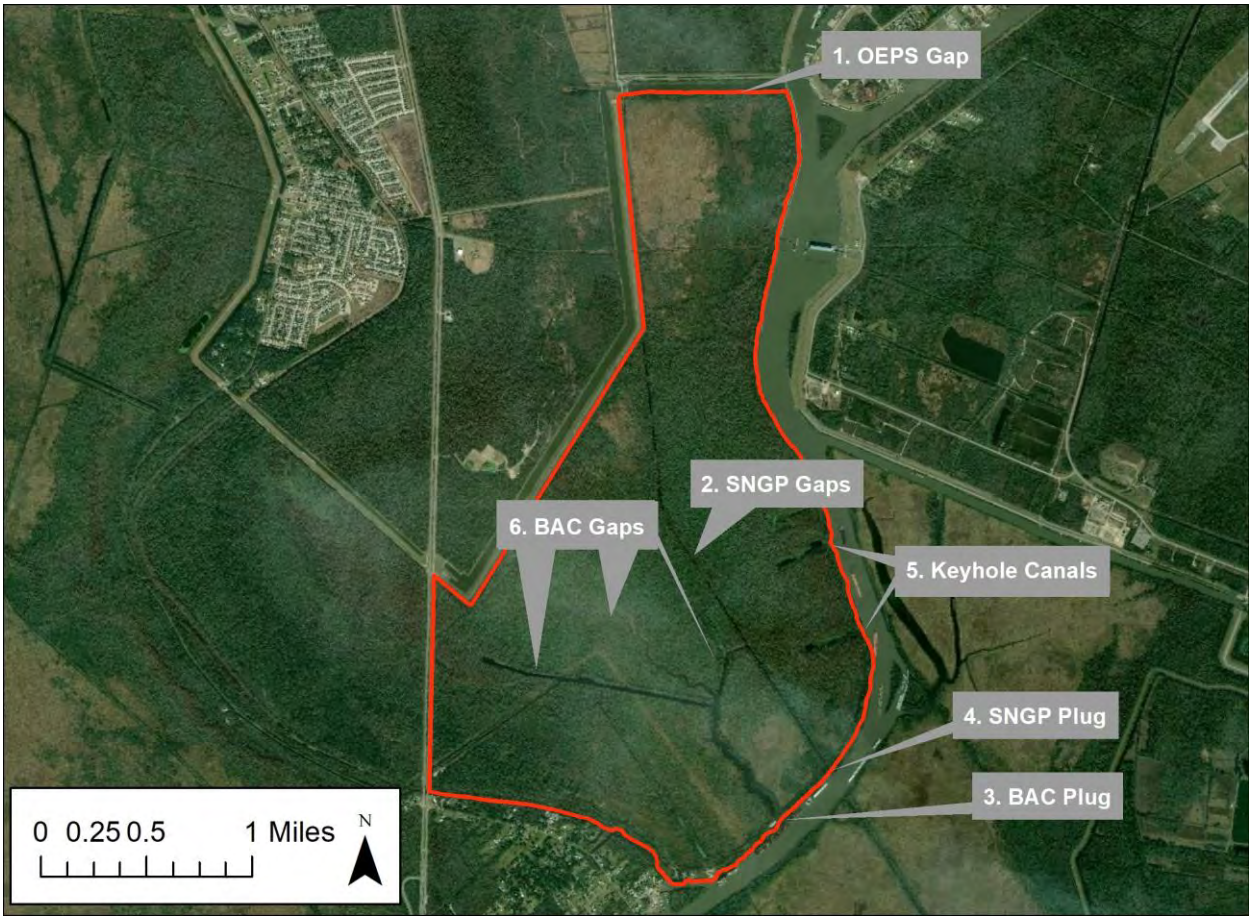

Figure 19. Map showing the BAC Site and location of the six augmentation measures initially considered.

5.0.1 Measure 1

Gap the dredged material disposal bank along the southern side of the OEPS outfall canal to partially restore historic sheet flow regime to the BAC 404c Site and provide a dedicated source of freshwater to provide additional nutrients.

5.0.2 Measure 2

Modify the spoil bank along the SNGP canal to provide hydrologic exchange between the northern and southern sections of the BAC Site, thereby partially restoring the historic sheet flow regime.

5.0.3 Measure 3

Modify the shell plug at Bayou aux Carpes to provide hydrologic exchange between the GIWW and the BAC Site, thereby partially restoring the historic sheet flow regime.

5.0.4 Measure 4

Close the SNGP canal to promote hydrologic flow within the BAC Site, thereby partially restoring historic sheet flow regime.

5.0.5 Measure 5

Gap or degrade keyhole oil well access canal banks to promote hydrologic flow within the BAC Site, thereby partially restoring historic sheet flow.

5.0.5 Measure 6

Gap or degrade oil well access roads to promote hydrologic flow within the BAC Site, thereby partially restoring historic sheet flow regime.

There are seven locations that were considered (Table 3, Figure 20). Some, all, or a combination of gapping and or degrading at these locations was considered.

Table 3. Description of the seven Measure 6 gap and/or degradation locations.

Measure 6 Descriptions and Locations	
6.1	Degrade or gap road existing road where Bayou aux Carpes meets the GIWW
6.2	Establish gaps in an old road adjacent to the east side of a canal located in the far southeast portion of the BAC site.
6.3	Establish gaps in an old road adjacent to the west side of a canal located in the far southeast portion of the BAC site.
6.4	Establish gaps in a road at the south of BAC site.
6.5	Degrade or gap a road adjacent to a canal in the southwestern portion of the BAC site.
6.6	Degrade or gap a road located north of the keyhole canals.
6.7	Extending the “Old Canal” such that it directly connects to the GIWW.

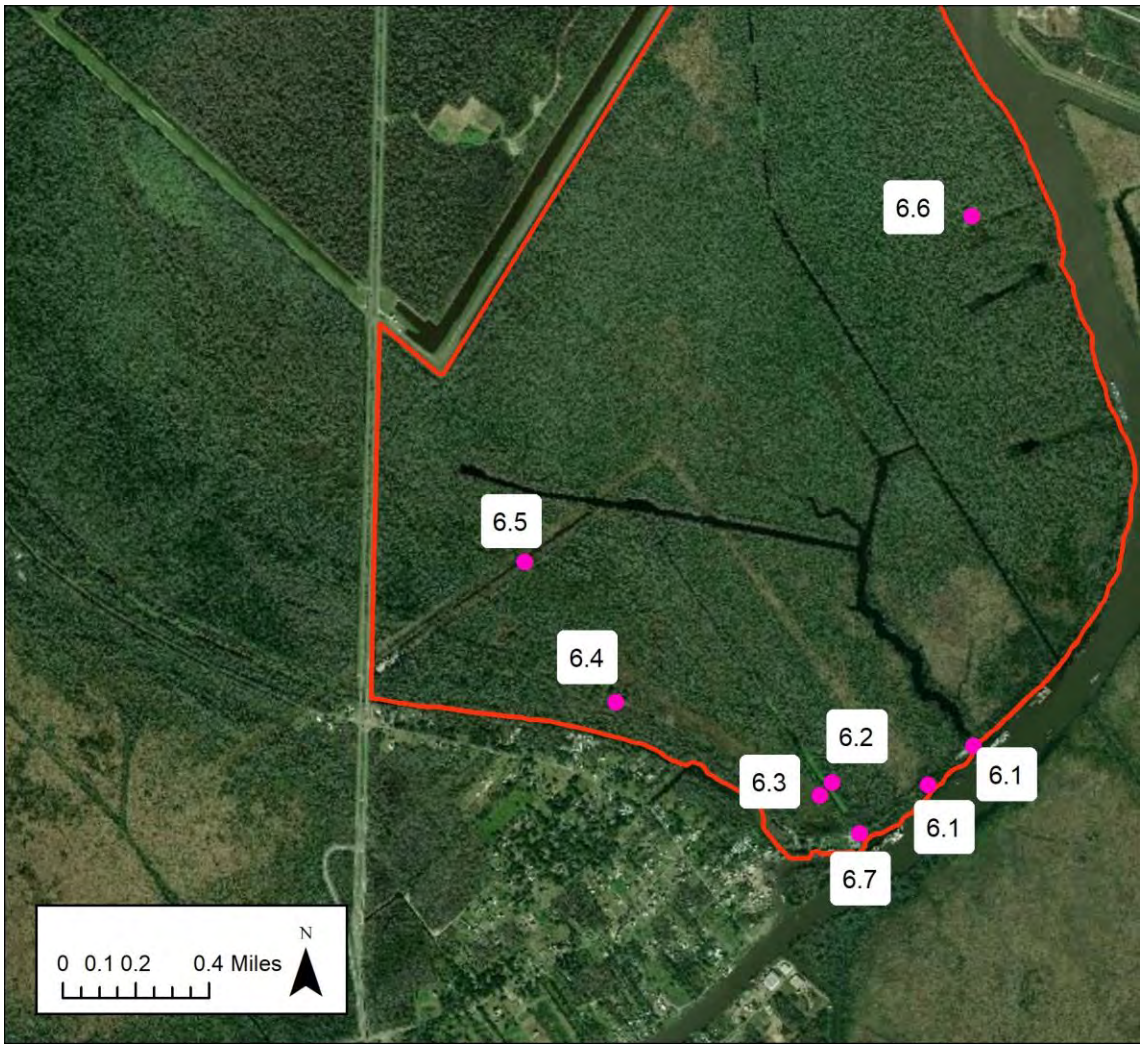

Figure 20. Measure 6 gap and/or degradation locations.

5.1 Initial Screening

The purpose of this section is to present the results of initial screening of the six augmentation measures from IER 12. Augmentation measures from IER 12 were initially screened for implementability and the potential to enhance the wetland functions and values of the BAC area. Screening occurred through various meetings with members of the IET and agency opinions were documented through email correspondence (Appendix 11). If results of this initial screening indicate a measure should be retained for further evaluation, then it was included in the final array of measures evaluated in Section 5.2.

5.1.1 Measure 1

Measure 1 could increase exchange between the OEPS outfall canal and the BAC site which could provide benefits to existing wetlands. It is also implementable, has no known landowner issues, or preliminary operations and maintenance issues that would preclude it from further evaluation. Further evaluation would be needed to determine whether it is likely to benefit existing wetlands. On March 14, 2013 the EPA, NPS, and USFWS stated this measure should be carried forward (Appendix 11). Measure 1 is retained for further evaluation as a part of the final array.

5.1.2 Measure 2

Measure 2 would gap the SNGP canal, which could provide increased sheet flow and provide hydrologic connectivity within the BAC Site. It is also implementable, has no known potential landowner issues, or preliminary operations and maintenance issues that would preclude it from further evaluation. On March 14, 2013 the EPA, NPS, and USFWS stated this measure should be carried forward (Appendix 11). Measure 2 is retained for further evaluation as a part of the final array.

5.1.3 Measure 3

Measure 3 would remove the shell plug at Bayou aux Carpes, increases hydrologic exchange between the BAC Site and the GIWW. This could restore a historic connection which could increase sheet flow and benefit wetlands within the BAC Site. It also is implementable, and has no preliminary operations and maintenance issues that would preclude it from further evaluation. There may be real estate issues associated with this measure, but these potential issues are expected to be minimal. On March 14, 2013 the EPA, NPS, and USFWS stated this measure should be carried forward (Appendix 11). Measure 3 is retained for further evaluation as a part of the final array.

5.1.4 Measure 4

Measure 4 would close an artificial connection at the SNGP canal and GIWW. It would also eliminate private landowner access to the Harvey Tract via the SNGP. EPA Region 6, NPS, and USFWS stated this measure should no longer be considered via email correspondence on March 14, 2013 (Appendix 11). As such, measure 4 is not further evaluated, and is not a part of the final array.

5.1.5 Measure 5

Measure 5 would gap keyhole canal(s) on the eastern edge of the BAC Site. The keyhole openings included in Measure 5 would likely involve some long-term maintenance. Concrete weir(s) with flap gate(s) or a concrete weir(s) with flashboard risers may be necessary and this structure would have to be maintained. EPA Region 6, NPS, and USFWS agreed to no longer consider this via email correspondence on March 14, 2013, because of an unwillingness to maintain structures (Appendix 11). Additionally, NPS had concerns that such gapping would allow saltwater intrusion into the adjacent swamp during storm events. As such, measure 5 is not further evaluated and is not recommended for further consideration.

5.1.6 Measure 6

Evaluation Result: Measure 6 (6.1 through 6.7) included one or more gaps and degradation of roads and other high ground (Table 3, Figure 20). The benefits of Measure 6 as a broad scale action were found to be limited. EPA Region 6, NPS, and USFWS agreed to no longer consider this measure, with the exception of measure 6.1, because of “unproven utility” via email on March 14, 2013 (Appendix 11). Measure 6.1 consisted of the removal of the shell plug at the confluence of Bayou aux Carpes and the GIWW, which is the same as Measure 3. As such, Measure 6 is not further evaluated and is not recommended for further consideration.

5.2 Final Array of Measures Evaluated

5.2.1 Final Array Evaluation Criteria

Three evaluation criteria were used to demonstrate the differences among measures in the final array (Risk and Reliability, Environmental, and Cost). Sub-criteria were developed for risk and reliability and environmental to focus the evaluation.

In brief, evaluation criteria reflect augmentation goals, but not constraints. For instance, if the mission is to buy a car, goals may be to have a low start-up and operating cost. This scenario would have the criteria of retail cost and gas mileage. Note that constraints are not considered as evaluation criteria (i.e. the retail cost of the car must be under $20,000) because measures cannot be compared based on this information; all measures considered should be designed to be under $20,000 before evaluation criteria are applied. For the purposes of Bayou aux Carpes 404(c) augmentation measures evaluation, the following has been proposed as evaluation criteria:

5.2.1.1 Risk and Reliability

Risk is defined as probability multiplied by consequences. An example of risk would be a calculation of the relative chance of saltwater intrusion multiplied by magnitude of anticipated plant mortality. Actions can be implemented to reduce risk, but because risk can never be completely eliminated, residual risk will remain. Reliability refers to the chance that a component of the system will fail to perform its intended purpose as a function of the forces placed upon it.

Since these two factors are similar, they will be considered together: Risk and Reliability. Five sub-criteria were used to evaluate the risk and reliability of each alternative measure considered:

1. Uncertainty Relative to Achieving Ecological Success;
2. Potential Need for Adaptive Management;
3. Uncertainty Relative to Implementability;
4. Self-Sustainability; and
5. Risk of Exposure to Physical Stressors (need probability and performance once exposed to measurements).

Relative qualitative scores for each risk and reliability sub-criteria are summarized in Table 4 for each measure in the final array. Each risk and reliability sub-criteria is further discussed in their respective sections for individual measures (Measure 1 – 5.2.2.2, Measure 2 – 5.2.3.2, and Measure 3 – 5.2.4.2).

Table 4. Summary results by Augmentation Measure for Risk and Reliability selection criteria.

Measure	*Uncertainty relative to achieving ecological success*	*Potential Need for Adaptive Management*	*Uncertainty Relative to Implementability*	*Self-Sustainability*	*Risk of Exposure to Stressors (need probability and performance once exposed measurements)*
1	- (no metric for ecological success established; partially re-establish sheet flow; unknown how it would affect nearby flotant marsh)	0 (may negatively affect nearby sensitive flotant marsh)	+ (publicly owned; may be difficult to access site for construction)	++ (debris removal unlikely)	++ (no expected physical stressors; e.g., wave action and boat wakes)
2	- - (no metric for ecological success; many gaps exist; may be redundant to canal backfilling project)	++ (unlikely for adaptive management action)	++ (spoil banks located on abandoned oil/gas pipeline canal)	++ (debris removal unlikely)	+ (limited boat traffic could, but not likely to influence gap geometry)
3	+ (no metric for ecological success established; partially re-establish sheet flow)	++ (unlikely for adaptive management action)	+ (may or may not be publicly owned; can design measure either way)	++ (debris removal unlikely)	0 (boat traffic and barge anchoring area may influence gap geometry; the likelihood of this is expected to be low to moderate; could design features to mitigate any potential future impacts)

*Evaluated as --. -, 0, +, ++ to indicate relative evaluations

5.2.1.2 Environmental

Seven sub-criteria were initially considered to evaluate the environmental impacts for the final array of augmentation measures:

1. Water Quality;
2. Habitat Impacts;
3. Wildlife Impacts;
4. Threatened and Endangered Species;
5. Aquatic / Fisheries;
6. Cultural Resources; and
7. Hazardous, Toxic, and Radioactive Waste

Threatened and Endangered Species (T&E) and hazardous, toxic and radioactive waste (HTRW) sub-criteria concerns were found to be similar across all Measures in the final array. Coordination with the USFWS regarding the ESA, MBTA, and BGEPA would continue if any measure(s) are further considered for construction. An HTRW Phase 1 evaluation would be conducted if any measure(s) are further considered for construction. Any required analyses and coordination would be documented in subsequent NEPA documentation.

There is no critical habitat for any Federally listed T&E species within the BAC Site. There were aerial surveys of the BAC Site conducted by LDNR for bald eagle nests and wading bird rookeries on March 16, 2010, April 12, 2010, February 18, 2011, May 7, 2013, March 7, 2013, and February 23, 2017. There were no wading bird rookeries and bald eagle nests observed during these surveys (Appendix 12). There are no known HTRW concerns within the BAC Site, but augmentation measures would have temporary direct impacts to air quality during construction. However, Jefferson Parish is currently in attainment of air quality standards. CEMVN would follow relevant environmental laws, procedures, and policy for any augmentation measure(s) further considered for construction, including the ESA, MBTA, BGEPA, CWA, CAA, and Engineer Regulation 1165-2-132.

For the reasons discussed in the paragraphs above, HTRW and T&E were not considered when evaluating augmentation measures in the final array. The remaining five environmental sub-criteria were used to evaluate environmental impacts for the final array:

1. Water Quality;
2. Habitat Impacts;
3. Wildlife Impacts;
4. Aquatic / Fisheries; and
5. Cultural Resources

Construction of each measure is expected to have temporary direct impacts (e.g., increased turbidity, vibrations, fugitive dust, noise, etc.). Similar to T&E and HTRW, these impacts are not further utilized for comparison of the measures because they are expected to be similar for all. Furthermore, all would be short-term and temporary during the period of construction after which sediment would settle and vegetate, stabilizing the area.

Augmentation measures would impact wetland habitat, fisheries, and wildlife. These impacts would include some adverse impacts due to the removal of earthen material (gapping or grading down) and habitat to restore the hydrology of the area. However, the measure(s) selected should restore hydrological exchange and improve water quality which should benefit fisheries and wildlife. With spoil banks gapped and canal plugs removed, fish and other aquatic species would have better, more direct access to resources and habitats that are currently inaccessible or otherwise circuitous and difficult to access. Any augmentation constructed would likely improve habitat conditions for fish, other aquatic, and wildlife species.

Overall, the environmental impacts of the selected augmentation measure(s) would restore a more natural hydrology while minimizing associated negative environmental impacts. Any initial adverse environmental impacts caused during construction (e.g., wetland fill) would be off-set by the long-term benefits to be realized, and therefore would not require additional compensatory mitigation. See methods sections (5.2.2.1, 5.2.3.1, 5.2.4.1) for more information on construction activities.

Relative scores for each environmental sub-criteria are summarized in Table 5 for each measure in the final array. Each environmental sub-criteria is discussed in their respective sections for individual measures (Measure 1 – 5.2.2.3, Measure 2 – 5.2.3.3, and Measure 3 – 5.2.4.3).

Table 5. Summary results by Augmentation Measure for Environmental selection criteria.

Measure	*Water Quality*	*Habitat Impacts*	*Wildlife Impacts*	*aquatic / fisheries*	*cultural resources*
1	- (slight long-term benefits in exchange flow possible; potential negative impacts from herbicide application and pollution from stormwater)	0 (1.4 - 3.1 ac of blh/swamp impacted from construction (50', 250' gap); success depends on operation of two structures; net benefit in flow exchange -7 ac to +23 ac; potential negative impact to flotant marsh)	0 (overall benefit likely limited and may have negative impacts to WQ and habitat)	0 (limited aquatic/fisheries impacts expected)	+ (likely would require limited further review)
2	0 (limited long-term benefits expected)	- (0.2 acres of ruderal forest / swamp impacted from construction; modeling suggested no net flow exchange benefit; limited anticipated benefits; may be redundant to canal backfilling project)	0 (limited to no benefit)	- (limited aquatic/fisheries impacts expected; may be redundant to canal backfilling project)	0 (would require further review; may be more extensive than M1)
3	++ (decreasing negative impacts of high salinity events; negative impacts associated with poor water quality in the GIWW expected to negligible and highly localized)	++ (0.7 acres of BLH / Swamp impacted from construction; modeling suggested highest net flow exchange benefit (+86 ac); increased exchange flow could improve wetland functions and values)	+ (most likely to have greatest wildlife habitat benefit)	+ (potential for net benefit to aquatic vegetation (with a risk of negative impacts to SAV); better access/habitat for estuarine transients)	0 (would require further review; may be more extensive than M1)

*Evaluated as - -. -, 0, +, ++ to indicate relative evaluations

5.2.1.3 Cost

Costs were divided into the following five sub-categories.

1. Construction
2. Real Estate
3. Operations, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R)
4. Monitoring
5. Adaptive Management (if the plan needs reversal; assumed same cost as original implementation plan)

Construction, OMRR&R, and real estate costs were estimated for each measure in November 2017 (Appendix 13). Real estate costs were updated in June 2019. Monitoring costs were estimated through coordination with USGS (Sarai Piazza, USGS, October 2017). Adaptive management costs were assumed to be equal to construction costs for each measure. The total construction cost was calculated by summing construction, real estate, and initial monitoring costs. Yearly monitoring and OMRR&R costs are presented as separate items from the total construction cost. The OMRR&R costs are anticipated to be similar for each measure.

Costs for each Measure in the final array are summarized in Table 6. Costs are discussed in their respective sections for individual measures (Measure 1 – 5.2.2.4, Measure 2 – 5.2.3.4, and Measure 3 – 5.2.4.4).

Table 6. Summary results of anticipated costs by Augmentation Measure. See Appendix 13.

Measure	***Construction***	***Real Estate***	***Monitoring***	***Adaptive Management (if plan needs reversal; assumes same cost as implementing plan)***	***TOTAL CONSTRUCTION COST (Not Including Adaptive Management)***	***OMRR&R***	***Monitoring Costs / year***
1	M1a - $211,912.50 M1b - $139,300	$5,000	initial - $10,000; $34,000/yr	M1a - $211,912.50 M1b - $139,300	***M1a - $226,912.50 M1b - $154,300***	not anticipated to be high; expected to be similar across projects; pending estimates	***$34,000****
2	$110,250	$10,000†	0	$110,250	***$120,250***	not anticipated to be high; expected to be similar across projects; pending estimates	***$0***
3	$119,875	$35,000†,‡	initial - $5,000; $17,000/yr	$119,875	***$159,875***	not anticipated to be high; expected to be similar across projects; pending estimates	***$17,000***

*This cost does not include an estimated cost for discrete water quality and soil porewater quality monitoring.
† This cost includes a special use permit from the Department of the Interior.
‡ This costs assumes the property is privately owned.

5.2.1.4 Flow Exchange

Solutions from a 2-D Hydrodynamic model were used to calculate flow exchange area for all Measures included in the final array as a proxy for estimating sheet flow (Section 2.2.5.3; Appendix 9, Annex 2). Increased flow exchange and sheet flow associated with benefits to water quality and plant health (Lane et al., 2015, Baustian et al., 2019). Table 7 summarizes flow exchange calculations by modeling scenario and augmentation measure. The results of these calculations are discussed throughout Sections 5.2.2, 5.2.3, 5.2.4.

Table 7. This table summarizes flow exchange acreages for simulations from The Bayou aux Carpes EPA designated 404c Wetland Model Study Revisions Study (Appendix 9, Annex 2).

Measure/Simulation Run	Description	Flow Exchange	Net Flow Exchange (Measure Implemented – Existing Conditions)
Measure 1: OEPS outfall canal spoil bank gapping			
Sluice gates open, no pumps operating	Existing condition	42 acres	
	75' gap	35 acres	-7 acres (-14 acres at existing gap and +7 acres at new gap)
	250' gap	50 acres	+8 acres (-30 acres at existing gap and +38 acres at new gap)
Sluice gates open, pumps operating at 256 cfs during peak condition after 6 hours.	Existing condition	618 acres	
	75' gap	633 acres	+15 acres
	250' gap	641 acres	+23 acres
Sluice gates closed, pumps operating at 256 cfs during peak condition after 6 hours.	Existing condition	661 acres	
	75' gap	664 acres	+3 acres
	250' gap	664 acres	+3 acres
Measure 2: Southern Natural Gas Pipeline canal spoil bank gapping			
Existing Condition		10 acres	
Gap Spoil banks in four locations (30 – 60 feet wide each)		10 acres	0 acres
Measure 3: Bayou aux Carpes plug removal			
Existing Condition		216 acres	
BAC plug removed only. *(no additional gaps)*		302 acres	+86 acres (Net flow exchange to SNGP canal area = +12 acres if plug is removed and no other changes to existing conditions)
BAC plug removed and gap spoil bank in two locations (30 – 60 feet wide each)		252 acres	+36 acres

5.2.2 Measure 1

5.2.2.1 Methods

Two options, a 250 foot and 75 foot gap in the OEPS outfall canal, were designed and evaluated for Measure 1. Either of these options would be constructed using similar methods. Earth moving equipment (such as a marsh buggy and backhoe) would be mobilized from the V-line levee access road north of the OEPS outfall canal (Figure 21). The berm on the northern side of the OEPS outfall canal would be used to transport this equipment to a location directly across from where the gap would be constructed. A 100 foot x 100 foot area would then be cleared of vegetation to stage the equipment. Downed vegetation could be stockpiled here, if necessary. The earth moving equipment would then be bridged or flexi-floated across the OEPS outfall canal and the proposed gap constructed. Vegetation would be allowed to regrow naturally in the temporary stockpiling area upon completion of construction. Access to the site to mobilize heavy machinery to construct this measure (and any potential future adaptive management work) may require crossing an existing WBV floodgate located on the north side of the OEPS outfall canal. Any damage to the floodgate resulting from construction would be repaired as part of the cost of implementing this measure.

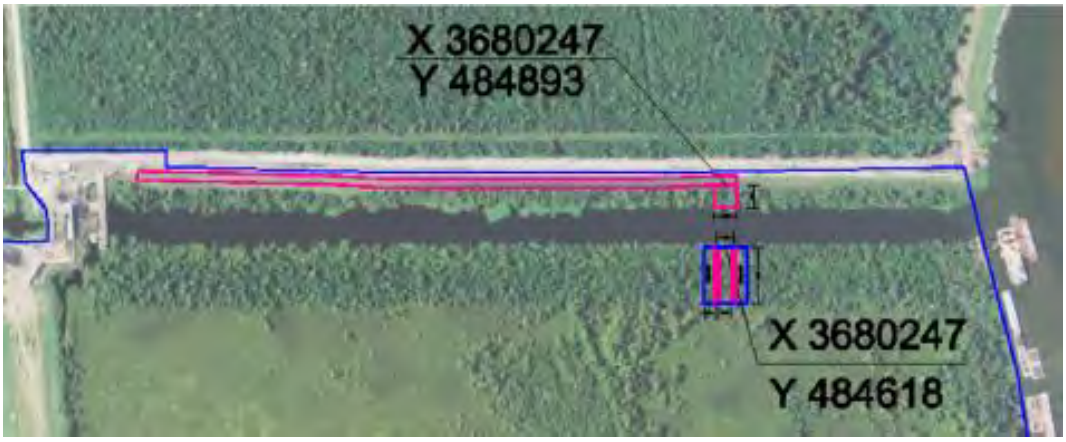

Figure 21. Plan view of the 75 foot wide alternative of Measure 1. The 250 foot wide alternative would use the same route and staging area, but larger gap ROW.

Several assumptions were made to facilitate preliminary engineering and design. The crown width of the existing spoil bank was assumed to be 100 feet with an elevation of approximately +3.0 feet NAVD88. The spoil bank would be degraded to the forest or marsh ground elevation, approximately +1.0 to 0.0 feet NAVD88. This would allow for water to enter from the canal, through the gap, and sheet flow through the BAC Site. Gap side slopes would be from 1:3 to 1:2. Excavated material would be placed on the existing spoil bank on either side of the gap to allow implementation of the adaptive management plan (Section 5.2.2.5), if necessary.

Vegetation would be cleared on either side of the gap to stockpile this material. The total cleared ROW, to include the gap, side slopes, and material storage area would be approximately 500 feet x 100 feet for the 250 foot gap and 200 feet x 100 feet for the 75 foot gap. Approximately 5,500 cubic yards of material would be dredged to create a 250 foot gap,

and approximately 1,500 cubic yards of material would be dredged to create a 75 foot gap. Figures 22 and 23 show the cross sectional views of the 250 foot and 75 foot gaps, respectively.

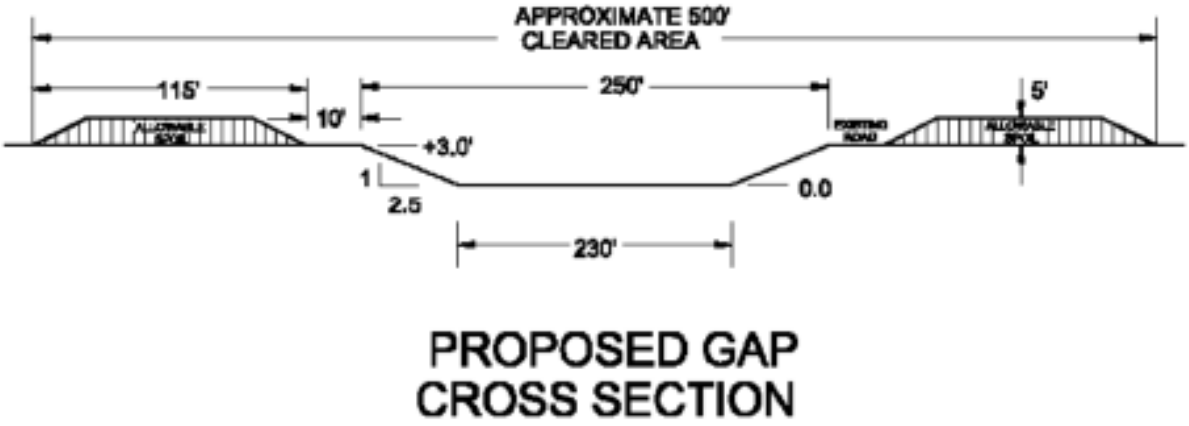

Figure 22. Cross section of proposed 250 foot gap for Measure 1.

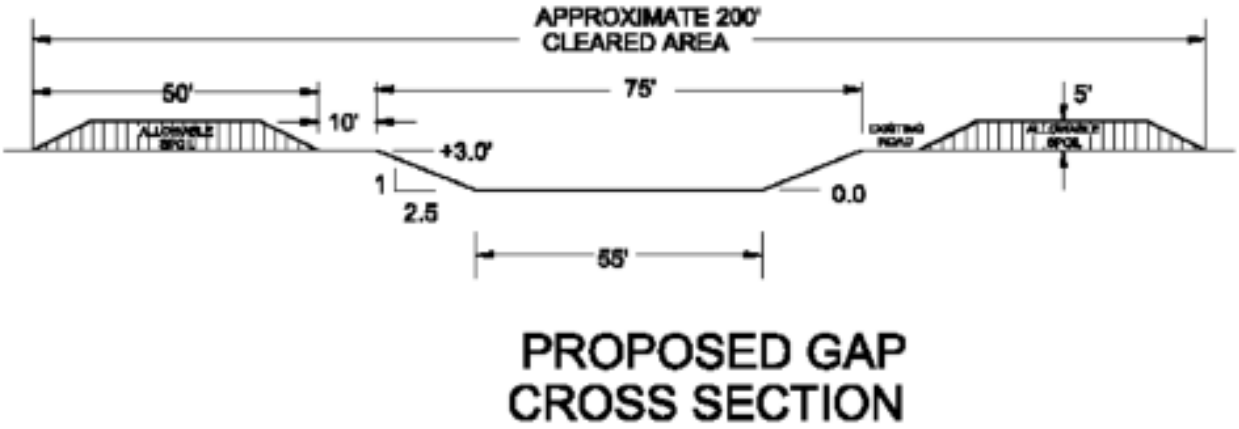

Figure 23. Cross section of proposed 75 foot gap for Measure 1.

5.2.2.2 Risk and Reliability

5.2.2.2.1 Uncertainty relative to ecological success

Ecological success for this and other measures designed may be difficult to measure. There have been no specifically measurable and/or quantifiable ecological outcomes identified by the IET. While there is general consensus that degrading spoil banks and increasing water exchange can be effective restoration tool for wetlands, flotant marshes exhibit unique properties and are sensitive to hydrologic changes. There is evidence that marsh soils closest to and most likely influenced by waters from the OEPS outfall canal are degraded (Appendix 8; Section 2.2.5.2).

The hydrodynamic modeling report showed that net differences in exchange flow would be positive, but relatively low for this measure (Table 7; Appendix 9, Annex 2). Furthermore, modeled changes in exchange flow were highly dependent on rainfall and storm water management. The report indicates that Measure 1 would produce the highest net change in exchange flow if there was rainfall over the area, the OEPS was operating, and the Old Estelle Flood Gate – South was closed (Table 7, Appendix 9, Annex 2). Even under this unlikely scenario, modeling suggests it would not perform as well as Measure 3 (Table 7, Appendix 9, Annex 2), but would be more effective than Measure 2.

The area immediately influenced by this measure has been undergoing a transition from marsh to wooded vegetation (Appendix 10; Section 3.2). It would be difficult to determine the impacts of this measure in an area that may be transitioning from one habitat type to another.

Any net increase in flow exchange also includes a net decrease in flow exchange within the existing approximately 100 foot wide channel between the OEPS outfall canal and the BAC Site (Table 7; Appendix 9, Annex 2). The impacts on the sensitive flotant marsh from reducing flow in this location and providing flow at the gap location are unknown.

For these reasons, Measure 1 has the most uncertainty relative to achieving ecological benefit (Table 4).

5.2.2.2.2 Potential need for adaptive management

Measure 1 is the most likely measure to need an adaptive management action due to the uncertainty over whether positive or negative impacts would be realized from implementation (See Section 5.2.2.2.1).

5.2.1.2.3 Uncertainty relative to implementability

Measure 1 would be easily implementable in terms of real estate requirements, because the land is publically owned. However, access may be difficult because there is no direct waterborne access for construction.

5.2.2.2.4 Self-sustainability

Measure 1 would likely be self-sustaining. There is a low risk associated with debris accumulation and removal. The OEPS outfall canal does accumulate FAV, but such

accumulation is unlikely to impact gap performance as Jefferson Parish uses herbicides to control unwanted FAV in the canal. It is expected that Jefferson Parish would continue this maintenance. Additionally, there is no apparent evidence that FAV is adversely impacting exchange at the existing 100 foot gap.

5.2.2.2.5 Risk of exposure to physical stressors

The risk of exposure to physical stressors is expected to be low for Measure 1. There are no expected physical stressors associated with wind or boat induced wave action. The area does not have a large fetch perpendicular to where the feature would be constructed, and there is little motorized water traffic anticipated based on limited access.

5.2.2.3 Environmental

5.2.2.3.1 Water quality

Increasing water exchange between the OEPS outfall canal and the BAC Site could cause negative impacts to wetland soils in the BAC Site. Herbicides are applied by Jefferson Parish in OEPS outfall canal three times per year. Increasing exchange flow with OPEDS Canal may increase marsh exposure to herbicides. Additionally, evidence suggests that source water from the OEPS outfall canal water may currently be negatively impacting marsh soils (Appendix 8, Section 2.2.5.2). Furthermore, there could be water quality impacts associated with introducing stormwater through the OEPS outfall canal into the BAC Site. However, this is not anticipated to be a major issue, because several analytes were tested within the BAC Site and vicinity, and none within the OEPS outfall canal and the BAC site were found to have levels that could adversely affect wetland plants and macroinvertebrates (Appendix 8). There would also be some temporary direct negative impacts to water quality associated with construction. Localized increases in turbidity could occur during construction, but would be temporary.

5.2.2.3.2 Habitat impacts

There would be between approximately 1.4 and 3.1 acres of ruderal forest and/or swamp impacted from construction of this feature (50 foot versus 250 foot gap). Measure 1 would not be implemented unless it is found to produce an overall benefit to the BAC Site through increased exchange flow. The USACE Model Study Revisions Report suggests that the maximum net habitat benefits, in terms of exchange flow, would be realized during a rain event when Jefferson Parrish operates the pump at OEPS and the Old Estelle Flood Gate – South is closed (Table 7; Appendix 9, Annex 2). This pumping station is operated infrequently, 16 days from 1 January 2016 through 30 September 2017 for a total of 52 hours of operation. The Old Estelle Flood Gate – South structure is usually open, unless there is an impending tropical storm, in accordance with the approved water control manual. Therefore, the maximum net benefits (i.e., increased exchange flow) would be nominal, may not provide incremental benefits, would not likely be realized, and would require close coordination between Jefferson Parish and SLFPA-W for operation of the OEPS and the Old Estelle Flood Gate – South.

5.2.2.3.3 Wildlife impacts

This feature would have limited benefits to wildlife through the enhancement of existing habitats. Benefits to wildlife habitat would mirror benefits to wetlands that are described in Sections 5.2.2.3.1 and 5.2.2.3.2. The loss of ruderal forest and swamp habitats would decrease the habitat available for certain species, however, these impacts would be offset by benefits to other wetlands within the BAC Site (See sections 5.2.2.3.1 and 5.2.2.3.2).

5.2.2.3.4 Aquatic resources and fisheries

Measure 1 is expected to have positive impacts to aquatic resources and fisheries by providing increased access. This increased access is expected to be minimal, because the gap would be dug to existing marsh elevation and the OEPS outfall canal has reduced connectivity with other major waterways outside of the BAC Site. That is, all surface water connections with waterways outside of the BAC Site are through water control structures. Aquatic habitats could be benefited through increased flow and exchange provided by this measure. However, there could be some negative impacts associated with the introduction of potentially poor water quality into the area which could harm BAC Site aquatic resources and fisheries (Section 5.2.2.3.1).

5.2.2.3.5 Cultural resources

A review of Measure 1 indicates that only assessment or reconnaissance level survey of the project area has been previously conducted and would require additional review to determine if this action would require consultation under Section 106 of the NHPA. The CEMVN will follow Section 106 review procedures if this measure is carried forward.

5.2.2.4 Cost

The total estimated construction and monitoring costs for Measure 1 were the highest among the final array (Table 7). Estimated construction costs were $139,300 for a 75 foot gap and $211,912.50 for a 250 foot gap. Real estate costs were estimated at $5,000, which was the lowest. Costs for OMRR&R were assumed to be low and similar across all measures in the final array. Initial monitoring costs were estimated to be $10,000 for the installation of two continuous water quality stations (one in the OEPS outfall canal, and one within the BAC Site marsh benefited by the newly created gap). Yearly monitoring costs were estimated to be $34,000 for the maintenance of the two continuous water quality stations.

5.2.2.5 Adaptive Management and Monitoring

The adaptive management and monitoring plan would be further developed between the NPS, EPA, CPRA, and CEMVN if this measure is selected for construction. A generalized adaptive management and monitoring approach is discussed, which would be used to kick off a more detailed adaptive management and monitoring plan discussion with the agencies.

Measure 1 would remove material from the spoil banks between the OEPS outfall canal and the BAC Site. The excavated material would be stockpiled adjacent to the gap on the existing spoil bank. The recommended adaptive management action would be to reclose the gap using the stockpiled material excavated during construction.

Baseline monitoring of vegetation and water quality data has been collected for the BAC Site. The USGS performed some preliminary porewater monitoring for marsh sites within the BAC Site from 2009 to 2012 (Appendix 8). Post construction monitoring in the area of influence of Measure 1 and at appropriate reference locations would be performed at an interval mutually agreed upon by the IET. Analytes specific to porewater and soil health would be prioritized, because source water from OEPS outfall canal may be associated with poor soil health in marsh habitats. The USFWS has vegetation monitoring sites within the BAC Site (Appendix 15). Relevant vegetation monitoring would continue within the effect area, if constructed. To supplement the USGS water and soil quality metrics, CEMVN recommends that two continuous water quality stations be installed and maintained with implementation of this measure. One station would be in the OEPS outfall canal and another would be inside the BAC Site in the effect area of the new gap.

Field visits to view site conditions (e.g., scouring and debris) and meetings between USACE, CPRA, NPS, and EPA should be held on a mutually agreed upon interval. During these meetings, monitoring reports, current conditions, and other relevant data (e.g., imagery or CRMS Station 0185 data) would be discussed and decisions made regarding whether implementation of adaptive management actions are necessary.

5.2.3 Measure 2

5.2.3.1 Methods

Measure 2 would include up to four gaps, two on the east bank, and two on the west bank of the existing SNGP canal (Figure 24). While the general location of each gap is defined below, the specific location would be determined in the field to avoid and minimize the felling of trees. The first west bank gap would be located approximately 1,250 feet interior from the GIWW, a paired east bank/west bank gap combination would be located approximately 2,340 feet interior from the GIWW, and the most interior east bank gap would located approximately 7,300 feet interior of the GIWW.

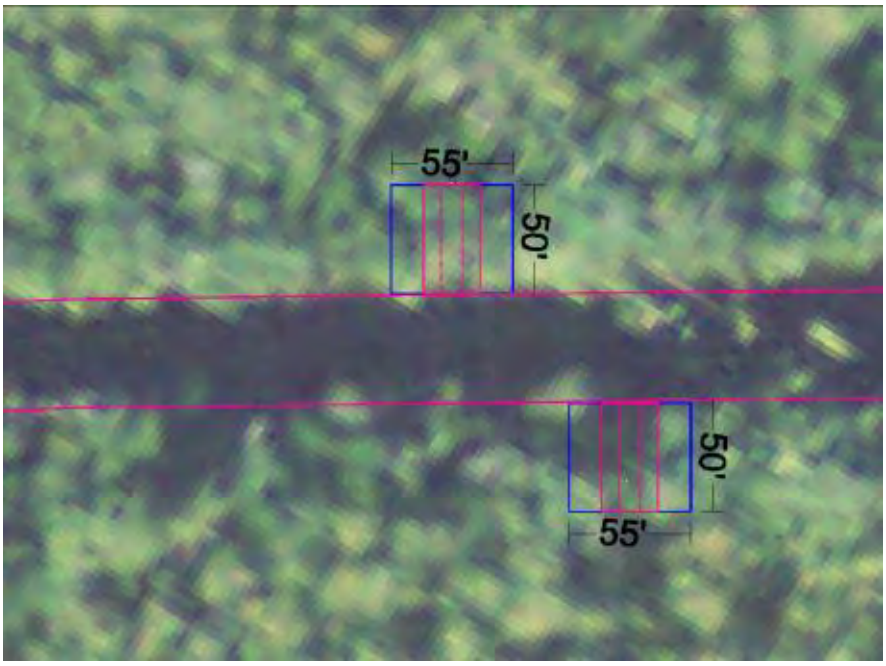

Figure 24. Plan view of paired gaps along the SNGP canal. The design of all four gaps would be similar to this.

Spoil bank ridges exist on both banks of the SNGP canal. In general, the east bank ridge is slightly higher in elevation than the west bank ridge. The east bank ridge was assumed to have a crown elevation of approximately +3.0 feet. The west bank ridge crown elevation was assumed to be approximately +2.0 feet.

Each gap would have 10 foot bottom width with side slopes ranging from 1:3 to 1:2 to accommodate a top width of approximately 25 feet (Figure 25). The gaps would be excavated to the forest ground, which is estimated to be 0.0 - +1.0 feet in elevation. This would allow for sheet flow from the canal, through the gap, and over the swamp. Each gap would require removal of approximately 50 cubic yards of excavated material which would be stockpiled adjacent to the gap. Each respective gap, including, clearing, excavation, and disposal, encompasses an area of approximately 0.05 acres.

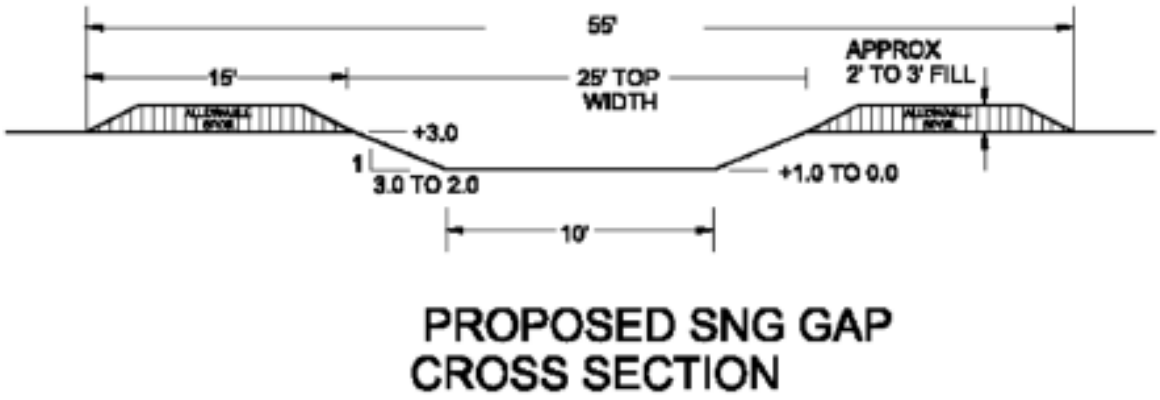

Figure 25. Representative cross section of a gap for Measure 2.

5.2.3.2 Risk and Reliability

5.2.3.2.1 Uncertainty relative to ecological success

Ecological success for this and other measures may be difficult to quantify as explained in Section 5.2.2.2.1. While there is general consensus that degrading spoil banks and increasing exchange flow can be an effective restoration tool for wetlands, there are already extensive existing gaps present on both banks of the SNGP canal (Figure 7) that already allow exchange between the canal and the BAC. As such, it is questionable whether additional benefits would result from additional gaps. Currently, the NPS has plans to degrade the entire SNGP canal spoil bank on their property (Appendix 16). The existing gaps and the NPS plan to degrade the spoil banks on their property would reduce or potentially eliminate any long-term net benefits from this measure.

5.2.3.2.2 Potential need for adaptive management

It is unlikely that there would be a need for adaptive management as a result of construction of Measure 2. There are many existing gaps along the BAC Site, and they do not appear to be resulting any negative impacts to adjacent habitat. In addition, it would be difficult to determine if this measure contributed to any potential post construction changes, because there are many nearby gaps, and modeling results indicate no net change in flow exchange (Table 3; Appendix 9).

5.2.3.2.3 Uncertainty relative to implementability

There are no known major uncertainties relative to implementability. This measure would be easily implementable, because it is publically owned and there is relatively easy public access to the site via watercraft.

5.2.3.2.4 Self-sustainability

There could be future issues of self-sustainability related to debris removal. Though rafts of water hyacinth and debris can be found in SNGP, debris removal is not anticipated to be a major issue as debris did not appear to be affecting existing gaps within the SNGP canal during

recent field visits. If debris removal proves necessary, then the cost associated with this would be minimal and infrequent.

5.2.3.2.5 Risk of exposure to physical stressors

The risk of exposure to physical stressors is expected to be low. The area does not have a large fetch perpendicular to where the feature would be constructed. Also, the existing gaps along the SNGP canal spoil banks do not exhibit any signs of erosion or other negative impacts resulting from boat traffic, or any other such stressors.

5.2.3.3 Environmental

5.2.3.3.1 Water quality

There would be some temporary negative water quality impacts associated with construction. Localized increase in turbidity would occur, but would return to normal after construction. There are no permanent direct, indirect, or cumulative negative impacts to water quality anticipated for Measure 2. Though there is a potential to realize some water quality benefits from implementation of this measure, the hydrodynamic modeling results (Appendix 9) did not demonstrate an increase in net flow exchange. Moreover, Jean Laffite Canal Backfilling Project is planning to degrade the SNGP canal spoil banks, including the areas that would be gapped by Measure 2. If constructed by the NPS, this project would eliminate the need for and the benefits of this measure.

5.2.3.3.2 Habitat impacts

This measure is predicted to have the lowest initial construction related negative impacts to habitat, approximately 0.2 acres of ruderal forest and/or swamp would be negatively impacted. This measure is not predicted to increase the flow exchange, as hydrodynamic modeling suggests no net increase or decrease of flow exchange (Table 3; Appendix 9, Annex 2).

5.2.3.3.3 Wildlife impacts

Ruderal forest and swamp habitat would be directly impacted during construction (i.e., clearing, grading and excavating). This would eliminate nesting and foraging habitat for wildlife in the project area and disrupt similar activities adjacent to the project area during construction. However, these adverse impacts to wildlife would be negligible as little existing habitat would be impacted and the construction duration would be short. Benefits to wildlife would be experienced through potential benefits to adjacent swamp associated with minor increases in hydrologic connection. However, modeling suggests no net increase or decrease of flow exchange for this measure.

5.2.3.3.4 Aquatic resources and fisheries

Measure 2 is expected to have limited positive aquatic and fisheries impacts associated with increased access. Benefits are anticipated to be limited to access and relatively small for two reasons

1. Modeling results indicate no net increase in water exchange (Appendix 9).

2. The SNGP canal spoil bank has many existing gaps on both sides (Figure 7).

Additionally although gapping the spoil banks would allow for better organism access, both spoil banks may be completely degraded via the Jean Laffite Canal Backfilling Project (Appendix 16).

5.2.3.3.5 Cultural resources

A review of Measure 2 indicates multiple previously recorded archaeological sites within the vicinity and would require additional review to determine if this action would require consultation under Section 106 of the NHPA. The CEMVN will follow its Section 106 review procedures, if this measure is carried forward.

5.2.3.4 Costs

Costs associated with Measure 2 were found to be the lowest among the three considered (Table 5). Construction costs were estimated to be $110,250, real estate costs were estimated at $10,000, and OMRR&R costs were assumed to be low and similar across all measures considered. There was no pre-construction monitoring specific to this measure. There is a nearby monitoring station (CRMS 0185) that reports water, vegetation, and spatial data (Figure 4). These data could be used for monitoring. There would be no yearly monitoring costs anticipated for this measure if CRMS 0185 is maintained.

5.2.3.5 Adaptive Management and Monitoring

The adaptive management and monitoring plan would be further developed between the NPS, CPRA, EPA, and CEMVN if this measure is selected for construction. In this section, a generalized adaptive management and monitoring approach is discussed. This generalized approach would be used to kick off a more detailed adaptive management and monitoring plan, if this measure is constructed.

Measure 2 would excavate material from the SNGP canal spoil banks to increase hydrologic connection. The suggested adaptive management plan would be to place material to reclose any gaps, effectively reversing construction. Material removed during construction would be stockpiled nearby to facilitate this adaptive management action, if needed.

Baseline monitoring of vegetation and water quality data has been collected for the BAC Site. USFWS has vegetation monitoring sites within the BAC Site (Appendix 15). Relevant vegetation monitoring would continue near the effect area of this measure, if constructed.

Field visits to view site conditions (e.g., scouring and debris) and meetings between USACE, CPRA, NPS, and the EPA would be held on a mutually agreed upon interval. During these meetings current conditions and other relevant data (e.g., imagery, CRMS Station 0185 data) would be discussed and decisions regarding adaptive management would be made.

5.2.4 Measure 3

5.2.4.1 Methods

The plug at the juncture of Bayou aux Carpes and the GIWW (Figure 27) would be removed. Construction access is available by road or water. Construction equipment and personnel could access the site by travelling Hwy 3134 to Barataria Blvd to Orleans Way in Crown Point, Louisiana. Once at the Crown Point boat launch, an existing private shell road would provide access to the plug. This road would be bisected by removal of the plug as it currently uses the plug to traverse Bayou aux Carpes. Water access would also be available directly from the GIWW.

Figure 27. Representative plan view of Measure 3.

Removing the plug would involve excavating a 40 foot bottom width gap, with 1:2.5 side slopes to an elevation of -4.0 feet NAVD88. The resulting top width of excavation would approximately 75 feet based on an assumption that the existing plug crown elevation is +3.0 feet NAVD88. An additional 100 feet of vegetation would be cleared along the shell road to stockpile excavated material. Stockpiled material is estimated to be approximately 1,700 cubic yards. The proposed plug removal (clearing, excavation, and disposal) encompasses an area of approximately 0.7 acres (Figure 28).

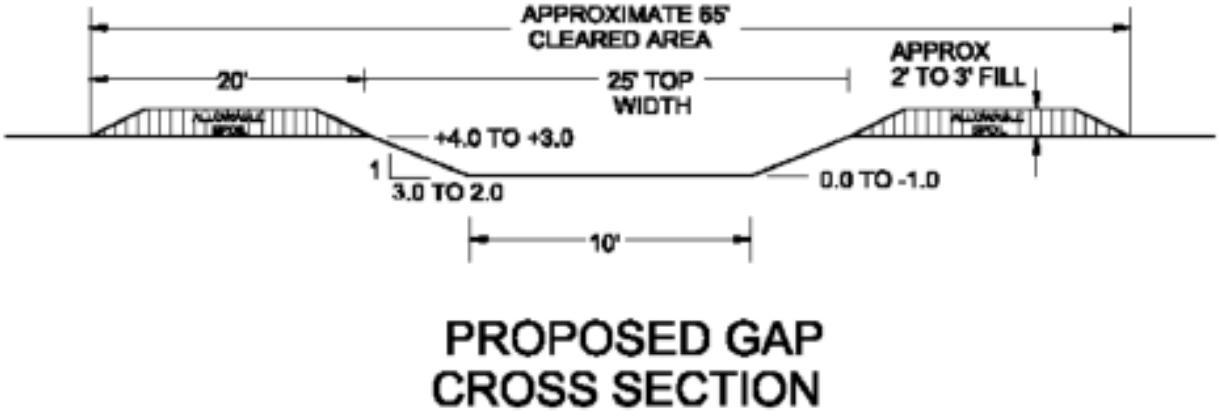

Figure 28. Cross section of a gap for Measure 3.

5.2.4.2 Risks and Reliability

5.2.4.2.1 Uncertainty relative to ecological success

Modeling results show that Measure 3 would provide the highest net increase in flow exchange of all measures (Table 7; Appendix 9, Annex 2). As such, this measure has the lowest uncertainty to achieving ecological success. This measure would also restore historic connectivity between the GIWW and Bayou aux Carpes.

5.2.4.2.2 Potential need for adaptive management

Measure 3 scored lowest for potential need for adaptive management (Table 4). This measure would restore historic connectivity between the BAC and the GIWW. The GIWW experiences periodic spikes in salinity and periodically conveys Mississippi River fresh water which may be of poor quality that could affect Bayou aux Carpes and its adjacent wetlands. However, the area affected by this measure is already exposed to water from the GIWW via oil and gas canals that connect Bayou aux Carpes to the SNGP. These canals allow GIWW water to enter Bayou aux Carpes, but may inhibit the draining of the area due to the circuitous route the water has to take.

5.2.4.2.3 Uncertainty relative to implementability

At the time of this writing, it is uncertain if the property where the Bayou aux Carpes plug is located is owned by the NPS, the State of Louisiana, or a private land owner. Further investigation is required to determine whether ownership could affect implementability of Measure 3. Variation in the location and design of the gap could be considered to alleviate this issue.

5.2.4.2.4 Self-sustainability

Measure 3 is expected to be self-sustaining, because it would be similar to the existing SNGP canal, making the need for OMRR&R activities unlikely. There are no anticipated issues related to FAV or other debris as described for Measures 1 and 2.

5.2.4.2.5 Risk of exposure to physical stressors

The risk of exposure to physical stressors is expected to be low to moderate. The area does not have a large fetch perpendicular to where the feature would be constructed, but boat traffic and wind in the GIWW, a major navigable waterway, may produce waves that reach the gap location and recreational boaters will likely use the gap to access Bayou aux Carpes more directly. The SNGP is less than 0.5 miles downstream and experiences similar boat traffic and appears to be stable. Currently there are commercial mooring dolphins with frequent barge tie-ups along the GIWW in the vicinity of the SNGP canal and the Bayou aux Carpes plug, which could dampen wave energy from the GIWW such as watercraft wakes. If physical stressors are anticipated to be a problem (e.g., erosion), design features such as adding sinuosity to the channel and/or stabilizing the gap would be considered if this measure is selected. Therefore, the risk of this is low to moderate, but should be considered during further design.

5.2.4.3 Environmental

5.2.4.3.1 Water quality

There would be some temporary negative water quality impacts associated with construction of Measure 3. Localized increase in turbidity could occur, but is likely to be temporary. The long-term water quality impacts are expected to be positive, because reconnecting Bayou aux Carpes with GIWW would likely increase flow exchange and allow for better drainage.

High salinity events in the GIWW can elevate both surface and porewater salinities within the BAC Site. The increased drainage in areas that are more hydraulically connected to the GIWW may allow porewater salinities to quickly return to normal levels following these events, while the lack of drainage in areas more hydraulically isolated from the GIWW may allow porewater salinities to remain elevated for extended durations. High porewater salinities were measured following high surface water salinities in the SNGP canal, which is more hydraulically connected to the GIWW than the Bayou aux Carpes plug. Porewater salinities at this site normalized a few months after surface water salinities decreased. In comparison, all porewater salinity observations were high (quarterly samples for a year) at a site near the Bayou aux Carpes plug. Implementation of Measure 3 would allow for better drainage of an area with high porewater salinities. This could potentially decrease soil porewater salinities and decrease the negative effects of future spikes in surface salinities.

Measure 3 could increase the influence of Mississippi River water in Bayou aux Carpes, however the water quality impacts associated with this are unknown and the Mississippi River water likely already impacts Bayou aux Carpes. Many studies have documented Mississippi River water quality issues (e.g., Turner and Rabalias, 1991, Boyd et al., 2003, Zhang et al., 2012), and these issues may negatively impact vegetation (Swarzenski et al., 2008). However, other studies suggest that restoring flow from the Mississippi River can benefit coastal wetlands in Louisiana (e.g., Lane and Day, 1999, Allison and Meselhe, 2010, Shaffer et al., 2016, Baustian et al., 2019). Mississippi River water from the GIWW is openly connected to Bayou aux Carpes through the SNGP canal and other oil and gas canals. Therefore, any increased Mississippi River influence as a result of Measure 3 may be limited to the area immediately surrounding the newly created gap.

5.2.4.3.2 Habitat impacts

There would be approximately 0.7 acres of shell road and ruderal forest and swamp impacted from construction of Measure 3. Measure 3 would not be implemented unless it is expected to produce overall benefits to the wetlands of the BAC Site through increased exchange flow. Modeling suggests the largest net increase of flow exchange area for this measure, which could benefit an additional 86 acres compared to existing conditions (Table 7, Appendix 9, Annex 2). This could reduce soil porewater salinity in an area with high porewater salinity (Section 2.2.5.2; Section 5.2.4.3.1; Appendix 8). This measure would also increase connectivity with Mississippi River water which other studies have found to benefit coastal wetland habitats (e.g., Lane and Day, 1999, Allison and Meselhe, 2010, Shaffer et al., 2016, Baustian et al., 2019).

5.2.4.3.3 Wildlife impacts

Approximately 0.7 acres of ruderal forest and swamp habitat would be directly negatively impacted during construction (i.e., clearing and excavating). This would eliminate nesting and foraging habitat for wildlife in the project area and disrupt similar activities adjacent to the project area during construction. However, these adverse impacts to wildlife would be small as little existing habitat would be impacted and the construction duration is so small. Wildlife would benefit from enhancement of adjacent swamp and aquatic habitat through the restoration of hydrologic connection and water exchange with the GIWW.

5.2.4.3.4 Aquatic resources and fisheries

The resulting plug removal is expected to increase flow exchange in the vicinity where SAV and FAV have been observed. Overall net impacts to aquatic vegetation could be positive with any negative impacts to SAV expected to be minimal or negligible. SAV and FAV were sampled every spring and fall from 2010 through 2012 near the BAC plug (Weston Solutions Inc., 2015). Up to four species of SAV were observed at a site in the Bayou aux Carpes plug vicinity (*Najas guadalupensis, Hydrilla verticillata, Ceratophyllum demersum,* and *Cabomba caroliniana*), with the lowest species diversity occurring in the 2012 samples (0 species for Spring of 2012 and *C. demersum* only for Fall of 2012). FAV was recorded during each survey with greater than 75% cover recorded from Spring 2011 through Spring 2012. This increase in flow exchange could have negative impacts associated with a decrease in SAV cover and positive impacts associated with decreased FAV cover. FAV species in the BAC Site are mostly nuisance species that can negatively impact aquatic resources, including SAV. Furthermore, Measure 3 may be the best opportunity for long-term benefits with respect to water quality, which could benefit aquatic resources and fisheries (Section 5.2.4.3.1). Gap design would be optimized to result in maximum benefits and minimize impacts to ecologically valuable aquatic vegetation to the extent possible.

Overall, it is expected that net positive impacts to aquatic and fisheries resources would result if this measure is constructed for four reasons.

1. Long-term negative impacts to SAV are expected to be minimal or negligible.
2. It would increase aquatic organism access and restore natural estuarine connectivity.
3. It would have the largest (relative to other measures considered) habitat benefit in terms of flow exchange and soil health.

5.2.4.3.5 Cultural resources

A preliminary review of potential cultural resources related to Measure 3 indicates multiple previously recorded archaeological sites within the vicinity and would require additional review to determine if this action would require consultation under Section 106 of the NHPA. The CEMVN will follow its Section 106 review procedures if this measure is carried forward.

5.2.4.4 Costs

Costs associated with Augmentation Measure 3 were found to be the higher than Measure 2, but lower than Measure 1 (Table 6). Construction costs were estimated to be $119,875. Real estate costs were estimated at $35,000, but may be lower due to land ownership uncertainty (See Section 5.2.4.2.3). Anticipated OMRR&R costs were assumed to be low and similar across all measures considered. Initial monitoring costs were estimated to be $5,000 (installation of a continuous water quality station near the confluence of Bayou aux Carpes and the GIWW). Yearly monitoring costs were estimated to be $17,000 for the maintenance of the water quality station.

5.2.4.5 Adaptive Management and Monitoring

The adaptive management and monitoring plan would be further developed between the NPS, EPA, CPRA, and CEMVN if this measure is selected for construction. In this section, a generalized adaptive management and monitoring approach is discussed. This generalized approach would be used to kick off a more detailed adaptive management and monitoring plan, if this measure is constructed.

Measure 3 would remove material from a shell road at the junction of Bayou aux Carpes and the GIWW to increase water flow exchange. The suggested adaptive management action would be to place material to reclose any gaps, effectively reversing construction. Material removed during construction would be stockpiled nearby to facilitate this adaptive management action, if needed.

Baseline monitoring of vegetation and water quality data has been collected for the BAC Site. USFWS has vegetation monitoring sites within the BAC Site (Appendix 15). USGS performed some preliminary porewater monitoring for marsh sites within the BAC Site from 2009 to 2012 (Appendix 8). Monitoring of soil porewater salinity in the immediate effect area of Measure 3 and at appropriate reference locations would continue on a mutually agreed upon interval, because of the high soil porewater salinity measured previously (Appendix 8). Water level, and conductivity and temperature meters were installed approximately 650 feet upstream of the Bayou aux Carpes plug in April 2018 for pre-construction monitoring. These data are recorded at hourly intervals and would continue through construction if this measure is carried forward. These instruments could be replaced by a permanent station (similar to CRMS) to collect continuous conductivity, water surface elevation, and temperature data. In addition, vegetation monitoring and soil porewater salinity could be measured discretely as part of this permanent station. Other permanent stations could be used as reference sites, such as CRMS 0185.

Field visits to view site conditions (e.g., scouring and debris) and meetings between USACE, NPS, CPRA, and the EPA would be held on a mutually agreed upon interval. During these

meetings, monitoring reports, current conditions, and other relevant data (e.g., imagery) would be discussed and decisions regarding adaptive management actions would be made.

6.0 Discussion

Measure 3 appears to offer the best opportunity to produce overall benefits to BAC Site wetlands through the restoration of historic connectivity and water exchange with the GIWW. The high porewater salinities measured in the vicinity of this measure could be improved with the restoration of historic flow regimes. There may also be some negative impacts to SAV that could be avoided or minimized by adding some sinuosity to the gap, although, this could result in additional direct impacts to other wetlands. Adaptive management and monitoring would help ensure the effectiveness of this measure by determining if unacceptable impacts from installing the gap are occurring and providing for the replacement of the plug if necessary.

Measure 1 may benefit BAC Site wetlands, however net benefits, in terms of increased flow exchange, are expected to be low to negligible, and it has the highest relative risk. Hydrodynamic modeling indicates this measure could increase exchange flow in the area, but the extent of this is dependent on the management of two structures with two different operators. Source waters from the OEPS outfall canal and the stormwater pumped into the canal may be associated with poor soil health. If this is true, increasing exchange could be detrimental to wetland soil health. Measure 1 is also predicted to have the highest construction related negative impacts to wetlands. Adaptive management and monitoring of this measure would be very important to ensure water quality and the condition of the soil do not produce negative impacts to marsh within the affected area. Adaptive management and total construction costs are predicted to be the highest for Measure 1.

Measure 2 is estimated to be the least expensive and least risky measure evaluated. A continuous water quality and vegetation monitoring station (CRMS 0185) station exists along the SNGP canal. This measure is unlikely to have any net negative impacts to wetlands, and would require the least monitoring. The most likely problem may be debris accumulation at the gaps, but this is not anticipated to be a major issue. However, adaptive management and monitoring would still need to be considered for this measure if it is constructed.

Measure 2 is also expected to have little environmental benefits. There are many existing gaps along the SNGP canal which reduce the net benefits of any additional gaps. Hydrodynamic modeling supports this by showing no net increase in exchange as compared to existing conditions. This measure may also be unnecessary, because the NPS has plans to degrade both spoil banks along the SNGP canal.

7.0 Conclusions

Measure 3 was found to be the highest performing measure with an acceptable level of risk. Measure 1 may provide some environmental benefits, but there are potentially unacceptable risks associated with this measure. Measure 2 is likely to have a limited impact to the BAC Site.

8.0 Recommendation(s)

Measure 3 is recommended as the only augmentation feature for implementation. It would restore a more natural connection between Bayou aux Carpes and the GIWW. Hydrodynamic modeling results suggest it would have the highest positive impact. There may be some porewater salinity problems in the vicinity that could be ameliorated by the increased drainage provided by this measure. Associated risks would be addressed during advanced engineering and design and/or through further development of an adaptive management and monitoring plan.

Measure 1 is not recommended because of potential risks. If this measure were to be constructed, robust adaptive management and monitoring program would be necessary to ensure negative impacts to the BAC are not realized.

Measure 2 is not recommended because it is likely to have limited to no environmental impacts, since it has little effect BAC Site hydrology. This measure may also be unnecessary if the Jean Laffite Canal Backfilling Project moves forward as expected.

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Bayou aux Carpes 404(c) Augmentation Interagency Environmental Team Meeting
Evaluation Report and Recommended Plan Discussion
September 24, 2019
Meeting Notes

I. Roll Call:

NPS – Guy Hughes
NPS - Dusty Pate
LDNR – Frank Cole
CPRA – Robert Routon
USFWS – Hannah Sprinkles
NMFS – Craig Gothreaux
LDWF – Matt Weigel
EPA – Raul Gutierrez
USACE - Patrick Smith
USACE - Melanie Goodman
USACE - Elizabeth Behrens
USACE - Catherine Bourg
USACE - Kevin Harper

II. A brief presentation of the Bayou aux Carpes 404(c) Augmentation Measures Evaluation Report (Report) was given. The Report was transmitted to the IET on August 31, 2019 for a 14 day IER comment period. There were no comments of non-concurrence received during the IET Report comment period. Explicit support for the recommended plan, Measure 3 as the TSP, was given by NPS, LDNR, LDWF, USFWS, and NMFS during the IET Report comment period. The LDEQ stated no objections. The USGS stated they cannot provide recommendations or concurrence. As per the report, the USACE recommends selecting Measure 3, removing the plug from Bayou aux Carpes and the GIWW, as the recommended plan. Results from the request for IET verbal concurrence or non-concurrence with the Report evaluation and recommended plan are as follows:

NPS – Guy Hughes – CONCUR
LDNR – Frank Cole – CONCUR
CPRA – Robert Routon – CONCUR
USFWS – Hannah Sprinkles – CONCUR
NMFS – Craig Gothreaux - CONCUR
LDWF – Matt Weigel – CONCUR
EPA – Raul Gutierrez – EPA does not object to the recommended plan; EPA would formally reply upon receipt of a formal request for approval.

III. Comments and responses related to engineering and design of the recommend plan were presented and discussed.
   a. In general, there was agency support for considering adding some sinuosity or meander where the plug occurs. The details of this would be determined at a later time and coordinated with the agencies.
   b. In general, there was some agency support for considering placing some or all material excavated as part of the recommended plan in the vicinity of the artificial connection at the Southern Natural Gas Pipeline Canal and the GIWW. After excavation, this material could become property of the NPS for their beneficial use in this manner.

c. There was a discussion regarding landownership and access if the recommended plan were to be implemented.
    i. It is likely that two private parcels on either side of the plug. Access may be limited to waterborne for the private landowner if the recommended plan is implemented.
    ii. More work/research is needed to fully understand landownership in the project vicinity.

IV. A kick-off discussion of the monitoring and adaptive management planning process for the recommended plan occurred.
    a. An interagency agreement with those willing and active members of the IER team would be developed documenting the commitment to participate in the planning and analyses.
    b. There was a consensus that the most likely adaptive management action would be bringing in new material to plug, effectively reversing the recommended plan.

Annex G: National Park Service Cooperating Agency Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVE
NEW ORLEANS, LA 70118-3651

November 18, 2020

Mr. Stan Austin
Regional Director
National Park Service Regional Office
Department of the Interior
South Atlantic Gulf Region 2
100 Alabama Street
Atlanta, GA 30303

Mr. Charles Hunt,
Superintendent
National Park Service
Jean Lafitte National Historical Park and Preserve,
419 Decatur Street,
New Orleans, LA 70130-1035

Dear Messrs. Austin and Hunt,

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) intends to prepare a Supplemental Environment Assessment (SEA) titled "Jean Lafitte National Historical Park and Preserve Augmentation Features Supplemental Environmental Assessment and National Historic Preservation Act Assessment of Effects, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation, Jefferson Parish, Louisiana, SEA 581". The SEA 581 would assess augmentation features within the Bayou aux Carpes (BAC) Clean Water Act Section 404(c) area (BAC Site). Much of the BAC Site is within the National Park Service's (NPS) Jean Laffite National Historical Park and Preserve. The CEMVN has been closely coordinating with NPS staff and other federal and state agencies during the plan formulation, alternative development, and selection of a tentatively selected plan for this project would like to formally invite the NPS to participate as a Cooperating Agency for SEA 581. The SEA 581 would identify and evaluate augmentation features to partially restore the wetland functions and values within the BAC Site.

We are inviting the participation of your agency as a Cooperating Agency pursuant to Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR §1501.6 and §1508.5), the Water Resources Council principles and guidelines (42 U.S.C. §1962-3), and USAGE Engineer Regulation (ER) 1105-2-100 (Paragraph 2-5.a.). The purpose of this request is to formalize, via designation as a Cooperating Agency, the continuing coordination and active participation by the NPS in the SEA 581.

The CEMVN would be responsible for sending out letter notifications to interested parties prior to the beginning of public review of the draft SEA 581, and requests that the NPS provide a list of interested parties to be provided public review notification via letter. The following coordination, consultation, and compliance associated with the SEA 581 will be completed by the CEMVN:

Bald and Golden Eagle Protection Act
Clean Air Act
Clean Water Act – Section 401 and Section 404
Coastal Zone Management Act
Endangered Species Act
Fish and Wildlife Coordination Act
Magnuson-Stevens Fisheries Conservation and Management Act
Migratory Bird Treaty Act
National Historic Preservation Act – Section 106

We would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007. The following review periods have been established in accordance with the current project schedule:

a. NPS Review of Draft SEA 581 begins November 2020.

b. Thirty (30) – day public review of Draft SEA 581 begins in January 2021.

c. NPS Review of Final SEA 581 begins in February 2021.

If you have any questions, please contact Patrick Smith, Biologist, at (504) 862-1583 or at Patrick.W.Smith@usace.army.mil.

Sincerely,

Troy Constance
Chief, Regional Planning and
Environment Division South

From:	Smith, Patrick W CIV USARMY CEMVN (USA)
To:	Hughes, Guy D
Cc:	Behrens, Elizabeth H CIV USARMY CEMVN (USA); Harper, Marshall Kevin (Kevin) CIV USARMY CEMVN (USA); Pate, Dusty H; Williams, Jolene; Whitbeck, Julie L; Goodman, Melanie L CIV USARMY CEMVN (US)
Subject:	Bayou aux Carpes cooperating agency letter
Date:	Wednesday, November 18, 2020 11:08:00 AM
Attachments:	2020-11-18 Cooperating Agency_Letter_SEA581_DRAFT_updated_signed.pdf

Hello Guy,

Please see attached cooperating agency letter addressed to Mr. Austin and Mr. Hunt.

Thanks,
Patrick

Patrick Smith, PhD
Biologist, Environmental Studies Section
Regional Environmental Planning Division, South
USACE, New Orleans District
(504) 862-1583

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Herbert Johnson, Tribal Council Chairperson
Alabama-Coushatta Tribe of Texas
571 State Park Rd 56
Livingston, TX 77351

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Mikko Skaalaba Johnson:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
1. Clearing vegetation,
2. Excavating earthen material to remove the plug, and
3. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

Area of Potential Effects (APE)

The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mr. Bryant J. Celestine, Historic Preservation Officer, Alabama Coushatta Tribe of Texas, celestine.bryant@actribe.org.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Gary Batton, Chief
Choctaw Nation of Oklahoma
Attn: Choctaw Nation Historic Preservation Department
P.O. Box 1210
Durant, OK 74702-1210

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Chief Batton:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where

Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
3. Excavating earthen material to remove the plug, and
4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

Area of Potential Effects (APE)

The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site

16PL260 are identified as prehistoric shell middens, and neither would be impacted by the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Dr. Ian Thompson, Director/Tribal Historic Preservation Officer, Choctaw Nation of Oklahoma, ithompson@choctawnation.com and Ms. Lindsey Bilyeu, NHPA Section 106 Reviewer, Choctaw Nation of Oklahoma, lbilyeu@choctawnation.com.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

David Sickey, Chairman
Coushatta Tribe of Louisiana
P.O. Box 818
Elton, LA 70532

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Chairman Sickey:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

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Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

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Area of Potential Effects (APE)

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Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Dr. Linda Langley, Tribal Historic Preservation Officer, Coushatta Tribe of Louisiana, llangley@coushattatribela.org and Mr. Johans Johns, jonasj@coushattatribela.org.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Melissa Darden, Chairman
Chitimacha Tribe of Louisiana
P.O. Box 661
Charenton, LA 70523

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Chairman Darden:

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Description of the Undertaking

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proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

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Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mrs. Kimberly Walden, M. Ed., Cultural Director/Tribal Historic Preservation Officer, Chitimacha Tribe of Louisiana, kim@chitimacha.gov.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

B. Cheryl Smith, Principal Chief
Jena Band of Choctaw Indians
P.O. Box 14
Jena, LA 71342

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Principal Chief Smith:

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proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

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A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mrs. Alina Shively, Tribal Historic Preservation Officer, Jena Band of Choctaw Indians, ashively@jenachoctaw.org.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Kristin Sanders, SHPO
LA State Historic Preservation Officer
P.O. Box 44247
Baton Rouge, LA 70804-4241

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Ms. Sanders:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
3. Excavating earthen material to remove the plug, and
4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

Area of Potential Effects (APE)

The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

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Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to the Section 106 Inbox, section106@crt.la.gov.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Cyrus Ben, Chief
Mississippi Band of Choctaw Indians
P.O. Box 6257
Choctaw, MS 39350

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Chief Ben:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
3. Excavating earthen material to remove the plug, and
4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

Area of Potential Effects (APE)

The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mr. Kenneth H. Carleton, Tribal Historic Preservation Officer/Archaeologist, Mississippi Band of Choctaw Indians, kcarleton@choctaw.org.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Mr. David Hill, Principal Chief
Muscogee (Creek) Nation
Attn: Historic and Cultural Preservation Office
P.O. Box 580
Okmulgee, OK 74447

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Principal Chief Hill:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where

Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
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4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
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16PL260 are identified as prehistoric shell middens, and neither would be impacted by the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Ms. Corain Lowe-Zepeda, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, section106@mcn-nsn.gov.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Greg Chilcoat, Principal Chief
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Principal Chief Chilcoat:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
3. Excavating earthen material to remove the plug, and
4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

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The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mr. David Franks, Tribal Historic Preservation Officer, Seminole Nation of Oklahoma, franks.d@sno-nsn.gov.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Marcellus W. Osceola, Chairman
Seminole Tribe of Florida
6300 Sterling Road
Hollywood, FL 33024

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
Plug Center Point (Lat. 29.776º N, 90.069º W)
Determination: No Historic Properties Affected

Dear Chairman Osceola:

The U. S. Army Corps of Engineers, New Orleans District (CEMVN), in cooperation with the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA), proposes to partially restore the hydrologic connection between Bayou aux Carpes and Bayou Barataria (Gulf Intracoastal Waterway or GIWW). CEMVN is the Lead Federal Agency, per 36 CFR 800.2(a)(2)), for this Undertaking. This work would involve removing earthen and shell material that was deposited to plug Bayou aux Carpes circa 1974 where these two waterways previously met (see Figure 1 for the project location on a 7.5" USGS map). As part of CEMVN's evaluation and in partial fulfillment of responsibilities under the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, CEMVN offers you the opportunity to review and comment on the potential of the proposed action described in this letter to affect historic properties. Additionally, in accordance with the of responsibilities of Executive Order 13175, CEMVN offers Federally-recognized Tribes the opportunity to review and comment on the potential of the proposed undertaking described in this letter to significantly affect protected tribal resources, tribal rights, or tribal lands.

Description of the Undertaking

The Bayou aux Carpes plug removal project (Undertaking) would consist of the removal of an earthen embankment, identified as a "plug", which was placed where Bayou aux Carpes intersects the GIWW in 1974. Most of the work associated with the

proposed Undertaking would occur within the EPA designated Bayou aux Carpes (BAC) site on property that is managed by the NPS as part of the JELA's Barataria Preserve. Other project activities would occur in state owned water bottoms and roadways. Removal of this earthen embankment has been designed to create a sinuous connection between Bayou aux Carpes and the GIWW to partially restore hydrologic connectivity and increase wetland functions and values of the BAC site, while minimizing erosion within the Bayou aux Carpes from waves generated in the GIWW. Construction duration would be anticipated to last approximately 90 days. Figure 2 shows the plan view of approximate maximum construction areas. Construction would consist of four activities:

1. Accessing the Project Area,
2. Clearing vegetation,
3. Excavating earthen material to remove the plug, and
4. Disposing excavated material within the BAC plug vicinity.

Construction activities as described and illustrated in this section represent the maximum area necessary to construct a feasible sinuous channel that would achieve augmentation goals of partially restoring hydrologic connection. Estimated quantities of borrow material and estimated capacities of disposal area are not equal (i.e., they do not add up) for two reasons:

1. This allows for flexibility for disposal options. That is, material can be placed within the best, in terms of perceived environmental benefits, places within disposal areas, and
2. The quantities described in this section are estimates with contingency and therefore represent maximum expected amounts.

Area of Potential Effects (APE)

The APE for direct and indirect effects is represented in Figures 1 and 3 and is the EPA designated Bayou aux Carpes site on property that is managed by the NPS as part of the JELA's Barataria Preserve. The APE consists of the plug excavation and removal location, access locations, vegetation clearing limits, and disposal areas adjacent to and along the Bayou aux Carpes bank line. The direct and indirect APE for the BAC site and work is estimated to be 5.2 acres (2.1 ha) in size.

Identification and Evaluation of Historic Properties

A review of the Louisiana Cultural Resources Map (on-line) indicates that the Barataria Unit of Jean Lafitte Historical Park Historic District National Register District, a cultural landscape encompassing five types of historic resources with a period of significance from 700 A.D. to 1910 A.D. all located in a distinctive environment, is located within three kilometers of the APE. Additionally, the search revealed that there are three archaeological sites within 1 kilometer of the APE. Site 16JE234 and site 16PL260 are identified as prehistoric shell middens, and neither would be impacted by

the proposed project. The third archaeological site, 16JE233, is located in the APE and was recorded in 2006 during a visual inspection by boat in support of post-Katrina debris removal. The site record for 16JE233 indicates that the site was recorded as a possible prehistoric *Rangia* shell midden and historic two-track road existing on the west bank of Bayou Barataria along the natural levee.

Contradicting the likelihood that this plug is a prehistoric archaeological site, a review of historic USGS maps available on-line for this location (New Orleans SE, LA 1932; Bertrandville 1940, 1947, 1951, 1966) all record the intersection of Bayou aux Carpes and Bayou Barataria as free flowing and without "plug" or levee. The disconnection is first recorded on a series of photo revisions to the 1966 Bertrandville 7.5' USGS map in 1980, which is consistent with the construction timeline. Also contradictory to the site form information, background research revealed that in 1964 CEMVN approved a flood control project, the Harvey Canal – Bayou Barataria Levee Project, that included the construction of levees along the west bank of Bayou Barataria and *the closure of Bayou aux Carpes* (EPA 1985). In 1970, CEMVN completed an Environmental Impact Statement recommending that the proposed Harvey Canal – Bayou Barataria Levee Project be constructed. CEMVN began construction of the levees in 1971 and completed work in November 1973. Following completion of the construction of the levees, federal funding was exhausted and remaining work was to be financed and completed by local governments. Sometime between 1974 and 1975, the Jefferson Parish Government completed the closure of Bayou aux Carpes using [Rangia] clam shell fill. Aerial Images dating from 1974 and 1975 show the location before and after the earthen and shell material was deposited (Figures 4 – 6). Considering the possibility that the shell material may have been borrowed from archaeological contexts, JELA team members and NPS South Eastern Archaeological Center archaeologists conducted a site assessment of the APE in 2010, determining that it was not an intact archeological site. Additionally, a CEMVN Archaeologist conducted a site visit in July of 2019. The archaeologist identified no artifacts and determined that there was no evidence that the presence of the Rangia clam shell indicated the presence of a prehistoric shell midden borrowed from another location (Figures 7-8).

In summary, the area recorded as archaeological site 16JE233 is a man-made feature dating from 1974-1975 as part of a "plug" constructed to close-off Bayou aux Carpes from Bayou Barataria and is not eligible for the national register in its own right. Background research by CEMVN has determined that site 16JE233 was inaccurately recorded as a possible prehistoric shell midden and that the presence of Rangia clam shell, as recorded during the 2006 boat survey, is the result of levee construction and the plugging of Bayou aux Carpes dating from 1974 to 1975. Accordingly, USACE concludes that there are no historic properties in the APE.

Assessment of Effects

Based on the information presented in this letter, CEMVN has determined that there are no historic properties, as defined in 36 CFR 800.16 (l) in the APE. Therefore, CEMVN is making a finding of **No Historic Properties Affected** for this undertaking and submitting it to you for review and comment. This project will be subject to the standard change in scope of work, unexpected discovery, and unmarked human burial sites act provisions. CEMVN requests your comments within 30 days.

We look forward to your review of this determination. Also, we recommend that the site record form be removed from the Louisiana Cultural Resources Database. Should you have any questions or need additional information, please contact Eric M. Williams, Supervisory Archaeologist at (504) 862-2862, eric.m.williams@usace.army.mil, or Jason Emery, District Tribal Liaison and Regional Technical Specialist at (504) 862-2364, jason.a.emery@usace.army.mil, U.S. Army Corps of Engineers, New Orleans District.

Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Dr. Paul N. Backhouse, Tribal Historic Preservation Officer, Seminole Tribe of Florida, THPOCompliance@semtribe.com.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NEW ORLEANS DISTRICT
7400 LEAKE AVENUE
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

Regional Planning and
Environment Division, South
Environmental Studies Branch
Attention: CEMVN-PDS-N

Joey Barbry, Chairman
Tunica-Biloxi Tribe of Louisiana
P.O. Box 1589
Marksville, LA 71351

RE: Section 106 Review Consultation for RPEDS/CEMVN SEA #581
Undertaking: Jean Lafitte National Historical Park and Preserve Augmentation Features, West Bank and Vicinity Hurricane and Storm Damage Risk Reduction System Augmentation Measures for the Bayou aux Carpes Clean Water Act (CWA), Section 404(c) Site, Jefferson Parish, Louisiana
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Sincerely,

WILLIAMS.ERIC.MITCHELL.1065454323

Digitally signed by WILLIAMS.ERIC.MITCHELL.1065454323

for MARSHALL K. HARPER
Chief, Environmental Planning Branch

CC: File
LA SHPO
NPS JELA Superintendent, Charles Hunt (Charles_Hunt@nps.gov)
An electronic copy of this letter with enclosures will be provided to Mr. Earl J. Barbry, Jr., Cultural Director, Tunica-Biloxi Tribe of Louisiana, earlii@tunica.org.

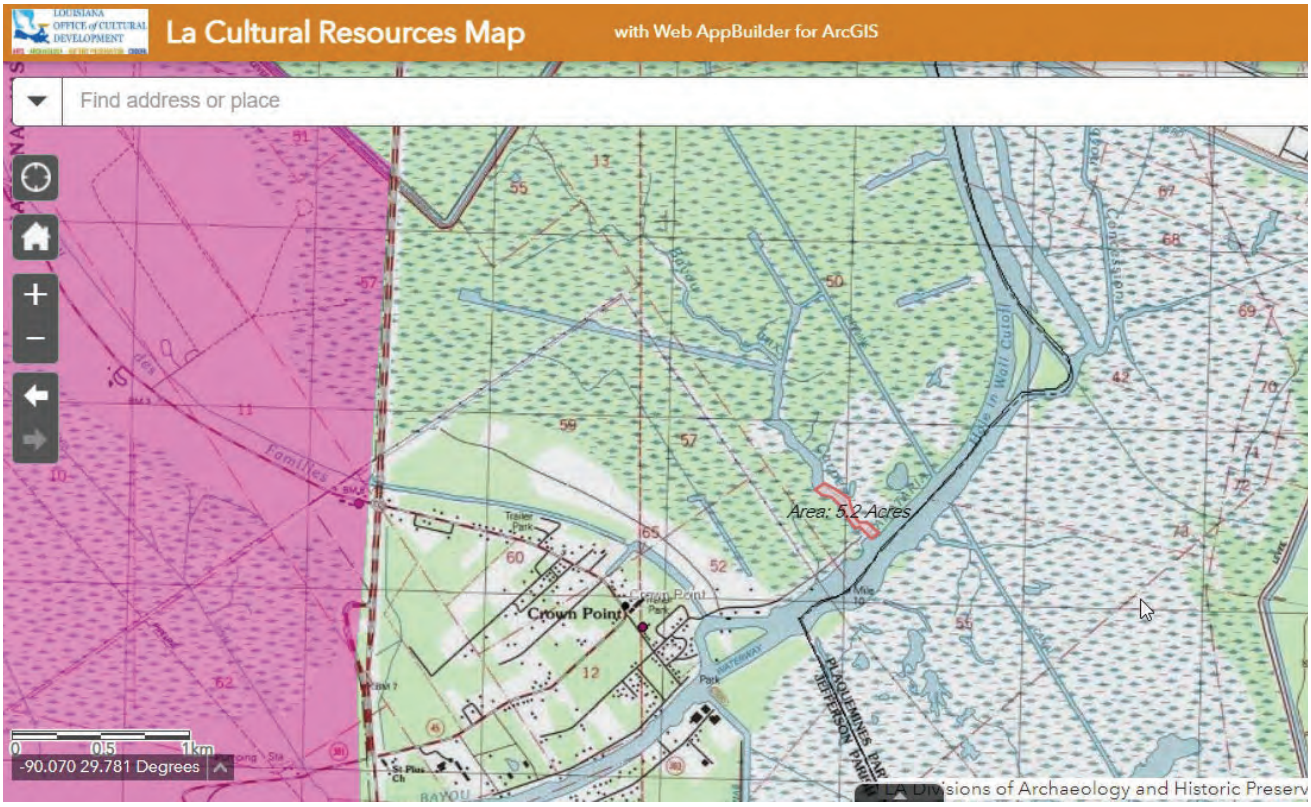

Figure 1. Bertrandville 7.5' USGS Map of Project Location and National Register Historic Districts (in pink).

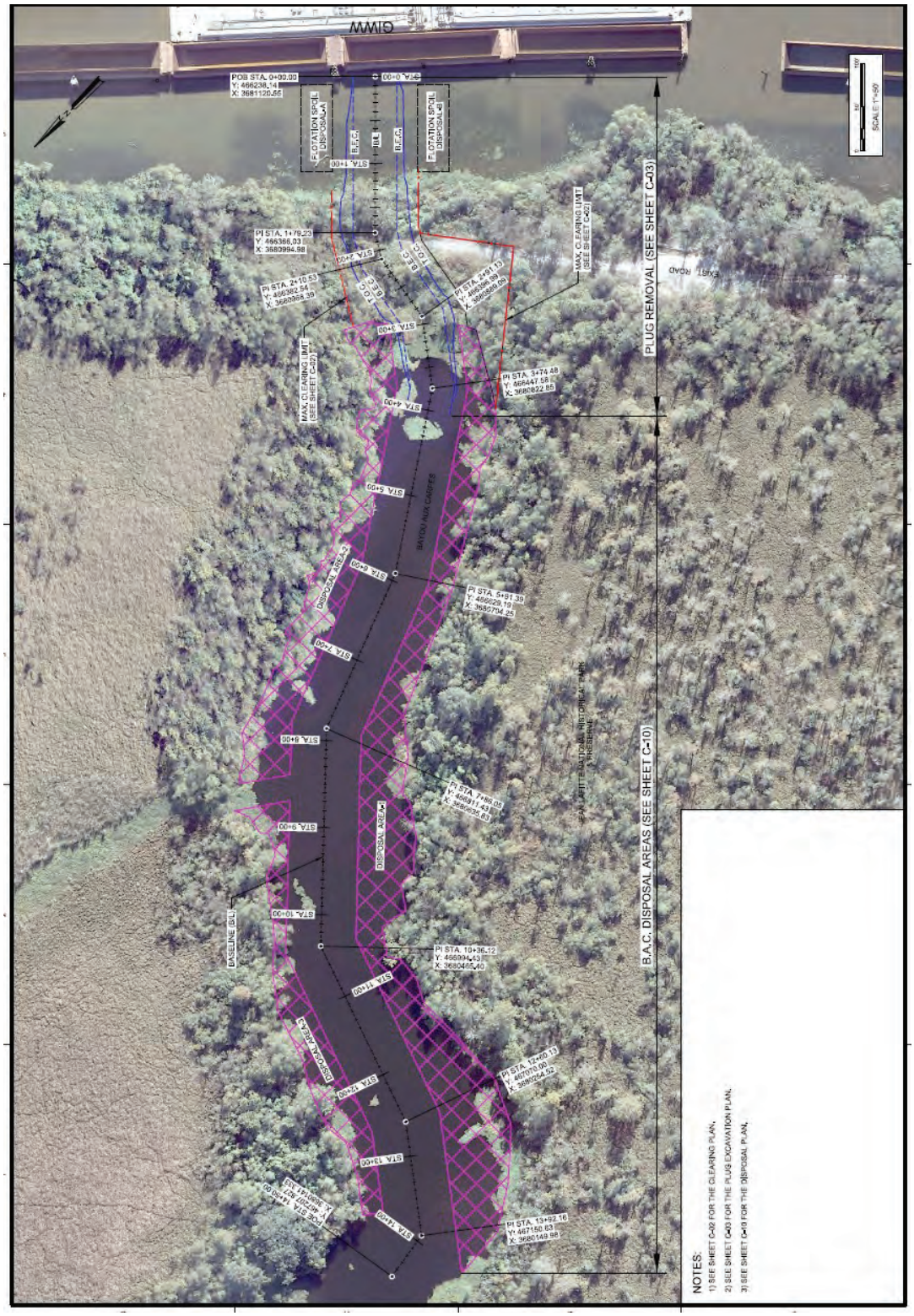

Figure 2. Construction Plans showing the various actions noted in the Description of the Undertaking.

Figure 3. APE outlined on an Aerial Image. Note Archaeological site 16JE233 recorded in the location of the BAC "plug" area.

Figure 4. 1974 Aerial Image of the BAC Project area (center). Note there is no "plug."

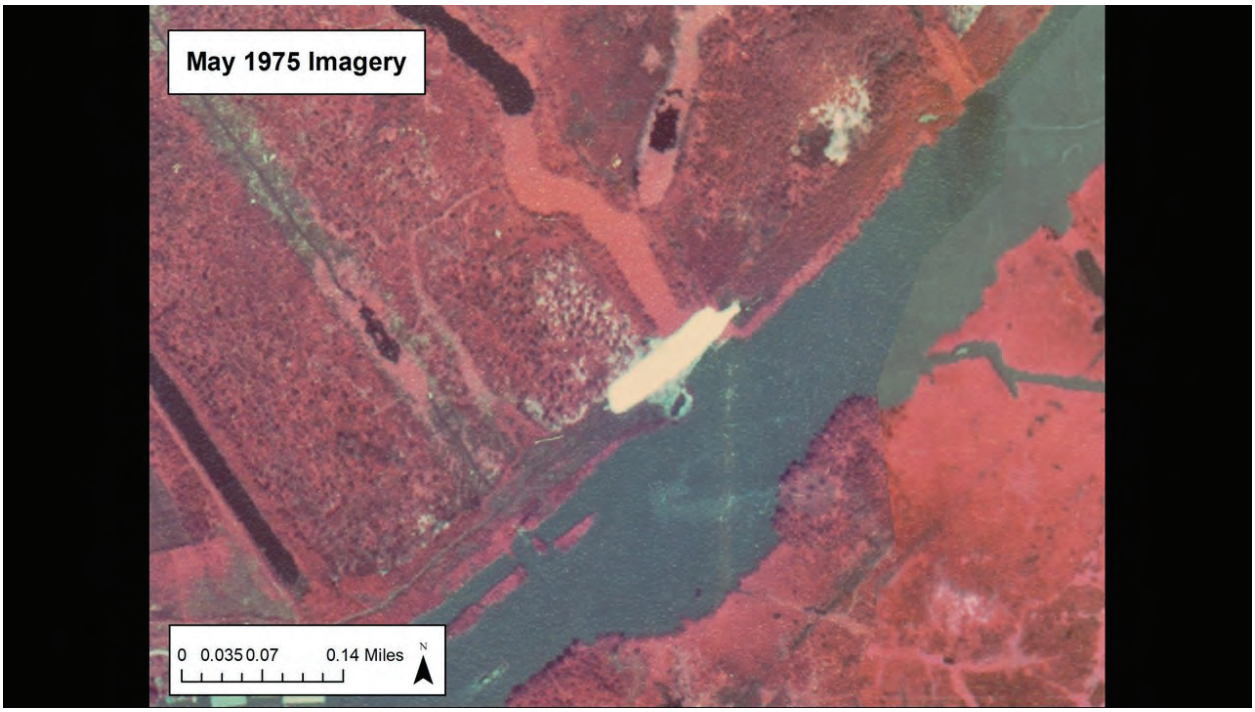

Figure 5. 1975 Aerial Image of the BAC Project area (center). Note muddy "plug."

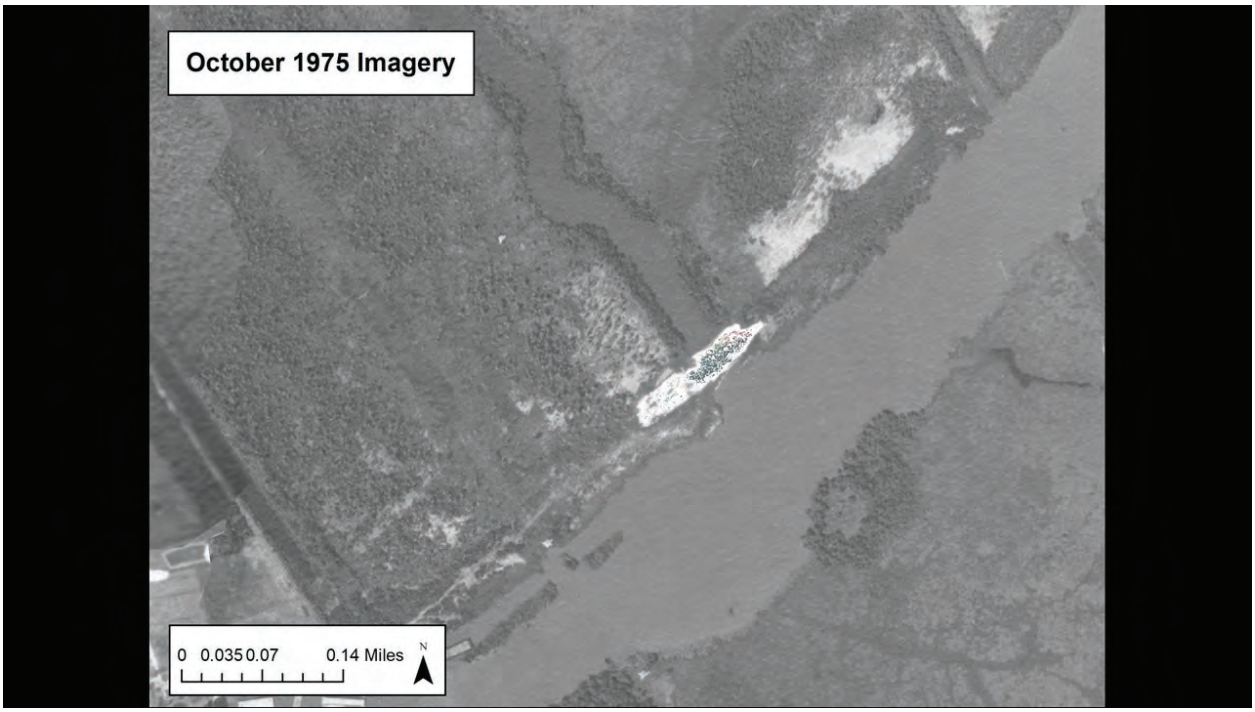

Figure 6. 1975 Aerial Image of the BAC Project area (center). Note "plug."

Figure 7. 2019 Site Visit Photo looking East across the plug. This area was examined without identifying any cultural material.

Figure 8. 2019 Site Visit Photo looking west toward levee and roadway. This area was examined without identifying any cultural material.