

**Klotz Associates, Inc., Town Creek, Walker County, Texas**  
**Mitigation Plan**

The USGS Quad reference map for the project site is Huntsville, Texas. The project site is located approximately at UTM coordinates 3,401,504.670m.N and 256,125.370m.E (NAD83). The project site is located northwest and southeast of the State Highway 30 and State Highway 75 intersection in Huntsville, Walker County, Texas.

**1.) Goals and Objectives**

The Applicant is proposing to re-establish 2,333 linear feet of Town Creek for the purpose of improving storm water management and reduce localized flooding. The main “pilot channel” of Town Creek will be re-established to its original location within the main channel of existing Town Creek, throughout the proposed project this would relocate the pilot channel an average of 2.5 feet from its current location. The proposed construction will not increase the length of the channel; it will function to capture all water that currently flows through and over the channel at this time. However, there will be a net increase in aquatic resource area through the use of multiple beneficial habitat creation devices within the proposed project. The Applicant proposes to utilize construction methods, specifically those that will allow for the creation of floodplain wetlands, placement of in-stream habitat structures, and bank armoring utilizing inter-locking block pavers in an effort to reduce future erosion. The planting of desirable hydrophytic vegetation is also proposed in the created wetlands and in any keyhole armoring structures. Some in line detention is also proposed in order to create deep pool habitat while also reducing flow surges during high rainfall events. These areas along with the proposed created floodplain wetlands, and in-stream habitat structures will serve as water quality features to remove suspended solids and other pollutants from storm water prior to its confluence with Parker Creek and subsequent release into Lake Livingston. The design criteria will meet all City of Huntsville water quality standards.

Since there will be a net increase in aquatic resources the Applicant contends that the project is self-mitigating. The existing pilot channel of Town Creek is only being relocated within the existing bed and bank of Town Creek. Town Creek currently has a Reach Condition Index (RCI) of 2.5 based on the Galveston District Stream Assessment Tool (SWG-Tool). The proposed project will have an RCI of 3.5 once construction is complete.

The Applicant will create the proposed RCI of 3.5 by creating more than four (4) habitat types within the new channel. This includes, but is not limited to, riffles, vegetative root wads, overhanging vegetation, plunge pools near the riffles, and some undercut banks. The Applicant is also proposing to place rip-rap along areas of the channel where erosion is likely to occur. The rip-rap will be placed mainly along the cut-bank side of the proposed sinuous curves. This will help to create and maintain channel integrity. Additionally, the Applicant is proposing to plant the proposed adjacent detention pond to further increase the water quality benefits of the project. See Table 1 below for a breakdown of the existing Town Creek linear feet and RCI and the proposed channel linear feet and RCI.

**Table 1: Existing and Proposed Stream Conditions**

Stream Name	Linear Feet	RCI	Habitat Types Present
Town Creek	2,333	2.5	Undercut banks, overhanging vegetation, and small amounts of riffle-pool complex
Proposed New Channel	2,333	3.0 – 3.5	Root wads, undercut banks, overhanging vegetation, riffle pools, plunge pools, J-hook veins, interlocking block paver TOE armoring, floodplain wetland creation

The primary function of Town Creek in the area is drainage and suspended solids sequestration. The primary function of the proposed changes to Town Creek will also be drainage and suspended solids sequestration. However, the proposed construction will create and maintain habitat, will have a much more stable channel condition, create additional wetland and deep pool habitat, create increased sinuosity, and allow for better water quality within the immediate watershed.

**2.) Baseline information**

Town Creek is within the heart of the City of Huntsville and is bordered by commercial and residential development and public infrastructure on all sides throughout the length of the project.

According to the Web Soil Survey of Walker County, the mapped units within the project boundaries are Gowker and Kanebreak soils (frequently flooded), Depcor-Urban Land Complex (1-8% slopes), and Annona-Urban Land Complex (1-8% Slopes).

The entirety of the project tract is located within the 100-year floodplain of Town Creek.

**3.) Site selection**

The relocation of Town Creek on-site will keep the created aquatic resource function within the same watershed and will provide for a net increase in stream function for this portion of Town Creek. The relocation on-site will allow the Applicant to construct the necessary storm water management improvements and create valuable habitat within the stream channel and directly adjacent to Town Creek.

**4.) Mitigation Work Plan**

The Applicant is proposing to re-establish the existing Town Creek pilot channel. The Applicant is proposing to create multiple habitat types within the proposed new channel by creating riffle and pool complexes, J-hook veins, floodplain wetland creation, TOE armoring with inter-locking block pavers and through vegetative plantings. Additionally, the Applicant is proposing to create a stable channel condition by placing erosion protection near potential erosion prone areas. A mitigation construction plan with detail view of the proposed work will be submitted under a separate header.

The proposed riffle complexes and plunge pools will be created by placing rip-rap within the proposed channel bottom to create the riffle in shallow areas of the channel. The plunge pools will be constructed and also allowed to develop over time as the water creates deep spaces at the end of the created riffles. The planting of native wetland plants along the channel and within the key-holes of the inter-locking block pavers as well as the created wetlands will create the thick vegetative root wads and overhanging vegetation desired for fish and other aquatic species. Additionally, there will be some natural undercutting of the bank that will provide additional habitat. The undercutting of the bank will be allowed to occur in yet to be determined areas that will not impact integrity of the channel and promote erosion.

### **5.) Site Protection and Maintenance**

The Applicant or its duly authorized representative will be responsible for performance standards described in Section 6.

### **6.) Performance Standards**

The proposed changes to Town Creek must achieve a minimum RCI of 3.0 within three (3) years from the completion of the construction and maintain the proposed RCI of 3.0 to 3.5 within five (5) years following the completion of construction. The RCI will be based on the SWG-Tool or subsequent stream models approved for use by the USACE Galveston District. The channel will be considered to have met minimum success criteria (MSC) if after three (3) years the RCI of 3.0 to 3.5 has been achieved and at least two (2) significant rainfall events have occurred.

Invasive species such as Chinese tallow (*Triadica sebifera*), deep rooted sedge (*Cyperus entrerianus*), and black willow (*Salix nigra*) will be controlled within the new channel and will be make up no more than five-percent (5%) of the aerial coverage.

### **7.) Monitoring Plan**

The proposed changes to Town Creek will be monitoring quarterly during first year after construction ideally following rainfall events in the area to assess flow dynamics and channel stability. The proposed new channel will then be monitored annually for the next four (4) years or until MSC is met. Monitoring reports will be submitted to the USACE Galveston District and will be in compliance with Regulatory Guidance Letter No. 08-03.

### **8.) Long Term Management Plan**

Long term maintenance will be carried out according to City of Huntsville standard operating procedure. Maintenance within the channel below the ordinary high water mark (OHWM) to remove accumulated sediment impeding flow, storm debris, and repair of rip-rap and other authorized structures covered by this action will be performed as needed.

### **9.) Adaptive Management Plan**

Should Town Creek not meet MSC or not achieve the proposed RCI by year five (5), the Applicant will work with the USACE to develop an adaptive management plan so that the proposed RCI is ultimately achieved and maintained.

**10.) Financial Assurances**

The Applicant will be financially responsible for the construction and monitoring. The City of Huntsville will be responsible for the long term maintenance of the proposed channel, as specified in Section 8.

**11.) Long Term Financing**

See Sections 6, 8, and 10 above for a breakdown of maintenance and financial responsibilities.

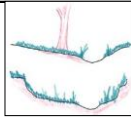
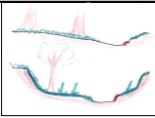
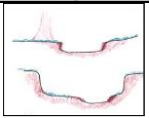
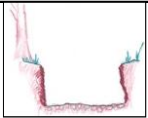
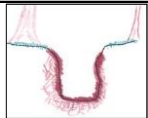
# Routine Stream Assessment Data Form for Level 1 Streams

U.S. Army Corps of Engineers Galveston District

File Number	Applicant	Stahler Stream Order	8 Digit HUC	Date	SAR #	Impact/SAR length	Impact Factor
SWG-2012001017	City of Huntsville	1		Oct. 2011	1	2333	

Name(s) of Evaluator(s)	Stream Name and Type
Andy Boswell & William Proctor	Town Creek Branch - Perennial

**1. Channel Condition:** Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

	Optimal	Suboptimal	Marginal	Poor	Severe	
<b>Visual Channel Condition Parameter</b>						
	Channel shows very little incision or widening and little or no evidence of erosion or unprotected banks. Indicators of stability include greater than 80% vegetative cover on the banks, stable point bars and bankfull benches may be present, mid-channel and transverse bars are rare or transient. The stream has access to active floodplain or fully developed bankfull benches. No bulkheading or riprap may be present.	Channel is slightly incised and contains a few areas of active erosion. Indicators of instability include vegetative cover or natural rock protection only present along 60-80% of the SAR, point bars and bankfull benches are likely present and transient sediment is present along 10-40% of the stream bottom. The stream has access to bankfull benches or developed floodplains along portions of the reach. Channel may show evidence of past channel alteration, but should be exhibiting notable recovery of a natural channel. Bulkhead and riprap are limited to 1-25% of the SAR.	Channel is incised or has had its course widened. Indicators of instability include the presence of erosional scars on 40-60% of the SAR, vegetative cover or natural rock only found on 40-60% of the SAR, vertical or undercut banks, or nickpoints associated with headcuts may be present and portions of the channel may be widening while other portions of the channel are narrowing, and transient sediments are found in 40-60% of the natural stream bed or bottom. The stream does not have access to the active floodplain. Bulkheading or riprap is found along 25-50% of the SAR.	Channel is over-widened or are incised with vertically or laterally unstable banks. Visual indicators of over-widening and incision include near vertical banks with shallow root depths, erosional scars present along 60-80% of the SAR, vegetative cover or natural rock is limited to 20-40% of the SAR, substantial sediment deposition of uniformed-size material is present along 60-80% of the SAR and pint bars and bankfull benches are absent. The stream does not have access to an active floodplain. Bulkheading and riprap are present along 50-80% of the SAR.	Channel is deeply incised or excavated with vertical or lateral instability in the stream bank. Indicators of instability include the streambed elevation is located below the rooting depth, both banks are vertical or undercut, vegetative surface protection or natural rock is only found along 20% or less of the SAR, the bank is sloughing an erosional scars or raw banks present on 80-100% of the SAR and 80% or more of the natural streambed is covered by substantial sediment resulting in threaded channels. The stream does not have access to an active floodplain.	
<b>Score</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2.5</b>

Notes: The entirety of this SAR is incised vertically and is bordered by non-stabilized banks. In many areas bank stabilization methods appear to have been utilized over many years due to constant erosion during rain events.

**2. RIPARIAN BUFFERS:** Assess both bank's 100 foot riparian areas along the entire SAR.

	Optimal	Suboptimal	Marginal	Poor	Severe		
<b>Riparian Buffers</b>	Native woody species represent greater than 60% of the coverage and wetlands are present.	Native woody community species represent greater than 60% coverage with NO wetlands present within the buffer OR native woody community species represent 3-60% coverage with wetlands present. No maintenance or grazing activities.	Native woody community species represent between 30-60% coverage with NO wetlands present. No maintenance or grazing activities.	Native woody community represents less than 30% coverage with no maintenance or grazing activities.	The buffer is dominated by one or more of the following: lawns, mowed or maintained right-of-way, no-till cropland, actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized or other comparable condition.	The area is dominated by impervious surfaces, mine spoil lands, denuded surfaces, conventional tillage row crops, active feed lots or comparable conditions.	
	<b>Condition Scores</b>	<b>5</b>	<b>High = 4.5</b> <b>Low = 4</b>	<b>3</b>	<b>2</b>	<b>1</b>	

Notes: The buffer zone of this SAR is heavily maintained and mowed. Direct buffer is either a mixture of Bermuda and St. Augustine grasses and impervious cover (concrete/asphalt).

<b>Right Bank</b>	% Riparian Area >	<b>100%</b>					<b>100%</b>		
	Score >	<b>2</b>							
<b>Left Bank</b>	% Riparian Area >	<b>100%</b>					<b>100%</b>		
	Score >	<b>2</b>							
							CI = (Sum % RA * Scores)/2		
							<b>Rt Bank CI &gt;</b>	<b>2.00</b>	<b>CI</b>
							<b>Lt Bank CI &gt;</b>	<b>2.00</b>	<b>2.00</b>

**3. INSTREAM HABITAT:** Logs or largewoody debris, deep pools, overhanging vegetation, coarse substrate, undercut banks, thick rootwads, dense macrophyte beds, riffles or runs, flats back water pools and plunge pools.

	Optimal	Suboptimal	Marginal	Poor	Severe	
<b>Instream Habitat/ Available Cover</b>	Greater than four (4) in-stream habitat types are present in the SAR	Four (4) types of habitat present in the SAR	Three (3) types of habitat present in the SAR	Two (2) or fewer types of habitat present in the SAR	No habitat types found in the SAR	
<b>Score</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2.00</b>

Notes: The SAR is free of most woody debris due to flow rate during rain events, however does have some areas with coarse substrate bottom in the form of placed crushed concrete causing minimal riffle-run complexes.

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Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor
SWG-2012-1017	City of Huntsville				Oct. 2011			

**4. CHANNEL ALTERATION:** Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock

	Optimal	Suboptimal	Marginal	Poor	Severe	
<b>Channel Alteration</b>	Channelization, dredging, alteration or hardening absent. Stream has unaltered patten or has normalize. No dams, dikes, levees, culverts, riprap, bulkheads, armor, drop structures or withdrawal structures within the SAR.	Less than 30% of the SAR is impacted by dredging, dams, dikes, levees, culverts, riprap, bulkheads, armor, drop structures or withdrawal structures. Evidence of past alteration may be present, but stream pattern and stability have recovered. Withdrawals, if present, have no observable affect on flow	Between 30-60 % of the SAR is impacted by dredging, dams, dikes, levees, culverts, riprap, bulkheads, armor, drop structures or withdrawal structures. Evidence of past alteration may be present, but stream pattern and stability are beginning to recovered. Withdrawals, if present, have may have an observable affect on flow, but no observable affect on habitat or biota.	Between 60-90 % of the SAR is impacted by dredging, dams, dikes, levees, culverts, riprap, bulkheads, armor, drop structures or withdrawal structures. Evidence of past alteration is present, and stream pattern and stability are not recovering. Withdrawals, if present, have may have an observable affect on both flow and habitat or biota.	Between 90-100% of the SAR is impacted by dredging, dams, dikes, levees, culverts, riprap, bulkheads, armor, drop structures or withdrawal structures. Withdrawals, if present, are large enough to have severe loss of flow and cause little to no habitat or biota.	
<b>SCORE</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2.50</b>

**Notes:** Approximately 60% of the SAR is impacted by placed rip-rap and other impreviuous bank stabalization methods. Past alteration occurred during the 1940s to the 1960s, currently the SAR and stream system cannot sustain normal flow rates during rain events.

**REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH**

NOTE: The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.

<b>THE REACH CONDITION INDEX (RCI) &gt;&gt;</b>	<b>2.25</b>
<small>RCI= (Sum of all CI's)/4</small>	
<b>COMPENSATION REQUIREMENT (CR) &gt;&gt;</b>	<b>0</b>
<small>CR = RCI X LF X IF</small>	

**INSERT PHOTOS:**

**DESCRIBE PROPOSED IMPACT:**