BACKGROUND

LFUCG's Phase I MS4 Permit (KPDES No. KYS00002 AI No. 74551) was issued on May 1, 2015, with a five-year duration period effective June 1, 2015. Part II requires the development and implementation of a modified approach for assessing drainage systems as follows:

> *Based on the outcomes from the Visual Stream Assessments conducted in 2009-2014, the permittee shall propose a modified approach and procedures for assessing the drainage systems identified as having the highest priority during Year 1 of the permit and implement the modified approach to inspect the drainage system areas of highest concern during permit Years 2–5.* (Page II-12)

As a result of the Visual Stream Assessments (VSAs) conducted between 2009-2014, 146 miles of stream were walked within the Urban Service Area. Stream assessments were performed in accordance with the Center for Watershed Protection's *Urban Subwatershed Restoration Manual 10 – Unified Stream Assessments: A User's Manual Version 2.0* (Kitchell and Schueler 2005). Stormwater outfalls, utilities, severe erosion, stream crossings, and trash and debris sites were assessed. Stream habitat was also assessed in accordance with EPA's Rapid Bioassessment Protocol. The results of this effort are summarized in **Table 1** below.

Table 1. Visual Stream Assessment Findings, 2009-2014

Watershed	Stream Miles Walked	Outfalls	Flowing Outfalls	Utilities	Severe Erosion	Stream Crossings	Trash Sites	Habitat Assessments
Cane Run	16.6	174	16	43	10	116	35	41
East Hickman	24.4	207	22	33	0	96	7	0
North Elkhorn	23.8	202	27	113	9	107	3	40
South Elkhorn	28.9	546	43	270	37	298	19	112
Town Branch	10.9	239	45	77	12	82	11	45
West Hickman	27.8	653	113	127	15	360	19	0
Wolf Run	13.5	264	15	53	18	114	19	0
Totals	145.9	2,285	281	716	101	1,173	113	238

The VSA effort, while labor intensive, was useful as an initial evaluation tool. All total, it took 175 days at an average rate of 0.8 miles walked and 30 features cataloged per day. For each feature, photos were taken, GPS coordinates were recorded, and datasheets were completed. In the field, streams were rigorously searched to ensure no features were missed, as some areas had not been mapped at the time of the inspection, and many outfalls were identified that were not previously mapped. Additionally, some areas found to be mapped as streams were actually roadway drainage ditches lacking bed and bank, while some streams were present that had not previously been mapped. Progress was slowed considerably in areas where dense bush honeysuckle along streams hindered accessibility.

A substantial amount of time was spent in reviewing the quality of the data to ensure that labels were consistent between the GPS coordinates, datasheet, and photos, and that all datasheets were consistently filled out and all fields were entered. Additionally, office time was spent linking the stormwater outfalls and sanitary sewer utilities identified in the field to previously mapped features and their corresponding identifiers.

Because only 46% of the features recorded were outfalls, considerable time was spent on items not directly associated with illicit discharges. Because of the extensive sanitary sewer assessment efforts which were ongoing, the visual inspection of the "utilities" did not provide much useful data with the exception of a few system defects. The stream crossing locations provided a comprehensive list of places the streams could be sampled in future efforts and showed the many obstacles to restoration efforts, but in general was not worth the effort spent in documentation. Sites with severe erosion, trash and debris sites, habitat assessments, and miscellaneous features helped to pinpoint pollution contributors, dump sites, springs and karst features, and explained some of the impact to aquatic organisms; however, this information is valuable for assessment of overall stream health, rather than specifically detecting illicit discharges.

While major outfalls are currently screened once every two years, outside of the VSAs, there is no effort to document flow at smaller outfalls as part of the MS4 program. Studies in other locales have found that numerous illicit discharges are missed because smaller outfalls are not monitored by MS4 programs.

When flowing outfalls were identified, the monitoring and investigations were typically pursued by Division of Water Quality environmental inspectors and tracked separately from the Visual Stream Assessments. As a result, the number of illicit discharges identified through this effort is unknown. Additionally, because the amount of flow and specific pollutant concentrations were not consistently measured at outfalls, the pollution load related to outfalls cannot be accurately determined and the flow sources cannot be comprehensively described. As a result of these lessons learned, the proposed modified approach focuses on assessing outfalls, monitoring pollutant concentrations, and comparing the results with known source libraries to categorize the flow source. Additionally, illicit discharge investigations launched as a result of the VSA effort should be tracked in Accela as originating from this assessment protocol and quantified annually.

For all watersheds except Wolf Run, the outfall severity was evaluated with a rating from 1 (no dry weather discharges, no staining, and no other concerns) to 5 (heavy discharge with strong color or odor, discharge having impact, or other major structural issues). These severity scores were used to highlight problem areas to direct maintenance efforts to broken, damaged, or poorly draining outfalls and identify potential pollutant sources.

Based on review of the results from the initial VSAs, the following modified approach will be implemented for assessment of the drainage systems during the 2015-2020 permit cycle.

PRIORITIZATION

The visual assessment of outfalls is best prioritized on a watershed basis. The VSAs will be scheduled to correspond with the schedule developed for LFUCG's Watershed-Focused Monitoring Program (WFMP). VSAs will be conducted during the WFMP "screening" year for each watershed in order to screen for key flowing outfalls which are not major outfalls, but which may be of benefit to include for additional inspection during the subsequent WFMP "monitoring" year. The proposed schedule (based upon calendar year) is as follows:

2016 Cane Run
2017 South Elkhorn
2018 West Hickman
2019 East Hickman and Boone Creek
2020 Town Branch
2021 North Elkhorn
2022 Wolf Run

MODIFIED APPROACH

VSAs will be conducted in accordance with the outfall assessment portion of the Center for Watershed Protection's *Urban Subwatershed Restoration Manual 10 – Unified Stream Assessments: A User's Manual Version 2.0* (Kitchell and Schueler 2005).

Previously Identified Outfalls

All outfalls previously identified along perennial or intermittent streams within the Urban Service Area will be physically inspected by an environmental inspector or contracted inspector for evidence of illicit discharges. The locations of each outfall will be mapped on aerial mapping at 1:7500 scale and previously collected data, including flow and outfall severity, will be summarized for use in the field by inspectors. Inspectors will locate and either confirm or update previously recorded data for the purpose of updating LFUCG's outfall inventory.

New Outfalls

Additional outfalls discovered during the course of locating previously identified outfalls be assessed. Areas in which construction may have added new outfalls since the previous stream assessment, as well as Urban Areas (as defined in the Stormwater Quality Management Program) outside of the Urban Service Area, will be assessed by walking the length of the perennial streams to locate new outfalls. Inspectors will look for indications of discharges entering the stream. New pipes 4" or greater in size will be inspected will be documented and a Visual Stream Assessment – Stormwater Outfall Data Sheet (**Appendix A**) will be completed.

Flowing Outfalls

Flowing outfalls will be assessed for indicators of pollution by physical appearance (*e.g.*, turbidity, excessive growth, discoloration) and odor. Any flow that has characteristics that may

be indicative of an illicit discharge will be screened for chemical indicators including pH, temperature, conductivity, ammonia, chlorine, detergents, and fluoride. Flow will also be estimated by measuring the outfall size, shape, material type, and water depth (pipe slope is assumed). Together, flow and concentrations will be used to provide a general estimate of loading from outfalls in each watershed.

Flowing outfalls with concentrations above action levels will be investigated for illicit discharges using IDDE-01: Illicit Discharge Detection and Elimination (IDDE) Protocol. Field investigators will call LexCall at 3-1-1 to report a "spill/non-emergency" and provide identification, location, the parameter above action levels, concentration, and time sampled. The LexCall interface will forward the information to the LFUCG Compliance and Monitoring Supervisors for assignment of an Environmental Inspector. This Environmental Inspector will begin at the monitoring site with the actionable result and will confirm the previously measured result. Investigators will then trace high results through the stormwater system and isolate sources using the IDDE Protocol. Results will be documented in ACCELA.

Town Branch Underground

Because long reaches of Town Branch and its tributaries are located underground, a visual assessment of the stormwater outfalls into the major underground reaches will be conducted on portions of these reaches to facilitate illicit discharge tracing. Confined space entry and safety protocols will be utilized in these assessments which will be completed by contracted inspectors. The portion of the underground system to be assessed will be based on safety, priority of suspected discharges, and cost. In areas where structural assessments and inventories have already been performed, all flowing pipes will be screened similarly to surface outfalls, but non-flowing outfalls will not be assessed or inventoried. Where structural assessments and inventories have not been performed, the assessments will be conducted similarly to the assessment of surface outfalls as described above.

APPENDIX A

LFUCG VISUAL STREAM ASSESSMENT STORMWATER OUTFALL DATA SHEET

VISUAL STREAM ASSESSMENT - STORMWATER OUTFALL DATA SHEET

VSA Grid No: _____ **Date:** _____ **Time:** _____ **Assessed by:** _____

Site ID No.: _____ **Lat (Y):** ___ ___ / ___ ___ ___ ___ ___ **Long (X):** ___ ___ / ___ ___ ___ ___ ___

Physical Address: _____ **Image ID:** _____

Outfall Type: Closed Pipe ☐ Open Channel ☐ **Bank:** *(Direction when facing downstream)* Left ☐ Right ☐ Head ☐

If Closed Pipe:	**Shape:**	**Size (in):**	**Material:**	**Texture:**	**Submerged:**
Single ☐	Circular ☐	Height: _____	Concrete ☐	Smooth ☐	No ☐
Double ☐	Elliptical ☐	Height: _____ Width: _____	PVC/Plastic ☐	Corrugated ☐	Partially ☐
Triple ☐			Metal ☐		Fully ☐

If Open Channel:	**Shape:**	**Size (in):**	**Material:**
	Trapezoidal ☐	Height: _____ Width (Top): _____ Width (Bottom): _____	Concrete ☐
	Parabolic ☐	Height: _____ Width: _____	Riprap ☐
	Rectangular ☐	Height: _____ Width: _____	Earthen ☐

Flow: Y / N Trickle ☐ Moderate ☐ Substantial ☐ **Revisit:** Y / N

Indicators of Illicit Discharge (Flowing Outfalls):

Odor: Y / N Sewage ☐ Rancid / Sour ☐ Petroleum/Gas ☐ Rotten Eggs ☐ Chlorine ☐

Color: Y / N Green ☐ Brown ☐ White ☐ Yellow ☐ Orange ☐ Red ☐

Turbidity: Y / N Slightly Cloudy ☐ Cloudy ☐ Opaque ☐

Floatables: Y / N Sewage (Toilet Paper, etc.) ☐ Petroleum (Oil Sheen) ☐ Suds ☐ Bio-Film ☐

Indicators of Illicit Discharge (All Outfalls):

Outfall Damage: Y / N Cracked / Chipped ☐ Corroded ☐ Peeling Paint ☐ Crushed ☐ Broken ☐

Stains/Deposits: Y / N Oil ☐ Flow Line ☐ Paint ☐

Abnormal Vegetation: Y / N Excessive ☐ Inhibited ☐

Benthic Pipe Growth: Y / N Brown ☐ Orange ☐ Green ☐

Poor Pool Quality: Y / N Odor ☐ Color ☐ Floatables ☐ Excessive Algae ☐

Other Concerns: Bank Erosion ☐ Excess Sedimentation ☐ Excess Trash ☐ Dump Site ☐ Fish Kill ☐

Outfall Severity: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Field Screening (Flowing Outfalls): Date: _____ Time: _____

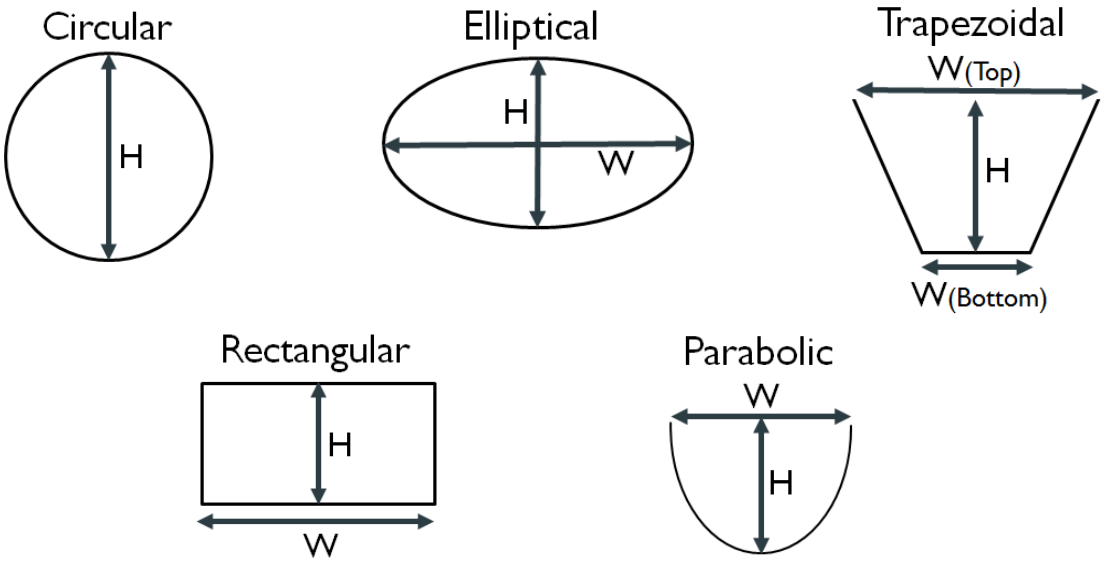
In Situ (Probe)		Action Limit	Field Kit		Action Limit
pH	_____	< 6, > 9 SU	Ammonia	_____	> 0.5 mg/L
Temperature	_____	> 32.2° C	Chlorine	_____	> 0.25 mg/L
Conductivity	_____	> 1,000 υS/cm	Detergents	_____	> 0.5 mg/L
			Fluoride	_____	> 0.5 mg/L

Note: If action limit is exceeded, call LexCall at 3-1-1 to report a "spill/non-emergency" and provide identification, location, parameter above action limit, concentration detected, and time sampled. The LexCall interface will forward the information to LFUCG Compliance and Monitoring for assignment to an environmental inspector. If sewage is detected, call KY E.R.T. at (800) 928-2380.

See reverse side for outfall measurement diagrams and severity index descriptions. If necessary, space for comments and location description and driving directions (for open channels or major closed pipes) provided on reverse.

VSA Outfall Measurement Diagrams

Site ID No.: _____



VSA Outfall Severity Index

1 Outfall does not have dry weather flow, staining, or appearance of causing any erosion problems.

2 Small flow from outfall is clear and odorless. Outfall does not have staining or appearance of causing any erosion problems.

3 Small flow from outfall that is mostly clear and odorless. If the flow does have faint color and/or faint odor, the amount of flow is very small compared to the stream's base flow and any downstream impacts, including erosion problems, appear to be minor and localized. Staining may be present in the outfall.

4 Small to medium flow from the outfall with an odor that is easily detected upon inspection and/or water collected in a sample bottle clearly has a color. Downstream impacts, including erosion problems, appear to be intermediate in severity. Staining may be present in the outfall and immediately downstream.

5 Heavy flow from the outfall with a distinct color and/or strong odor that are noticeable at the outfall from a distance. The amount of flow is significant compared to the stream's base flow and any downstream impacts, including erosion problems, appear to be significant in severity. Staining likely present in the outfall and for a distance downstream.

Location Description and Directions (Detail if open channel OR major closed pipe):

_____

_____

_____

_____

Note: "Major" is defined as ≥ 36" in diameter unless draining from an industrial area then > 12" in diameter.

Notes or Comments:

_____

_____

_____