## Cover Sheet

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|---|---|
| Proposed Action: | The U.S. Army Corps of Engineers is proposing to reduce the damages associated with flash flooding of historically significant structures along North and South Gabouri Creeks and to develop recreational features on the Mississippi River Levee in the City of Ste. Genevieve, Ste. Genevieve County, Missouri. |
| Type of statement: | Environmental Assessment |
| Lead Agency: | U.S. Army Corps of Engineers |
| For further information and to submit comments: | U.S. Army Corps of Engineers<br>Attn: Ken Cook (PD-C)<br>1222 Spruce St.<br>St. Louis, Missouri 63103<br>314-331-8498<br>Kenneth.m.cook@usace.army.mil |

How to read this EA: Sections 1 and 2 are an Executive Summary and Sections 3 and 4 contain supporting information. Section 2 includes a matrix that compares the effects of the alternatives.

# Draft Environmental Assessment
With Draft Finding of No Significant Impact

# General Reevaluation Report

# Flood Control Project
# Parts 2, 3 and 4

# Sainte Genevieve, Missouri

**December 2015**


**U.S. Army Corps of Engineers**

**Regional Planning and Environment Division North**

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# CONTENTS

**1 Purpose of and Need for Action** ..... 3
1.1 Proposed Action: ..... 3
1.2 Need and Purpose of Action: ..... 3
1.3 Project Goals: Six project goals have been identified: ..... 3
1.4 Related Documents ..... 3
1.5 Scoping ..... 4
1.6 Relevant Resources ..... 5
1.7 Permits: ..... 5
**2 Alternatives Including Proposed Action ..... 6**
2.1 General: ..... 6
2.2 No Action Alternative ..... 6
2.3 Final Array of Alternatives ..... 7
2.4 North Gabouri Creek Alternatives ..... 7
2.5 South Gabouri Creek Alternatives ..... 9
2.6 Recreation Alternative ..... 10
2.7 Summary and Comparison of Alternatives ..... 11
**3 Affected Environment ..... 17**
3.1 General Description: ..... 17
3.2 Physical Resources: ..... 17
3.3 Biological Resources: ..... 19
3.4 Aquatic Resources: ..... 19
3.5 Terrestrial Resources: ..... 20
3.6 Socio-economic Description ..... 23
3.7 Cultural Resources ..... 24
**4 Environmental Consequences and Cumulative Effects** ..... 27
4.1 Physical Resources – Alternatives ..... 27
4.2 Biological Resources – Alternatives ..... 30
4.3 Terrestrial/Riparian Resources - Alternatives ..... 33
4.4 Endangered Species: ..... 33
4.5 Recreation ..... 35
4.6 Cultural Resources ..... 35

4.7 Cumulative Effects ..... 37
4.8 Aesthetics ..... 38
4.9 Unavoidable Adverse Impacts ..... 39
4.10 Relationship of Short-Term Uses and Long-Term Productivity ..... 39
4.11 Any Other Disclosures ..... 40
**5 Relationship of Proposed Action to Environmental Requirements** ..... 40
**6 Literature Cited** ..... 42
**7 List of Agencies Consulted and Agencies, Organizations, and Persons Receiving the Environmental Assessment** ..... 43

**Tables**

Table 2-1 - Final Array of Alternatives for North and South Gabouri Creeks ..... 11
Table 2-2 – Summary and Comparison of North Gabouri Alternatives ..... 12
Table 2-3 – Summary and Comparison of South Gabouri Alternatives ..... 14
Table 2-4 – Recreation Alternatives Comparison and Summary ..... 16
Table 4-1 – Summary of Ecological Impacts ..... 35

**Figures**

Figure 1 - Boundaries of the Ste. Genevieve National Register and National .... 26

**Appendix A: Plates**
**Appendix B: Agency Coordination**

# 1 Purpose of and Need for Action

## 1.1 Proposed Action

The U.S. Army Corps of Engineers (Corps), in cooperation with the city of Ste. Genevieve, MO, is proposing to reduce flood damages to historical structures caused by flash flooding along North and South Gabouri Creeks and develop a bike trail along the eastern levee that overlooks the Mississippi River. Non-structural measures would be implemented to reduce flood damages.

## 1.2 Need and Purpose of Action

The Mississippi River Levee project to reduce the risk of flood damages at Ste. Genevieve was completed in 2002. Two additional phases of the project are yet to be completed: tributary flooding and recreation. The purposes of the proposed projects are to reduce flood damages to the city of Ste. Genevieve and its nationally-recognized historic resources from tributary flooding and to provide outdoor recreational opportunities. This action is needed to comply with authorizing documentation that states, “Congress finds that, in view of the historic preservation benefits resulting from the project, the overall benefits of the project exceed the costs of the project.” Tourism related to the historic nature of this community and the resulting local economic benefits are especially vital to this community.

## 1.3 Project Goals: Six project goals have been identified

- Minimize displacement of people, homes, and businesses.
- Minimize operations and maintenance costs and responsibilities.
- Maximize the number of structures with reduced damages.
- Safeguard and improve the quality of the environment in the study area, including ecological and cultural resources.
- Reduce future flood damages to historic structures, the economic losses, and the social disruption caused by flooding of North Gabouri Creek and South Gabouri Creek.
- Increase the quantity and quality of outdoor recreation facilities in the project area.

## 1.4 Related Documents

Project Authorization: A feasibility study and several previous investigations and reports were referenced in the Ste. Genevieve, Missouri Feasibility Report and Environmental Impact Statement (EIS) dated June 1984. A final EIS report was prepared by the St. Louis District Corps. It included the District Engineer’s finding that “no Federal action by the Corps of Engineers is warranted when examined under the National Economic Development criteria.” In a Report to the Chief of Engineers dated 16 April 1985, the

Board of Engineers of Rivers and Harbors recommended “that improvements for flood control in Ste. Genevieve, Missouri, be authorized for construction generally in accordance with the plan and recommendations of the Division Engineer…” Congress referred to the Board of Engineers report when authorizing the project. Authorization was contained in the Water Resources Development Act of 1986 (Public Law 99-662) Section 310 which states, “Congress finds that, in view of the historic preservation benefits resulting from the project, the overall benefits of the project exceed the costs of the project.”

A 1994 Design Memorandum obtained approval for the implementation of the Mississippi River Levee portion of the authorized project and included a draft Environmental Assessment (EA) that was prepared to address changed conditions. The “Finding of No Significant Impact” was signed on 30 Jan 1995 and was followed by a signed Record of Decision for the earlier Environmental Impact Statement on 30 June 1995. The design of the tributaries and recreation components was postponed pending resolution of the Federal Emergency Management Agency buyouts following the 1993 flood. It was reasoned that the buyout of residential properties might result in the removal of many homes along North and South Gabouri Creeks that would possibly impact the need for the flood protection measures.

The design of the creeks and recreation components was further delayed by the uncertainty that there would be sufficient non-Federal funds remaining after construction of the Mississippi River Levee. As the Levee portion neared completion, it became evident that there would be sufficient non-Federal funds remaining and the tributaries and recreation components began to be revisited. It soon became apparent that the combination of buyouts following the 1993 Mississippi River historic flood and the change in environmental rules and regulations since the 1984 report would require a General Reevaluation Report (GRR, i.e. project reformulation). Because impacts associated with proposed new alternatives for the tributary flooding and recreation components were not expected to be significant, an EA was prepared, rather than an EIS.

## 1.5 Scoping

This EA analyzes and summarizes the physical, biological, social and cultural impacts of the proposed alternative flood risk management measures and recreation facilities on the environment.

Several agencies participated in scoping the National Environmental Policy Act requirements for this project including the U.S. Fish and Wildlife Service (FWS), the Missouri Department of Conservation (MDC), the Missouri Department of Natural Resources (MDNR), The Nature Conservancy (TNC) and the Missouri Department of Transportation (MoDOT). Internal to the

Corps, engineering, regulatory and cultural resources personnel also participated in the scoping process. Public meetings were held in February 2004 and September 2006 to discuss project alternatives. Re-scoping meetings were held with the City of Ste. Genevieve in 2015.

The FWS and MDC provided initial comments regarding associated environmental impacts to the environment and endangered species. Outstanding issues related to the proposed project and alternatives include potential riparian and stream impacts associated with stream channelization, bridge replacements, stream realignment, detention basins, interior ponding areas, levee construction and adverse impacts to historic structures. Mitigation would be required for any unavoidable adverse impacts to streams, riparian forests and wetlands. Cumulative impacts to the biological, aquatic and cultural resources related to alternatives are addressed in Section 4 of this document.

## 1.6 Relevant Resources

**Biological Resources**: The federally endangered Indiana bat, pallid sturgeon, interior least tern, and the threatened northern long-eared bat, piping plover and Rufa red knot may occur in the project area.

**Aquatic Resources**: Channelization, bridge replacements, detention basins, interior ponding areas, stream realignment and levees are project alternatives that were considered and could affect the aquatic resources. Stream channelization could reduce the habitat available to aquatic species and cause the loss of riparian vegetation affecting stream wildlife. Stream straightening can result in stream erosion, sedimentation, loss of riparian vegetation and a change in channel hydraulics. Bridge construction could deteriorate stream quality if designed and implemented improperly. Detention basin construction could impact wetlands and bottomland hardwoods.

**Cultural Resources**: Non-structural and structural alternatives could impact Ste. Genevieve historic structures and setting. For example, any structure elevation (FP) would have visual impacts not only on the structure itself but also on nearby unaltered structures. Structural alternatives would affect the integrity of the historic view-shed of the project area. Five structures (3 historic) on North Gabouri Creek and 11 structures (7 historic) on South Gabouri are the focus of the GRR study and this environmental assessment.

## 1.7 Permits:

No Clean Water Act permits would be required for the project.

# 2 Alternatives Including Proposed Action

## 2.1 General:

This chapter describes the alternatives and compares the alternatives in terms of their environmental impacts and their achievement of project objectives. Alternatives were formulated by Corps project staff including engineering and project management, Ste. Genevieve city government, the general public and the environmental resource agencies including the MDC, MDNR, and FWS. The history and description of measures and alternatives developed and screened is found in the GRR report. The North Gabouri final array alternatives are defined and summarized in Section 2.2; South Gabouri final array alternatives are defined and summarized in Section 2.4. In addition, the No Action alternative is reviewed.
Project alternatives were evaluated to determine whether they supported the project objectives. Environmental impacts to, among others, endangered species, streams, wetlands and riparian areas were considered in the analysis and evaluation of alternatives.

## 2.2 No Action Alternative

Previous floods including the Great Flood of 1993 and tributary flooding have caused damage to historic and non-historic structures. The no action alternative would continue to allow tributary flooding to occur. No floodproofing or inundation risk reduction measures would be implemented. Inundation of nine historic and six non-historic structures may occur whenever there is a flash flood. Mississippi River flooding has been prevented since the completion of the Mississippi River Levee at Ste. Genevieve in 2003.

### 2.2.1 Past, Present and Reasonably Foreseeable Actions

**Past Actions with Relevance to Current Resource Conditions**: The construction of the Mississippi River levee has reduced the inundation risk for Ste. Genevieve to the 500-yr level. When Mississippi River levels are high the pump house gates are closed and interior water is pumped out to the Mississippi River.

**Present Actions of Relevance:** No actions are being taken to reduce the flood risks. The National Park Service has recently concluded that Ste. Genevieve meets the criteria for suitability for inclusion in the national park system.

**Reasonably Foreseeable Actions of Relevance**: The City of Ste. Genevieve may replace bridges on North Gabouri to prevent a backup of creek waters, although its effectiveness in reducing flooding is uncertain pending further study.

## 2.3 Final Array of Alternatives

The final array of alternatives carried forward for consideration includes the No Action Alternative for North and South Gabouri. Table 2-1 shows the other alternatives and refers to their designation in the planning analysis – described below.

## 2.4 North Gabouri Creek Alternatives

### 2.4.1 Channelization and Bridges (CH-BR-FP):

The channel and bridges alternative is essentially the authorized plan for North Gabouri, adjusted slightly to account for changes to the existing conditions, and to address the one percent (100-year) flood event. It is a combination of the channelization and bridge replacement measures. The channelization aspects of this plan were not generally supported by the environmental agencies; however, it was carried forward for comparison purposes because it was the authorized plan. This alternative involves channel widening from just downstream of the double railroad bridge downstream of Main Street to a point just upstream of Fourth Street for a distance of approximately 2,042 feet. The new channel would have a 30-foot bottom width with 1 on 2.5 side slopes. The two railroad bridges and the bridges at Main Street and Fourth Street would be replaced. This alternative protects all but two structures (452 and 454). See Plate 1 for a drawing of this alternative.

### 2.4.2 Modified Channel and Levee (L2-CH2):

This is a modified version of the alternative that was originally proposed in the GRR planning process for North Gabouri that would have had more environmental impacts. In the new alternative the levee would start behind the homes at high ground just west of Sixth Street, cut across the North Gabouri channel, curve through the city park and continue generally adjacent to the creek until it intersects with high ground near the creek at Third Street. This shortened levee would cut across the small bend in the creek near Sixth Street and a diversion channel would be cut to reconnect the cut-off portions of the creek. Instead of the levee and cut-off channel cutting off 2,837 feet of creek channel, it would cut-off approximately 530 feet. The diversion channel would be reduced to 320 feet instead of the alternatively proposed 1,750 feet. The Fourth St. bridge would be replaced and the Third St. bridge would be removed and not replaced. Three landside ponding areas with interconnecting double 36-inch reinforced concrete pipes would collect run-off and allow a gradual release after a storm through gravity drains into North Gabouri Creek. A lift station would be constructed in ponding area 2a. The ponding area piping would also require the relocation of house #408. An existing levee on the south side of the creek would be raised one to three feet depending on location. LaHaye

Street would likely be ramped up and over the levee. See Plate 2 for a drawing of this alternative.

### 2.4.3 Non-Structural (Floodproofing (FP)):

The non-structural alternative selected includes wet floodproofing of two historical structures. Initially, the structures were individually evaluated to determine the most effective non-structural measures. Wet floodproofing was seen as the most practical and desirous of all these measure as discussed in the GRR. Therefore, the non-structural alternative assumed that all possible damaged structures would be wet floodproofed.

***North Gabouri structures proposed for floodproofing***:

1. Structure # 300, a Queen Anne Victorian house which is a contributing structure to the National Historic Landmark District.
2. Structure #408, a Victorian brick house listed on the National Register of Historic Places and has a preservation covenant.
3. Structure #311 – Not eligible for the National Register.
4. Structure #454 – Not eligible for the National Register.

Wet floodproofing for these structures would primarily consist of filling basements and crawlspaces with coarse sand or pea gravel to an elevation 30" below the floor joist of the structure after breaking up the basement floor to allow for drainage. Filling these areas prevents them from being used or "finished off' and subsequently flood damage still accrue. Any utilities would be relocated to areas above the design flood elevation or waterproofed. Items such as electrical connection boxes can be waterproofed. Vents that meet the FEMA requirements for ingress and egress of water are also required. The property owner may be compensated for the loss of basement space, if appropriate.

Maintenance responsibilities would fall on the individual structure owners. Structure owners choosing not to participate in this plan (if chosen) would be required to sign a document stating their non-participation, which would be filed with the property records.

Recognizing the uncertainty inherent in the hydraulic model, all structures calculated to be damaged by the 100-year event, as well as all structures within 1 foot of being damaged, were included in the cost-estimate for this alternative. See Plate 3 for a drawing of this alternative.

### 2.4.4 Public Input on Alternative Plans for North Gabouri:

A public meeting was held in February 2004. At that meeting, the public was asked to rank similar alternatives according to their preferences. For North Gabouri Creek, the voting was very clear – the most preferred alternative was the Channel and Levee plan (the earlier GRR version with

more impacts). The voting was closer between the other two alternatives but the LaHaye Levee came in second and the non-structural alternative was third. At the public meeting in September of 2006, the community was presented with the presumed final alternatives and there was good support for the floodproofing and levee alternatives. Less support was found for the original channelization plan. Detention basins were added as a measure after these public meetings mostly because of their effectiveness in controlling flash flooding. No public meeting has been held to discuss the slightly revised 2015 alternatives.

## 2.5 South Gabouri Creek Alternatives

### 2.5.1 Channelization and Bridges:

The Channel and Bridges (CH-BR-FP) alternative is essentially the authorized project, adjusted slightly to account for changes to the existing conditions and to address the 1 percent (100-year) flood event. It involves channel widening for a distance of 7,457 feet from the railroad bridge just downstream of Main Street to State Highway 61. The new channel would have a 20-foot bottom width with 1 on 2 side slopes. Two railroad bridges (where the Missouri-Illinois railroad crosses the creek upstream of Main Street and upstream of Seventh Street), and the bridge at Fourth Street would be replaced. This plan protects all but two structures, which would be protected by wet floodproofing. See Plate 4 for a drawing of this alternative.

### 2.5.2 Non-Structural (Floodproofing (FP)):

For the floodproofing alternative, most of the flooded structures were visited and thoroughly examined (as homeowners would allow) to determine the feasible floodproofing options as determined by engineers. The costs of the feasible measures were estimated and the least-costly measure was identified. For South Gabouri Creek, wet floodproofing was identified as the most cost-effective measure for all but one of the seven structures. Structure 257 receives first floor flooding and is therefore a poor candidate for wet floodproofing. It also has a stone foundation that is in a severely deteriorated state that would need to be re-built in order to dry floodproof. Elevating the structure was determined to be the most effective measure. Maintenance responsibilities would fall on the individual structure owners. Structure owners choosing not to participate in this plan (if chosen) would be required to sign a document stating their non-participation, which would be filed with the property records. See Plate 5 for a drawing of this alternative.

***South Gabouri structures proposed for floodproofing***:

1. Structure #244, eligible for listing on the National Register.
2. Structure #255, eligible for listing on the National Register.
3. Structure #240, eligible for listing on the National Register.

4. Structure #233, listed on the National Register.
5. Structure #236, eligible for listing on the National Register.
6. Structure #76, a French vertical log structure that is a contributing structure to the National Historic District.
7. Structure #207 - not eligible for the National Register
8. Structure #209 - not eligible for the National Register
9. Structure #232 - not eligible for the National Register

### 2.5.3 Public Input on Alternative Plans for South Gabouri:

A public meeting was held in February 2004. At the meeting, the public was asked to rank the similar alternatives according to their preferences. For South Gabouri Creek, the voting was much less clear than that for North Gabouri Creek, with a nearly even split among the alternatives and many participants electing to abstain until more detail became available on the floodproofing alternative. At the public meeting in September of 2006, the community was presented with the presumed final alternatives and was requested to provide comments. Analysis of comments received indicated that many were in favor of floodproofing by elevation; however, there was also support for levees and channelization as well as combination options. No public meeting has been held to discuss the slightly revised 2015 alternatives.

## 2.6 Recreation Alternative

The Recreation Plan would consist of trail development on the 2.3 miles of the Mississippi River Levee. Development would be in phases according to demand. Other than the “No Action Alternative” no other plans were considered. The tentatively selected recreation plan is described in the following paragraphs.

### 2.6.1 Main Levee:

Proposed plans include 2.3 mile asphalt-surfaced trail on the Mississippi River Levee. A trail with an asphalt surface would accommodate all recreationists including persons with disabilities. All typical trail support facilities such as benches and signage would be included in the final design. Lighting would be provided on the main levee for visitor safety and to increase visitor opportunities to recreate. See Plate 6 for a drawing that depicts this plan.

### 2.6.2 North Gabouri Levee:

No recreation plan for North Gabouri will be pursued due to the selection of the non-structural alternative as the tentatively selected plan, i.e., there are no basic project lands.

## 2.7 Summary and Comparison of Alternatives

### 2.7.1 Evaluation of Alternatives:

***Flood Risk Management Tentatively Selected Plan (TSP):*** In general, flood risk management studies will identify the National Economic Development (NED) plan as part of their decision-making process. The NED plan is defined as "the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment". Because the project's authorizing language stipulated that the project is justified based on historical benefits, traditional economic benefits have not been developed during this study. Instead, each alternative's cost has been weighed against its effectiveness and the environmental and cultural impacts.

The lowest cost action alternative for each creek is floodproofing. This alternative has also been shown to best address the project's objectives of reducing flood damages while preserving historic resources. After carefully weighing the costs, the cultural impacts, and the risks, the City, State and Corps agree that the floodproofing alternatives on both the North Gabouri and South Gabouri Creeks are identified as the tentatively selected plans to reduce flood damages.

***Recreation TSP:*** The TSP for recreation consists of an asphalt-surfaced trail on the Mississippi River Levee as described in Section 2.6. All typical trail support facilities such as benches and signage would be included in the final design. Lighting would be provided on the main levee for visitor safety.

**Table 2-1 - Final Array of Alternatives for North and South Gabouri Creeks**

| **North Gabouri** | |
|---|---|
| **Alternative** | **Description** |
| CH-BR-FP | Channelization, bridge repair/replacement, floodproofing |
| L2-CH2 | Levee and channelization |
| FP – **Tentatively Selected Plan** | Nonstructural options - floodproofing |
| **South Gabouri** | |
| CH-BR-FP | Channelization and bridge repair/replacement, floodproofing |
| FP – **Tentatively Selected Plan** | Nonstructural options - floodproofing |

Impacts related to the five alternatives are described and summarized in Tables 2-2 and 2-3 to enable the identification of the preferred alternatives. Detailed evaluation of the environmental impacts is presented in Section 4

of this EA. Environmental impact analysis of the recreation alternatives on the Mississippi River Levee are presented in Table 2-4.

**Table 2-2 – Summary and Comparison of North Gabouri Alternatives**

| North Gabouri Alternative Plans and Impacts | EC- No Action | CH-BR-FP - Channel, bridges and floodproofing | L2-CH2 - Levee, limited channel | FP Floodproofing (TSP)* |
|---|---|---|---|---|
| **Flooding** | Flash flooding would continue to impact structures. | Would reduce risk of flooding up to the 100-year level. Impacts 2,042 feet of stream. | Flooding would be prevented in most areas. Impacts 850 feet of stream. | Flash flooding would continue but structures would be protected |
| **Stream Hydraulics** | Expected to remain the same with periodic flooding | May increase stream speed downstream of project and potentially cause headcutting. | May increase stream speed downstream of project and potentially cause headcutting. | Same as No Action |
| **Water Quality** | Continued impacts from urban and agriculture run-off | Temporary deterioration during construction. | Temporary deterioration during construction | Same as No Action |
| **Wetlands** | Remain rare in the project area | Remain rare in the project area | Impacts 0.5 acre of forested wetland. | Same as No Action |
| **Aquatic Resources** | Continued adverse effects from urban and agriculture run-off | Major impacts to creek aquatic invertebrates, fish habitat, and riparian zone where channelization occurs. Temporary impacts during bridge construction. Mitigation required. | Major impacts to stream ecology due to cut-off and routing through new diversion channel; also temporary impacts due to bridge removal. Mitigation required for 530 ft of creek that is not replaced by cut-off. | Same as No Action |
| **Terrestrial/Riparian Forest** | Expected to remain the same | Loss of 2 acres of riparian forest. | Loss of 3 acres of riparian forest. | Same as No Action |
| **Endangered Species** | No effect or not likely to adversely affect | Potential impacts to bat habitat. | Potential impacts to bat habitat. | Same as No Action |
| **Socio-economic** | Continued damage to structures and continued O&M costs for cleanup. | Results in reduced risk to the city's historic resources. | Results in reduced risk to the city's historic resources. | No damages assessed to historic structure below the 100 yr. flood. |

| North Gabouri Alternative Plans and Impacts | EC- No Action | CH-BR-FP - Channel, bridges and floodproofing | L2-CH2 - Levee, limited channel | FP Floodproofing (TSP)* |
|---|---|---|---|---|
| **Cropland** | Subject to periodic flooding | Subject to periodic flooding | 46 acres of farm ground identified for borrow. | Same as No Action |
| **Community Impacts** | Continued flooding of residents and temporary interruption of access during flood events. | Reduced risk of flooding, but temporary impacts related to construction. High cost for project would reduce funding for other community endeavors. | Reduced risk of flooding at 100-year level, but temporary impacts related to construction. Loss of bridge at 3rd Street may inconvenience some. | Temporary impact to residents during construction. Temporary interruption of access during flood events. |
| **Historic Sites** | Continued potentially damaging impacts to structures during flooding. | Historic structures are at reduced risk of flooding. Historic bridges would require replacement. | Historic structures are at reduced risk of flooding. Potential adverse impact to one historic site that requires relocation. Historic bridges would require replacement. | Historic structures are floodproofed, except for two: one is elevated and one is left as is. |
| **Archeological Sites** | New sites may be discovered | Potential impacts to unknown sites. | Potential impacts to unknown sites. | Same as No Action |
| **Aesthetics** | Continued damage to private and public properties resulting in deterioration and unsightly aesthetics of flooding. | Reduction of flood risk up to 100-year level. However, loss of trees along the creeks, uniform channel and new bridges would detract from aesthetics. Potential negative changes to view-shed. | Improved due to reduction of flood risk up to 100-year level and reduced footprint of levee on LaHaye Street. Potential negative changes to view-shed. | No damage to private structures, but flood cleanup still necessary. Possible visual impacts due to one structure being raised (about 2 feet). |
| **Meets project objectives.**** | Does not minimally meet project objectives. | Moderately meets project objectives. | Moderately meets project objectives | Moderately to fully meets project objectives. |

*Tentatively Selected Plan

**Project objectives:

- Minimize displacement of people, homes, and businesses.
- Minimize operations and maintenance costs and responsibilities.
- Maximize the number of structures with reduced damages.
- Safeguard and improve the quality of the environment in the study area, including ecological and archaeological resources.
- Reduce future flood damages to historic structures, the economic losses, and the social disruption caused by flooding of North Gabouri Creek and South Gabouri Creek.
- Increase the quantity and quality of outdoor recreation facilities in the project area.

**Table 2-3 – Summary and Comparison of South Gabouri Alternatives**

| South Gabouri Alternative Plans and Impacts | EC- No Action | CH-BR-FP Channel and Bridges | FP Floodproofing* |
|---|---|---|---|
| **Flooding** | Flash flooding would continue to impact structures. | Would reduce the risk of flooding up to 100-year level. Approximately 7,457 feet of stream would be impacted. | Flash flooding would continue but structures would be protected |
| **Stream Hydraulics** | Expected to remain the same with periodic flooding | May increase stream speed and potential headcutting. | Same as No Action |
| **Water Quality** | Continued impacts from urban, agriculture and quarry run-off | Temporary deterioration due to construction and disturbance of lime sediment. | Same as No Action |
| **Wetlands** | Remain rare in the project area | Remain rare in the project area | Remain rare in the project area |
| **Aquatic Resources** | Continued adverse effects from urban, agriculture and quarry run-off | Major impacts to aquatic invertebrates, fish habitat, and riparian zone where channelization occurs. Temporary impacts during bridge construction. | Same as No Action |
| **Terrestrial/Riparian Forest** | Expected to remain the same | Loss of 1.2 acres of riparian forest. | Same as No Action |
| **Endangered Species** | No effect or not likely to adversely affect | Loss of riparian habitat (BLH) and may have potential impacts on Indiana and northern long-eared bats | Same as No Action |
| **Socio-economic** | Continued damage to structures and continued O&M costs for cleanup. | Results in protection of the city's economic base. | Flooding can still interrupt city services, no historic structure impacts would occur below the 100 yr. flood. Continued O&M costs for cleanup. |
| **Cropland** | Subject to periodic flooding | Subject to periodic flooding | Same as No Action |
| **Community Impacts** | Continued flooding of structures. Temporary interruption of access during flood events. | Reduced risk of flooding, but high cost for project would reduce funding for other community endeavors. | Temporary interruption of access during flood events. |

| South Gabouri Alternative Plans and Impacts | EC- No Action | CH-BR-FP Channel and Bridges | FP Floodproofing* |
|---|---|---|---|
| **Historic Sites** | Continued, potentially damaging impacts to structures during flooding. | Two historic structures are protected. | Historic structures are wet floodproofed, but continued exposure to flash flooding; historic integrity of one may be compromised because of the need to elevate. |
| **Archeological Sites** | New sites may be discovered | Potential impacts to unknown sites. | Same as No Action |
| **Aesthetics** | Continue damage to private and public properties and unsightly aesthetics due to flooding. | Improved due to reduction of effects of flooding up to 100-year level. However, loss of trees along the creeks, uniform channel and new bridges would detract from aesthetics. Negative impacts to viewshed. | Flood cleanup still necessary. Potential slight impact due to one structures being raised (about 2 feet) and others not. |
| **Meets project objectives.**** | Does not minimally meet project objectives. | Moderately meets project objectives. | Moderately to fully meets project objectives. |

*Tentatively Selected Plan

**Project objectives:

- Minimize displacement of people, homes, and businesses.
- Minimize operations and maintenance costs and responsibilities.
- Maximize the number of structures with reduced damages.
- Safeguard and improve the quality of the environment in the study area, including ecological and archaeological resources.
- Reduce future flood damages to historic structures, the economic losses, and the social disruption caused by flooding of North Gabouri Creek and South Gabouri Creek.
- Increase the quantity and quality of outdoor recreation facilities in the project area.

**Table 2-4 – Recreation Alternatives Comparison and Summary**

| Recreation Plans | Main Levee Plan* |
|---|---|
| **Physical Environment** | No impacts to air or water quality. |
| **Biological Resources** | No impacts to biological resources. |
| **Socio-economic** | Provides excellent recreation opportunities. |
| **Meets project objectives.** | Meets recreation objective. |

*Tentatively Selected Plan

# 3 Affected Environment

## 3.1 General Description

The Ste. Genevieve, Missouri project is located in Ste. Genevieve County about 54 miles south of St. Louis. The city of Ste. Genevieve is on the right descending bank of the Mississippi River, between river miles 122 and 125 above the Ohio River. The existing environment affected by this project includes the riparian environment associated with North and South Gabouri Creeks and the Mississippi River Levee area within the City of Ste. Genevieve. The area is generally urban in nature, although the creek banks are generally vegetated and the creeks shaded. The Mississippi River Levee area was constructed in 2002 and is considered previously disturbed area. The City has approximately 4,500 residents. Tourism is a large part of the economy in addition to the local industries, one of the largest being limestone mining. The historic nature of Ste. Genevieve and the many unique French historic structures in Ste. Genevieve have resulted in a thriving tourist industry.

## 3.2 Physical Resources

**3.1.1 Surface Water:** The Ste. Genevieve project area includes the city of Ste. Genevieve and the watersheds of the North Gabouri Creek and the South Gabouri Creek that flow through the city. The North Gabouri watershed includes 7.4 square miles upstream of the Union Pacific railroad just east of North Main Street. The South Gabouri watershed includes 6.2 square miles above the Union Pacific railroad at Main Street. The upper portions have a cobble and gravel substrate with in-stream cover consisting of a mixture of man-made and natural debris. The lower portions of the streambeds are a mixture of bedrock, cobble, gravel and man-made debris. The Mississippi River Levee area includes a mitigation area with open water and tree plantings that were required as a result of wetland impacts associated with construction of the river levee.

The floodplain of North Gabouri Creek is used for pastures or crop production for most of its six mile length. High density urban development occurs in the floodplain from river mile 1.2 to 2.0 from its confluence with the Mississippi River. The floodplain for South Gabouri Creek is highly developed from river mile 1.4 to 2.3 from its confluence with the Mississippi River. Above Highway 61, the stream flows through the Mississippi Lime Company for nearly one mile. For the remainder of its six mile length, the South Gabouri Creek floodplain is generally used for agricultural production.

North and South Gabouri Creeks are narrow streams with low base flows. The upper ends of the watersheds are intermittent during drought periods. The streams pass through a mixture of pasture, forest and cropland in their upper reach and Ste. Genevieve in their lower reaches. The upper portions of the streams have a cobble and gravel substrate with little in-stream cover. The channels of both forks of Gabouri Creek meander, with pools, riffles, and resting areas in undercut banks and pools, shaded by riparian vegetation that includes trees in the 30 plus year old category. At the confluence of the two streams, the stream is wide and deep. Water levels are influenced by the watershed flows and the Mississippi River when the flood gates are open.

**3.1.2 Water Quality:** Although the water quality of South Gabouri Creek is subject to limestone runoff from the limestone plant located upstream of the construction site, it is in fair condition in the project area. Stream quality meets all the state criteria except for the lower reach of the South Gabouri Creek affected by turbidity and deposition of solids as a result of runoff from the mine quarry.

**3.1.3 Air Quality:** The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. EPA regulates these pollutants by developing human health-based or environmentally-based permissible pollutant concentrations. EPA then publishes the results of air quality monitoring, designating areas as meeting (attainment) or not meeting (nonattainment) the standards or as being maintenance areas. Maintenance areas are those areas that have been re-designated as attainment from a previous nonattainment status. A maintenance plan establishes measures to control emissions to ensure the air quality standard is maintained in these areas. The project area is in attainment of the NAAQS for all pollutants (USEPA 2015).

**3.1.4 Soils**: The creek bottoms generally consist of Haymond silt loam (66), 0 to 3 percent slope that is frequently flooded. In the upper reaches of North Gabouri Bloomsdale silt loam (82a) is found with 0 to 3 percent slopes that

is frequently flooded as well. Ashton silt loam (50A), 0 to 3 percent slopes that is rarely flooded occurs near Third St. on North Gabouri and along the north bank of South Gabouri Creek. Menfro silt Loams, 9 to 14 percent slopes (16D2 and 16E2), are eroded and occur along the border slopes of the creeks. Haynie silt loam, 0 to 2 percent slope that is frequently flooded is found in the borrow areas. All construction activities would occur in the Haymond, Ashton or Haynie silt loams. Ste. Genevieve lies on the New Madrid Fault Line, which is a major seismic zone in the Midwestern United States. It has the potential to produce large earthquakes in the future.

**3.1.5 Landform**: Elevations in the area range from 360 feet NGVD where Gabouri Creek meets the Mississippi River to 900 feet NGVD in the western uplands of North Gabouri Creek. Areas around the city exhibit karst features such as sink holes, joint cavities, caves, karst ponds, losing streams, shallow holes, and springs. The bedrock underlying the area is principally composed of limestones and occasional shale's and limestones. Karst topography does occur in the Ste. Genevieve city area, but as far as is known at this time, not in potential construction areas.

**3.1.6 Floods**: Major tributary flooding has occurred on the streams at least eight times in the past. Headwater flooding in the 1990's occurred at the same time as Mississippi River flooding before construction of the Mississippi River Levee. Creek channels have remained stable, but some long-time residents believe that the deeper holes in the creek have filled in with rock and soil over the years. In the future, Ste. Genevieve may experience higher water from precipitation run-off than occurred in the past if development continues in the watersheds outside the City limits. More information can be found in the Hydrology and Hydraulics section of the General Reevaluation Report

## 3.3 Biological Resources

**General**: A few remnants of floodplain forest exist along the North and South Gabouri Creeks. Most of the uplands are a patchwork of forest and pasture with forest being more extensive in the headwaters. Crop production is limited to the narrow creek floodplains. Wildlife habitat quality is considered to vary from good to excellent in the headwaters, and from fair to poor in the urban and intensively farmed areas. The project areas except for borrow areas are urban.

## 3.4 Aquatic Resources

North and South Gabouri Creeks are considered perennial - with gravel/cobble substrates – flows varying depending on time of year/season/rainfall. The fish fauna of urban streams such as South and North Gabouri Creeks is less varied than other faunal regions because it is subject to widely fluctuating environmental conditions, and only fishes

tolerant of these fluctuations can persist. The numbers and species composition of fishes in a given stream depends on location and such intrinsic factors as physical habitat (current, depth, substrates, riffle/pool ration wood snags and undercut banks), water quality (temperature, dissolved oxygen, suspended solids, nutrients, and toxic chemicals), and biotic interactions (exploitation, predation, and competition).

Fish species assemblages in streams would vary considerably from the headwaters to the outlet due to changes in many hydrologic and geomorphic factors which control temperature, dissolved oxygen, gradient, current velocity, and substrate. Fish species richness tends to increase downstream as gradient decreases and stream size increases. Fish species found in North and South Gabouri Creeks include central stoneroller, green sunfish, rainbow darter, black bullhead, emerald shiner, golden redhorse and bluegill.

Amphibians that may occur in the project area include the spotted salamander, eastern tiger salamander, slimy salamander, eastern American toad, cricket frog, gray tree frog, spring peeper, western chorus frog, bullfrog, green frog, pickerel frog, and the southern leopard frog. Reptiles that may occur in the project area include the common snapping turtle, three-toed box turtle, red-eared slider, northern fence lizard, five-lined skink, six lined racerunner, eastern yellow-bellied racer, ring-necked snake, black rat snake, northern water snake, rough green snake and the eastern garter snake.

## 3.5 Terrestrial Resources

Most of the project area is comprised of mowed areas (backyards and parks) or city streets. Riparian areas are vegetated with shrubs, vines and some large trees. Except for a few areas, the vegetated riparian zone is very narrow, the larger trees composed of sycamore, elms, cottonwood, silver maple, and occasional nut bearing species such as oaks. Small portions within the project areas are maintained for utility line easements. The recreation portion of the project is proposed for previously disturbed levee areas.

**3.1.7 Threatened and Endangered Species:** In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the Army Corps of Engineers accessed the FWS endangered species website (USFWS 2015a) on October 1, 2015 to obtain a listing of Federal threatened or endangered species that may occur in the vicinity of the project. The FWS website indicates the following species are in the vicinity of the proposed project area: the federally endangered Indiana bat (*Myotis sodalis*), pallid sturgeon (*Scaphirhynchus albus*), interior least tern (*Sterna antillarum*),

and the threatened northern long-eared bat (*Myotis septentrionalis*), piping plover (*Charadrius melodus*) and Rufa red knot (*Calidris canutus rufa*).

### 3.1.8 Biological Assessment:

***Indiana Bat*** - From late fall through winter Indiana bats in Missouri hibernate in caves in the Ozarks and Ozark Border Natural Divisions. During the spring and summer, Indiana bats utilize living, injured (e.g. split trunks and broken limbs from lightning strikes or wind), dead or dying trees for roosting throughout the state. Indiana bat roost trees have been found to be as small as 3 inches diameter at breast height (dbh) with loose or exfoliating bark (USFWS 2015). Most important are structural characteristics that provide adequate space for bats to roost. Preferred roost sites are located in forest openings, at the forest edge, or where the overstory canopy allows some sunlight exposure to the roost tree, which is usually within 1 km (0.6 mi.) of water. Indiana bats forage for flying insects (particularly moths) in and around the tree canopy of floodplain, riparian, and upland forests. During site visits in 2006, staff biologists from the Corps and the FWS did not observe suitable roost trees for the Indiana bat. The draft Fish and Wildlife Coordination Act report prepared in December 2006 indicated that Indiana bats would not be impacted by the project. Suitable Indiana bat summer habitat may occur in the forested areas adjacent and within the Ste. Genevieve project site.

***Least Tern*** -The interior population of the interior least tern is characterized as a colonial, migratory waterbird, which resides and breeds along the Mississippi River during the spring and summer. Least terns arrive on the Mississippi River from late April to mid-May. Reproduction takes place from May through August, and the birds migrate to the wintering grounds in late August or early September (USACE 1999). Sparsely vegetated portions of sandbars and islands are typical breeding, nesting, rearing, loafing, and roosting sites for least terns along the Middle Mississippi River (MMR). Nests are often at higher elevations and well removed from the water's edge, a reflection of the fact that nesting starts when river stages are relatively high (USACE 1999). In alluvial rivers, sandbars are dynamic channel bedforms. Individual sandbars typically wax and wane over time as fluvial processes adjust channel geometry according to varying sediment load and discharge, the construction of river engineering works, and other influences.

***Pallid Sturgeon*** - These bottom dwellers in the Missouri and Mississippi rivers in Missouri are found in areas of strong current that have firm sand substrates in the main river channels. They prey on small fishes and immature aquatic insects that are sucked from the bottom sediments. These fish are rarely found, but widely distributed (MDC 2015).

***Rufa Red Knot*** - The rufa red knot is a robin-sized shorebird that annually migrates from the Canadian Arctic to southern Argentina. Changing climate conditions are already affecting the bird's food supply, the timing of its migration and its breeding habitat in the Arctic. The shorebird also is losing areas along its range due to development. New information shows some knots use interior migration flyways through the South, Midwest and Great Lakes. Small numbers (typically fewer than 10) can be found during migration in almost every inland state over which the knot flies between its wintering and breeding areas. This shorebird is irregularly observed feeding on mudflats, sandbars, shallowly flooded areas and pond margins along the Missouri and Mississippi Rivers from May 1 through September 30 (USFWS 2015b).

***Piping Plover*** - Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. The female lays four eggs in its small, shallow nest lined with pebbles or broken shells. Both parents care for the eggs and chicks. When the chicks hatch, they are able to run about and feed themselves within hours. Piping plovers are migratory birds and occasionally are seen on Missouri shorelines or wetlands. In the spring and summer they breed in northern United States and Canada. There are three locations where piping plovers nest in North America: the shorelines of the Great Lakes, the shores of rivers and lakes in the Northern Great Plains, and along the Atlantic Coast. In the fall, plovers migrate south and winter along the coast of the Gulf of Mexico or other southern locations (USFWS 2015c).

***Northern Long-eared Bat*** - The northern long-eared bat was recently declared a federally threatened species throughout its range (Federal Register 4 May 2015). The northern long-eared bat is sparsely found across much of the eastern and north central United States and spend winter hibernating in caves and mines. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Within hibernacula, they are found in small crevices or cracks. During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. They have also been found, rarely, roosting in structures like barns and sheds. Foraging occurs in floodplain and upland forests. Forest fragmentation, logging and forest conversion are major threats to the species. One of the primary threats to the northern long-eared bat is the fungal disease, whitenose syndrome, which has killed an estimated 5.5 million cave-hibernating bats in the Northeast, Southeast, Midwest and

Canada. Suitable northern long-eared bat summer habitat may occur in the forested areas adjacent and within the Ste. Genevieve project site.

***Protected Species*** - The federally protected **bald eagle** (*Haliaeetus leucocephalus*) is known to occur in the region. Bald eagles are common migrants and winter residents throughout the state and are uncommon breeders along some of the major rivers and larger reservoirs in the state. During winter, they congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. Wintering eagles usually occupy river habitats between November 15 and March 1, and use large diameter riparian tree species as daytime perches and night roosts. They usually perch within a riparian corridor or along lake shores and prefer areas with limited human activity. At night, wintering bald eagles may congregate at communal roosts and will travel as much as 20 kilometers (12 miles) from feeding areas to a roost site. The period January 1 to March 1 is important for initiating nesting activity; March 1 to May 15 is the most critical time for incubation and rearing of young. Bald eagles are known to prefer trees greater than 11 inches dbh and within 100 to 600 feet of water for perching sites. Eagles also tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood and sycamore are often selected over other trees for perching and roosting.

***Wetlands*** - In the vicinity of Ste. Genevieve, wetlands are found predominantly along the Mississippi River in areas of slow draining soils subject to seasonal overbank flooding. Wetlands are uncommon along North and South Gabouri Creeks in the project area and vicinity, because overbank flooding is infrequent and slowly draining soils are rare. However, a small 0.5-acre forested wetland occurs within a larger area of floodplain forest along North Gabouri Creek in the project area. According to historic aerial photography, this forest is about 20 year old. However this area was recently cleared and is now mowed.

## 3.6 Socio-economic Description

### 3.2.1 Economy1:

***Jobs by Sector***: February 2015 unemployment in St. Genevieve County was 6.6 percent compared with 6.3 percent statewide. There were 8,447 jobs in the county in 2014. In 2011, Manufacturing accounted for more

[1] Source: ***University Extension, Office of Social and Economic Data Analysis at http://oseda.missouri.edu***

than 18 percent of all jobs (1,438). Local Government (909), Farm (662) and Construction (596) were among the largest employment sectors.

***Agriculture***: In 2007 there were 717 farms in St. Genevieve County. They had total sales of about $365,000 and production expenses of $1.2 million which generated -$797,000 in net farm income. There were 5.5% of farms in the county with sales of $100,000 or more—63 percent had less than $10,000 in sales.

***County Income Patterns***: St. Genevieve County generated over $644.6 million of total personal income in 2012. The per capita income in the county was $36,337 compared with $39,133 for Missouri. The largest sources of income by industrial sector came from manufacturing (13%). local government (8%) and wholesale trade (5.4%) together generated about $172 million of personal income.

Place of Residence Estimates for 2013 showed 24.7 percent of the St. Genevieve County population resided in the city of St. Genevieve (4,405). In addition, 4.9 percent lived in the smaller towns of St. Mary (351) and Bloomsdale (518). Most county residents (70%) lived in unincorporated, open country areas of the county (12,504).

**3.2.2** Tourism focused around the historic nature of Ste. Genevieve is an important part of the City's economy and influences several areas of employment.

## 3.7 Cultural Resources

The French Colonial buildings in Ste. Genevieve today comprise the greatest concentration of French Colonial residences existing anywhere in the United States. Besides an architectural resource unequalled elsewhere in the United States, there exists for Ste. Genevieve a significant documentary record, much of it very old and handwritten in French. Ste. Genevieve is significant and unique because it has been occupied continuously since it was settled and because many of its earliest French colonial buildings did not disappear during the intervening years. One-fourth of all of North America's French colonial buildings are located in Ste. Genevieve. Ste. Genevieve contains the only collection of French colonial houses anywhere on the continent. Its many old residences, its archives and traditions, and its historical continuity make it a living memorial to the settlement and development of America.

Important archeological sites which span the last 9,000 years of prehistory have been identified in the vicinity of Ste. Genevieve. One is listed on the National Register of Historic Places. Artifacts which date from the late prehistoric period and from the early historic period have been found within the Ste. Genevieve city limits.

Ste. Genevieve's significant historical and architectural heritage has won national recognition. In 1960, the Secretary of the Interior designated a major part of the city and the agricultural fields between the town and the river a National Historic Landmark District. Ste. Genevieve was in the first group of six landmark districts so designated, a group that included Williamsburg, Virginia; Charleston, South Carolina; and Old Deerfield, Massachusetts. Part of the community is a Registered National Historic Landmark, and many structures are listed on the National Register of Historic Places, the nation's official list of historically significant properties worthy of preservation. See Figure 1 for a map showing the National Register and National Historic Landmark Districts.

Ste. Genevieve contains three of the five known remaining "poteaux-en-terre" structures in North America. These are structures where posts were arranged vertically and anchored in the ground. In October 2006, Public Law 109-319 authorized the Secretary of the Interior to study the suitability and feasibility of designating portions of Ste. Genevieve County as a unit of the National Park Service. In August 2015 the NPS concluded that Ste. Genevieve meets the criteria for suitability for inclusion in the national park system. Tributary flooding affects fewer historic buildings: 14 percent for the 100-year flood (both creeks) and one-third for the Standard Project Flood (both creeks).

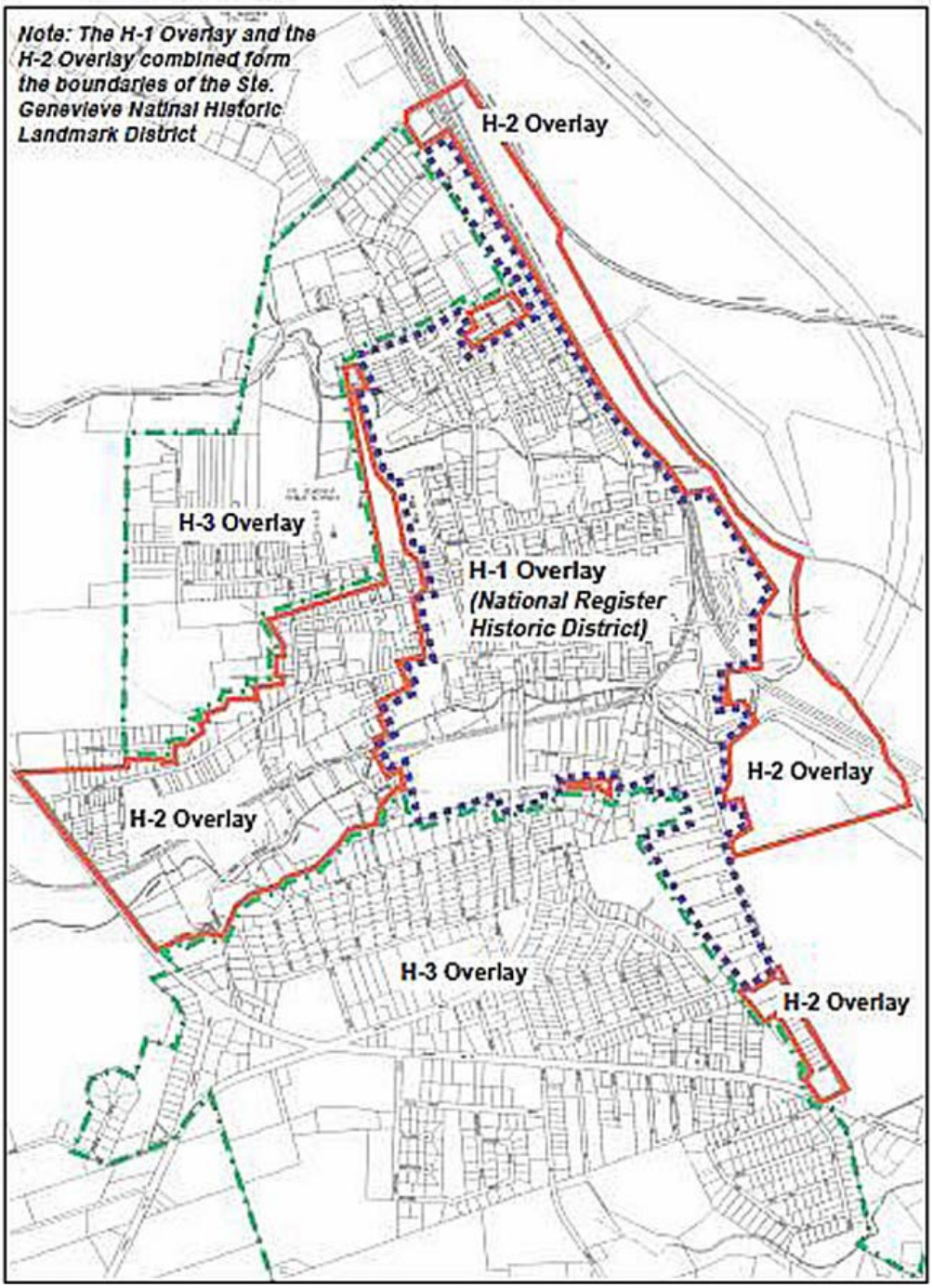


**Figure 1. Boundaries of the Ste. Genevieve National Register and National Landmark Historic Districts**

**3.3.1 Aesthetics:** The city of Ste. Genevieve has a pleasing visual appearance with its many well-kept historic homes, many with gardens, situated on the west bank of the expansive Mississippi River floodplain. The riparian corridors are wooded and naturally scenic; although maintained utility line easements are located in some areas.

**3.3.2 Prime Farmlands:** No project lands are qualified as prime farmland. Except for one small area of row crops along South Gabouri Creek, agricultural land use on the creek floodplains is limited to an occasional pasture. About one mile to the east, cropland is a predominant land use on the Mississippi River floodplain.

# 4 Environmental Consequences and Cumulative Effects

This chapter is organized by resource topics, with the impacts of all alternatives combined under each resource. All impacts associated with each alternative are described in Tables 2-2, 2-3, 2-4 and 4.1. The impacts of the recreation alternative are addressed in Section 4.2.4.

## 4.1 Physical Resources – Alternatives

### 4.1.1 Flooding

***No Action***

Direct Effects: If no action is taken, the North and South Gabouri Creeks would continue with the same hydrology and be inundated during flash floods. Flooding of historic structure foundations and basements and some minimal erosion would occur.

Indirect Effects: The historic structures that are flooded may suffer foundation damage from repeated flooding.

***Channelization and Levee***

Direct Effects: Flooding would be curtailed up to the 100-year level, except for structures 454, 235 and 256 that will be floodproofed and structure 408 that would require relocation.

Indirect Effects: Less flooding of the floodplain occurs.

***Floodproofing***

Direct Effects: Wet floodproofing requires basements to be filled with sand after breaking up the basement floor and basement utilities are waterproofed. Wet floodproofing would prevent future damage claims from

flooding. One structure, the Chadwell structure, would need to be raised due to its low first floor elevation.

Indirect Effects: The North and South Gabouri floodplains would still experience flooding.

***The Tentatively Selected Plan: Wet floodproofing would prevent damages to all but two historic structures on North and South Gabouri Creeks.***

### 4.1.2 Hydraulics

***No Action and Floodproofing:***

Direct Effects: The no action and floodproofing alternatives would still permit unimpeded flooding.

Indirect Effects: Temporary over-street flooding would continue to occur.

***Channelization North and South Gabouri***:

Direct Effects: In the channelization alternatives, the proposed actions would reshape the natural stream beds into a trapezoidal channel lined with rip-rap.

Indirect Effects: Some straightening of the channel would be a result of widening the channel. Widening the channel, removing bankside vegetation and debris would increase hydraulic efficiency and velocity.

***North Gabouri, levee and channelization***:

Direct Effects: The Channel and Levee alternative for North Gabouri would require cutting off an 850-foot section of North Gabouri Creek where it is contiguous with LaHaye Street.

Indirect Effects: Shortening the channel by 530 feet could cause additional channel problems both up and downstream of the cut-off such as headcutting (gradual upstream incising of the stream channel) and increased stream velocity downstream. Headcutting causes upstream progression of substrate destabilization and accelerated bank erosion. Straightening channels reduces stream length and increases gradient. Accelerated bank erosion increases channel width and causes downstream deposition to maintain hydraulic efficiency. Bridge replacement at Fourth St. would increase hydraulic efficiency.

***The Tentatively Selected Plan: Floodproofing would allow continued uncontrolled flow during flash floods on both North and South Gabouri Creeks.***

### 4.1.3 Water Quality

***No Action and Floodproofing***

Direct Effects: Water quality would likely remain in its current state. Stream quality meets all the state criteria except for the lower reach of the South Gabouri Creek affected by turbidity and deposition of solids as a result of runoff from the mine quarry.

Indirect Effects: The South Gabouri would continue to be impacted from limestone runoff from the quarry located upstream of the project area as well as urban run-off. The North Gabouri would continue to be impacted from urban and agriculture run-off.

***All Other Alternatives***

Direct Effects: Water quality would be temporarily deteriorated during construction for the channelization and levee alternatives.

Indirect Effects: Channelization would result in lime sediment being removed from South Gabouri Creek.

***The Tentatively Selected Plan: Floodproofing would not appreciably change water quality for the North Gabouri and South Gabouri Creeks.***

### 4.1.4 Air Quality

***No Action and Floodproofing***

Direct Effects: Air quality in the vicinity of the work area would be expected to continue as is for the floodproofing alternatives. No impacts are associated with the No Action Alternative

Indirect Effects: No impacts are associated with the No Action and Floodproofing Alternatives

***North Gabouri Levee and channelization***:

When a federal action is being undertaken in a nonattainment area, the federal agency responsible for the action is required to determine if its action conforms to the applicable State Implementation Plan (SIP). A SIP is a plan that provides for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS) and includes emission limitations and control measures to attain and maintain the NAAQS. Equipment needed to construct these proposed features is assumed to include trackhoes, trucks, bulldozers and scrapers. During operation, this equipment would generate emissions including volatile organic compounds (VOCs), oxides of nitrogen (NOx), and particulate matter (PM), but their impact on air quality would be temporary and limited and would not attain the minimum threshold for which a conformity

determination must be performed. An analysis was conducted to determine the conformity of the Ste. Genevieve work to the SIPs for the states of Missouri and Illinois. The project area is in an attainment area; therefore, there are no issues.

Direct Effects: None

Indirect Effects: None.

***The Tentatively Selected Plan: During construction, floodproofing activities to protect the structures on South Gabouri would have temporary impacts effect on air quality***.

### 4.1.5 Climate Change

The proposed federal action of non-structural modifications is not anticipated to be affected by climate change during the life of the project. Climate change reports differ on whether precipitation may increase or decrease and describe significant uncertainty in forecasting regional precipitation change in the next 50 to 100 years. Therefore, the study assumed that these watersheds are not anticipated to incur significant precipitation changes due to climate change within the anticipated 50 year period of analysis.

## 4.2 Biological Resources – Alternatives

**4.2.1 Aquatic Resources:** North and South Gabouri Creeks are functioning streams. North Gabouri Creek has some pollution impacts from farm animals being in the creek. Streams that are exposed to constant grazing of livestock have increased turbidity, increased number of fecal coliforms, and lower presence of a woody riparian buffer (Sovell et al. 2000). Impacts can also be seen on invertebrate populations, which can be highly diverse in a natural system, but decrease along agricultural stretches and further decrease in urban stretches (Lenat and Crawford 1994).

***No Action and Floodproofing***

Direct Effects: Aquatic resources for both creeks would likely remain in their current state.

Indirect Effects: Flooding would continue with its associated effects to some aquatic resources – both positive (a number of species are known to

respond to flood pulse) and negative (increased turbidity and sediment deposition).

***Channelization, bridge repair/replacement, floodproofing,*** **North Gabouri*:***
Direct Effects: aquatic resources would be impacted by the 2,042 foot channelization work in the streams or along the banks. All water-dependent species within the affected reaches would be destroyed or temporarily displaced during construction. Channelized streams armored with riprap would provide habitat for some invertebrates and other smaller aquatic species, but would be less than ideal when compared to natural habitat (Laason et al. 1988).

Indirect Effects: The armoring with riprap creates a more homogenous habitat that limits structural complexity, negatively impacting diversity of the stream (Peterson et al. 1987). Shifts in fish species composition, diversity, and biomass would occur as channelization alters the habitats required for movement, reproduction, feeding, and cover (Lau et al. 2006). Channelization would shorten the stream and shortened channel lengths would potentially cause higher stream velocities than some aquatic life can withstand and provide no resting places. The removal of riparian vegetation along the creeks would cause increased and rapidly fluctuating water temperatures, and would leave no shading for fish life (Beugly and Pyron 2010). The impacts would be sustained until riparian vegetation reaches maturity, perhaps requiring as a minimum 10 to 15 years. Mitigation for these impacts would be required.

***Levee and channelization:***
Direct Effects: The North Gabouri levee and diversion channel alternative would remove a total of 850 feet of natural stream that would be replaced by a stream mitigation project and the 320 foot cut-off channel. This would likely have significant impacts on aquatic resources both above and below the project area

Indirect Effects: Indirect impacts would include increased erosion, sediment loads, and destruction of riparian zones, removal of accumulated debris and alteration of instream sinuosity, all of which would create a more homogenous habitat structure (Lau et al. 2006). Channelized stream armored with riprap would provide habitat for invertebrates and other smaller aquatic species, but is less than ideal when compared to natural habitat (Lau et al 2006). In addition to impacts mentioned for North Gabouri channelization, this channelization would shorten the stream. Shortened channel lengths would potentially cause higher stream velocities than some aquatic life can withstand and provide no resting places. The new diversion channel would require approximately 10 to 15 years to establish

streambank vegetation. Implementation of this alternative would require mitigation for the stream and riparian habitat losses.

***Channelization and bridge repair/replacement, South Gabouri:***

Direct Effects: South Gabouri aquatic resources would be significantly impacted by the 7,457 feet of channelization work in the streams or along the banks. Most instream and riparian habitat would be lost or modified.

Indirect Effects: Channelized streams armored with riprap would provide a habitat for some invertebrates and other smaller aquatic species, but it would be less than ideal when compared to natural habitat (Laason et al. 1988). Biological responses occur relative to changes in structural content, habitat diversity, hydrology, and water quality. Greater sinuosity provides more habitat for fish and wildlife per stream length (Lau et al. 2006). Biota is affected by changes in water quality variables such as turbidity and temperature (Beugly and Pyron 2010). Shifts in fish species composition, diversity, and biomass would occur as channelization alters the habitats required for movement, reproduction, feeding, and cover. The loss of biodiversity can be attributed to the reduction in riffle and pool quality within channelized streams (Lau et al. 2006). The removal of riparian vegetation along the creeks would cause increased and rapidly fluctuating water temperatures, and would leave no shading for fish life. All water-dependent species within the affected reaches would be destroyed or temporarily displaced during construction. The aquatic habitat would be degraded by the removal of trees and riparian vegetation. The impacts would be sustained until riparian vegetation reaches maturity, perhaps requiring a minimum 10 to 15 years. Shortened channel lengths due to channelization cause higher stream velocities than some aquatic life can withstand and provide no resting places.

Other potential effects of construction in streams would include the release of sediment and pollutants, including the limestone sediment in South Gabouri, which would affect aquatic organisms downstream from the project site at least temporarily. Sediment in streams can have serious impacts on instream biota (Nerbonne and Vondracek 2001). While fish are mobile and can escape the direct impacts of channelization, the relatively immobile benthic invertebrates are particularly vulnerable to channel degradation.

Impacts associated with these alternatives are identified and quantified in Table 4-1. Mitigation would be required for stream impacts

***Tentatively Selected Plan: Floodproofing Alternatives would have no effect on the biological resources along South Gabouri.***

## 4.3 Terrestrial/Riparian Resources - Alternatives

The South Gabouri Creek is generally lined with trees (e.g., sycamore, silver maple and hackberry) in a narrow band varying in dbh from 8 to 12 inches. Interspersed with the trees are various shrubs. In most places, the adjacent land is maintained by landowners by mowing. Although the band of bottomland hardwoods is narrow, it is long and that accounts for the quantity of the terrestrial habitat impacted. These impacts are identified and quantified in Table 4-1.

***No Action and Floodproofing***

Direct Effects: Flood debris left as a result of flash flooding could impact the terrestrial resources as well as any damage to structures. Streets, lawns and some agricultural fields could potentially be covered with debris and sedimentation. Clean-up could be required where it might be heavy.

Indirect Effects: Terrestrial/riparian resources would likely remain in their current state.

***Channelization, bridge repair/replacement, floodproofing; levee and channelization****:* Terrestrial resources would be impacted by the same measures that impact the aquatic resources:

Direct Effects: Channelization of the lower North Gabouri includes the impacts associated with the loss of 1.2 acres of riparian bottomland hardwoods. The levee and diversion channel plan, with ponding areas, includes the impacts due to the loss of 3 acres of bottomland hardwoods and a half-acre of forested wetland. These impacts would be the result of removal of riparian vegetation to allow for construction. For the South Gabouri channelization, 4.3 acres of bottomland hardwoods would be lost.

Indirect Effects: The modification of naturally meandering streams can lead to a significant increase in temperatures and the drying out of streams, therefore having negative impacts on fish and macroinvertebrate communities (Beugly and Pyron 2010).

***The Tentatively Selected Plan: Floodproofing Alternatives would have no effect on the terrestrial resources along North and South Gabouri Creeks.***

## 4.4 Endangered Species

The FWS website lists the following species as in the vicinity of the proposed project areas as of October 1, 2015: the federally endangered Indiana bat, pallid sturgeon, interior least tern, and the threatened northern long-eared bat, piping plover and Rufa red knot. No bald eagles are known to nest within 660 feet of the project; therefore, the project will not

affect the bald eagle. No bald eagle nests are known to occur in the project area. Wintering bald eagles would most likely roost during the winter on the Mississippi River and not inland in Ste. Genevieve.

***Indiana bat*** - Prior to construction, if suitable roost trees are found among the project riparian or wooded areas, they would be need to be removed from the site between 1 October and 31 March, to avoid adversely affecting the Indiana bat. Surveys were not indicated in the draft FWCA report. The proposed project may affect but is not likely to adversely affect the Indiana bat.

***Pallid sturgeon*** – This project would not impact any Mississippi River habitat; therefore, this project would have no effect on the pallid sturgeon.

***Interior least tern*** - This project would not impact any Mississippi River shoreline habitat; therefore, this project would have no effect on the interior least tern.

***Northern long-eared bat*** - Prior to construction, if suitable roost trees are found in the project riparian or wooded areas, they would need to be removed from the site between April 1 and October 1, to avoid adversely affecting the northern long-eared bat. The proposed project may affect, but not adversely affect the long-eared bat.

***Piping plover*** - This project would not impact any riverine shoreline habitat; therefore, this project would have no effect on the piping plover.

***Rufa red knot*** – This project would not impact any riverine shoreline habitat; therefore, this project would have no effect on the rufa red knot.

**Summary**: The project alternatives as proposed may affect the northern long-eared bat and Indiana bat. If Indiana or northern long-eared bat habitat would be affected, then construction in those areas would be limited to the times of year when they are in their hibernacula: October 1 to April1.

The draft FWCA report from 2006 is included in Appendix B and the conclusions of that report are applicable and relevant. The UFWS supports the alternatives that are least impactful to the environment, namely, the non-structural alternatives. Their order of preference for North Gabouri is the non-structural alternatives, the levee and diversion channel and lastly the original authorized plan. On South Gabouri Creek it is the non-structural alternative, and secondly the original authorized plan.

## 4.5 Recreation

Direct Impacts: The recreation features of this project would be constructed on previously disturbed ground, the Mississippi River levee. Although there are many other park and recreation experiences available within the area, this facility would provide a recreation experience that is otherwise unavailable.

Indirect Impacts: Recreation may have a beneficial, but minor impact on tourism at Ste. Genevieve.

***The Tentatively Selected Plan: No adverse impacts are anticipated with the recreation plan***.

**Table 4-1 – Summary of Ecological Impacts**

| Summary of Ecological Impacts | | | |
|---|---|---|---|
| | **Riparian Acreage** | **Stream Channel Disturbed** | **Wet-lands** |
| **North Gabouri Alternatives** | | | |
| No Action | 0 | 0 | 0 |
| Channel and Bridges | 1.2 | 2,042 ft. | 0 |
| Channel and Levee | 3.00 | 530 ft. | 0.5 |
| Floodproofing | 0 | 0. | 0 |
| **South Gabouri Alternatives** | | | |
| No Action | 0 | 0 | 0 |
| Channel and Bridges | 4.28 | 7,457 ft. | 0 |
| Floodproofing* | 0 | 0 | 0 |
| ***** Tentatively Selected Plan | | | |

## 4.6 Cultural Resources

**No Action Alternative:**

Direct Effects: The No Action Alternative would be a beneficial action by maintaining existing historic structures in a natural setting. However, a single flood could cause severe damage or the loss of a historic building. A structure could also be gradually ruined by repeated flooding over time. The “poteaux-

en-terre" structures, with their wood and earth foundations, are particularly susceptible to damages as a result of flooding.

Other than the risk of the complete loss of a historic structure, there is also a risk that flood-prone historic structures would be less appealing to individuals or businesses who wish to own and maintain a historic structure. This not only affects the structure's attractiveness on the real estate market, but also has long-term adverse consequences for its historic integrity, as owners are likely to invest less time and money in rehabilitation and restoration. All of the historic structures damaged by North and South Gabouri Creek flooding are privately owned and occupied.

Indirect Effect: These historic structures would remain unprotected and could be adversely affected by continued flash floods on North and South Gabouri Creeks.

***The Tentatively Selected Plan****: As stated previously, the Tentatively Selected Plans for flood damage reduction include floodproofing of structures along both creeks. The recreation plan includes a trail and related facilities associated with the Mississippi River levee. Any structure elevation would have visual impacts not only on the structure itself but also on nearby structures. Wet floodproofing would have little to no visual impacts on the structures themselves or the surrounding structures, as exterior modifications are anticipated to be minimal or non-existent.*

*Alternatives - Channelization, bridge repair/replacement, floodproofing; Levee and channelization; channelization, bridge repair/replacement; and channelization, bridge repair/replacement and floodproofing*

Direct Effects: The channelization alternatives would protect the historic structures by evacuating the flash flood flows and Levee Channelization Alternative would physically protect two structures on North Gabouri, but would require that an historic brick structure be moved and that would cause a loss of its historic integrity. The channelization alternatives would require replacement of bridges. A number of the bridges are contributing structures to the National Register District and it would be necessary to replace them with historic looking bridges. This would require a special consultation with the SHPO, including a Memorandum of Agreement, and also mitigation plan would need to be developed. The same would be required for the moving of the historic brick structure because its deed is restricted with historic covenants that require special consultation for any alterations.

Indirect Effects: Channelization may disturb unknown archaeological and historic sites in the areas affected by such actions.

***Wet Floodproofing Alternative***

Direct Effects: All structures would be wet floodproofed, and only one structure, the Chadwell structure on South Gabouri, would be elevated because it has a low first floor elevation. This would have an adverse effect on its historic integrity.

Indirect Effects: Continued flooding of foundations may require repairs which the owners may or may not do depending on their feelings about being flooded repeatedly. This may result in deteriorated structures and a loss in value.

***The Tentatively Selected Plan: Direct and indirect effects describe the adverse effects of the TSP*.**

## 4.7 Cumulative Effects

Cumulative effects are those "impacts which result from the incremental consequences of an action when added to other past and reasonably foreseeable future actions" (40 CFR 1508.7). The project boundary for cumulative effects is the City of Ste. Genevieve, characterized as urban with some wooded areas and open fields. A high percentage of land is in private ownership.

Ste. Genevieve was founded in circa 1750 on the banks of the Mississippi River. In 1785 due to a series of flood events the town was moved inland to its present location. Between 1790 and 1951 Ste. Genevieve evolved with the influx of various immigrants to the area. This development of the community is memorialized in the various architecture styles representing all periods of this evolution in the Historic District. The Mississippi River Levee was completed in 2002 and protects much of the Ste. Genevieve Historic District from Mississippi River floods. However, flooding continues in the upper reaches of both creeks. Additionally, since initial project authorization, the social and political climate regarding environmental effects of projects has changed. These changes resulted in a need to re-examine the authorized plans for those parts of the project which address creek flooding. Importantly, the National Park Service has recently concluded that Ste. Genevieve meets the criteria for suitability for inclusion in the national park system.

Given past impacts to the area (population growth, urban development, flooding, and removal of historic structures), and current condition of the area, it is anticipated that the TSP would not substantially add to the alterations of the human or natural environment of the area. The floodproofing alternative would have no effect on the upper reach flooding. Our project would have minimal cumulative effects to the city of St.

Genevieve. Any impacts from floodproofing construction would be temporary and insignificant. Floodproofing would have a small beneficial cumulative effect because it would preserve the historical integrity of these structures, which contributes to the importance of the Ste. Genevieve National Historic Landmark District. In the future the City of Ste. Genevieve may replace bridges on North Gabouri to prevent a backup of creek waters, although its effectiveness in reducing flooding is uncertain pending further study. Implementation of the TSP would likely have a minor contribution to the stabilization of the community and tourism economics of Ste. Genevieve.

## 4.8 Aesthetics

***No Action Alternative and Floodproofing Alternatives:***

Direct Effects: Flood debris left as a result of flash flooding would impact the aesthetics as well as any damage to structures. Streets and lawns would potentially be covered with debris and sediment and clean-up would be required where it might be heavy. The elevation of one structure, while others remain un-elevated, which would be true for one structure on South Gabouri, may reduce the aesthetic value as well. Any structure elevation would have visual impacts not only on the structure itself but also on nearby unaltered structures. All attempts would be made to minimize the visual impacts of elevation, but the original cultural integrity of the structure may be lost due to the diminished historic integrity of the property's design, setting, and feeling. In consultation with the staff of the State Historic Preservation Office of Missouri and National Register staff, a determination was made that buildings that have been elevated still may be eligible for the National Register if the elevation is limited, say one or two feet.

Indirect Effects: All the historic structures are privately owned and if flooding was allowed to continue they may not want to invest in repairs which could lead to negative visual impacts. Other than the risk of the complete loss of a historic structure, there is also a risk that flood-prone historic structures would be less appealing to individuals or businesses who wish to own and maintain a historic structure. This not only affects the structure's attractiveness on the real estate market, but also has long-term adverse consequences for its historic integrity, as owners are likely to invest less time and money in rehabilitation and restoration. Nearly all of the historic structures damaged by North and South Gabouri Creek flooding are privately owned and occupied.

***Channelization, bridge repair/replacement, floodproofing, levee and channelization***

Direct Effects: The authorized plans and plans that would place levees near homes would also detract from the aesthetics of the community. The

development of the ponding areas may detract from the aesthetics of the N. Gabouri City Park.

Indirect Effects: Of the final array of alternatives, the levees, channelizing the creek, and removing of historic buildings and structures (bridges) would have the greatest alteration to the visual setting of the city. It would affect the viewshed of the historic structures and the view from the historic structures. The primary noticeable changes would be new bridges (which could be constructed to appear historic), the temporary loss of vegetation along the creek, and a more uniform creek channel throughout the city.

***The Tentatively Selected Plan: Direct and indirect effects describe the adverse effects of the TSP***.

***Recreation Alternative***

Direct Effects: No impacts are associated with the recreation alternatives.

Indirect Effects: The current plan would create a demand to build access facilities to support levee recreation.

***The Tentatively Selected Plan: No adverse effects are anticipate under the TSP other than those associated with minor development along the bike trail.***

## 4.9 Unavoidable Adverse Impacts

Unavoidable adverse impacts of implementing the TSP may include the need to elevate the Chadwell structure on South Gabouri.

## 4.10 Relationship of Short-Term Uses and Long-Term Productivity

An outcome of the proposed action would be to prevent the degrading of the historical value of identified structures in Ste. Genevieve, Missouri. Short-term would be defined as the impacts that may accrue over a couple years whereas long-term would be defined as the impacts that may span a decade or more. The floodproofing alternative would allow in the short-term the preservation of Ste. Genevieve biological resources and the physical resources, i.e. stream hydraulics, whereas the no action alternative could result in the degrading of historic resources that may result in the loss of the historic integrity of some structures and the economic productivity of tourism in the area.

## 4.11 Any Other Disclosures

No hazardous or toxic wastes are known to occur in the project area; no mineral and energy resources would be impacted.

# 5 Relationship of Proposed Action to Environmental Requirements

## Compliance with environmental requirements is summarized below.

**National Environmental Policy Act of 1969.** The project is in partial compliance with the National Environmental Policy Act, and would be in full compliance after the public review process for the proposed action is completed and a Finding of No Significant Impact (FONSI) is signed, assuming a FONSI is appropriate.

**Endangered Species Act of 1973**. The FWS will have an opportunity to review and comment on this EA and the biological assessment within it. Therefore, this project is in partial compliance with the Endangered Species Act.

**Fish and Wildlife Coordination Act of 1958.** The Corps concurs with the guidance and recommendations the FWS has made to avoid impacts to threatened and endangered species. Coordination will continue with the FWS during the public review process for the proposed action, when the FWS would have an opportunity to review and comment on this EA. Therefore, this project is in partial compliance with the Fish and Wildlife Coordination Act.

**National Historic Preservation Act of 1966, As Amended (PL 89-665**); The Archeology and Historic Preservation Act (PL 93-291); and Executive Order 11593. Archival research and consultation with the Missouri SHPO have been conducted in accordance with the National Historic Preservation Act, as amended; the Archeological and Historic Preservation Act, as amended and Executive Order 11593. SHPO consultation was initiated in June 2005. In a July 6, 2007, letter response, the Missouri SHPO concurred with the Corps' preliminary adverse effect determination. The project will affect historic properties included in or eligible for inclusion in the National Register of Historic Places. It was agreed that, when project designs were finalized (2015), that the SLD would formally develop a Memorandum of Agreement with the SHPO, the National Parks Service, and the President's Advisory Council on Historic Preservation (ACHP). This document will specify the process by which the SLD will mitigate or avoid any potential

impacts to significant archaeological resources or standing architectural structures within the Ste. Genevieve National Landmark District.

**Clean Water Act of 1972**. The project is in compliance with the Clean Water Act. No 404(b)1 permit or 401 Water Quality Permit would be required.

**Clean Air Act of 1972**. This project is in compliance with Clean Air Act General Conformity Rules. No air quality permits would be required for this project.

**Farmland Protection Policy Act of 1981.** No prime or unique farmland would be impacted by implementation of this project. This proposed action is in compliance with this Act.

**Wild and Scenic River Act of 1968**. No designated Wild and Scenic river reaches would be affected by project related activities. This act is not applicable.

**Federal Water Project Recreation Act.** This project would not adversely affect existing recreational opportunities. Therefore, this project is in compliance with the goals of this act.

**Migratory Bird Treaty Act and Migratory Bird Conservation Act**. No migratory birds would be affected by project activities. The project is in compliance with this acts.

**Bald Eagle Protection Act**: No bald eagle nests are located within the project area. The project is in compliance with this act.

**Executive Order 11990, Protection of Wetlands.** No wetlands will be impacted under the TSP.

**Executive Order 11988, Flood Plain Management**. The purpose of this E.O. is to discourage federally induced development in floodplains. No development is proposed for the floodplain. This project is in compliance with the goals of this E.O.

**Executive Order 12898, Environmental Justice**. This E.O. directs federal agencies to provide for full participation of minorities and low income populations in the federal decision making process. It further directs agencies to fully disclose any adverse effects of plans and proposals on minority and low income populations. Floodproofing will have no disproportionately adverse effects on minority or low income populations . The project is in compliance with the goals of this E.O.

**Executive Order 13112, Invasive Species.** This project would not foster the spread of invasive species and is in compliance with this E.O.

# 6 Literature Cited

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Laasonen, P., T. Muotka, and I. Kivijarvi. 1998. Recovery of macroinvertebrate communities from stream habitat restoration. Aquatic Conservation: Marine and Freshwater Ecosystems 8:101-113.

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U.S. Environmental Protection Agency 2015. U. S. Environmental Protection Agency green book nonattainment areas for criteria pollutants as of January 30, 2015. http://www.epa.gov/airquality/greenbk/ . Accessed 19 February 2015.

# 7 List of Agencies Consulted and Agencies, Organizations, and Persons Receiving the Environmental Assessment:

The U.S. Fish and Wildlife Service and the Missouri Department of Conservation were contacted regarding this project.

| | |
|---|---|
| Ms. Amy Salveter<br>U.S. Fish and Wildlife Service<br>Columbia Ecological Services Field Office<br>101 Park DeVille Drive, Suite A<br>Columbia, MO 65203-0007 | Ms. Janet Sternburg<br>Policy Coordinator<br>Missouri Department of Conservation<br>P.O. Box 180<br>Jefferson City, MO 65102 |

**The draft EA will be sent to the following agencies, organization and individuals for comment and review:**

## Federal

Honorable Senator Roy Blunt
United States Senate
7700 Bonhomme, #315
St. Louis, Missouri 63105

Honorable Senator Claire McCaskill
United States Senate
5850 Delmar Blvd, Ste A
St. Louis, MO 63112

Representative Jason Smith
District 8
2502 Tanner Drive, Ste 205
Cape Girardeau, MO 63703

U.S. Fish and Wildlife Service
608 East Cherry Street, Room 200
Columbia, Missouri 65201

Environmental Coordinator
U.S. Department of Agriculture
Rural Development
601 Business Loop 70 West
Parkade Center, Suite 235
Columbia, Missouri 65203

Natural Resources Conservation Service
Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203

Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001-2637

The National Historic Landmarks Program of the NPS
Midwest Region
601 Riverfront Drive
Omaha, NE 68102-4226

Deputy ADCRPS Preservation Assistance Programs
National Park Service
1201 Eye Street, NW
Washington, DC 20005

Project Manager
National Park Service
12795 W. Alameda Parkway
Denver, CO 80228

EPA Region 7__FOR NEPA DOCUMENTS:
r7_nepa@epa.gov

## State of Missouri

Policy Coordination Section
Missouri Department of Conservation
P.O. Box 180
Jefferson City, Missouri 65102-0180

Missouri Department of Natural Resources
Historic Preservation Program
PO Box 176
Jefferson City, MO 65102-0176

Director's Office
Missouri Department of Natural Resources
P.O. Box 176,
Jefferson City, Missouri 65102

Floodplain Management Manager
State Emergency Management Agency
P.O. Box 116
Jefferson City, Missouri 65102

## Non-Governmental Organizations

Sierra Club
2818 Sutton Ave,
St. Louis, MO 63143

The Nature Conservancy
Missouri Field Office
PO Box 440400
St. Louis, MO 63144

American Bottoms Conservancy
P.O. Box 4242
Fairview Heights, IL 62208

## Local

City of Ste. Genevieve
P.O. Box 112, 165 S. 4th Street
Ste. Genevieve, Missouri 63670

# Appendices

# Appendix A
# Plates

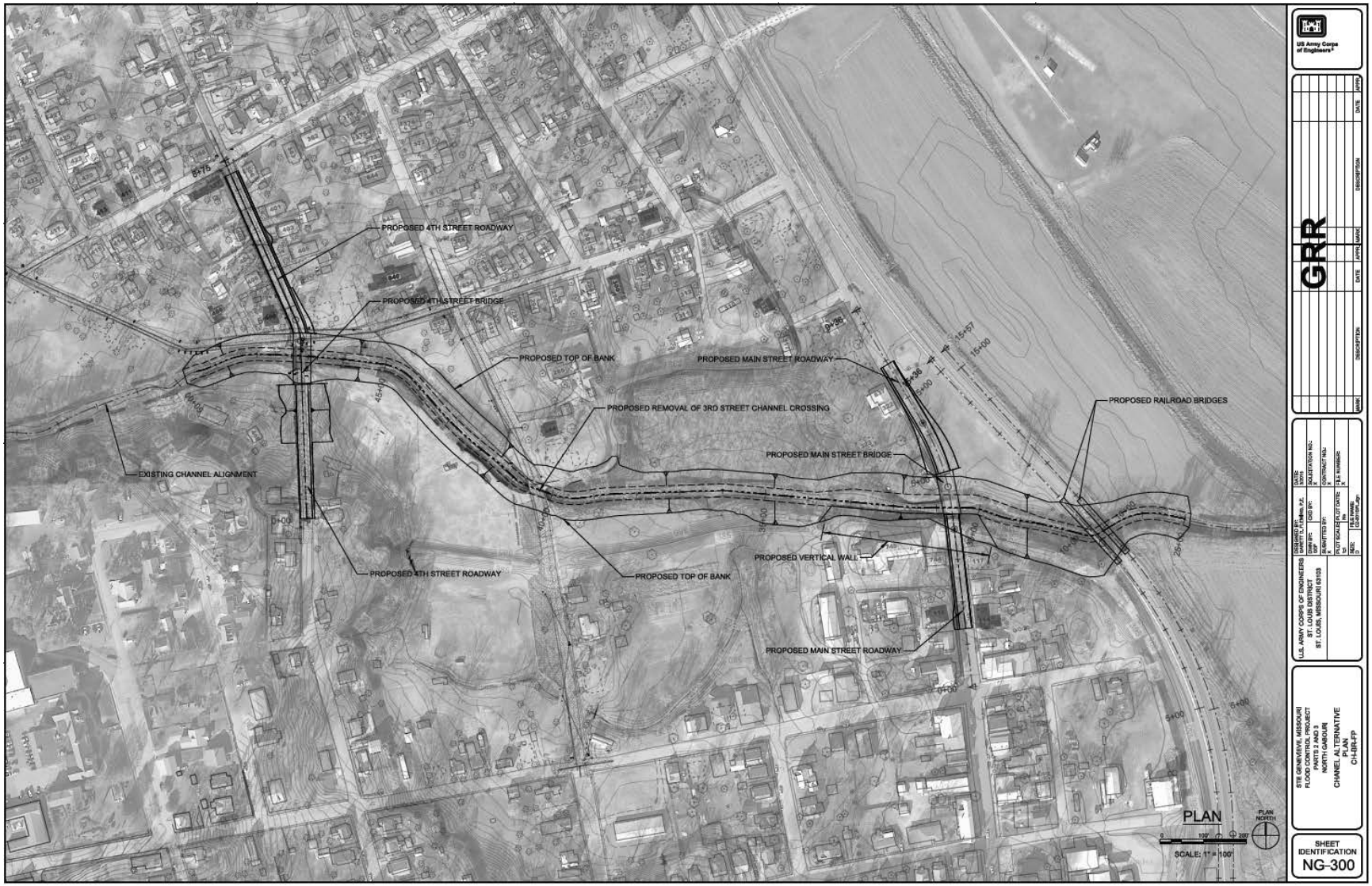



**Plate 2 – N. Gabouri Channel Plan (CH-BR-FP)**

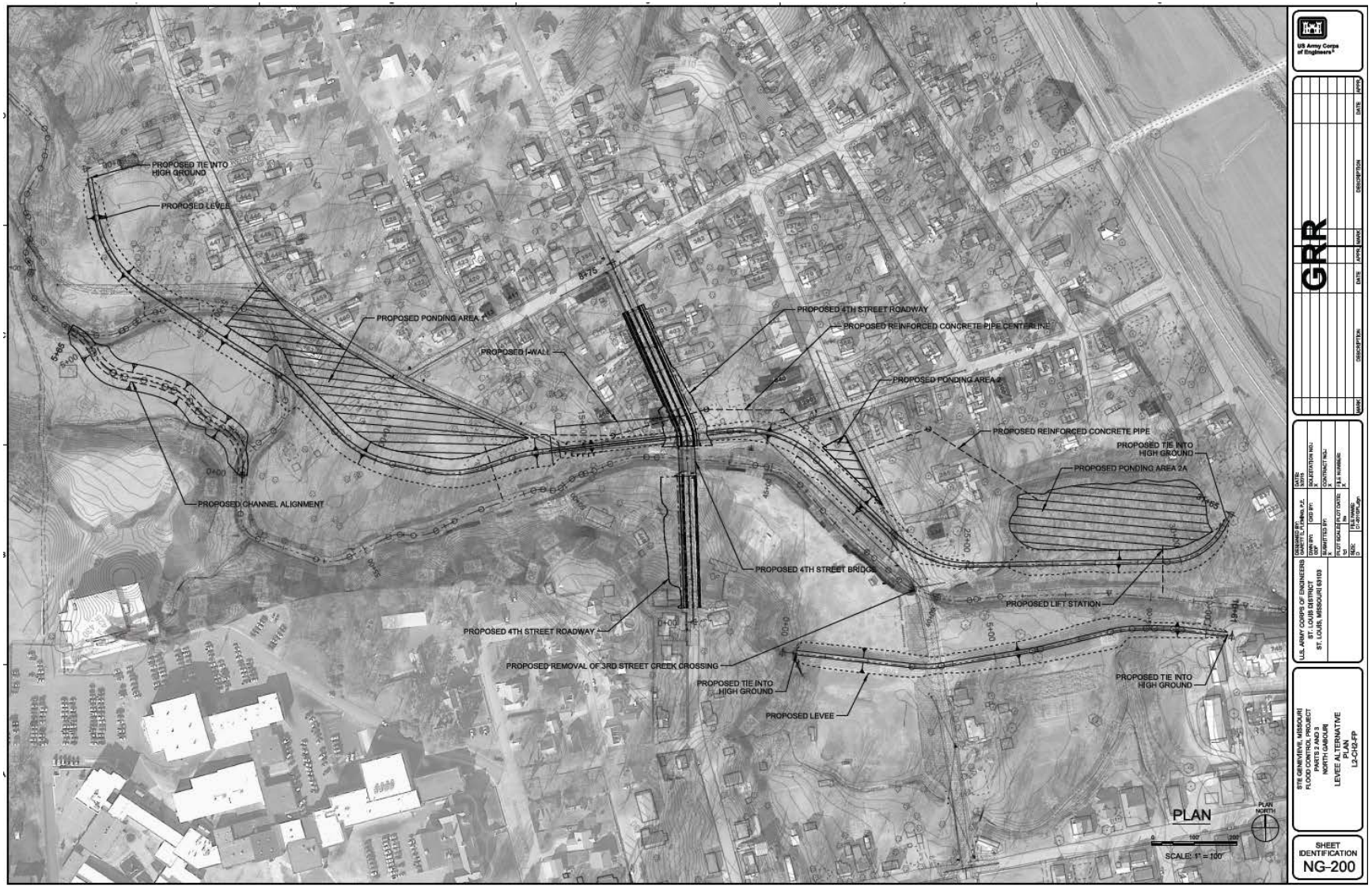



**Plate 2 – N. Gabouri Levee and Channel Diversion (L2-CH2)**


**Plate 3 – N. Gabouri Floodproofing (FP)**

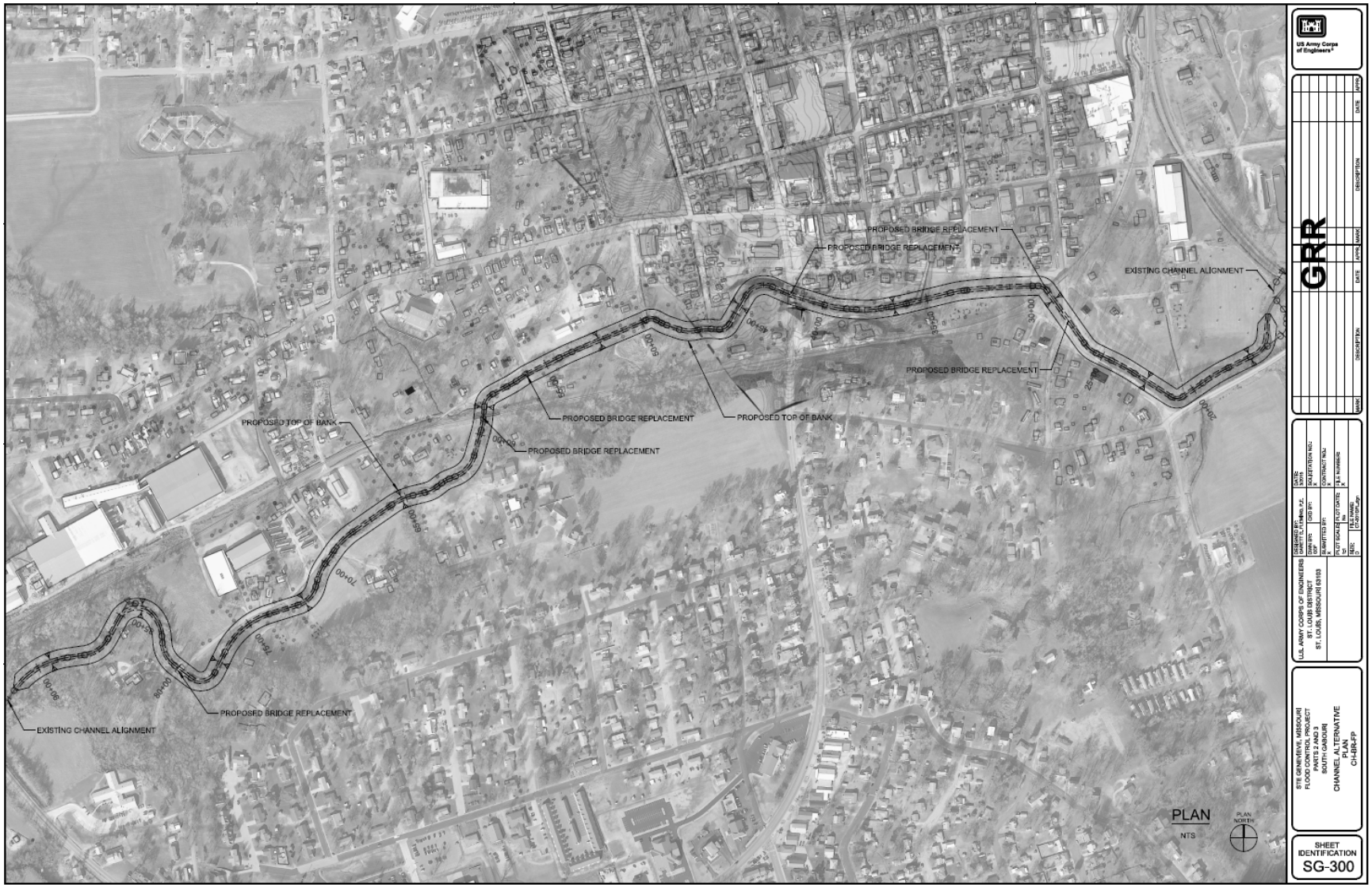



**Plate 4 – S. Gabouri Channel Plan (CH-BR-FP)**


**Plate 5 – S. Gabouri Floodproofing Plan (FP)**

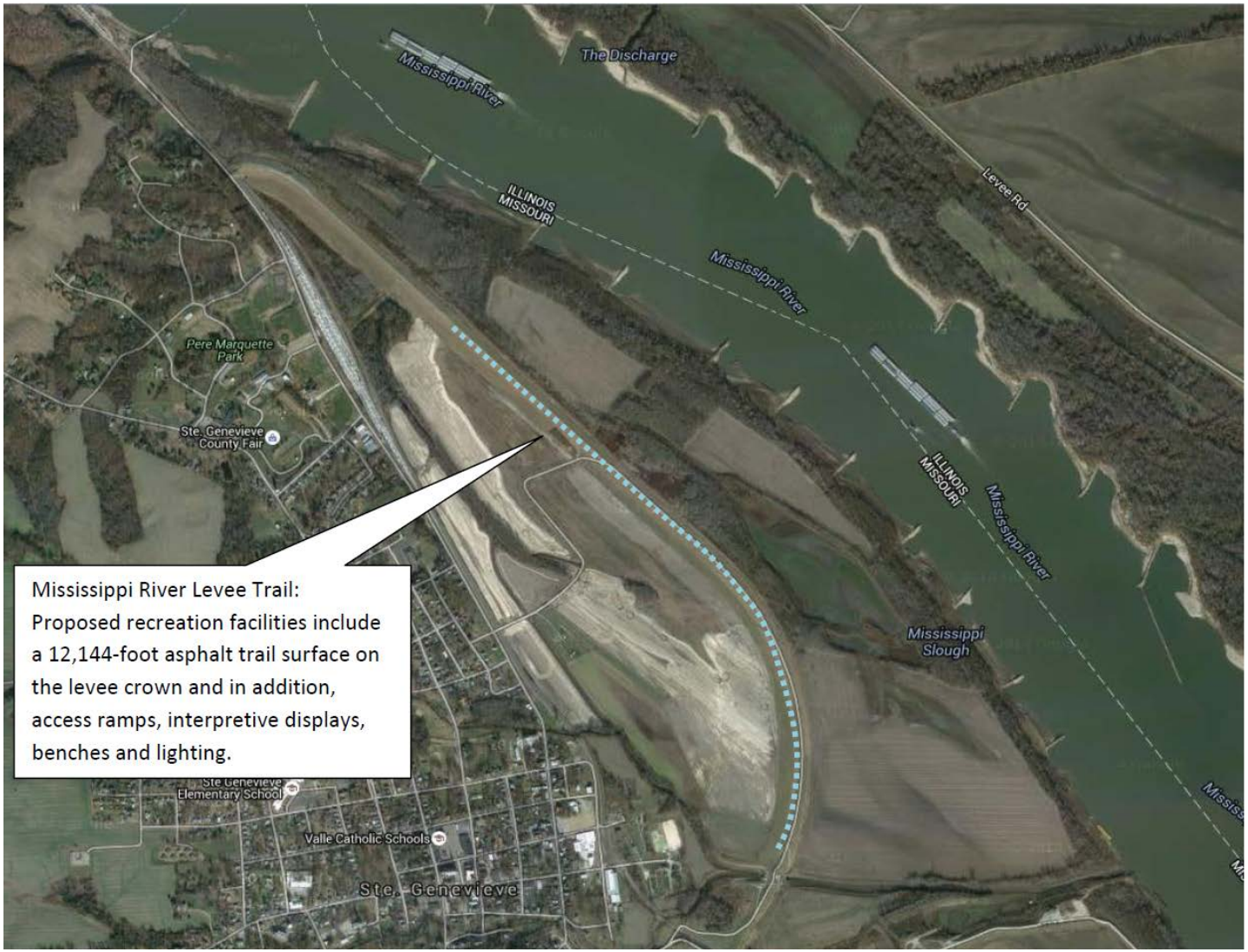



**Plate 6 – Recreation Features on the Main Levee**

# Appendix B
# Coordination

# Heritage Review Report

Missouri Department of Conservation
Policy Coordination Unit
P. O. Box 180
Jefferson City, MO 65102
573-522-4115 X 3250 -- Shannon.Cave@mdc.mo.gov

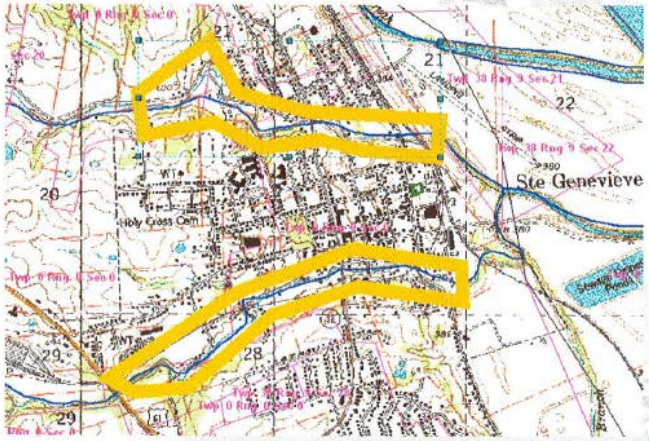
Francis Walton
Environmental Analysis Branch USACE
1222 Spruce Street
St. Louis, MO 63103-2833

**Project type:** flood protection
**Location:** North & south Gabouri Creeks within Ste. Genevieve
**County:** Ste. Genevieve
**Date query received:** March 9, 2006

**This is not a site clearance letter**, but a report of Missouri Department of Conservation records concerning public lands and sensitive resources known to be near and possibly affected by the proposed project.

Prepared by:
10-Mar-06

**Species/habitats with Federal or State concerns:** *No Records Found*




**Concerns & management recommendations** based on site or project details, not related to specific heritage records:
The project area is in region with known karst geologic features (e.g. caves, springs, and sinkholes, all characterized by subterranean water movement). Such features are not routinely identified in heritage records but may be encountered by the project. Since cave fauna are influenced by changes to water quality, every effort should be made to protect groundwater in the project area. See http://www.mdc.mo.gov/documents/nathis/endangered/karst.pdf for best management information.

Streams in the area should be protected from soil erosion, water pollution and in-stream activities that modify or diminish aquatic habitats. Best management recommendations relating to streams and rivers may be found at http://www.mdc.mo.gov/documents/nathis/endangered/streams.pdf

**Draft Fish and Wildlife Coordination Report (December 2006)**
The following is a Draft Fish and Wildlife Coordination Act Report (CAR report) for the St. Louis District, U.S. Army Corps of Engineer's General Reevaluation Report (GRR) for the Ste. Genevieve, Missouri, flood control project. The Fish and Wildlife Service (FWS) and the Missouri Department of Conservation (MDC) developed this report which provides an analysis of the impacts on fish and wildlife resources from implementation of the proposed project alternatives. We are submitting this report in accordance with the Fish and Wildlife Coordination Act (48 stat.401, as amended; 16 U.S.C. 661 et. Seq.), and the National Environmental Policy Act (42 U.S.C., 4321-4327). This draft report, however, does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the Act.

The Ste. Genevieve flood control project was authorized by the Water Resources Development Act of 1986 (Public Law 99-662). The purposes of the project are to protect the city of Ste. Genevieve and its nationally-recognized historic resource from Mississippi River flooding (Part 1, completed), to reduce flood damages along North and South Gabouri Creeks (Parts 2 and 3, respectively), and to provide outdoor recreation opportunities (Part 4).

During the course of the 1982 Ste. Genevieve Feasibility Study, many flood damage reduction measures were considered including structural and non-structural measures.

Structural measures included levees; floodwalls; interior drainage features such as pump stations, gravity drains, ditching, and channel relocation; detention dams and reservoirs; diversions; channel enlargement; clearing and snagging; bridge replacement; and improvement of the hydraulic efficiency of bridges.

Non-structural measures included demolition of buildings, relocation of buildings, floodproofing, and elevating buildings.

<u>North Gabouri Creek Alternatives</u>

Three different alternatives are being considered for North Gabouri Creek: the original authorized plan, channel and levee alternative, and non-structural (elevation and floodproofing).

The original authorized alternative required widening approximately 3,700 feet of creek channel from two railroad tracks downstream of Main Street to a point upstream of 6$^{th}$ Street and replacement of three bridges. Much of the new channel would be lined with rip-rap. The estimated cost would be approximately $8,300,000.

The Channel and Levee alternative would require elevating a section of LaHaye Street to act as a levee, replacing the 3$^{rd}$ and 4$^{th}$ street bridges and cutting off a

250-foot section of the creek to construct the levee. Minor temporary channel impacts would occur during the replacement of the bridges. The 250-foot section of channel would be filled and replaced with an approximate 210-foot channel. Riparian vegetation would be removed along a portion of the levee construction and the entire length of the channel cutoff. The approximate cost would be $2,900,000.

The Non-structural alternative would involve elevating 12 structures and floodproofing structures with basements. The approximate cost would be $400,000.

South Gabouri Creek Alternatives

Three alternatives are being considered for South Gabouri Creek: the original Authorized Plan, Levee Alternative and Non-structural alternative (floodproofing and elevation of structures).

The original Authorized Plan required widening approximately 5,200 feet of creek channel for the railroad track to Highway 61, replacement of all bridges between the railroad track and Highway 61 and floodproofing two structures. Much of the new channel would be lined with rip-rap. The approximate cost would be $4,400,000.

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The Levee alternative requires the construction of a levee from Fifth Street to Gabouri Street to high ground. The approximate cost would be $2,500,000.

The Non-structural alternative would involve elevating 15 structures and floodproofing structures with basements. The approximate cost would be $350,000.

**Fish and Wildlife Resources**

The study area is located in Ste. Genevieve County in southeastern Missouri. Ste. Genevieve is on the edge of the Mississippi River floodplain, between river miles 122 and 125 above the Ohio River.

The study area for North and South Gabouri Creeks includes the entire watershed of the creeks, down to where they join together and pass through the Mississippi River levee. The North and South Gabouri Creek watersheds consists of approximately 7.4 and 6.2 square miles, respectively. Gabouri Creek divides into South and North Gabouri Creeks at a point 0.9 miles from the Mississippi River.

Elevations in the area range from 360 feet NGVD where Gabouri Creek meet the Mississippi River to 900 feet NGVD in the western uplands of North Gabouri Creek. Areas around the city exhibit karst features such as sink holes, joint

cavities, caves, karst ponds, losing streams, shallow holes, and springs. The bedrock underlying the area is principally composed of limestones and occasional shales and limestones

The floodplain of North Gabouri Creek is used for pasture or crop production for most of its six mile length. High density urban development occurs in the floodplain from river mile 1.2 to 2.0 from the Mississippi River. The floodplain for South Gabouri Creek is highly developed from river mile 1.4 to 2.3 from the Mississippi River. Above Highway 61, the stream flows through the Mississippi Lime Company for nearly one mile. For the remainder of its six mile length, the South Gabouri Creek floodplain is generally used for agricultural production.

North and South Gabouri Creeks are narrow streams with low base flows. The upper end of the watershed is intermittent during drought periods. The streams pass through a mixture of pasture, forest and cropland in their upper reach and Ste. Genevieve in its lower reach. The upper portions of the streams have a cobble and gravel substrate with little instream cover. The lower portion of the streams has a mixture of bedrock, cobble, gravel and man-made debris.

At the confluence of the two streams, the stream is wide and deep. Water levels of this segment of stream are influenced by the Mississippi River and watershed flows.

The following pictures were taken during two field trips to the project site. Photos 1 and 2 were taken during the summer time and show a relatively well-developed riparian corridor. Photo 5 was taken further downstream of photos 1 and 2 near the proposed North Gabouri Creek cutoff. Photos 3 and 4 were taken during the winter and show the disturbed stream banks downstream of the confluence of North and South Gabouri Creeks. Little riparian vegetation is evident and channel width is more incised and narrow then the three summer photos taken upstream.

**1. North Gabouri Creek and riparian habitat**

**2. North Gabouri Creek and riparian habitat**

**3. Gabouri Creek**

**4. North Gabouri Creek at LaHaye Street**

A review of the National Wetland Inventory map, dated 1993, show the following wetlands that occur in the project area:

- PFO1A temporarily flooded palustrine forested wetlands
- R2UBG unconsolidated bottom intermittently exposed lower perennial

riverine wetland

- PUBG unconsolidated bottom, intermittently exposed palustrine wetland
- PEMFh impounded semi-permanently flooded palustrine emergent wetland
- PUBFx excavated unconsolidated bottom, semi-permanently palustrine wetland

Although the water quality of Gabouri Creek is subject to limestone runoff from the limestone plant located upstream of the construction site, it is in fair condition in the project area. The channel of both forks of Gabouri Creek does meander, has pools and riffles, resting areas in undercut banks and pools, and is shaded by riparian vegetation that includes trees in the 30+ year old category.

Stream corridors are used by wildlife more than any other habitat type. The faunal composition of a stream corridor is a function of the interaction of food, water, cover, and spatial arrangement (Thomas et al. 1979, SCR report).

Fish fauna of urban streams such as Gabouri Creek is less varied than other faunal regions because it is subject to widely fluctuating environmental conditions, and only fishes tolerant of these fluctuations can persist. The numbers and species composition of fishes in a given stream depends on the location and such intrinsic factors physical habitat (current, depth, substrates, riffle/pool ration wood snags and undercut banks), water quality (temperature, dissolved oxygen, suspended solids, nutrients, and toxic chemicals), and biotic interactions (exploitation, predation, and competition). Representative fish species that may occur at the site are … (Mike could you throw in some fish types?)

Fish species assemblages in streams will vary considerably from the headwaters to the outlet due to changes in many hydrologic and geomorphic factors which control temperature, dissolved oxygen, gradient, current velocity, and substrate. Fish species richness tends to increase downstream as gradient decreases and stream size increases.

Amphibians that may occur in the project area include the spotted salamander, eastern tiger salamander, slimy salamander, eastern American toad, cricket frog, gray treefrog, spring peeper, western chorus frog, bullfrog, green frog, pickerel frog, and the southern leopard frog. Nearly all amphibians depend on aquatic habitats for reproduction and overwintering. While less restricted by the presence of water, many reptiles are found primarily in stream corridors and riparian habitats. Reptiles that may occur in the project area include the common snapping turtle, three-toed box turtle, red-eared slider, northern fence lizard, five-lined skink, six lined racerunner, eastern yellow-bellied racer, ring-necked snake,

black rat snake, northern water snake, rough green snake and the eastern garter snake.

Birds are the most commonly observed terrestrial wildlife in riparian corridors. Nationally, over 250 species have been reported using riparian areas during some part of the year. Bird species richness in Midwestern stream corridors reflects the vegetative diversity and width of the corridor. Over half of these breeding birds are species that forage for insects on foliage (vireos, warblers) or species that forage for seed on the ground ( doves, orioles, grosbeaks, sparrows). Next in abundance are insectivorous species that forage on the ground or on trees (thrushes, woodpeckers).

Songbirds nest in the under and overstory of bottomland and riparian forests. Riparian forest habitat is very important to the species of wildlife that inhabit the urban stream ecosystem. Riparian vegetative cover stabilizes banks and shades the stream. It also provides large woody debris and detritus which provides cover and a food source for aquatic species. Existing riparian vegetation should be retained to the extent feasible.

The combination of cover, water, and food resources in riparian areas make them desirable habitat for a variety of mammals. Mammals that may frequent the area include the opossum, eastern mole, little brown bat, eastern pipistrelle, big brown bat, eastern cottontail rabbit, woodchuck, eastern gray squirrel, fox squirrel, southern flying squirrel, deer mouse, white-footed mouse, prairie vole, muskrat, house mouse, coyote, red fox, raccoon, mink, striped skunk and the white-tailed deer. Riparian areas provide tall dense cover for roosts, water, and abundant prey for a number of bat species including the little brown bat, eastern pipistrille, big brown bat and the red bat.

Endangered Species Comments

The Indiana bat *Myotis sodalist* and the bald eagle *Haliaeetus leucocephalus* may occur in the project area.

From late fall through winter Indiana bats in Missouri hibernate in caves in the Ozarks and Ozark Border Natural Divisions. During the spring and summer, Indiana bats utilize living, injured (e.g. split trunks and broken limbs from lightning strikes or wind), dead or dying trees for roosting throughout the state. Indiana bat roost trees tend to be greater than 9 inches diameter at breast height (dbh) (optimally greater than 20 inches dbh) with loose or exfoliating bark. Most important are structural characteristics that provide adequate space for bats to roost.

Preferred roost sites are located in forest openings, at the forest edge, or where the overstory canopy allows some sunlight exposure to the roost tree, which is usually within 1 km (0.6 mi.) of water. Indiana bats forage for flying insects

(particularly moths) in and around the tree canopy of floodplain, riparian, and upland forests.

During sites in 2003 and 2005, staff biologists from the corps and the Service did not observe suitable roost trees for the Indiana bat. Therefore, if no suitable roost trees, as described above, are removed from the site between April 1 and October 1, then we believe that the proposed project is not likely to adversely affect the Indiana bat.

Bald eagles are common migrants and winter residents throughout the state and are uncommon breeders along some of the major rivers and larger reservoirs in the state. During winter, they congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. Wintering eagles usually occupy river habitats between November 15 and March 1, and use large diameter riparian tree species as daytime perches and night roosts. They usually perch within a riparian corridor or along lake shores and prefer areas with limited human activity. At night, wintering bald eagles may congregate at communal roosts and will travel as much as 20 kilometers (12 miles) from feeding areas to a roost site. The period January 1 to March 1 is important for initiating nesting activity; March 1 to May 15 is the most critical time for incubation and rearing of young.

Bald eagles are known to prefer trees greater than 11 inches dbh and within 100 to 600 feet of water for perching sites. Eagles also tend to roost on the tallest trees (greater than 63 feet above ground level). Cottonwood (*Populus deltoides*) and sycamore (*Platanus occidentalis)* are often selected over other trees for perching and roosting. We recommend the project be designed to avoid the loss of trees matching these criteria.

No known bald eagle nests are known to occur in the project area. Wintering bald eagles would most likely roost during the winter on the Mississippi River and not inland in Ste. Genevieve. Therefore, we believe the project will not affect the bald eagle.

## Potential Project Impacts on Fish and Wildlife Resources

No-action alternatives were considered early in the planning process.

### North Gabouri Creek Alternatives

The original authorized alternative, the doubling of the width of the channel, would impact approximately 3,700 feet of the creek channel. The proposed trapezoidal channel lined with rip-rap would provide little habitat for aquatic species. Some straightening of the channel would be a result of widening the channel. Riparian vegetation would be removed on one or both sides of the stream. Widening the channel, removing bankside vegetation and debris would

increase hydraulic efficiency and velocity, but reduces bank resistance to erosion.

The Channel and Levee alternative would require cutting off a 250-foot section of Gabouri Creek near the LaHay Street Levee. Photo 4 shows a section of stream just downstream from the cut-off. Although little habitat would be lost in the cut-off section of stream, shortening the channel could cause additional channel problems both up and downstream of the cut-off. Channelization causes headcutting, which can affect an area much larger than the project area. Headcutting causes upstream progression of substrate destabilization and accelerated bank erosion (Hartfield 1993).

Straightening channels reduces stream length and increases gradient. Accelerated bank erosion increases channel width and causes downstream deposition to maintain hydraulic efficiency. Additionally, the removal of riparian vegetation causes increased and rapidly fluctuating water temperatures, and have no shading for fish life. Shortened channel lengths cause stream velocities higher than some aquatic life can withstand and provide no resting places.

Biological responses to channelization occur relative to changes in structural content, habitat diversity, hydrology, and water quality. Greater sinuosity provides more habitat for fish and wildlife per stream length (Simpson *et al.* 1982). Biota is affected by changes in water quality variables such as turbidity and temperature. Shifts in fish species composition, diversity, and biomass would occur as channelization alters the habitats required for movement, reproduction, feeding, and cover.

Bank instability can migrate upstream and into lower-gradient tributaries. Pool-riffle sequences, scattered in the affected channel are very sensitive to channel width and channelization. Other potential effects of both alternatives would include the release of sediment and pollutants, including the limestone, which would affect aquatic organisms downstream from project site. While fish are mobile and can escape the direct impacts of channelization, the relatively immobile benthic invertebrates are particularly vulnerable to channel degradation.

The non-structural alternative would not impact any fish and wildlife habitat.

South Gabouri Creek Alternatives

The authorized plan impacts on South Gabouri Creek would be similar to impacts in the authorized plan for North Gabouri Creek (described above).

The levee alternative would involve the removal of some floodplain vegetation but would not directly affect the existing aquatic habitat.

The non-structural alternative would not impact any fish and wildlife habitat.

**Summary and Recommendations**

The No Action Alternative would not impact the faunal communities in the project area. The non-structural alternative would reduce flood damages by modifying or relocating the damageable property, rather than by modifying the aquatic and terrestrial habitat. Levee construction on both South and North Gabouri Creeks would have only minor impacts on riparian and floodplain habitat. Therefore, these project impacts would not require any compensatory mitigation.

We recommend that the Corps consider the non-structural alternatives. Floodproofing the existing buildings would meet project goals and not further impact the fish and wildlife resources at the site.

Construction activities that would cause impacts to aquatic and riparian habitat are the cut-off to North Gabouri Creek and the widening of a total of 8,900 feet of the two streams. The riparian vegetation would be removed along the lengths of the stream. Compensatory mitigation would be required to offset the losses caused by these activities.

Mitigation success of habitat impacts depends on very careful planning, design, construction, and monitoring. A good objective of stream corridor riparian restoration might be to restore native plant communities along the stream corridor. A survey and analysis of the plant community composition and distribution should precede an effort of this type. A riparian corridor of at least 100-feet-wide should be established on each side of the stream.

Wooded corridors also filter sediment, trap flood debris, reduce bottom land erosion, improve water quality and enhance fish and wildlife habitat.

The loss of any aquatic habitat should involve in-kind replacement. Temporal replacement losses to forested habitat should be al least 2.5 to 1 and should be as close to the project site as possible.

The structural alternatives would involve both long and short term impacts. Short term impacts could be reduced by using best management practices during construction. The construction of a new channel or the widening of the existing channel would likely remove all instream habitat. Therefore, key restoration elements of the new channels should include the creation of pools and riffles and the addition of greater structural complexity across the stream bed. Typical instream structures include installation of log check dams, stone wing deflectors and bolder clusters along the stream channel.

Different methods can be used to stabilize the channel and prevent erosion. Bank stabilization measures include imbricated rip-rap, brush bundles, soil engineering method such as willow stakes and bio-logs, and rootwads.

Generally, direct seeding of trees result in less consistent survival than planting of seedlings. Therefore, we recommend that 2 or 3-year-old bare-root seedling be planted in an even distribution over the forested areas impacted by the project. This would require 450 seedlings per acre for adequate coverage. No single species should compromise more than 20 percent of the total plantings for the disturbed sites. Restricting species for possible planting to heavy masted species such as oaks, is appropriate, as light masted species, such as maples, ashes, can be expected to invade the sites naturally. Competing vegetation should be controlled (minimum of 3 years) until the woody plants are established.

Quantitative monitoring should occur annually for at least 5 years to determine if all success criteria have been attained. The development and inclusion in the mitigation plan of success criteria (performance standards) is essential for ensuring the successful achievement of the compensatory mitigation goal.

In summary, on North Gabouri Creek we support the non-structural alternative, the levee and channel change and last the original authorized plan in that order. On South Gabouri Creek the non-structural alternative, the levee and last the original authorized plan. The original authorized plan on both streams would require substantially more mitigation then the other alternatives. The channel change on North Gabouri Creek would also require mitigation. The remaining combination of alternatives would likely not require any mitigation. We would encourage that regardless of the alternatives, best management practices be used during construction and that a riparian corridor be planted along the entire length of the project construction.

Many of our recommendations may be proposed during the outdoor recreational phase of the project.

Planning, Programs, and Project Management Division
Planning and Project Development Branch

May 1, 2007

Ms. Judith Deel
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Dear Ms. Deel:

Per our conversation at the stakeholder meeting in Ste Genevieve on April 2nd, I am enclosing photographs (three disks and three sets of color copies) of structures and streetscapes in Ste Genevieve that have been altered to approximately reflect the visual changes that may occur if some structures are elevated as part of the flood damage reduction project. These images are based solely on very preliminary concepts and have not included any level of design effort or coordination with the homeowners or stakeholders. If structure elevation is included in the Ste Genevieve project, the City, homeowners, and SHPO will have input to the final appearances of these structures.

Additionally, upon further examination of the available data, it appears that structure elevation would be required of only 11 structures. The remaining structures would need modifications to prevent basement flood damages but would not need to have their first floors raised. Due to the very specific and very minor visual changes, most of these structures are not included in the enclosed pictures (unless they are incidentally included in one of the streetscapes). If these structures *are* shown in one of the streetscapes, they have not been modified. Of the 11 elevated structures, our records show only 6 have historical significance.

Each set of color copies includes a summary of all of the evaluated structures, indicating which ones we show having historical significance, which would have their first floors elevated (and how high) and which ones are included in streetscapes. Also included are the base maps which show the structure locations, utilizing the structure inventory numbers.

In providing these items to you, we wish to receive some information from your office indicating your concerns regarding the impacts of structure elevation on the National Register and National Landmark contributing resources.

We look forward to working with you as this effort progresses. Please feel free to contact Terry Norris (314-331-8464) or myself (314-331-8404) with any questions or comments that you may have. Thank you for your participation.

Sincerely,

Michelle Kniep
Project Manager

Planning, Programs, and Project Management Division
Planning and Project Development Branch

April 3, 2007

Ms. Judith Deel
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Dear Ms. Deel:

Per our conversation at last night's meeting in Ste Genevieve, I am enclosing three copies of the Ste Genevieve Tributaries and Recreation Preliminary Draft Report, dated February 2007. This is the Corps' initial documentation of the study process and findings and is provided for your general information at this time. A final draft report will be produced in the near future and provided to you for official coordination purposes.

As we discussed last night, we will also attempt to provide you with photographic illustrations of the approximate visual changes to the structures and the streetscapes if the non-structural alternatives were implemented. I am not sure of the timeframe for providing these examples to you but will work to do it as quickly as possible.

In providing these items to you, we wish to receive some information from your office indicating your concerns regarding the impacts of the non-structural alternatives on the National Register and National Landmark contributing resources.

We look forward to working with you as this effort progresses. Please feel free to contact Terry Norris (314-331-8464) or myself (314-331-8404) with any questions or comments that you may have. Thank you for your participation.

Sincerely,

Michelle Kniep
Project Manager

STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

July 6, 2007

Ms. Michelle Kniep
Corps of Engineers
1222 Spruce Street
St. Louis, Missouri 63103-2833

RE: Project number: 006-SG-07, Proposed Flood Protection, Ste. Genevieve, Ste. Genevieve County, Missouri (COE)

Dear Ms. Kniep:

Thank you for submitting information on the above referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which requires identification and evaluation of cultural resources.

Staff from the State Historic Preservation Office have reviewed the information provided for the proposed flood protection project in the Ste. Genevieve Historic District in Ste. Genevieve, Missouri, which is a National Historic Landmark and listed in the National Register of Historic Properties. The before and after photo simulations were very helpful and based on that information we have the following comments:

- Regarding the proposed elevation of the buildings, in accordance with the Advisory Council on Historic Preservation's regulation Protection of Historic Properties (36 CFR Part 800), Section 800.5, it is our opinion that the proposed project will have an **adverse effect** on the National Register of Historic Places listed buildings.
    - According to National Register Staff buildings that have been elevated are no longer eligible for the National Register due to the diminished historic integrity of the property's design, setting, and feeling.
    - Elevation of historic buildings is not consistent with the *Secretary of the Interior's Standards for Rehabilitation.*
    - Staff is also concerned with the ability of the buildings to withstand elevation.
- We recommend the preparation of a Memorandum of Agreement (MOA) that outlines the steps needed to mitigate the adverse effect.

- Stipulations in the MOA should be determined in consultation with the Federal agency, our office, the Advisory Council, if participating, and any other interested parties, including the City and the National Park Service.
  - We recommend that mitigation include the following:
    - Archival black and white before and after photographs of the individual buildings to be elevated and the streetscapes.
    - Floor plans of the buildings to be elevated.
    - Archaeological survey of each property to be elevated. We recommend the whole lot be surveyed due to the heavy machinery that will be involved in the process of elevating the buildings.
    - A structural engineer's report for each building to be elevated prior to elevation. The structural engineer should have proven experience in working with historic buildings.
    - SHPO should review and comment on the proposed foundation materials for each building.
    - The National Register nomination should be revised to reflect the modifications to the buildings and change the status from contributing to noncontributing.
    - Each property owner participating in the project should be required to issue a notarized letter stating that they are aware that if they participate in the project their building is no longer eligible for listing in the National Register of Historic Places and any benefits of National Register listing.
    - The Corps of Engineers should hold another public meeting to discuss the effects of their project on historic properties.
    - The contractor completing the elevation work should have proven experience in working with historic buildings.

- Regarding the proposed levee construction, in accordance with the Advisory Council on Historic Preservation's regulation Protection of Historic Properties (36 CFR Part 800), Section 800.5, it is our opinion that the proposed project will have an adverse effect on the National Register of Historic Places listed district. **However it is our preferred alternative because it is a reversible alteration and it will protect historic outbuildings, public infrastructure, archaeological sites, and the community better than individual building elevation.**
- We recommend the preparation of a Memorandum of Agreement (MOA) that outlines the steps needed to mitigate the adverse effect.

- Stipulations in the MOA should be determined in consultation with the Federal agency, our office, the Advisory Council, if participating, and any other interested parties, including the City and the National Park Service.
  - We recommend that mitigation include the following:
    - Before and after archival black and white photographs of the affected streetscapes.
    - An archaeological survey of the levee location.

In accordance with Section 800.6(a)(1), the Corps of Engineers shall forward the necessary adequate documentation to the Executive Director, Advisory Council on Historic Preservation, the Old Post Office Building, 1100 Pennsylvania Avenue NW, #809, Washington, D.C 20004. Pending receipt of the Council's decision on whether it will participate in consultation, no action shall be taken which would foreclose Council consideration of alternatives to avoid or satisfactorily mitigate any adverse effect on the property in question. **Please be sure to copy us on any correspondence to the ACHP.**

If you have any questions please write Missouri Department of Natural Resources, State Historic Preservation Office, Attn: Review and Compliance, P.O. Box 176, Jefferson City, Missouri 65102, or call Alison Dubbert at (573) 751-7862. Please be sure to include the **SHPO Project Number (006-SG-07)** on all future correspondence relating to this project. If the information is provided via telephone call, please follow up in writing for our files.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Mark A. Miles
Director and Deputy
State Historic Preservation Officer

MAM:ad

C: Sandra Koller, Ste. Genevieve
Terry Norris, COE
Rachel Franklin Weekley, NPS

REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

January 10, 2011

Curation and Archives Analysis Branch
Engineering and Construction Division

Mr. Mark A. Miles
Deputy State Historic Preservation Officer
P.O. Box 176
Jefferson City, Missouri 65102

Subject: Phase II Ste. Genevieve Flood Risk Management Project, North and South Gabouri Creek's Historic Properties Investigations **SHPO Project # (006-SG-07)**

Dear Mr. Miles,

The following represents a status update on this complex and challenging project. The U. S. Army Corps of Engineers (COE), St. Louis District (SDL) has completed its preliminary analysis of the array of potential flash-flood risk management options for National Register potentially eligible standing structures within the project area. Structural options considered included combinations of the following: (1) upstream dry reservoirs, (2) flood walls, (3) channel realignment/channelization, and (4) earthen levees/berms.

Adoption of any of these flood risk management designs have the potential to result in adverse effects to each of the eleven historic structures identified below and on the enclosed maps. Suggested steps to mitigate the potential adverse effects of these design options related to the historic structures include structure relocation, structure elevation, construction of individual ring levees, systemic levees/berms, flood proofing, and HABS recordation followed by structure removal.

Prior to any activity that could result in physical damage to any of the structures discussed below, updated HABS level documentation and archaeological investigation shall be completed. Additional archaeological investigations (minimally Phase I and Phase II testing) will almost certainly be required as project designs become more defined. The particular nature/level/location of these activities will be specified in an MOA signed by all required governmental agencies as project designs are better defined.

***Historic Structures***

Two historic structures within the project area are **contributing elements to the French Colonial National Landmark District.** The structures are:

1. Lalumondiere House, located at 801 S. Gabouri Street (COE structure #239) on the South Gabouri, and
2. Beaucamp House, located at 810 LaHaye Street (COE structure #452).

Two additional houses that will likely be impacted by the undertaking along the North Gabouri are the subject of consultations with both the City and the property owners. The first is the Etienne Joseph Govreau House, located at 415 LaHaye Street (COE structure #468) on the North Gabouri. Discussions regarding this property center on egress to the house, which will be permanently disrupted by project construction. The second is the Burke House, located at 398 North Third Street (COE structure #284). The setting and view shed of this structure will be altered by construction. Minimizing these impacts is the subject of current discussions.

Additional structures of **vernacular style, dating to the late nineteenth and early twentieth centuries**, both listed (or considered eligible for listing) and not listed on the National Register of Historic Places include the following.

South Gabouri

1. 627 Market Street (COE structure #212) is both listed and a contributor to the National Register Nomination for the Ste. Genevieve Historic District (SHPO communication dated 8/27/2010).
2. 191 S. Seventh Street (COE structure #236) is listed or eligible for listing.
3. 803 S. Gabouri Street (COE structure #240) is listed or eligible for listing.
4. 736 S. Gabouri Street (COE structure #255) is not listed.
5. 163 S. Seventh Street (COE structure #233) is not listed.
6. Chadwell (COE structure #257) is not listed.

North Gabouri

7. 413 LaHaye Street (COE structure #408) is not listed.

***Preliminary Recommendations***

The following recommendations for each of the above historic structures were formulated by COE staff following on-site meetings/conversations with various individuals, including homeowners, city administrators, and historic properties professionals at SHPO.

**Contributing elements to the French Colonial National Landmark District**

1. Lalumondiere House, located at 801 S. Gabouri Street (COE structure #239), should be stabilized to period of initial construction, according to acceptable historic preservation standards recommended by the NPS and the Missouri SHPO.
2. Beaucamp House, located at 810 LaHaye Street. No flood damage reduction measures are recommended for the National Landmark Beaucamp House (COE structure #452). This recommendation is based upon the unique location of the structure on the North Gabouri floodplain. Construction and placement of flood protection measures (flood proofing walls or a ring levee) within the narrow confines of the floodplain between this structure and the North Gabouri Creek channel would result in unacceptable physical impacts to the structure and /or to the visual integrity of the setting.
3. Etienne Joseph Govreau House, located at 415 LaHaye Street (COE structure #468) on the North Gabouri. Alternative access ways to the house will be proposed contingent on the disposition of the property next door (#408).

**Vernacular style, dating to the late nineteenth and early twentieth centuries**
Based upon the deteriorated condition of the following five structures and upon landowner discretion, it is recommended that these late nineteenth/early twentieth century structures be the subject of HABS recordation and be removed from the floodplain. It is further recommended that the project's design include an open space greenway along the banks of South Gabouri (replete with interpretive signage and pathways) between the Lalumondiere House and the Ste. Genevieve City Hall. This green space would be developed to approximate the late eighteenth century to early nineteenth century floodplain land use (based upon available GLO and cartographic information) surrounding the NHS Lalumondiere structure.

1. 627 Market Street (COE structure #212).
2. 163 S. Seventh Street (COE structure #233).
3. 191 S. Seventh Street (COE structure #236).
4. 736 S. Gabouri Street (COE structure #255).
5. Chadwell (COE structure #257).

Two further structures exhibiting late nineteenth and early twentieth century vernacular style are recommended for HABS documentation and further action (not yet determined).

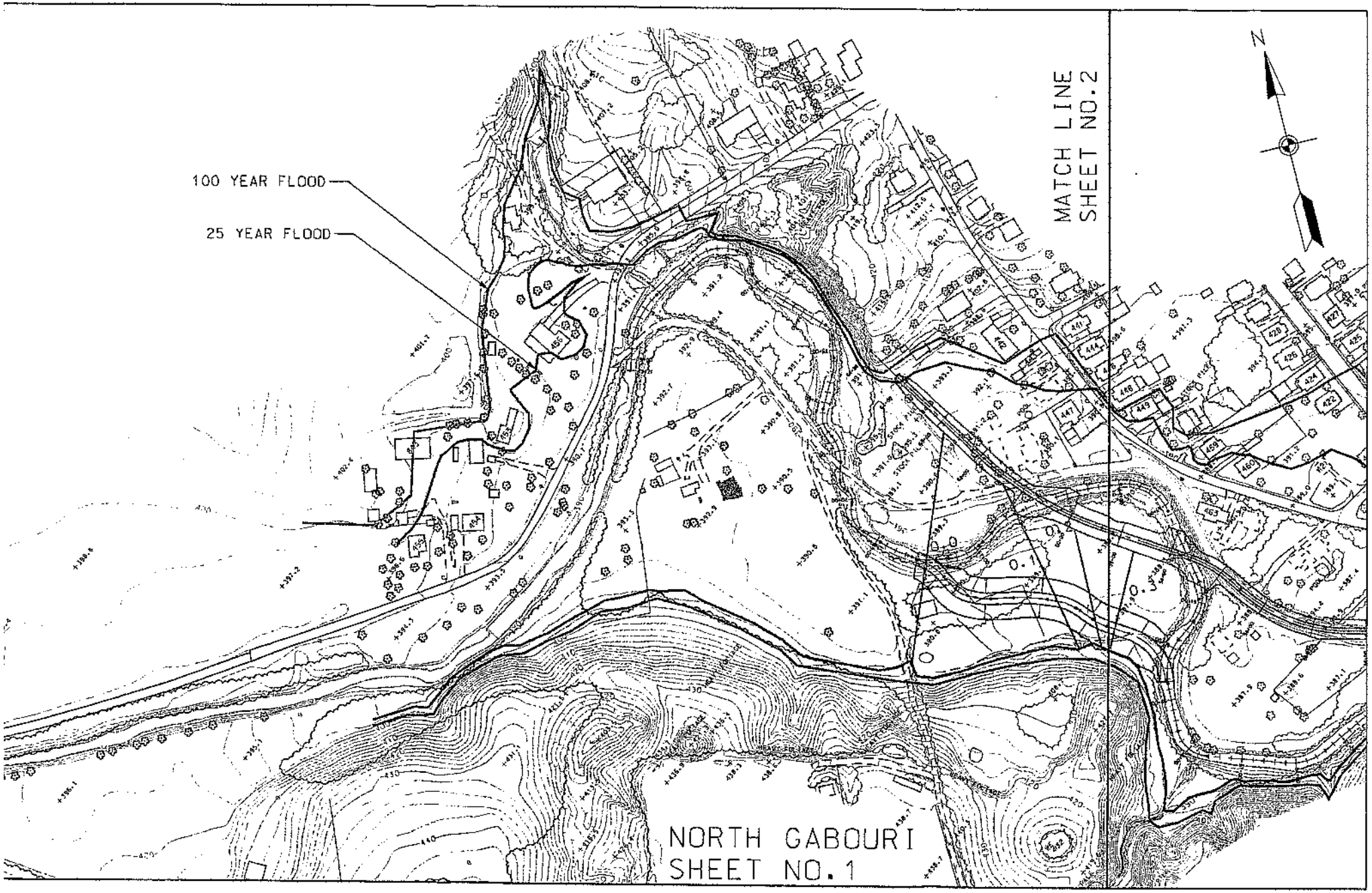
6. 803 S. Gabouri Street (COE structure #240). It is recommended that this late nineteenth century brick residential structure located immediately upstream of structure #239 be flood proofed according to standards acceptable to the COE. If, however, the property owner elects the "buy out" option, HABS documentation will be undertaken and the structure removed
7. 413 LaHaye Street (COE structure #408), North Gabouri Creek Victorian Red Brick Structure, with potential impacts. Recommendations for this property focus on buy-out.

Dr. Terry Norris, SLD archaeologist, has been part of the design team on this project from its inception. Please contact Dr. Norris at (314) 331-8464 with your questions regarding the recommendations discussions within this transmittal. Thank you in advance for your prompt review and comments on this important work.

Sincerely,

Michael K. Trimble, Ph.D.
Chief, Curation and Archives
Analysis Branch

Enclosure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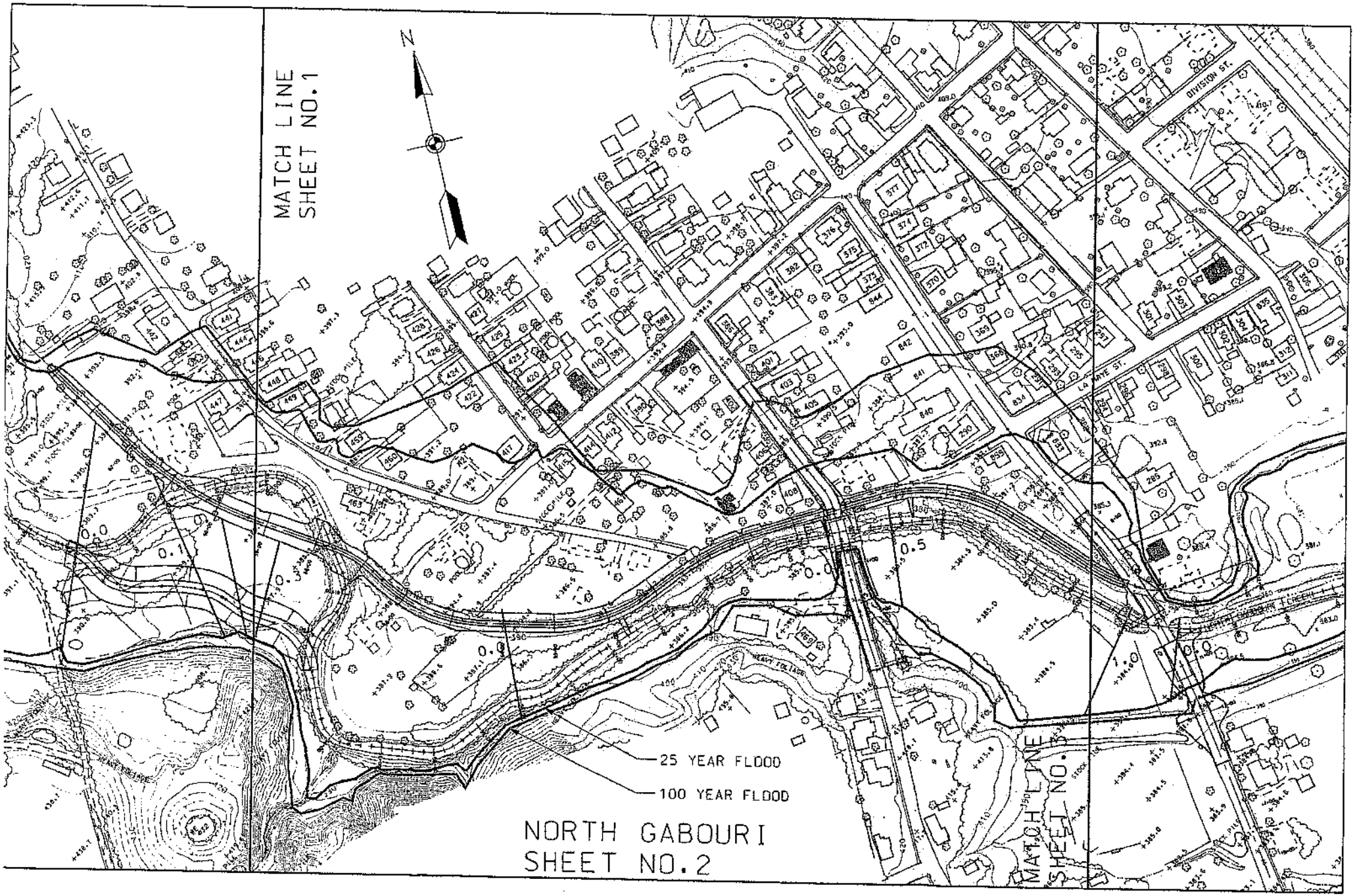
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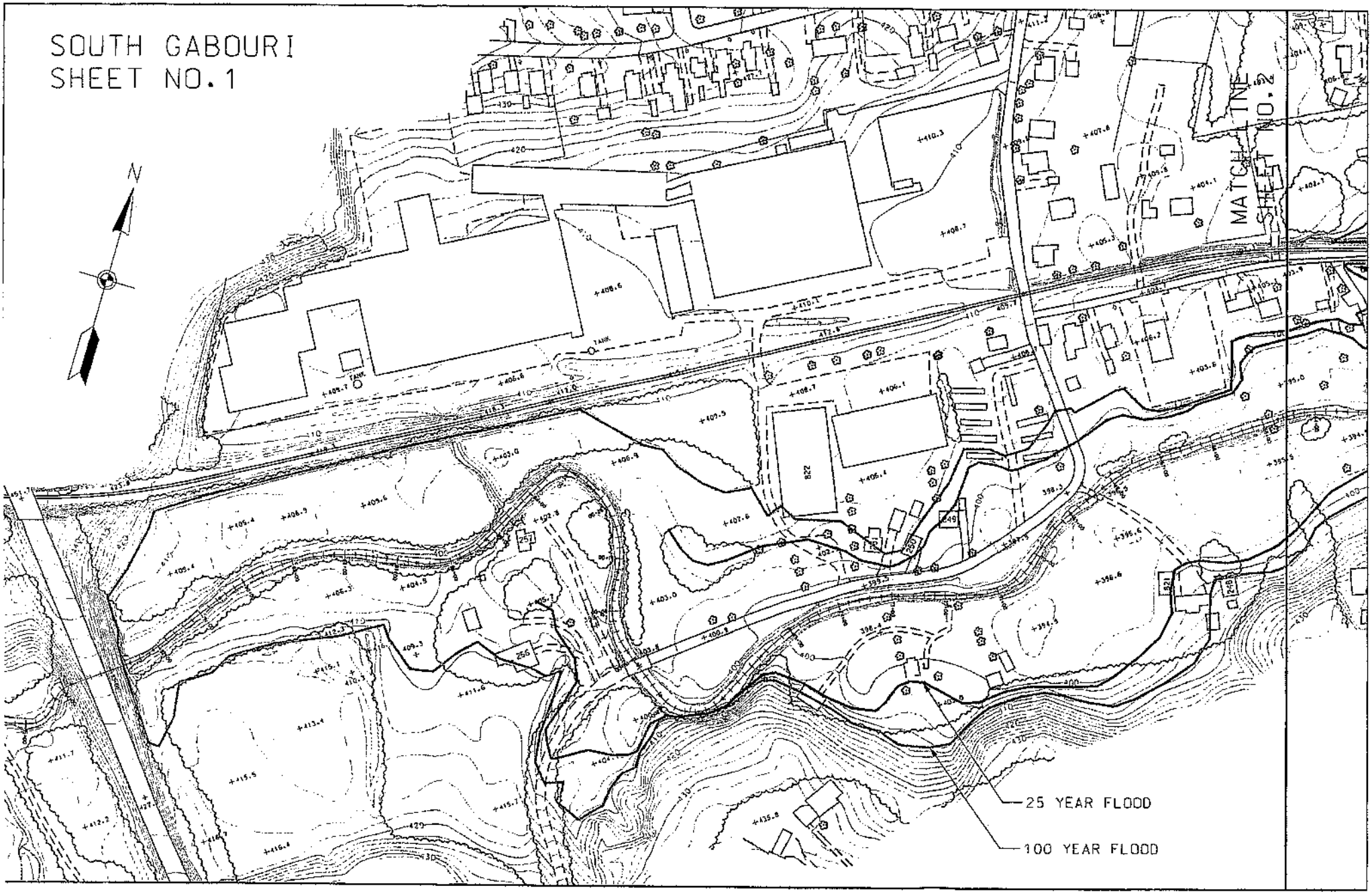
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MATCH LINE
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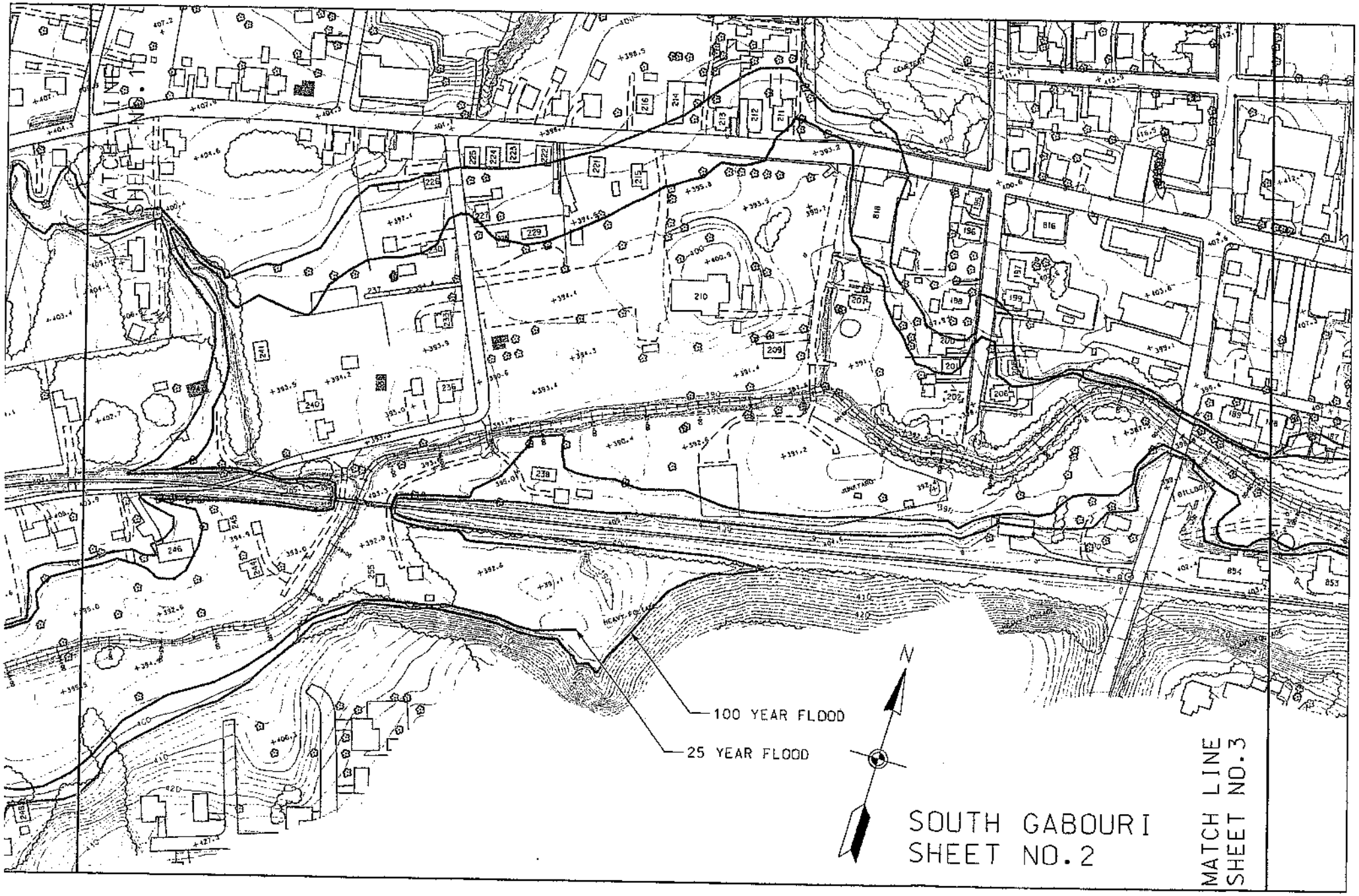
25 YEAR FLOOD
100 YEAR FLOOD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SOUTH GABOURI
SHEET NO. 2
MATCH LINE
SHEET NO. 3

rec'd 2/15/11

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

February 9, 2011

Mr. Michael Trimble
Chief, Curation and Archives Analysis Branch
Department of Army, St. Louis District COE
1222 Spruce Street
St. Louis, MO 63103-2833

Re: **SHPO Project Number: 006-SG-07** – Phase II Ste. Genevieve Flood Risk Management Project, Ste. Genevieve County, Missouri (COE)

Dear Mr. Trimble:

Thank you for submitting information about the above-referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which require identification and evaluation of cultural resources.

Based on the information provided, we have the following comments about the proposed flood control proposal:

1. Lalumondiere House (National Historic Landmark): We agree that this option is acceptable and preferred.
2. Beauchamp House (National Historic Landmark): This option is acceptable.
3. Etienne Joseph Govreau House (National Historic Landmark): We look forward to reviewing the preferred alternative once issues with 413 LaHaye are resolved.
4. Other National Register listed and/or eligible properties: It appears that the preferred alternative will have the greatest impact to a number of the historic properties. Please provide documentation explaining why the COE prefers buyout for the following properties:
    1. 627 Market Street (National Register of Historic Places listed)
    2. 163 S. 7th Street (National Register of Historic Places listed)
    3. 191 S. 7th Street (National Register of Historic Places eligible)
    4. 736 S. Gabouri Street (National Register of Historic Places eligible)
    5. Chadwell (National Register of Historic Places eligible)
    6. 413 LaHaye Street (National Register of Historic Places listed): Please be advised that the SHPO has a preservation covenant on this building. Special consultation will be required to negotiate any proposed demolition.
    7. 803 S. Gabouri (National Register of Historic Places eligible): The COE letter indicated that buyout not preferred but considered the second best option.

The most recent cost estimates our office has indicate that flood proofing will be a less costly alternative for most of these properties. Please provide justification for electing to buyout the properties instead of flood proofing. Additionally, we recommend providing an explanation as to why the structural options mentioned in the letter (upstream dry reservoirs, flood walls, channel realignment/channelization, and earthen levees/berms) are not considered feasible.

Please remember that the purpose of the flood control project is to protect the historic resources of Ste. Genevieve. We look forward to working with you to come up with a more sensitive option for the properties proposed for buyout.

If you have any questions please write Missouri Department of Natural Resources, State Historic Preservation Office, Attn: Review and Compliance, P.O. Box 176, Jefferson City, Missouri 65102, or call Rebecca Prater at (573) 751-7958. Please be sure to include the **SHPO Project Number (006-SG-07)** on all future correspondence relating to this project. If the information is provided via telephone call, please follow up in writing for our files.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Mark Miles
Director and Deputy
State Historic Preservation Officer

MAM:rp

C: Brenda Schloss, City of Ste. Genevieve
Terry Norris, COE

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO

October 1, 2015

Mr. Mark A. Miles
Deputy State Historic Preservation Officer
P.O. Box 176
Jefferson City, Missouri 65102

Subject: Update on the U.S. Army Corps of Engineers Recommended Alternative for the General Re-evaluation Report of the Ste. Genevieve Flood Protection Project, North and South Gabouri Creek's (SHPO Project # 006-SG-07)

Dear Mr. Miles,

The following information is an update to SHPO Project #006-SG-07. The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, St. Louis District (CEMVS) is preparing a General Reevaluation Report (GRR) for parts 2, 3, and 4 of the recommended plan outlined in the 1984 feasibility report titled, *Sainte Genevieve, Missouri, Flood Control Study for Historic Sainte Genevieve*. The city of Ste. Genevieve will be the non-Federal Sponsor for the construction, operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) of the project. The report includes sponsor, agency and public input. It will present solutions to provide flood risk management measures to structures along North and South Gabouri Creeks (parts 2 and 3) and provide recommendations for recreational improvements to the area (part 4).

Both structural and non-structural measures were developed to address flooding and subsequent damages due to flooding events. Measures were combined into 15 alternative plans, and after screening, a focused array of six plans were evaluated, resulting in tentative selection of two flood risk management plans, one for each creek. The previously identified selected alternative for the North Gabouri Creek consisted of levee construction and bank armoring. The previously identified selected alternative for the South Gabouri Creek consisted of non-structural measures. However, the Sainte Genevieve flood control project, authorized by the Water Resource Development Act (WRDA) of 1986, was justified by Congress based on the fact that historic preservation benefits resulting from the project exceeded the cost of the project. A recent review of the levee alternative has determined that the alternative could be counterproductive, due to the negative effects it would have on Historic Properties. Therefore, the non-structural floodproofing alternatives are being recommended for all affected structures, on both the North and South Gabouri Creeks, as the Tentatively Selected Plan.

Based on recent hydraulic modeling and first floor elevation surveys, the project has identified 15 structures that could suffer damage during a 1% flood event, 10 of which are historically significant. Eight of the identified Historic Properties are being recommended for wet floodproofing.

**North Gabouri**

1. 230 LaHaye Street (COE structure # 300), a Queen Anne/Victorian house which is a contributing structure to the National Historic District.
2. 413 LaHaye Street (COE structure #408), a Victorian brick house listed on the National Register of Historic Places and has a preservation covenant.

**South Gabouri**

1. 872 South Gabouri Street (COE structure #244), eligible for listing on the National Register.
2. 736 South Gabouri Street (COE structure #255), eligible for listing on the National Register.
3. 803 South Gabouri Street (COE structure #240), eligible for listing on the National Register.
4. 163 South Seventh Street (COE structure #233), listed on the National Register.
5. 191 South Seventh Street (COE structure #236), eligible for listing on the National Register.
6. 68 South Gabouri Street, the Moses Austin Outbuilding (COE structure #76), a French vertical log structure that is a contributing structure to the National Historic District.

Wet floodproofing for these structures would primarily consist of filling basements and crawlspaces with coarse sand or pea gravel to an elevation 30" below the floor joist of the structure. Filling these areas prevents them from being used or "finished off" and subsequently flood damage still accrue. Any utilities would be relocated to areas above the design flood elevation or waterproofed. Items such as electrical connection boxes can be waterproofed. Vents that meet the FEMA requirements for ingress and egress of water are also required. The property owner may be compensated for the loss of basement space, if appropriate. If the compensation is other than monetary (i.e., involves modifying the structure), additional coordination with your office is anticipated.

Dry floodproofing was not selected for any structures due to the depth of flooding, condition of each structure, technical challenges, and required human intervention.

The remaining two structures, the National Landmark Beaucamp House, 810 La Haye Street (COE structure # 452), and the National Register eligible structure Chadwell (COE structure #257) are considered poor candidates for wet floodproofing because of their unique locations along the Gabouri creeks. No flood damage reduction measures are recommended for the Beaucamp House. Elevation of the structure is recommended for Chadwell due to it receiving first floor flooding, which cannot be addressed by wet floodproofing. Additionally, dry floodproofing would involve modifications to the structure's exterior and repair/replacement of the deteriorated foundation.

We appreciate your continued assistance and patience with our efforts to preserve and protect the historic assets of Ste. Genevieve and request that you concur with our recommended plan of non-structural floodproofing. Please feel free to contact Lara Anderson at (314) 331-8779 with your questions regarding the recommendations discussed within this transmittal. Thank you in advance for your prompt review and comments on this important work.

Sincerely,

Michael K. Trimble, Ph.D.
Chief, Curation and Archives
Analysis Branch

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

November 13, 2015

Michael K. Trimble, Ph.D.
Chief, Curation & Archives Analysis Branch
Corps of Engineers, St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

Re: Ste. Genevieve Flood Protection Project, North & South Gabouri Creeks (COE) Ste. Genevieve County, Missouri

Dear Dr. Trimble:

Thank you for submitting information on the above referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which requires identification and evaluation of cultural resources.

We have reviewed the additional information provided concerning the above referenced project. The non-structural flood proofing alternatives will have a significantly reduced effect on properties that have been determined to be eligible for inclusion in the National Register of Historic Places, or that are individually listed or are contributing to the Ste. Genevieve National Register Historic District. However, the proposed wet proofing may lead to effects due to the relocation of utilities or additions to compensate for loss of space. We look forward to the opportunity to consult with you on alternatives and effects of the wet proofing and the proposed elevation of the Chadwell property.

Please be advised that, should project plans change, information documenting the revisions should be submitted to this office for further review. In the event that cultural materials are encountered during project activities, all construction should be halted, and this office notified as soon as possible in order to determine the appropriate course of action.

If you have any questions, please write Judith Deel at State Historic Preservation Office, P.O. Box 176, Jefferson City, Missouri 65102 or call 573/751-7862. Please be sure to include the SHPO Log Number (**006-SG-07**) on all future correspondence or inquiries relating to this project.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Toni M. Prawl

Toni M. Prawl, Ph.D.
Director and Deputy State
Historic Preservation Officer

TMP:jd