

**404(B)(1) ANALYSIS**

**Section 404 (b)(1) Analysis  
Leon Creek, San Antonio Texas**

**I. Project Description**

**a. Location**

The proposed flood damage reduction project is located on Leon Creek, a tributary to the San Antonio River, within the city of San Antonio, Bexar County, Texas.

**b. General Description**

A complete description of the proposed project including maps and figures that augment the description are included in the main text of the report to which this analysis is appended. A summary of project features is provided below.

Specific construction activities associated with the NED plan alternative include the construction of a levee along Leon Creek to protect against damages attributed to a 1% annual exceedance probability (AEP) and the modification of 2,738 linear feet of the Leon Creek channel to accommodate the hydraulic impacts of the construction of the levee. Channel modifications to Leon Creek would be designed utilizing natural channel design principles to mitigate for aquatic impacts and the channel capacity would be increased to accommodate the planting of native aquatic and riparian vegetation along the Leon Creek 'self-mitigation' of impacts to area natural resources.

**c. Authority and Purpose**

The Leon Creek Feasibility Study is authorized by the Guadalupe and San Antonio Rivers and Tributaries, Texas, Resolution adopted by the Committee on Transportation and Infrastructure, U.S. House of Representatives, House Resolution Docket 2547, 11 March 1998. The objective of the study is to examine flood damage reduction alternatives along Leon Creek in San Antonio, Texas, and recommend a flood damage reduction project for implementation if one could be found that is technically and economically feasible, environmentally acceptable, and supported by the San Antonio River Authority (SARA).

**d. General Description of Dredged or Fill Material**

**(1) General Characteristics of Material**

The material would be derived primarily from the channel banks along Leon Creek. The fill material is comprised primarily of clayey gravel, loose gravelly sand, and hard clay.

**(2) Quantity of Material**

Approximately 96,600 cubic yards of soil derived from cutting the channel would be reutilized as backfill on side slopes of the channel and construction of the adjacent levee structure, if the material suitable. Approximately 27,100 cubic yards of excavated material would be removed from the project area and placed in a licensed disposal site. Two scales of natural channel design features are proposed for the channel. Eight small in-stream structures each comprised of 56 cubic yards of riprap and 30 cubic yards of

boulders would be interspersed throughout the channel. At the downstream extent, a larger in-stream structure comprised of approximately 195 cubic yards of riprap and 174 cubic yards of boulders would be constructed. Altogether, the in-stream structures would result in 1,057 cubic yards of material placed within the channel.

**(3) Source of Material**

The riprap and boulders would be brought in from local commercial sources.

**e. Description of the Proposed Discharge Site(s)**

**(1) Location**

Discharge into waters of the United States would occur along the banks and bottom of Leon Creek. Bottom channel widths for Leon Creek vary from 15 to 50 feet. Surplus material would be removed from the project area and deposited into a disposal site that would not impact waters of the United States.

**(2) Size**

The surface area of the channel at top of the bank would be approximately 20 acres in size.

**(3) Type of Site**

The disposal site would be confined (not placed in open water). Disposal will be conducted in the dry, compacted and followed by stabilization with vegetation.

**(4) Type(s) of Habitat**

The EPA Rapid Bioassessment Method was used to characterize the aquatic habitat of Leon Creek. The existing habitat condition scores indicate that Lower Leon Creek is of moderately high quality receiving a habitat score of 148 out of a possible 200, with 200 representing a pristine habitat. A low water crossing backs the creek up to form a pool habitat at the lower extent of the project reach. In addition to the aquatic habitat, excavation to form the channel would also impact approximately 20 acres of low to moderate quality upland forest that transitions to a grassland savannah towards the lower end of the reach.

**(5) Timing and Duration of Discharge**

Discharges would occur over the entire construction period which is estimated to be 6 to 9 months. It is anticipated that once the project begins, there would be continual construction until completion.

**f. Description of Disposal Method**

Equipment used to excavate and to backfill the channel would be done by front end loaders, possibly with rippers, other heavy excavation equipment including bulldozers and dump trucks.

**II. Factual Determinations**

## **a. Physical Substrate Determinations**

### **(1) Substrate Elevation and Slope**

The existing profile slope of Leon Creek is variable, but averages 0.07%. The proposed would result in a relatively constant average slope of 0.01%.

### **(2) Sediment Type**

The sediment in the Lower Leon Creek reach is silty clay. Because of the natural channel design proposed for the channel modifications incorporates sediment transport balance as a key design factor, excessive sedimentation and erosion is not expected.

### **(3) Dredged/Fill Material Movement**

After the material is placed in the channel bottom and side slopes, it would be compacted and stabilized by native vegetative plantings. Only minor movement of fill material would occur after stabilization.

### **(4) Physical Effects on Benthos**

The existing benthos would be temporarily impacted within the proposed 2,703 linear feet of channelization; however, the natural channel design of the proposed channel improvements would restore the aquatic function and benthic habitats to the system. The proposed in-stream structures would create pool, riffle, run, and glide habitats that would sustain a diverse and abundant benthic community. During construction, erosion and sedimentation Best Management Practices (BMPs) would be utilized to minimize impacts to benthos downstream of the proposed project area.

### **(5) Other Effects**

No other effects are anticipated.

### **(6) Actions Taken to Minimize Impacts**

Alternatives were investigated during the study as displayed in the main report, including the creation of a bypass channel and several channel configurations. The channel configuration incorporating the in-stream structures associated with the natural channel concept was selected as it would mitigate the ecological impacts in contrast with channelizing and armoring the stream with hardened structures. In addition, additional excavation was incorporated into the channel to accommodate the planting of native, woody, riparian vegetation within the proposed flood channel. The riparian vegetation would provide vital organic input into the stream channel and provide valuable shading that maintain water temperatures and dissolved oxygen levels at ecologically beneficial levels. BMPs would also be implemented to minimize erosion and sedimentation during construction and establishment of the riparian vegetation.

## **b. Water Circulation, Fluctuation and Salinity Determinations**

### **(1) Water, Consider effects on:**

**(a) Salinity**

The project would not impact salinity in Leon Creek.

**(b) Water Chemistry (pH.etc.)**

No current water quality data is available for this stream in the project area, however, no long term impacts to water chemistry are anticipated from project implementation as the stream structure and function will be similar after project completion.

**(c) Clarity**

Temporary disruption to water clarity is expected during construction. After the channel is completed and stabilized, water clarity would be similar to that found in the stream now.

**(d) Color**

No changes in color are anticipated following construction.

**(e) Odor**

No changes in odor should occur following construction

**(f) Taste**

The stream is not used as a potable water source within any portion of the area that would be impacted by the project.

**(g) Dissolved Gas Levels**

Minor changes may result in the concentration of dissolved gasses of Leon Creek due to the potential aeration resulting from the in-stream structures. The upper section of the proposed channel improvements consists of riparian woodlands while the lower section is bordered by grassland/savannah habitats. Although the proposed woody vegetation proposed along the riparian corridor would provide shading to regulate water temperatures and dissolved oxygen concentrations in the lower section of the proposed project area, these benefits may be neutralized by the opening of wooded habitats in the upper section. However, any changes in dissolved gas levels are expected to be minimal.

**(h) Nutrients**

The project as proposed would not increase nutrient loading to the stream.

**(i) Eutrophication**

Eutrophication is not evident in the project reach and there would be no factors changed that would impact eutrophication of the aquatic system of Leon Creek.

**(2) Current Patterns and Circulation**

**Flow and Water Circulation**

**(a) Current Patterns and Flow**

Much of Leon Creek flows through urban and suburban environments and is heavily influenced by stormwater runoff magnified by the relatively high impervious cover in the watershed. Patterns of flow are dependent on the distribution and intensity of rainfall over this area. The normal patterns of precipitation result in minor fluctuations of flow intensity through the system. Heavy thunderstorms can induce large flows and higher water surface elevations. Circulation basically does not change as the system has no braids or large in-stream detention. The project as proposed would not alter flows or circulation patterns, but would decrease the water surface elevations, causing less out of bank flows that cause damages to existing structures in the urban area.

**(b) Velocity**

There would be a minor increase in velocity for most flow events due to channelization of the stream and the widening of bridge crossings. Overall, any areas where velocities that would might induce scour would be controlled by the placement of the in-stream structures designed to dissipate energy while creating pool and riffle habitats. Where required, the channel and banks would be protected with suitable erosion control techniques.

**(c) Stratification**

Stratification in the project reach does not occur now in the stream nor would it occur following project implementation.

**(d) Hydrologic Regime**

Two-year flood flows with the proposed project completed would be approximately 12,200 cubic feet per second and 116,900 cubic feet per second for the 100 year event. Although existing flows were not measured, more frequent events were not computed but vary from essentially no flows during and following dry summer conditions to a few cubic feet per second for several days following local rainfall.

**(3) Normal Water Level Fluctuations**

Existing water level fluctuations have not been measured. Upon completion of the proposed channel, water surface elevation would fluctuate 5 to 6 feet between the 2 year and 100 year flood events.

**(4) Salinity Gradients**

No changes to salinity gradient would occur

**(5) Actions That Will Be Taken to Minimize Impacts**

The natural channel design of the proposed action avoids and minimizes impacts to the flow and circulation of waters in the project reach. Although the in-stream structures result in the pooling of the stream, they mirror the pool and riffle sequences found in natural streams. Impacts were further reduced minimizing the aerial extent of the channel modifications and minimizing the channel width as much as feasible.

**e. Suspended Particulate/Turbidity Determinations**

### **(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site**

Only temporary increases in suspended particulates and turbidity levels would occur during construction. Most fill would occur in the dry. There would be some movement of these materials downstream of the construction zone should high flow events occur prior to stabilization.

### **(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column**

#### **(a) Light Penetration**

Changes to light penetration would occur during construction associated with minor turbidity increases. Appropriate erosion and sedimentation controls would be implemented to mitigate impacts to downstream waters. After project completion and stabilization, the clarity of the stream would return to preconstruction levels.

#### **(b) Dissolved Oxygen**

Temporary lowering of dissolved oxygen could occur during construction. Dissolved oxygen may increase as a result of aeration over the in-stream structures placed within the channel as part of the natural channel design. Woody riparian vegetation planted along the stream channel would shade the stream further benefitting the dissolved oxygen levels of the stream. Effects of the project to dissolved oxygen would not extend significantly downstream of the construction zone.

#### **(c) Toxic Metals and Organics**

No water testing was conducted in the immediate proposed project area and no data was identified to provide information on water quality measures. The proposed project would not result in the introduction of toxicants into Leon Creek. The watershed is primarily urban with most of the run-off coming from industrial, commercial, and residential areas. Several ground water wells are located in the watershed above the project area to remove and treat contaminated ground water before entering Leon Creek. Although the ground water wells and treatment facilities would not be impacted by the proposed project, there is a remote possibility that the soils in and around the creek could contain residual contamination from prior exposure. Therefore, soil excavated from the channel would be tested for contaminants before being used in the levee or bank reconstruction. If site soils exceed toxicity standards, the project sponsor would be responsible for site reclamation prior to construction of the project.

#### **(d) Pathogens**

No pathogens would be added to the water column as a result of this project.

#### **(e) Aesthetics**

The proposed natural channel design of the Leon Creek channel would create pool, riffle, run, and glide habitats providing a naturalized aesthetic to the modified Leon Creek channel. In addition, the restoration of native riparian vegetation after channel construction would also restore the natural aesthetics of the area.

**(f) Others as Appropriate**

No other effects to water column are anticipated

**(3) Effects on Biota**

Displacement of local biota would occur during construction as mobile species would emigrate to adjacent habitats. Although sessile species would be impacted during construction activities, the natural channel design and restoration of the woody vegetation would restore the aquatic and riparian habitats of Leon Creek.

**(a) Primary Production, Photosynthesis**

Aquatic and riparian vegetation would be removed from the project site during the modification of the Leon Creek channel. Once the channel is constructed, primary producers would be restored to the aquatic and riparian ecosystem. No net loss of primary production is anticipated as the result of the proposed action.

**(b) Suspension/Filter Feeders**

Suspension and filter feeders would be temporarily displaced during construction activities. BMPs would be established to control erosion and sedimentation downstream that may otherwise impact filter feeders. Once the proposed channel is constructed, suspension and filter feeders would repopulate the riffle and pool habitats created through the natural channel design. No net loss of suspension or filter feeders is anticipated as the result of the proposed action.

**(c) Sight Feeders**

Sight feeders would be temporarily displaced during construction activities. BMPs would be established to control erosion and sedimentation downstream that may otherwise impact sight feeders. Once the proposed channel is constructed, sight feeders would repopulate the riffle and pool habitats created through the natural channel design. No net loss of sight feeders is anticipated as the result of the proposed action.

**(4) Actions taken to Minimize Impacts**

The length of the channelized reach of Leon Creek was minimized to reduce impacts to aquatic biota. BMPs will be established to control erosion and sedimentation to minimize impacts to biota downstream. By utilizing a natural channel design for the modified channel and restoring native riparian vegetation, long term impacts to the aquatic biota would be minimized and inconsequential.

**d. Contaminant Determinations**

The proposed project would not result in the exposure of toxicants to the biota of Leon Creek. As previously stated, if site soils exceed toxicity standards due to potential contamination of adjacent properties, the project sponsor would be responsible for site reclamation and providing an uncontaminated site prior to construction of the project.

**e. Aquatic Ecosystem and Organism Determinations**



**(1) Effects on Plankton and Nekton**

Temporary impacts to plankton and nekton would occur during construction of the modified channel. However, the in-stream structures included in the natural channel design would result in a series of riffle/pool complexes throughout the project reach. The habitat diversity provided by the created pools and riffles would provide habitat to a diverse community of plankton and nekton once the channel and vegetation is restored. Therefore, no net loss of plankton and nekton is anticipated.

**(2) Effects on Benthos.** No additional effects other than those previously discussed were identified.

**(3) Effects on Aquatic Food Web**

Temporary disruptions to the food web would occur during construction. However, the in-stream structures of the proposed natural channel design would result in a series of riffle/pool complexes throughout the project reach. This habitat diversity would provide habitat to a diverse community of organisms at all trophic levels. Therefore, no net loss of species or negative impacts to trophic levels are anticipated as the result of the proposed action.

**(4) Effects on Special Aquatic Sites.**

**(a) Sanctuaries and Refuges**

No fish and wildlife sanctuaries or refuges occur within the project area.

**(b) Wetlands**

No wetlands were identified within the area to be impacted by the project.

**(c) Mud Flats**

No mud flats were observed within the study area to be impacted by the project

**(d) Vegetated Shallows**

No vegetated shallows were observed in the area to be impacted by the project.

**(e) Coral Reefs**

No coral reefs occur within the project area.

**(f) Riffle and Pool Complexes.**

The in-stream structures of the proposed natural channel design would result in a series of riffle/pool complexes throughout the project reach. Therefore, riffle and pool complexes may increase as a result of the proposed action.

**(5) Threatened and Endangered Species**

The project would not affect any federally listed threatened or endangered species.

**(6) Other Wildlife**

Wildlife inhabiting the aquatic and riparian habitats within the project reach would be temporarily displaced during construction of the proposed channel. Mobile species would emigrate to adjacent habitats placing. Although sessile species would be impacted during construction activities, the natural channel design and restoration of the woody vegetation would restore the aquatic and riparian habitats of Leon Creek.

## **(7) Actions to Minimize Impacts**

### **f. Proposed Disposal Site Determinations.**

#### **(1) Mixing Zone Determination**

Most fill would occur within areas of the channel while in a dry state and only minimal mixing would occur, primarily due to churning of shallow waters by equipment traversing the channel bottom. Best Management Practices will be implemented such as silt curtains to lower impacts. Disposal of surplus material would occur at an offsite location that is not within waters of the United States.

#### **(2) Determination of Compliance with Applicable Water Quality Standards**

The 2012 Section 303(d) list published by the Texas Commission on Environmental Quality classifies Segment 1906\_04 (Lower Leon Creek from Highway 353 to two miles upstream) as impaired for aquatic life uses based on depressed dissolved oxygen and for fish consumption use based on PCBs in edible tissue. As discussed in previous sections, the non-federal project sponsor would be responsible for providing an uncontaminated project site before the proposed action would commence; therefore, the proposed project would not contribute to the fish consumption use limitations within the lower sections of Leon Creek. In addition, the natural channel design and native vegetation restoration associated with the modified channel may actually provide some aeration of water as it flows over the riffle structures. Although this aeration would not substantially address the aquatic life limitations of Lower Leon Creek, the proposed action would not contribute to a decline in dissolved oxygen concentrations.

#### **(3) Potential Effects on Human Use Characteristic**

##### **(a) Municipal and Private Water Supply**

Municipal and private water supplies in the action area rely on groundwater associated with the Edwards Aquifer. The project area is not located in the recharge or contributing zone of the Edwards Aquifer and Leon Creek is not utilized as a local water supply; therefore, the proposed action would not impact the local water supply.

##### **(b) Recreational and Commercial Fisheries**

No signs of recreational fisheries activities were identified. No significant impact to recreational fisheries is anticipated. No commercial fisheries were identified within the project area

##### **(c) Water Related Recreation**

No additional effects to water related recreation are anticipated

**(d) Aesthetics**

The proposed natural channel design of the Leon Creek channel would create pool, riffle, run, and glide habitats providing a naturalized aesthetic to the modified Leon Creek channel. In addition, the restoration of native riparian vegetation after channel construction would also restore the natural aesthetics of the area.

**(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves**

No parks, monuments, seashores, wilderness areas, research sites, or preserves occur in the project area.

**g. Determination of Cumulative Effects on the Aquatic Ecosystem**

Because the proposed action would utilize natural channel design principles and would entail the restoration of native riparian habitat, the direct impacts were mitigated. The temporary effects of construction activities that may the result at the project site and areas downstream would be relatively minor. However, with proper BMPs in place, these minor impacts would not substantially contribute to cumulative impacts on water quality for are waterbodies.

**h. Determination of Secondary Effects on the Aquatic Ecosystem**

No secondary effects on the aquatic ecosystem were identified

FINDING OF COMPLIANCE  
FOR  
LEON CREEK, SAN ANTONIO, TEXAS

1. No significant adaptations of the guidelines were made relative to this evaluation.
2. Several channel configurations were initially considered including an extension of the proposed channel length upstream of Military Drive and a bypass channel that would convey floodwaters across the bend of Leon Creek. In addition, two different channel designs were considered: an engineered trapezoidal channel and a natural channel design channel. In order to avoid and minimize impacts to aquatic and riparian habitats, a shorter section of channelization was proposed with the channel capacity designed to accommodate the replacement of native aquatic and riparian vegetation. This alternative would enable the proposed project to “self-mitigate” impacts to aquatic habitats onsite.

3. The planned disposal of dredged material within the construction area would not violate established State water quality standards for Leon Creek. The disposal operation will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.
4. Use of the selected disposal sites will not harm any endangered species or their critical habitat.
5. The proposed disposal of dredged material will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values will not occur. Impacts to riparian forest impacts were identified and will be mitigated onsite by replacing native riparian vegetation at a density of 70 trees per acre.
6. Appropriate steps to minimize potential adverse impacts of the discharge on aquatic systems include use of suitable erosion control technologies including the implementation of procedures to protect against erosion and sedimentation during and after construction.
7. On the basis of the guidelines the proposed disposal site for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.