Inspection of Stormwater Infrastructure in South Park Neighborhood, Houston

Summary for Community Partners

January 16, 2018

This summary describes the condition of stormwater infrastructure in two locations in the South Park neighborhood in Houston, Texas. The inspection was carried out on 28 sample units (Figure 1). Each sample unit consisted of approximately 100-ft long street segment and included drainage features within the right-of-way lines. The field inspection was performed in three ways: citizen scientists (10 students from Jones Futures Academy High School in Houston, Texas), trained inspectors (Texas A&M civil engineering graduate students), and measurements taken by a mobile light detection and ranging (LiDAR) unit.

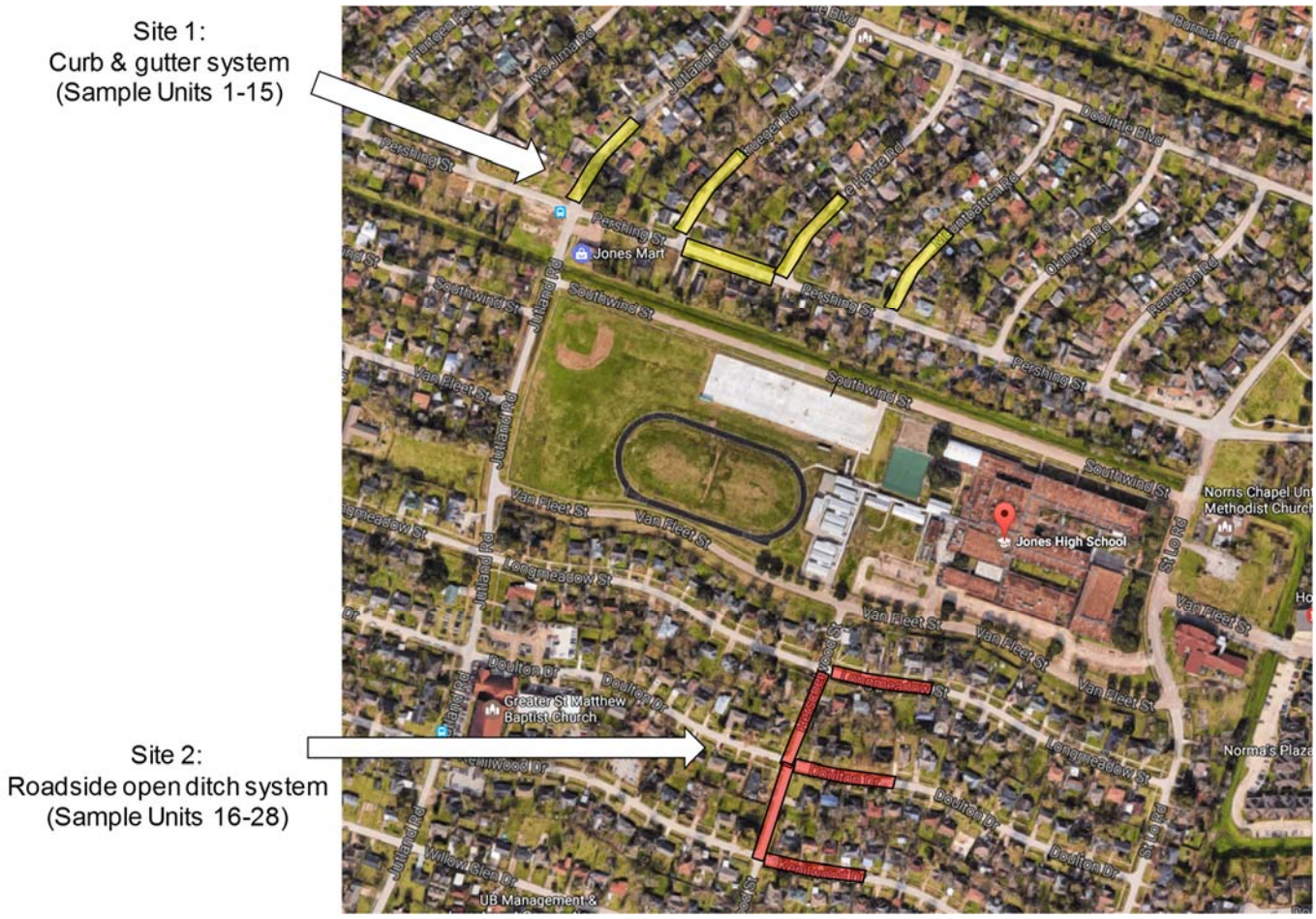

Figure 1: Sites of Inspected Sample Units.

For each sample unit, each asset type (e.g., culverts, drain inlets, etc.) was inspected against a set of performance standards (Table 1).

Table 1: Performance Standards and Effects

Stormwater Element	PS No.	Performance Standard (PS)	Performance Effect
Ditches and Front Slopes	1	Ditches are almost completely unobstructed (at least 90% free of blockage and sediment buildup).	Water flow
	2	Ditches and front slopes have no washouts or ruts greater than 6 inch deep.	Erosion
	3	Ditches are free of standing water	Health
	4	For grass-lined or unimproved ditches, side slopes are not steeper than three horizontal to one vertical (3:1).*	Erosion and Safety
	5	Ditch grade (longitudinal slope) is at least 0.1-foot per 100 feet.*	Water flow
	6	Ditch depth is between 2.5 feet and 4 feet from adjacent edge of pavement.*	Flood and Safety
	7	Ditch bottom is at least 2 feet wide.*	Water flow
Curb and Gutter	8	No obstructions (including vegetation) in gutter that exceed 2 inches in depth for more than one foot (continuous).	Water flow
	9	No washouts or ruts along the curb that are deeper 6 inches.	Erosion and Physical damage
	10	Gutter grade (longitudinal slope) is at least 0.3-foot per 100 feet.*	Water flow
	11	Curb height is at least 4 inches.*	Water flow
Sidewalks and wheelchair ramps	12	Free of depressions, bumps, and potholes that can lead to ponding of water.	Physical damage
Pavement	13	For pavement without curb, edge of pavement is free of open cracks & shoulders (if present) are free of washouts.	Physical damage and Erosion
	14	Roadway pavement is free of depressions and potholes that can lead to ponding of water.	Physical damage
	15	Pavement slope to the side (cross slope) is at least 2-feet per 100 feet.*	Flood
Pipes & Culverts	16	Pipes/culverts openings are at least 90% free of blockage and sediment buildup.	Water flow
	17	Installed grates are unbroken and in place.	Erosion
	18	No dip or damage in road over a cross pipe.	Physical damage
	19	No eroded area at the inlet or outlet that is 1.5 times wider or longer than the pipe opening.	Erosion
	20	Pipes/culverts are covered with at least one foot of soil backfill from top of the pipe (excluding pavement).*	Flood and Physical Damage
Drain Inlets	21	Installed grates are unbroken and in place.	Erosion
	22	Inlet openings are almost completely unobstructed (at least 90% unobstructed).	Water flow

* Indicates performance standard was evaluated using LiDAR only.

LiDAR Data: Out of 300 cross-sections generated for each sample unit, 30 cross-sections were randomly selected and evaluated after filtering out cross-sections that were unsuitable (e.g., blockage by passing or parking vehicles). Figures 2 and 3 show typical cross-sections for streets with curbs, and streets with open ditches respectively.

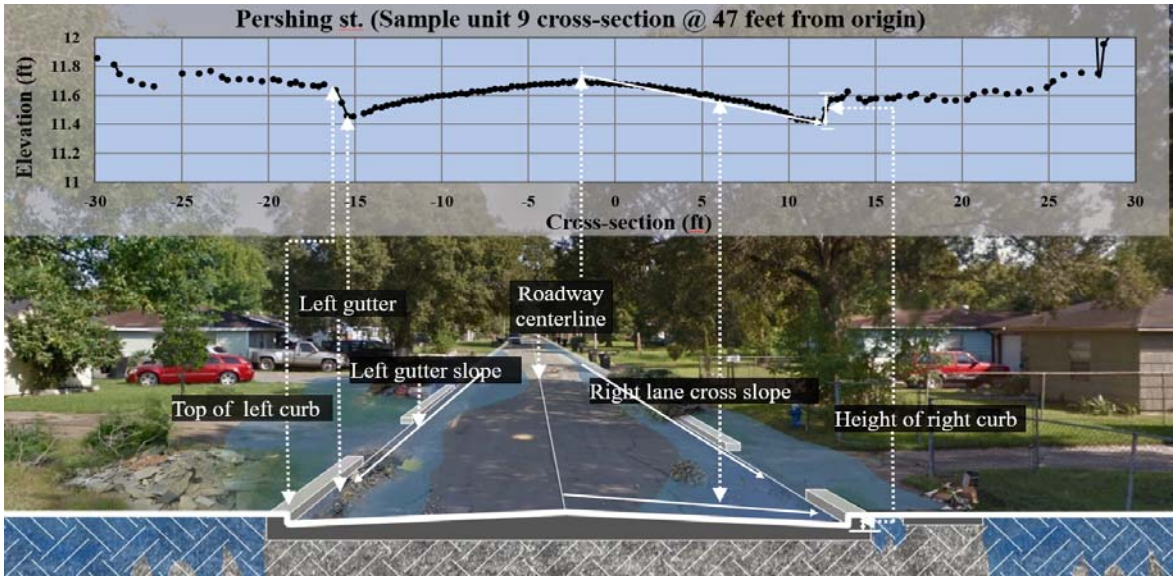

Figure 2: LiDAR Evaluation of sample units with curbs

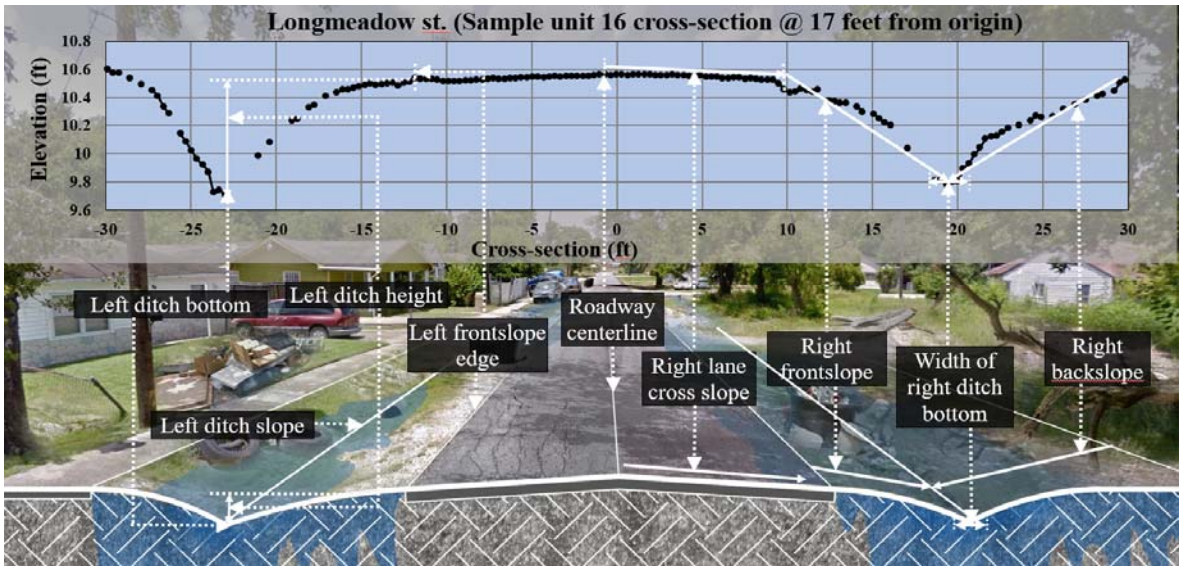

Figure 3: LiDAR Evaluation of sample units with open ditches

For PS No. 5, 7, 8, 12 and 16, ratings of pass or fail were assigned to each applicable performance standard based on majority of either pass or fail for the 30 cross-sections generated from the LiDAR data. Videos collected by the LiDAR unit were used to evaluate other performance standards.

Condition Ratings

For each sample unit, a 0-100 sample unit score (SUS) was computed as the ratio of the number of passing performance standards to the number of applicable performance standards, with 100 representing full compliance with the performance standards. SUSs obtained from the citizen scientists, trained inspectors, and LiDAR unit are shown in Figure 4. These scores show that most of the sample units failed more than half of the performance standards. The performance aspects of most failed performance standards are related to poor water flow issues and physical damage to drainage assets.

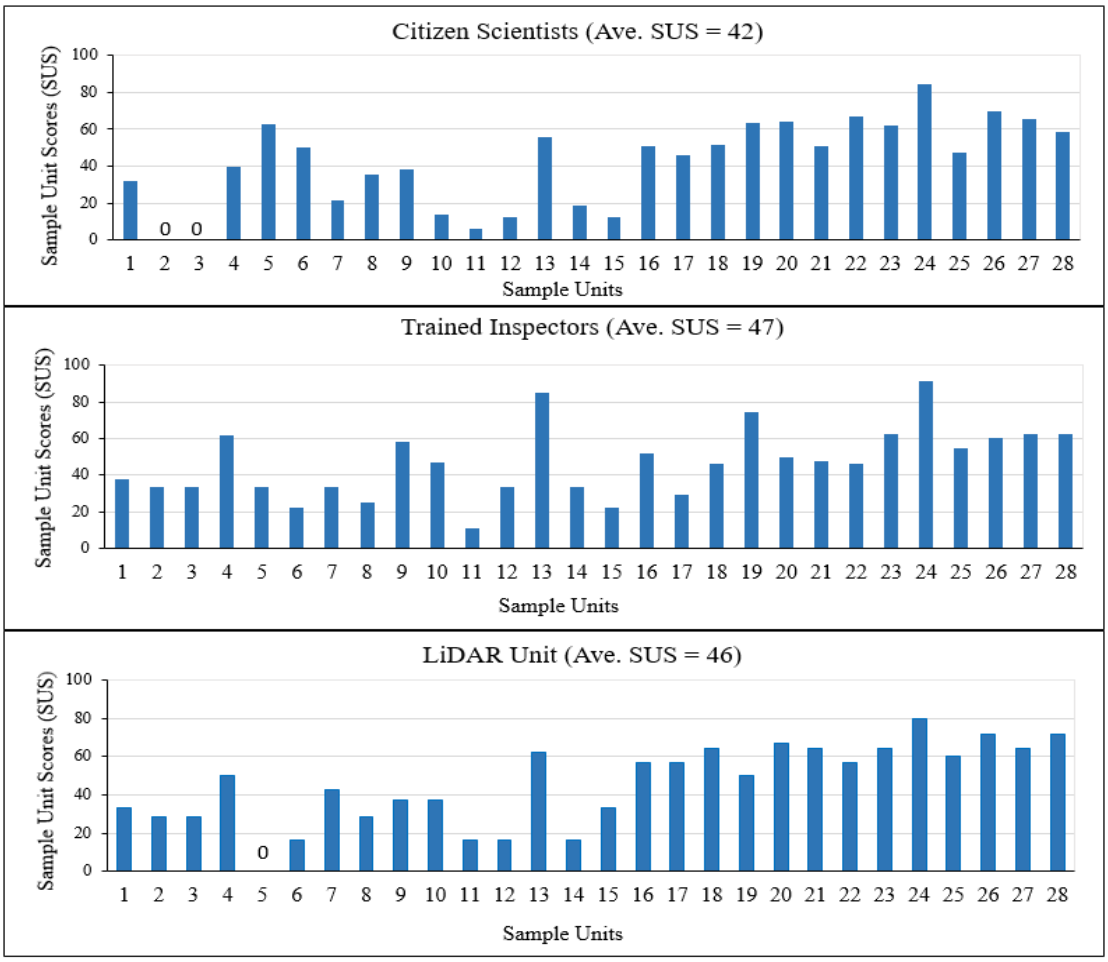

Figure 4: Computed Sample Unit Scores for South Park Neighborhood

Acknowledgement

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