Memorial Park Demonstration Project, Harris County Flood Control Project ID W100-00-00-X043, SWG-2012-01007

Clarifications/Updates to United States Army Corps Of Engineers Comment Letter Dated February 4, 2015

Topic	Referenced Response Number	Clarification/Update
Provide Plan Sheet for Access Route	None	Plan Sheet for Access Route: City of Houston access preference, adjacent to previous access, no wetland impacts **See Attachment 1**
Provide Updated Plan Sheets	None	Minor revisions to the following sheets from the May 1, 2014, Individual Permit (IP) Public Notice: Sheet 29 of 41 and Sheet 39 of 41 **See Attachment 2**
Provide Revegetation Plan Updates	None	The Harris County Flood Control District (HCFCD) has engaged a Vegetation Advisory Workgroup comprised of area experts with knowledge of local vegetation communities, ecology, revegetation methods, monitoring practices, and long-term vegetation maintenance within riparian areas. This Workgroup will assist in the selection of vegetation that considers hydrologic zones, promotes long-term soil stability and is conducive to developing full canopy coverage. In addition, HCFCD is conducting research for alternatives to Bermuda grass for initial site stabilization. **See Attachment 3** Update of Sheet 41 of 41 from the May 1, 2014, IP Public Notice
Provide clarification on statement saying it is expected that less than 80% of the trees and vegetation in the project area will be removed	Item 32	The maximum percentage of area associated with possible impacts to existing vegetation within the project reach along Buffalo Bayou is 51.37% NOTE –this calculation does not include: • measurements of vegetation on vertically eroded banks (or cliffs) due to the difficulty in accurately measuring these areas. These additional measurements would lower the percentage of possible impacts. • invasive vegetation that will need to be removed, and due to HCFCD's commitment to minimize and avoid desirable native vegetation, the actual percentage of impacts to existing vegetation will be lower than 51.37% and cannot be quantified until construction begins. At that time, the project site will be reviewed in phases with a certified arborist, urban forester, City of Houston officials, park officials, and the contractor to identify and minimize impacts, making minor adjustments to slope grading where possible, and utilizing soft access methods (mulch beds) to cross pre-identified critical root zones. The total project reach proposed for active restoration along Buffalo Bayou consists of 21.90 acres of land. The total area within the project reach proposed for active restoration along Buffalo Bayou, where no vegetation exists (beneath the waterline and on the slopes where no vegetation is present) consists of 10.65 acres of land. By subtracting the 10.65 acres from the 21.90 acres, there are 11.25 acres of land remaining where there could be impacts to existing vegetation within the project reach along Buffalo Bayou. [11.25 acres of impacts to existing vegetation divided by 21.90 acres of project reach = 51.37%]

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	Item 32 (cont'd)	The planting plan for the project includes planting 14.53 acres of land (which includes the 11.25 acres of possible impacts to existing vegetation plus an additional 3.28 acres of new land that will be created by re-establishing slopes and areas of geomorphic floodplain where none currently exist). The overall planting plan is critical for supporting the long-term stabilization objective of the project.
Request for Monitoring Plan	Item 27	A Monitoring Plan was developed based on the comments received to demonstrate post project uplift, including geomorphic stability, macrobenthic and fish levels, tree, shrub and emergent wetland planting survival and levels of noxious and invasive species. **See Attachment 4**
Provide Updated Plan Sheet for the Hogg Bird Tributary Planting Plan	None	Updated Plan Sheet for Hogg Bird Tributary repair to address sheet flow from COH outfall. Revisions reflect grading changes, but use the same footprint with no additional impacts to Waters of the U.S. **See Attachment 5** Update of Sheet 40 of 41 from the May 1, 2014 Individual Permit Public Notice
Provide Updated Plan Sheet for Oxbow Grading Plan	None	Updated Plan Sheet for Oxbow grading details for wetland creation and plantings, same footprint, no additional impacts to Waters of the U.S. **See Attachment 6** Update of Sheet 22 of 41 from the May 1, 2014 IP Public Notice
Provide more detail to the Project Alternatives included in the Individual Permit Application	Item 1,36,45, 75-78,80, 116,149,215, 217,218,221, 222,226,227, 244,248,252, 271,288,305, 320,355,356	Updated Project Alternatives **See Attachment 7**
Provide more information about the Natural Channel Design technique examples cited in the responses	Item 2, 224	HCFCD has successfully implemented Natural Channel Design techniques on several projects in Harris County. Severe streambank erosion and channel incision on Cypress Creek at Meyer Park was restored using a geomorphic channel design with bankfull benches, constructed riffles for grade control, a stable meander pattern, and native woody riparian plantings. The Mason Creek extension upstream of Porter Road was created with a meandering geomorphic channel, geomorphic floodplain connectivity, and native woody riparian plantings. Streambank erosion and excessive sedimentation on Buffalo Bayou from Sabine to Shepherd was rehabilitated with bankfull benches, natural meander realignment, vegetated geogrids, and native woody riparian plantings. Vogel Creek channel improvements were constructed with a meandering geomorphic channel including geomorphic floodplain connectivity and native woody riparian plantings. Streambank erosion on Rummel Creek in Edith L. Moore Nature Sanctuary was restored using a rock cross-vane for channel grade control and bank stabilization with native woody riparian plantings. Each of these projects was successful by reconnecting or establishing geomorphic floodplain access, ensuring proper natural channel dimension, pattern, and channel profile, and planting native woody riparian vegetation for improved long-term riparian function. While these projects were successful and used some of the same natural stable channel techniques, none of these projects had as robust or extensive reforestation plan as is proposed for the Memorial Park Demonstration Project (MPDP).

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CMAR Details	Item 13, 67, 109, 135, 185, 242, 259	The Construction Manager at Risk (CMAR) method is an alternate type of construction delivery method authorized by state law that HCFCD has chosen for this proposed project. This delivery method allows for the selection of a prequalified contractor to oversee the construction of the proposed project. The CMAR team selected for the project is SpawGlass Civil Construction, Inc., and their stream restoration specialist subcontractor Shamrock Environmental, Corp. The CMAR team will aid HCFCD in working out the logistics of the least damaging access and construction methods to ensure minimal impacts to the site and adjacent parkland use while conducting the work associated with the project. The design team will be involved throughout the construction process in coordination with HCFCD and the CMAR to ensure the proposed design is implemented properly or if necessary, equivalent design techniques are utilized for minor deviations found to be necessary in areas of critical in-stream structure installation (i.e., toewood installation, vegetated stabilized earthen wall installation). Some of the techniques include: • Limiting all construction access to the areas of disturbance identified in the IP • Construction fencing around existing wetlands to be avoided • Preserving existing, desirable native vegetation by reviewing the project site in phases with a certified arborist, urban forester, City of Houston officials, park officials, and the contractor to identify and minimize impacts, making minor adjustments to slope grading where possible, and utilizing soft access methods (mulch beds) to cross pre-identified critical root zones • Sediment control measures such as stabilized construction access, reinforced silt fencing, and strip sodding • Public safety measures such as construction fencing, a traffic control plan, and flagmen at recognized trail crossings
Provide more detail to Item 23 of the Individual Permit Application: Description of Avoidance, Minimization and Compensation	Item 116,180	Updated Attachment A (Items 18-25) from the IP Application includes more than Item 23 to include minor edits and to correct errors in numbering of the section. **See Attachment 8**
Provide clarification of project length versus length of project impacts	None	USACE requested the length of actual project impacts be clarified from the length of the project study area and reach. The IP submittal had these numbers: 6,600 linear feet (LF) of Buffalo Bayou and 800 LF of the Hogg Bird Tributary of Buffalo Bayou. Here are the updated numbers: HCFCD is proposing to restore approximately 5,700 LF of Buffalo Bayou and 560 LF of Hogg Bird Tributary. Approximately 1,057 LF of Buffalo Bayou through the project reach will not receive any type of active restoration. This is the total length of the four (4) No Work zones located throughout the proposed project reach. The table summarizing these numbers is included in Attachment 8 above (Item 22)

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Topic	Referenced Response Number	Clarification/Update
Provide measurements that address the comment about the impacts to trees in the Hogg Bird Sanctuary area	Item 41	The Hogg Bird Sanctuary consists of 16.47 acres of land. The total area proposed for active restoration within the Hogg Bird Sanctuary consists of 0.95 acres of land. The total area within the Hogg Bird Sanctuary proposed for active restoration where no vegetation exists (beneath the waterline) consists of 0.27 acres of land. By subtracting the 0.27 acres from the 0.95 acres, there are 0.68 acres of land remaining where there could be impacts to existing vegetation within the Hogg Bird Sanctuary. [0.68 acres of impacts to existing vegetation divided by 16.47 acres of land = 4.13%, resulting in minimal, if any, impact to bird habitat within the Hogg Bird Sanctuary.]
Add information about inventory of Cherry Laurel and monitoring their presence (as a native but invasive species)	Item 71	Monitoring Plan, page 6-3 "Noxious and Invasive Species" states that presence of noxious, invasive species will be managed according to the maintenance plan should areal coverage exceed 10% at the time of scheduled monitoring events. Therefore, Cherry Laurel could be present if occurring naturally up to 10% coverage.
Spell out "WARSSS"	Item 186	"WARSSS" = Watershed Assessment of River Stability and Sediment Supply
Clarify what technical information would be obtained from the activities described in the monitoring plan in relation to the proposed project, including sediment load reduction (nutrients, bacteria and other pollutants)	Item 187	Multiple research publications and the United States Environmental Protection Agency (U.S. EPA) have identified the strong relationship between sediment, bacteria, and other pollutants because of the propensity for these pollutants to attach to sediment particles. Brinkmeyer et al. (2015) demonstrated that the streambed and bank sediments are a significant source of bacteria in the water column of Buffalo Bayou. Bank erosion analysis indicates that the MPDP reach contributes significant sediment loads in proportion to the overall sediment load of Buffalo Bayou. A Sediment Load and Bacteria Monitoring Plan has already been implemented to document effectiveness of the proposed restoration measures to reduce sediment loading and to determine secondary water quality benefits associated with the bacteria, nutrients, and other pollutants attached to sediment. Monitoring of bacteria levels includes measurements in the water column and from the streambed and bank sediments. The Monitoring Plan includes sampling events during multiple flow conditions (high and low), and will document water quality before, during, and after completion of the proposed project.
Clarify how rock outcropppings would be handled if encountered	Item 189	The areas proposed for active restoration have been reviewed numerous times from the water's surface of the bayou at various elevations, and no existing rock outcroppings were noted. Existing rock outcroppings along Buffalo Bayou, outside of the project reach, have recently become visible due to the erosion that has occurred (widening and deepening of the bayou) because the earthen material previously located around them has been washed away. If encountered during construction, existing rock outcroppings will be covered and preserved in place if possible. These areas will be handled on a case by case basis.
State why the 2004 Memorial Park Conservation Master Plan is or is not relevant	Item 189	The 2004 Memorial Park Conservation Master Plan is not directly relevant to the proposed project as it was not specific to this project reach or goals. In addition, since its publication in 2004, there has been a rapid rate of erosion noted by the City of Houston Parks and Recreation Department and other property owners along the project reach, the loss of vegetation due to the years of severe drought, impacts from large storm events including Hurricane Ike, and the rapid channel migration in the middle meander of the project reach has been noted. The 2004 Memorial Park Conservation Master Plan concentrates on the upland park areas and not on the condition or possible future repair methods of the bed and banks of Buffalo Bayou.

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Clarify the change in length of Buffalo Bayou within the project reach (commenter stated 20%)	Item 198	The existing stream based on the centerline measurement through the project reach is 6,100 linear feet (LF) of total stream length, and the proposed project will reduce the stream length based on centerline measurement through the project reach to 5,700 LF of total stream length. This alteration will result in shortening the existing stream length by 6.6% in order to improve the bayou's dimension, pattern, and profile, allowing the streambed to establish a dynamic equilibrium.
Clarify post stream condition assessment score information for the riparian buffer parameter	Item 200	Assessment of the riparian buffer parameter is described beginning on page 10 of the USACE Galveston District Stream Condition Assessment (2013). The post condition riparian buffer score was assessed based on proposed plantings of native woody riparian species and presence or absence of wetlands within the buffer of each specific transect. USACE Galveston District staff indicated that a post condition assessment score is compared to a pre-condition assessment score to determine functional lift. A breakdown in riparian buffer scores for each individual transect is available in the Level 1 Stream Assessment Data Forms in the Stream Assessment Report.
Provide additional information about the City of Houston's floodplain permit process.	Item 204	The City of Houston is the floodplain administrator and issues floodplain development permits. The purpose of this permit is to show, through hydrologic and hydraulic modeling, that once constructed the project will not create an impact to the floodplain. The City of Houston issues permits once they receive sealed construction drawings.
Provide update on status of archaeological reports	Item 209	The Intensive Archaeological Survey of 1.3 mile Segment of Buffalo Bayou has been updated and was sent to Jerry Androy (USACE) on February 9, 2015. The updates were minor clarifications requested by Texas Historical Commission (THC). An archeological monitoring plan has been developed at the request of the THC and will be used during construction. HCFCD received a copy of the letter from USACE to THC's State Historic Preservation Officer dated December 8, 2014. The letter requested concurrence that no historic properties will be affected by the proposed permit action in compliance with Appendix C of 33 CFR Part 325 (7) (b).
Clarify comment referring to the following statement: "Also, the HCFCD's application states it will not improve water quality (page 452)"	Item 211	Page 452 shows Table 2: Stream Tool Results Comparison. This page compares the existing and proposed stream condition assessment parameters, which includes the aquatic life use variable representing water quality among other items. No change is depicted in this variable from existing to proposed condition as a function of the methodology used to assign those scores. The USACE Level 1 Stream Condition Assessment Tool includes a parameter for Aquatic Use, which is based off the Texas Commission on Environmental Quality (TCEQ) Aquatic Life Use category score for the stream segment. TCEQ has assigned the Buffalo Bayou stream segment through the proposed project reach an Aquatic Life Use score of Poor (or 2.0) as shown in Table 2: Stream Tool Results Comparison (page 452). Because the TCEQ is responsible for periodically re-assessing stream segments for Aquatic Life Use re-classification, the proposed Aquatic Life Use score cannot change until it is re-assessed by TCEQ. Therefore, even though HCFCD anticipates water quality improvements from the proposed project, the proposed score must remain poor until TCEQ reassesses the stream segment. As a result of the current methodology applied by the USACE Level 1 Stream Condition Assessment Tool, the scoring will not reflect the proposed water quality improvements.

Topic	Referenced Response Number	Clarification/Update
	Item 211 (cont'd)	Despite the inability to change the TCEQ stream segment assessment score as implemented by the Stream Condition Assessment Tool, HCFCD anticipates water quality improvements as a result of the proposed project. The proposed project will stabilize the stream channel and banks with a dimension, pattern, and profile, which will reduce sediment loads and other pollutants associated with sediment from the currently eroding streambanks. Additionally, the proposed planting plan will re-establish native woody vegetation within the riparian corridor and streambanks to filter runoff, stabilize the soils, and shade the water.
Discuss Robin Sotir's targeted streambank stabilization method and its applications within the project reach	Item 223, 245	Robin Sotir's method of stabilizing streambanks focuses on the use of large amounts of riprap/rock placed at the base of the eroded slope, within the streambed. The method includes installation of geogrid/mechanically supported earthen fill lifts and heavy plantings to stabilize only the targeted area of visual erosion. Although it is useful at stabilizing the targeted area of visual erosion, it provides no relief to the stream system as a whole because it does not dissipate erosive flows within the stream, especially one the size of Buffalo Bayou. In a stream the size of Buffalo Bayou, this method would create additional erosion problems downstream of the area of application. The riprap/rock utilized at the base of Sotir's method is similar to a hardened concrete application in that it transfers erosive flows towards the opposite channel bank downstream causing further erosion. Sotir's method is useful at treating the symptoms when properly applied in smaller streams with less shear stress at the base of the slopes. Sotir's method has been applied in two locations that HCFCD is aware of within the proposed project reach and both locations have subsequently exhibited active erosion occurring directly upstream and downstream of the area where the targeted application was applied. Sotir's method does not address the overall stream system, including dimension, pattern and profile, which the proposed project fully incorporates based on the results of the assessments conducted prior to designing the project.
Provide cost-benefit statement addressing use of taxpayer funds	Item 226	HCFCD is one of three funding partners sharing the cost for this project, and its interest is both in the preservation of stormwater conveyance capacity as well as the ability to support the conservation of forests on public lands. The erosion in the project area is occurring on both sides of the bayou, and the property owners whose property is experiencing this erosion are the City of Houston (Memorial Park), private homeowners, as well as the River Oaks Country Club. Instead of individuals working alone to protect only their property, all affected property owners are working together to demonstrate that by addressing the stability of both banks of the bayou, the erosion issues will be minimized. Working together in a public-private partnership enables all entities to leverage funds to address both actively eroding streambanks, as well as improve water quality by reducing sediment deposition, maintain flood carrying capacity, achieve long-term stream stability, and restore the ecosystem to more natural and desirable conditions.
Provide statement addressing secondary impacts	Items 235	The areas within the project that will be impacted have been addressed. Avoided areas (such as wetlands) will be fenced and not impacted. Due to the nature of the project there are no secondary impacts. Any avoided wetlands will not lose hydrologic connections. Any impacts related to construction activities would be temporary.

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Add reference to plans included on USACE notice related to the flow entering the Hogg Bird Tributary and the sizing of proposed dissipation pools	Item 247	The size of the proposed riprap scour dissipation pool for the storm sewer outfall located at the upstream limit of the Hogg Bird Tributary can be viewed on sheet 32 of 41 in the posted USACE notice for the proposed project. The indicated scour dissipation pool length, width and depth are all sized to handle necessary dissipation of the known flow (q) of the storm sewer outfall pipe. The referenced dam 2 is not a man-made dam/structure, but instead is a buildup of eroded sediment which has become displaced by the erosive flows of the storm sewer outfall pipe. The installation of the properly sized scour dissipation pool will prevent further erosion of the streambed substrate and ensure reduced sediment load in the overall stream system caused by the erosive flow of the storm sewer outfall.
Describe why and how cuts are needed to stabilize the bayou	Item 249	The excavation (cuts) and fill activities would be used only in the areas necessary to re-establish a stable geomorphological dimension, pattern and profile. The proposed cut and fill activities are necessary to stabilize the channel from continuing erosion, which is currently causing loss of public and private land and wildlife habitat. By re-establishing a stable geomorphological form or dimension, pattern and profile, the project will result in sustainable stable banks within the project reach where native vegetation can be re-established down to the water's edge of Buffalo Bayou.
Explain why the 80% project plans are adequate for IP submittal	Item 284	The project plans at 80% submittal are final in that the lines, grades, and proposed impacts to jurisdictional waters of USACE are set. The 90% and 100% plan submittals are merely milestones for minor clarifications to construction notes and specifications needed to finalize the plans prior to project bidding and construction. For the purpose of obtaining a USACE permit based on impacts to jurisdictional waters of USACE, the 80% project plan set is appropriate.
Clarify the difference between this project and the previous project along Buffalo Bayou from Sabine to Shepherd	Item 291	Buffalo Bayou along Allen Parkway was channelized in the mid 1960's to be made wider and deeper for flood damage reduction purposes, and the land directly adjacent to and within this portion of the bayou system is a City of Houston park. Since it is utilized as a City of Houston park, numerous trails, pedestrian bridges, open space and multi-functional use facilities are located on this portion of Buffalo Bayou and most of the landscape/vegetation features reflect a park-like setting. Buffalo Bayou along the proposed project reach has never been channelized and in the last few years has experienced significant erosion and degradation along private and public property including Memorial Park. This project proposes to create a narrower streambed to allow for the re-vegetation and establishment of a native vegetation canopy to cover the streambed and provide sustainable stable slopes through the project reach. No trails, pedestrian bridges, open space or multi-functional facilities are proposed as part of this project. Although the project improvements from Shepherd Drive to Sabine Street used some geomorphic principles, that project has more active park features and does not have as robust and extensive reforestation plan as the proposed Memorial Park Demonstration Project. Therefore, the finished Memorial Park Demonstration Project will look drastically different than Buffalo Bayou between Shepherd Drive and Sabine Street.

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Clarify if Monitoring Plan will include monitoring for wildlife	Item 331	There is no specific measure in the Monitoring Plan for wildlife. However, the Monitoring Plan will demonstrate post project uplift, including geomorphic stability, macrobenthic and fish levels, tree, shrub and emergent wetland planting survival and levels of noxious and invasive species that will create riparian habitat for wildlife.
Provide information about the requirement to comply with the City of Houston's Tree Protection Ordinance	Item 374	The proposed project is located in the City of Houston. The City spells out its requirements for tree protection under the City of Houston Code of Ordinances – Chapter 33 (Planning and Development), Article V (Trees, Shrubs and Screening Fences) and Article VI (Protection of Certain Trees). This ordinance requires that any trees removed be replaced on the basis of one caliper inch of tree planted for one caliper inch of tree removed. HCFCD will most certainly comply with this requirement within its robust revegetation plan.